



CITY OF KIRKLAND
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MEMORANDUM

To: Planning Commission

From: Deb Powers, Urban Forester
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Date: June 28, 2018

Subject: Introduction to Code Amendments for Kirkland Zoning Code Chapter 95, Tree Management and Required Landscaping
File Number CAM18-00408

Staff Recommendation

This is an opportunity for the Planning Commission to learn more about the citywide tree codes and related urban forestry issues in advance of working on the Kirkland Zoning Code (KZC) Chapter 95 amendments. Staff encourages the Planning Commission to ask questions related to the tree code update.

Background

Balancing growth and development while maintaining a [livable community](#) is a primary reason for establishing codes for tree protection. Periodic code updates allow an opportunity to review code effectiveness, and ensure the codes remain relevant, are consistent with best available science and align with the community's vision. This memo will provide a brief history of KZC Chapter 95, introduce principles and practices that form the basis of tree codes, and describe how the current code works. With that background, a project outline including timeline, preliminary scope of code changes, and public outreach strategy, will be presented to the Planning Commission on July 12, 2018 for direction on the project going forward.

History of Kirkland's Tree Code

In 2002, during a time of significant land development, extensive tree removal was an issue of increasing concern to Kirkland residents. At that time, numerous research findings pointed to the environmental, social and human health benefits of urban forests or "[nearby nature](#)" in cities. In response, the City Council adopted a series of interim ordinances: with new single family home development, all "perimeter" trees (within 10 feet of the property lines) were required to be retained, but tree removal was allowed for the construction of structures, access, utilities, etc. With subdivisions, 25 percent of the existing trees on site had to be retained, regardless of their condition. Property owners that wanted to remove trees (where no development was involved) were limited to removing two trees per year.

In 2006, the City adopted its first comprehensive tree code in Chapter 95 of the Kirkland Zoning Code, "Tree Management and Required Landscaping" (Attachment 1 – current code to date). A summary chart of the regulations is included as Attachment 2. The initial development of the code spanned a number of years and involved the general public and the development community. In 2010, a number of minor and moderate amendments were made, mainly to clarify aspects of the code. At that time, the Council decided to not pursue major updates to tree retention requirements associated with development.

The 2011 annexation of the Finn Hill Neighborhood involved adopting a King County overlay code into the Kirkland Zoning Code. Known as the Holmes Point Overlay (HPO), it became Kirkland Zoning Code Chapter 70. The code applies to a sub-neighborhood area and as a reflection of the community's desire to retain its woodland character, is generally more restrictive than the citywide tree code. The HPO code is currently undergoing a separate amendment process that may result in a few minor changes to the citywide tree codes that are applicable in the HPO only. Attachment 3 is an overview of the differences between the existing and proposed codes.

Vancouver WA, Olympia and Kirkland were the first 3 cities in the Pacific Northwest to adopt comprehensive tree codes. Although municipal tree codes vary due to each community's unique vision, most neighboring cities (Woodinville, Kenmore, Issaquah, etc.) have adopted tree codes based on the region's earliest model. Some cities have conducted one or two code revisions to reflect changing community views, address issues with code use, or to adjust the requirements in response to canopy cover gains or loss.

What is Canopy Cover?

Put simply, tree canopy cover is the outline of leaf surface seen from above. It is typically expressed in acreage or by percentage in relation to other land cover such as impervious surfaces or land use such as zoning. Information from canopy assessments is used to

- Establish canopy goals
- Prioritize locations for tree planting efforts
- Establish master plans
- Inform code development or updates

When overlaid with other mapping data (census data for example), canopy data can inform social, economic, and ecological policies ranging from stormwater management, [environmental equity](#) and public health issues. It's important to note what canopy cover is not. It does not provide a "boots-on-the-ground" detailed level of information. For example, canopy cover data does not inventory tree species or health/condition. It is a 2-dimensional *quantitative* value.

This short [video](#) provides a brief overview of canopy cover: what it is and what it's used for. A basic understanding of tree canopy cover is needed to make decisions on whether the City should change its code requirement methodology to a canopy-based system or to make adjustments to code requirements. How the data is collected is relevant to either.

Canopy data is typically obtained using three common methods. See Attachment 4 for a comparison summary, noting that Kirkland utilized the third method, High Resolution Imagery for its 2002, 2010 and 2018 canopy studies (as a clarification, the [Kirkland 2011 Urban Tree Canopy Report](#) was based on 2010 imagery). Some key differences between canopy data-

collecting methods are the range in cost, accuracy and the level of complexity involved. The Planning Commission will have an opportunity to discuss tree canopy cover in greater detail at the June 28, 2018 Study Session, particularly in regards to using canopy cover as a tree code requirement metric. The canopy data information presented herein will facilitate that and future discussions.

With the HPO code revision process, the Finn Hill Neighborhood Alliance (FHNA) has suggested that the City use the first method ("iTree") to analyze canopy cover data on a lot-by-lot basis rather than use the City's current tree density credit system to guide tree protection efforts. As shown in Attachment 4, the iTree method of obtaining tree canopy data is more suitable for quick estimations over very large areas. The level of accuracy and imagery quality are not appropriate for parcel-sized analysis, which is evident with online [iTree Canopy](#) tool use.

As explained at the May 24, 2018 Planning Commission meeting, the second method using "fly-over" ortho-photography imagery, currently employed by the City of Lake Forest Park, can be problematic when used as a basis for code requirements due to the subjective nature and experience level when each user (homeowner, developer, permit applicant, staff, etc.) delineates canopy cover. For example, it's fairly common for shrubs, meadow grass and sometimes turf to be accidentally included as canopy cover, skewing the canopy data. If the canopy data derived from ortho-flyovers is the basis for retention/replanting requirements, an acceptable margin of error needs be defined so that the requirements can be applied in a fair and consistent manner, enforced and in some cases, appealed.

Information on the City's current metric for tree retention and replanting, "tree density credits" is provided in this memo under the 'KZC 95 Overview' section in anticipation of a comparative discussion at the June 28, 2018 Planning Commission meeting. The policy direction and guiding document section below and the following description of how the City's tree codes work are a primer to that discussion.

Benefits of Trees and Policy Direction

The City's [Urban Forest Strategic Management Plan](#) ((UFSMP) Appendix A, page 63) is a good tool to use in evaluating potential changes or different approaches to urban forest management. In regards to canopy cover, Kirkland's 'Optimal Performance' status (UFSMP Section 5, page 42) suggests that although canopy cover is an important criteria, the City may want to shift its resources to urban forestry criteria where lower performance or an absence of data is indicated, such as looking at opportunities for improving public tree care and instituting tree planting programs for low-canopy cover locations.

These performance indicators provided guidance for the most recent Comprehensive Plan update, expanding Policy E-2.1 to include "...strive to achieve a healthy, resilient urban forest," marking a shift from focusing on canopy goals – a measure of quantity – to urban forest quality to ensure long-term sustainability and maximum public benefits of trees, the regulatory basis for tree codes.

KZC 95 Overview

Following the policy direction established in the Comprehensive Plan, the citywide tree code, Chapter 95 of the Kirkland Zoning Code (KZC), "Tree Management and Required Landscaping" (Attachment 1) establishes a permit process and standards for the protection and replacement of trees primarily on private property. The regulations address tree management in three basic categories: tree removal where no development is involved, tree retention associated with development activity, and required landscaping, which typically applies to commercial and multifamily development. Attachment 2 summarizes Kirkland's tree code.

Regarding tree removal, the following sections address tree management for non-development and development situations and provide scenarios to illustrate how the code is administered. A few basic definitions are in order when discussing tree removal.

Definitions

Significant Tree – A tree that is at least six (6) inches in diameter at breast height (DBH) as measured at 4.5 feet from the ground.

Hazard Tree – A tree that meets the following criteria:

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

Nuisance Tree – A tree that meets either of the following criteria:

- a. Is causing obvious physical damage to private or public structures, including but not limited to: sidewalk, curb, road, driveway, parking lot, building foundation, or roof; or
- b. Has sustained damage from past maintenance practices. The problems associated with the tree must be such that they cannot be corrected by reasonable practices including but not limited to: pruning of the crown or roots of the tree, bracing, and/or cabling to reconstruct a healthy crown.

Tree Removal Not Associated With Development

- a. Tree Removal Notifications

The majority of tree removal not associated with development is exempt from a permit requirement. Exempt from permit requirements are cases where the owner of a developed property wants to remove one or two trees within a 12-month period, there is no pending development application, and the following conditions are met:

- At least two significant trees remain
- The property is not covered by the tree retention agreement required for new development (new residence built within the last five years)
- The trees are not in a Native Growth Protection Easement (NGPE)
- The trees are not in a critical area of its buffer (i.e., streams, steep slopes, and wetlands)
- There are not subdivision restrictions listed on the deed or plat map
- The property is not subject to shoreline vegetation requirement

- The property is not within the Holmes Point Overlay (HPO)

Although this type of tree removal does not require a permit, the City makes available a tree removal notification form that enables property owners and tree removal companies to verify code compliance and document the activity in advance of the actual removal. Of the 680 tree removals reviewed by the City in 2016, 531 were tree removal notifications. Tree removal notification requests are free of charge.

The real-life example shown in Figure 1 below is a property that has no critical areas and is not located within the Holmes Point Overlay. After researching the property data in Energov (the City's internal permit tracking system), it was also determined that the property had no conditions that would require a permit. The owner was eligible to remove two trees from the property and submitted a Tree Removal Notification Form that was approved.

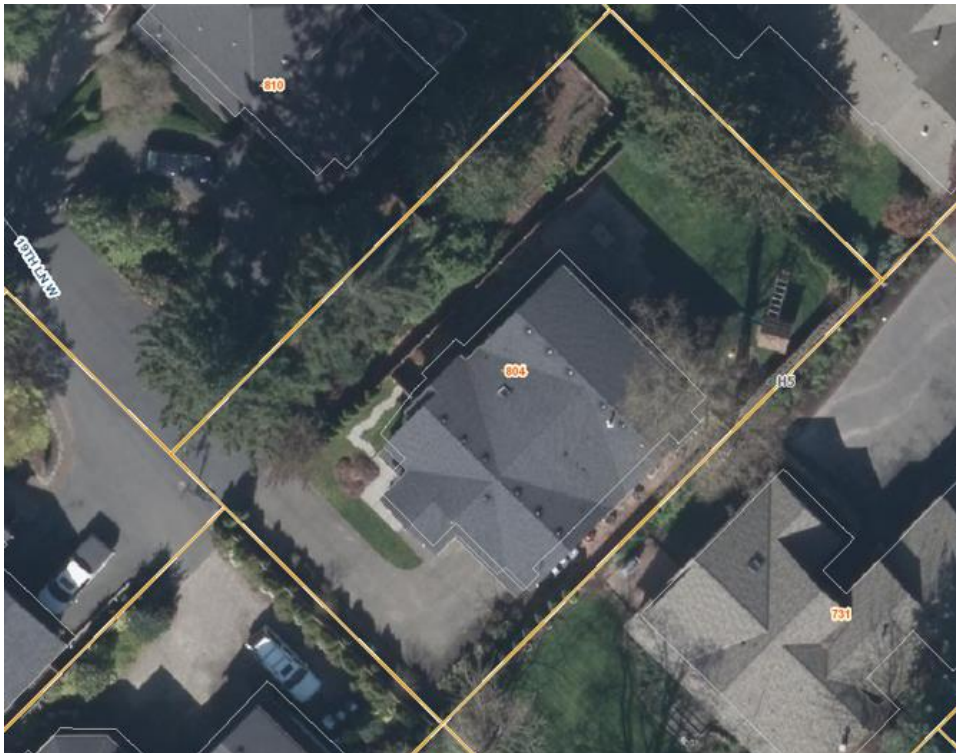


Figure 1 – GIS snapshot of a property with no conditions. Removal of two trees was allowed and owner submitted Tree Removal Notification Form

b. Tree Removal Permits

Tree removal or pruning requests (not associated with development) that are not exempt from a permit as discussed above must be approved by the City prior to proceeding. These permits fall into the following two categories:

- Tree Removal Permit for removal of more than two trees or for removal that does not meet the conditions noted above (for example, in a critical area buffer, in the HPO). While an arborist report is generally required with this permit, an applicant may instead submit photos for trees with obvious defects or for trees

causing obvious damage to property. Arborist reports must be done by a qualified professional. A permit fee of \$211 is required.

- Public Tree Removal & Pruning Permit Application for either the pruning or removal of street (public) trees. Removal of public trees requires an arborist report by a qualified professional (see the description of qualified professional below). A permit fee of \$211 is required for processing a public tree removal request. Unlike tree removal permits on private property, tree permits for right-of-way trees are reviewed by the Public Works Street Division. Pruning requests have no fees, but an ISA (International Society of Arboriculture) Certified Arborist is required to prune public trees to the ANSI A300 Standard.

A recent example is a property located within the Holmes Point Overlay that includes both private and public tree removal permitting (Figure 2). The property owner requested removal of a total of seven trees, four of which were on private property and two in the adjacent right-of-way (ROW) along NE 116th Street. Two separate permit applications were submitted: a Tree Removal Permit Application and a Public Tree Removal & Pruning Permit Application. Each permit was accompanied by an arborist report completed by a qualified professional. The Development Review Arborist performed a site visit and peer review of the arborist report for private property trees for compliance with the Kirkland Zoning Code.

Three of the trees met the City's hazard tree definition and so removal was approved. The fourth tree did not meet the hazard tree definition and was not approved for removal. A Planning Official Decision Letter was sent to the applicant that outlined this information and replanting requirements. The Public Tree Removal & Pruning Permit Application was routed to the Public Works Arborist for review and approval. Public Works crews removed two of the right-of-way trees as hazard trees.



Figure 2 - GIS snapshot of a property located in the Holmes Point Overlay where the property owner requested removal of seven trees, including private and public trees

Tree Removal Associated With Development

To understand how staff approaches administration of the KZC relative to trees, it is important to understand that Kirkland has a tree retention-based code, and not a tree replacement-based code. The purpose and intent of Chapter 95 focuses on the retention and maintenance of healthy trees and vegetation as the basis of development review. The Code uses a tree credit system to assess the collective existing trees on site by trunk size and to establish a minimum replanting standard for all single family residential development sites. The following section breaks down tree retention review associated with the two most prominent development types in Kirkland: infill development, where an existing residence is demolished and replaced; and land division, whereby exiting lots are divided into multiple lots through a short plat or subdivision.

To begin dissecting the complexity of the assessment of sometimes large numbers of trees on a site proposed for development, Planning staff follows four general steps: 1) assess the trees, 2) classify the trees, 3) establish a retention plan, and 4) protect the trees during development. Each of these four phases of the review and construction process are multifaceted and involve many stakeholders. Administration has evolved over the years through staff training, consensus building, and implementation. Staff regularly meet to discuss best practices, issues, and make sure we are consistently applying the code.

Assess the trees

All development permits require certain information be included with an application related to the existing onsite and offsite trees. This information is obtained through a Tree Plan, which is comprised of reports, surveys, and plans identifying and illustrating the health, location, and protection measures for each tree on the subject property, as well as trees located offsite that may be impacted by the proposed development activity (see section 95.30, Attachment 1). These materials, including an arborist report prepared by a qualified professional, are evaluated by the City's Development Review Arborist, and encompasses performing a site visit and peer review of the applicant's submittal materials. Incomplete or inadequate information requires correction through the permit review process.

Classify the trees

With the completion of the peer review, the Development Review Arborist will provide an initial classification of the trees and collaborate with the assigned Planner on confirming the retention requirements for the proposal. All trees are evaluated and placed into three separate categories, based on a retention value. The retention values are located in the definitions of Chapter 95 KZC (see Attachment 1). This breakdown of the tree inventory, simply put, inventories all trees based on health and location and places them into the following categories: High, Moderate, and Low Retention Value Trees.

Retention Values: What are they?

Trees are classified into three retention categories. Moderate Retention Value trees are healthy trees located within an area of a lot that is allowed to support buildings or associated structures and improvements (e.g., residence, driveways, patios). These trees are required to be retained "if feasible." Low Retention Value trees are unhealthy trees or trees located in an area where removal is unavoidable due to anticipated development impacts. High Retention Value trees are those viable and healthy trees located in tree groves, required setback yards, required

landscape areas, sloped areas, and environmentally sensitive areas (see KZC section 95.10, Attachment 1). These trees are required to be retained "if possible." For brevity, this memo focuses on High Retention Value trees, as these are the trees most often part of debate or disagreement among various interests. The Code provides staff significant leverage to require the retention of High Retention Value trees (95.32 KZC).

Tree Retention Plan

The next step in the process is perhaps the most complicated, as it relates to the establishment of which trees will be designated for retention and which trees may be removed. Based on the classification status of a tree, the Planner must make a determination as to the feasibility of retention, while still allowing the property to develop. Staff rely on our Development Review Arborist to assist in finding the most beneficial tree retention plan for the project. The plan must benefit the maintenance of the existing trees on site while acknowledging the development rights of the property owner.

Tree Protection

The final phase of the review process is closely related to the retention plan phase, and seeks to determine the best and most reasonable level of protection for those trees required to be retained. Protection during development requires six foot tall chain link fencing with notification signage (see Attachment 7 for fencing detail). The location of protection measures is initially proposed by the applicant and confirmed or revised as required by the Development Review Arborist. The fencing location is required to be shown on the site plan and is inspected by the Planner prior to permit issuance. Protection fencing is required to be installed and maintained in place throughout the development of the project. The fencing is intended to clearly delineate where grading, digging, construction, and similar activities shall not occur, in order to maintain the pre-development health and viability of the tree(s).

Development Complexities

The development or redevelopment of a property in Kirkland must be designed and proposed to satisfy many of variables and code requirements, all coming together to provide for safe and livable community. The "perfect world" scenario for Planners conducting permit review is a development project planned around its specific site conditions. This is the standard recommendation that staff provide from the genesis of a project, where the applicant is reminded to consider existing trees as well as the following conditions:

- Access: location/configuration
- Storm water drainage requirements
- Utilities (water, sewer, etc.)
- Neighboring trees
- Topography
- General design concepts

Unfortunately, more often than not, the individual home design has already been chosen, and tree retention is an afterthought. The regulations provide incentives and variations to development standards (KZC section 95.32) to protect trees, but these tools don't provide significant motivation to save trees on the margins of a developable area.

Infill Development

The removal and replacement of a residence often provides some of the greatest challenges for tree retention. Typically, pre-existing residential properties contain mature trees located around the perimeter of a smaller home footprint. Infill development consistently replaces a smaller footprint with a home built to the maximum code allowances, including floor area ratio, lot

coverage, and setbacks. The development impacts of homes running up against the maximum development standards leave limited room on an infill site to accommodate tree retention. Attachment 8 provides a before and after example of an infill development.

Land Division

The division of land can follow two review paths relative to Tree Plan criteria in KZC 95: the preferred Integrated Development Plan (IDP) process, or the Phased Review process. The IDP option places all the tree review up front in the planning and design of the short plat or subdivision. The phased review follows the above mentioned assessment, classification, retention, and protection steps independently at each stage of the development: the short plat review and decision; the demolition permit; the Land Surface Modification permit review; and then at each residential dwelling unit permit review. Both processes have their benefits depending on the site conditions, but the IDP places the emphasis on collaborative design and planning of a project between the applicant and the City.

The division of land provides for some of the more dramatic changes to our communities relative to tree and canopy retention or loss. The process of dividing one parcel into multiple, is accompanied by requirements for access roadways, sewer lines, storm water facilities (vaults), building footprints, and all the associated grading and excavation required to clear for and build these infrastructure improvements. The clearing limits required to install a foundation or a storm water vault require additional clearing and excavation which consistently impact trees onsite.

Staff is often required to engage in negotiation regarding tree retention or removal, balancing the Code, the needs of the applicant and the concerns of adjoining property owners. Contentious issues with developers arise when retention of trees is required due to the tree classification (e.g., High Retention Value) and such retention impacts the applicant's preliminary design for structures and improvements. For example, a developer initially planning to remove trees from the front of a new lot, where a driveway was proposed, would be required to change the house design due to those trees meeting the HRV definition as a grove.

The same scenario results in significant loss of tree canopy when one lot is divided into two. Staff works through the code requirements and will establish a retention plan that provides for reasonable development of proposed lots, which must be considered throughout the development of the site.

Tree Density Credits

Kirkland uses a tree density credit system based on timber stocking level models. The premise is that a unit defined by trunk diameter (DBH), a general indicator of tree size, translates to canopy cover over time. The table in KZC 95.33.1 illustrates how credits are awarded to existing significant trees depending on trunk size:

(Credits per minimum trunk diameter – DBH)

DBH	Tree Credits	DBH	Tree Credits	DBH	Tree Credits
3 – 5"	0.5				
6 – 10"	1	24"	8	38"	15
12"	2	26"	9	40"	16
14"	3	28"	10	42"	17
16"	4	30"	11	44"	18
18"	5	32"	12	46"	19
20"	6	34"	13	48"	20
22"	7	36"	14	50"	21

Other cities using a tree credit system include Issaquah, Medina, Kenmore, Woodinville and Vancouver, WA. The City of Renton found credits too complicated to administer and revised their tree code to a simple 1:1 removal-to-replacement approach. The use of tree credits is prevalent due to

- Ease of data collection regardless of expertise – one needs a measuring tape and a calculator
- Online access to the internet is unnecessary
- There are few discrepancies with trunk size; industry standards apply to multiple-trunked trees or other variations
- Trunk diameter correlates with tree growth and size

An objection to using a tree credit system is that the present day credit requirement is not precisely equivalent to the long-term canopy goal.

Challenges

The City's tree regulations have resulted in the protection and enhancement of Kirkland's urban forest. However, this does present a number of challenges, including the following:

- **Code Construct:** The City's tree regulations were crafted to be responsive to the unique condition of each site and to avoid any substantive diminution of development rights assigned by other allowances of the KZC. Application of these regulations is not like administering precise regulations like a setback (for instance, there's little discretion or subjectivity involved in ascertaining where a 20-foot setback on a given property begins or ends). Rather, depending on the assigned retention value of trees, the tree regulations contain requirements such as: "applicant is encouraged to retain viable trees," "retain and protect trees with a high retention value to the maximum extent possible," and "retain and protect trees with a moderate retention value if feasible." The lack of prescription is intentional and typical of tree protection regulations because conditions vary on every site. However, it does set up a process where tree retention can turn into a lengthy negotiation about what exactly is possible or feasible.

- **Resources:** Of all the individual development regulations administered by Planning staff (setbacks, building height, FAR, lot coverage), tree regulations are the most time consuming – from plan review to final inspection. Adequate resources have been provided for staff to administer the requirements, with the exception of shortcomings in the inspection process discussed below. Policy and code revisions, conducting education and outreach, and oversight for projects such as Kirkland's next tree canopy assessment present resource challenges as well, which speaks to the desire to simplify and clarify the City's tree regulations and make them more understandable and predictable to homeowners and the development community.
- **Perception:** Trees tend to be a polarizing issue in the development process and tree removal associated with development tends to be a lightning rod for community angst about development and change. The process of regulating which trees must be saved with a permit can be contentious with a developer while the process of explaining to a neighbor why certain trees were removed can be similarly contentious. As illustrated in the examples provided above, these decisions are based on complex regulations applied to the unique conditions of each development site.
- **Neighboring Trees:** To a large extent, the tree regulations do not pertain to properties directly adjacent to a development project. This intentionally sidesteps the difficult legal issues around property rights between neighbors. The bottom line is that alleged damage to neighboring trees are addressed as a civil issue between property owners. When issues arise, the City often refers complainants to Bellevue Mediation for assistance.
- **"Leveraging" the 2 Per Year Allowance:** As discussed above, a property owner is generally entitled to remove one or two trees per year provided there are not pending development permits for the property. Developers will commonly exercise this right (or have the seller exercise this right) immediately prior to submitting a development permit application.
- **Inspection and Enforcement:** Given the current volume of construction across the City, there has been criticism that the City's inspection and enforcement of tree protection during development is not as robust as it should be. Inspection and enforcement of tree protection occurs at three stages in the development process: prior to permit issuance, during construction, and at final inspection. The greatest gap in inspection and enforcement of tree protection is during the construction process, largely due to the long intervals between scheduled City inspections at defined stages of the development process. This proactive enforcement of tree violations during construction differs from the City's current reliance on complaints to identify violations of which the City is not aware. The Planning and Building Department is exploring the possibility of formulating a service package for temporary assistance to improve inspection and enforcement capabilities and ensure that trees intended for protection are not negligently damaged or destroyed during construction.

As part of the work on the Holmes Point Overlay regulations, staff will also be recommending City-wide improvement to construction fencing and sign requirements and more significant penalties for violations.

Project Description

The adopted 2018-20 Planning Work Program description of the Chapter 95 update is:

The City's tree canopy continues to be a primary place-making feature of Kirkland, but concern has been expressed that certain development processes do not allow for holistic consideration of tree protection at an early stage in the site/project review process. This task will evaluate whether an Integrated Review process (during which site subdivision, grading, infrastructure, and development are reviewed together) would be appropriate for projects throughout the City in order to better protect the City's tree canopy while providing more certainty for the development community. Other amendments to the tree regulations will also be undertaken.

At the July 12, 2018 Planning Commission meeting, staff will present potential code amendments that have been compiled to date, including any that have arisen from the Holmes Point Overlay code revision process. A preliminary scope, timeline and public outreach strategy will be presented at that time for Planning Commission direction going forward.

Attachments:

1. KZC Chapter 95 (June, 2018)
2. Tree Code Summary Chart
3. HPO-KZC 95 Code Comparison Chart
4. Tree Canopy Data Collection Methods

cc: File Number CAM18-00408

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95.05 Purpose and Intent

1. Trees and other vegetation are important elements of the physical environment. They are integral to Kirkland's community character and protect public health, safety and general welfare. Protecting, enhancing, and maintaining healthy trees and vegetation are key community values. Comprehensive Plan Policy NE-3.1 describes working towards achieving a City-wide tree canopy coverage of 40 percent. The many benefits of healthy trees and vegetation contribute to Kirkland's quality of life by:

- a. Minimizing the adverse impacts of land disturbing activities and impervious surfaces such as runoff, soil erosion, land instability, sedimentation and pollution of waterways, thus reducing the public and private costs for storm water control/treatment and utility maintenance;
- b. Improving the air quality by absorbing air pollutants, mitigating the urban heat island effect, assimilating carbon dioxide and generating oxygen, and decreasing the impacts of climate change;
- c. Reducing the effects of excessive noise pollution;
- d. Providing cost-effective protection from severe weather conditions with cooling effects in the summer months and insulating effects in winter;
- e. Providing visual relief and screening buffers;

- f. Providing recreational benefits;
- g. Providing habitat, cover, food supply and corridors for a diversity of fish and wildlife; and
- h. Providing economic benefit by enhancing local property values and contributing to the region's natural beauty, aesthetic character, and livability of the community.

2. Tree and vegetation removal in urban areas has resulted in the loss to the public of these beneficial functions. The purpose of this chapter is to establish a process and standards to provide for the protection, preservation, replacement, proper maintenance, and use of significant trees, associated vegetation, and woodlands located in the City of Kirkland.

The intent of this chapter is to:

- a. Maintain and enhance canopy coverage provided by trees for their functions as identified in KZC 95.05(1);
- b. Preserve and enhance the City of Kirkland's environmental, economic, and community character with mature landscapes;
- c. Promote site planning, building, and development practices that work to avoid removal or destruction of trees and vegetation, that avoid unnecessary disturbance to the City's natural vegetation, and that provide landscaping to buffer the effects of built and paved areas;
- d. Mitigate the consequences of required tree removal in land development through on- and off-site tree replacement with the goals of halting net loss and enhancing Kirkland's tree canopy to achieve an overall healthy tree canopy cover of 40 percent City-wide over time;
- e. Encourage tree retention efforts by providing flexibility with respect to certain other development requirements;
- f. Implement the goals and objectives of the City's Comprehensive Plan;
- g. Implement the goals and objectives of the State Environmental Policy Act (SEPA); and
- h. Manage trees and other vegetation in a manner consistent with the City's Natural Resource Management Plan.
- i. Preserve and protect street trees, trees in public parks and trees on other City property.

(Ord. 4238 § 2, 2010; Ord. 4010 § 2, 2005)

95.10 Definitions

The following definitions shall apply throughout this chapter unless the context clearly indicates otherwise. Definitions that apply throughout this code are also located in Chapter 5 KZC.

1. Caliper – The American Association of Nurserymen standard for trunk measurement of nursery stock. Caliper of the trunk shall be the trunk diameter measured six (6) inches above the ground for up to and including 4-inch caliper size and 12 inches above the ground for larger sizes.
2. Critical Root Zone – The area surrounding a tree at a distance from the trunk, which is equal to one (1) foot for every inch of trunk diameter measured at 4.5 feet from grade or otherwise determined by a qualified professional (example: one (1) foot radius per one (1) inch DBH).
3. Crown – The area of a tree containing leaf- or needle-bearing branches.
4. Diameter at Breast Height (DBH) – The diameter or thickness of a tree trunk measured at 4.5 feet from the ground. DBH is also known as Diameter at Standard Height (DSH).

5. Dripline – The distance from the tree trunk, that is equal to the furthest extent of the tree’s crown.
6. Grove – A group of three (3) or more significant trees with overlapping or touching crowns.
7. Hazard Tree – A tree that meets all the following criteria:
 - a. A tree with a combination of structural defects and/or disease which makes it subject to a high probability of failure;
 - b. Is in proximity to moderate to high frequency targets (persons or property that can be damaged by tree failure); and
 - c. The hazard condition of the tree cannot be lessened with reasonable and proper arboricultural practices nor can the target be removed.
8. Impact – A condition or activity that affects a part of a tree including the trunk, branches, and critical root zone.
9. Limit of Disturbance – The boundary between the protected area around a tree and the allowable site disturbance as determined by a qualified professional measured in feet from the trunk.
10. Nuisance Tree – A tree that meets either of the following criteria:
 - a. Is causing obvious physical damage to private or public structures, including but not limited to: sidewalk, curb, road, driveway, parking lot, building foundation, or roof; or
 - b. Has sustained damage from past maintenance practices.

The problems associated with the tree must be such that they cannot be corrected by reasonable practices including but not limited to: pruning of the crown or roots of the tree, bracing, and/or cabling to reconstruct a healthy crown.
11. Public Works Official – Designee of the Public Works Director.
12. Qualified Professional – An individual with relevant education and training in arboriculture or urban forestry, having two (2) or more of the following credentials:
 - International Society of Arboriculture (ISA) Certified Arborist;
 - Tree Risk Assessor Certification (TRACE) as established by the Pacific Northwest Chapter of ISA (or equivalent);
 - American Society of Consulting Arborists (ASCA) registered Consulting Arborist;
 - Society of American Foresters (SAF) Certified Forester for Forest Management Plans;

For tree retention associated with a development permit, a qualified professional must have, in addition to the above credentials, a minimum of three (3) years’ experience working directly with the protection of trees during construction and have experience with the likelihood of tree survival after construction. A qualified professional must also be able to prescribe appropriate measures for the preservation of trees during land development.

13. Retention Value – The Planning Official’s designation of a tree based on information provided by a qualified professional that is one (1) of the following:
 - a. High, a viable tree, located within required yards and/or required landscape areas. Tree retention efforts shall be directed to the following trees if they are determined to be healthy and windfirm by a qualified professional, and provided the trees can be safely retained when pursuing alternatives to development standards pursuant to KZC 95.32:

- 1) Specimen trees;
 - 2) Tree groves and associated vegetation that are to be set aside as preserved groves pursuant to KZC 95.51(3);
 - 3) Trees on slopes of at least 10 percent; or
 - 4) Trees that are a part of a grove that extends into adjacent property, such as in a public park, open space, critical area buffer or otherwise preserved group of trees on adjacent private property. If significant trees must be removed in these situations, an adequate buffer of trees may be required to be retained or planted on the edge of the remaining grove to help stabilize;
- b. Moderate, a viable tree that is to be retained if feasible; or
 - c. Low, a tree that is either (1) not viable or (2) is in an area where removal is unavoidable due to the anticipated development activity.
14. Significant Tree – A tree that is at least six (6) inches in diameter at breast height (DBH) as measured at 4.5 feet from the ground.
15. Significantly Wooded Site – A subject property that has a number of significant trees with crowns that cover at least 40 percent of the property.
16. Site Disturbance – Any development, construction, or related operation that could alter the subject property, including, but not limited to, soil compaction, tree or tree stump removal, road, driveway or building construction, installation of utilities, or grading.
17. Specimen Tree – A viable tree that is considered in very good to excellent health and free of major defects, as determined by the City’s Urban Forester.
18. Street Tree – A tree located within the public right-of-way; provided, that if the trunk of the tree straddles the boundary line of the public right-of-way and the abutting property, it shall be considered to be on the abutting property and subject to the provisions of this chapter.
19. Tree Removal – The removal of a tree, through either direct or indirect actions, including but not limited to: (1) clearing, damaging or poisoning resulting in an unhealthy or dead tree; (2) removal of at least half of the live crown; or (3) damage to roots or trunk that is likely to destroy the tree’s structural integrity.
20. Viable Tree – A significant tree that a qualified professional has determined to be in good health, with a low risk of failure due to structural defects, is windfirm if isolated or remains as part of a grove, and is a species that is suitable for its location.
21. Wildlife Snag – The remaining trunk of a tree that is intentionally reduced in height and usually stripped of its live branches.
22. Windfirm – A condition of a tree in which it withstands average peak local wind speeds and gusts.

(Ord. 4551 § 4, 2017; Ord. 4238 § 2, 2010; Ord. 4193 § 1, 2009; Ord. 4010 § 2, 2005)

95.20 Exemptions

The following activities are exempt from the provisions of this chapter:

1. Emergency Tree Removal. Any tree that poses an imminent threat to life or property may be removed. The City must be notified within seven (7) days of the emergency tree removal with evidence of the threat for removing the tree to be considered exempt from this chapter. If the Planning Official determines that the emergency tree removal was not warranted or if the removed tree was required by a development permit, the Planning Official may require that the party obtain a permit and/or require that replacement trees and vegetation be replanted as mitigation.

2. **Utility Maintenance.** Trees may be removed by the City or utility provider in situations involving interruption of services provided by a utility only if pruning cannot solve utility service problems. Utility maintenance shall conform to a City-approved Utility Vegetation Management Plan.

3. **Commercial Nurseries or Tree Farms.** A nursery or tree farm owner may remove trees that are being grown to be sold as Christmas or landscape trees.

(Ord. 4238 § 2, 2010; Ord. 4010 § 2, 2005)

95.21 Tree Pruning

1. **Tree Pruning of Street Trees.** It is the responsibility of the abutting property owner to maintain street trees abutting their property, which may include pruning, watering, and mulching. In order to prune, trim, modify, or alter a street tree, the abutting property owner shall apply for a permit by filing a written application with the City. Pruning shall conform to the most recent version of the American National Standards Institute (ANSI) A300 Part 1 – 2001 pruning standards or as outlined in an approved Utility Vegetation Management Plan. The City reserves the right to have City or utility crews perform routine pruning and maintenance of street trees.

2. **Tree Pruning on Private Property.** A permit is not required to prune trees on private property. Pruning which results in the removal of at least half of the live crown will be considered tree removal and subject to the provisions in KZC 95.23.

Tree topping is not allowed. If a tree required by this chapter is smaller than six (6) inches in diameter and is topped, it must be replaced pursuant to the standards in Chapter 1.12 KMC. If a tree six (6) inches or larger in diameter is topped, the owner must have a qualified professional develop and implement a 5-year restoration pruning program.

(Ord. 4281 § 1, 2011; Ord. 4238 § 2, 2010)

95.23 Tree Removal – Not Associated with Development Activity

1. **Introduction.** Tree and vegetation removal in urban areas has resulted in the loss of beneficial functions provided by trees to the public. The majority of tree canopy within the City of Kirkland is on private property. The purpose of this section is to establish a process and standards to slow the loss of tree canopy on private property, contributing towards the City's canopy goals and a more sustainable urban forest.

2. **Permit Required for Removal of Trees on Private Property or City Right-of-Way.** It is unlawful for any person (other than City crews) to remove, prune, trim, modify, alter or damage a tree in a public park or on any other City property.

No person, directly or indirectly, shall remove any significant tree on any property within the City, or any tree in the public right-of-way, without first obtaining a tree removal permit as provided in this chapter, unless the activity is exempted in KZC 95.20 and subsection (5) of this section.

3. **Tree Removal Permit Application Form.** The Planning and Building Department and Public Works Department shall establish and maintain a tree removal permit application form to allow property owners to request City review of tree removal for compliance with applicable City regulations. The tree removal application form shall include at a minimum the following:

- a. A site plan showing the approximate location of significant trees, their size (DBH) and their species, along with the location of structures, driveways, access ways and easements.
- b. For required replacement trees, a planting plan showing location, size and species of the new trees in accordance to standards set forth in KZC 95.33(3).

4. **Tree Removal Permit Application Procedure and Appeals.**

- a. Applicants requesting to remove trees must submit a completed permit application on a form provided by the City. The City shall review the application within 21 calendar days and either approve, approve with

conditions or modifications, deny the application or request additional information. Any decision to deny the application shall be in writing along with the reasons for the denial and the appeal process.

b. The decision of the Planning Official is appealable using the applicable appeal provisions of Chapter 145 KZC.

c. Time Limit. The removal shall be completed within one (1) year from the date of permit approval.

5. Tree Removal Allowances.

a. Except in the Holmes Point Overlay zone, any private property owner of developed property may remove up to two (2) significant trees from their property within a 12-month period without having to apply for a tree removal permit; provided, that:

- 1) There is no active application for development activity for the site;
- 2) The trees were not required to be retained or planted as a condition of previous development activity; and
- 3) All of the additional standards for tree removal and tree removal permits as described in subsections (5)(b) through (e) of this section are met.

The Planning and Building Department shall establish and maintain a tree removal request form. The form may be used by property owners to request Department review of tree removal for compliance with applicable City regulations.

b. Tree Retention and Replacement Requirements.

- 1) Tree Retention. For single-family homes, cottages, carriage units, two/three-unit homes, two (2) trees shall be required to remain on the subject property.
- 2) Tree Replacement.
 - a) For every significant tree that is removed and is not required to remain based on subsection (5)(b)(1) of this section, the City encourages the planting of a tree that is appropriate to the site.
 - b) If a tree removal request is for one (1) or both of the trees required to remain, a tree removal permit and one-for-one replacement is required. the replacement tree shall be six (6) feet tall for a conifer and 2-inch caliper for deciduous or broad-leaf evergreen tree.
 - c) For all other uses not listed in subsection (5)(b)(1) of this section, a tree removal permit is required and the required tree replacement will be based on the required landscaping standards in KZC 95.40 through 95.45.

c. Shoreline Jurisdiction. Properties located within the City's shoreline jurisdiction are subject to additional tree removal and replacement standards if the tree(s) to be removed are located within the required shoreline setback. See Chapter 83 KZC for additional standards.

d. Removal of Hazard or Nuisance Trees. Any private property owner seeking to remove any number of significant trees which are a hazard or nuisance from developed or undeveloped property or the public right-of-way shall first obtain approval of a tree removal permit and meet the requirements of this subsection.

- 1) Tree Risk Assessment. If the nuisance or hazard condition is not obvious, a tree risk assessment prepared by a qualified professional explaining how the tree(s) meet the definition of a nuisance or hazard tree is required. Removal of nuisance or hazard trees does not count toward the tree removal limit if the nuisance or hazard is supported by a report prepared by a qualified professional and approved by the City.
- 2) Trees in Critical Areas or Critical Areas Buffers. See Chapter 90 KZC.

3) The removal of any tree in the Holmes Point Overlay Zone requires the planting of a native tree of a minimum of six (6) feet in height in close proximity to where the removed tree was located. Selection of native species and timing of installation shall be approved by the Planning Official.

4) Street Trees. Street trees may only be removed if determined to be a hazard or nuisance. If the removal request is for street trees, the Public Works Official may consider whether the tree(s) are now, or may be in the future, part of the City's plans for the right-of-way. The City shall require a one-for-one tree replacement in a suitable location.

e. Forest Management Plan.

1) A Forest Management Plan must be submitted for developed, significantly wooded sites (over 40 percent canopy coverage) of at least 35,000 square feet in size in which removal of more than two (2) trees is requested and is not exempt under KZC 95.20. A Forest Management Plan must be developed by a qualified professional and shall include the following:

- a) A site plan depicting the location of all significant trees (a survey identifying tree locations is not required) with a numbering system of the trees (with corresponding tags on trees in the field). The site plan shall include size (DBH), species, and condition of each tree;
 - b) Identification of trees to be removed, including reasons for their removal and a description of low impact removal techniques pursuant to subsection (5)(e)(2) of this section;
 - c) A reforestation plan that includes location, size, species, and timing of installation;
- 2) The following Forest Management Plan standards shall apply:
- a) Trees to remain should be dominant or co-dominant in the stand, healthy and windfirm.
 - b) No removal of trees from critical areas and their buffers, unless otherwise permitted by this chapter.
 - c) No removal of specimen trees, unless otherwise permitted by this chapter.
 - d) No removal of healthy trees that would cause trees on adjacent properties to become hazardous.
 - e) The reforestation plan ensures perpetuity of the wooded areas. The size of planted trees for reforestation shall be a minimum of three (3) feet tall.
 - f) Logging operations shall be conducted so as to expose the smallest practical area of soil to erosion for the least possible time. To control erosion, native shrubs, ground cover and stumps shall be retained where feasible. Where not feasible, appropriate erosion control measures to be approved by the City shall be implemented.
 - g) Removal of tree debris shall be done pursuant to Kirkland Fire Department standards.
 - h) Recommended maintenance prescription for retained trees with a specific timeline for such management.

(Ord. 4551 § 4, 2017; Ord. 4491 § 3, 2015; Ord. 4437 § 1, 2014; Ord. 4408 § 1, 2013; Ord. 4372 § 1, 2012; Ord. 4238 § 2, 2010)

95.25 Sustainable Site Development

All activities regulated by this chapter shall be performed in compliance with the applicable standards contained in this chapter, unless the applicant demonstrates that alternate measures or procedures will be equal or superior to the provisions of this chapter in accomplishing the purpose and intent of this chapter as described in KZC 95.05.

Applicants requesting alternative compliance shall submit a site assessment report prepared by a qualified professional detailing how the proposed alternative measures will be equal or superior to the benefits provided by the established trees to be removed. Qualifying projects shall implement sustainable site development strategies throughout the construction process as well as contain measurable performance standards for the techniques used. Examples of sustainable site development include building placement with minimal site impact, habitat protection, water conservation, heat island reduction, storm water flow runoff control and water quality, and utilization of the site's natural services such as solar and wind. Requests to use alternative measures and procedures shall be reviewed by the Planning Official, who may approve, approve with conditions, or deny the request.

(Ord. 4238 § 2, 2010; Ord. 4010 § 2, 2005)

95.30 Tree Retention Associated with Development Activity

1. Introduction. The City's objective is to retain as many viable trees as possible on a developing site while still allowing the development proposal to move forward in a timely manner. To that end, the City requires approval of a tree retention plan in conjunction with all development permits resulting in site disturbance and for any tree removal on developed sites not exempted by KZC 95.20. This section includes provisions that allow development standards to be modified in order to retain viable significant trees.

In order to make better decisions about tree retention, particularly during all stages of development, tree retention plans will require specific information about the existing trees before removal is allowed. Specific tree retention plan review standards provided in this section establish tree retention priorities, incentives, and variations to development standards in order to facilitate preservation of viable trees.

A minimum tree density approach is being used to retain as many viable trees as possible with new development activity. The requirement to meet a minimum tree density applies to new single-family homes, cottages, carriage units, two/three-unit homes, and new residential subdivisions and short subdivisions. If such a site falls below the minimum density with existing trees, supplemental planting is required. A tree density for existing trees to be retained is calculated to see if new trees are required in order to meet the minimum density for the entire site. Supplemental tree location priority is set as well as minimum size of supplemental trees to meet the required tree density.

The importance of effective protection of retained trees during construction is emphasized with specific protection standards in the last part of this section. These standards must be adhered to and included on demolition, grading and building plans as necessary.

Properties within jurisdiction of the Shoreline Management Act are subject to additional tree retention and protection regulations as set forth in Chapter 83 KZC.

Properties within the Holmes Point Overlay zone are subject to additional tree retention and protection regulations as set forth in Chapter 70 KZC.

2. Tree Retention Plan Required. An applicant for a development permit must submit a tree retention plan that complies with this section. A qualified professional may be required to prepare certain components of a tree retention plan at the applicant's expense. If proposed development activities call for more than one (1) tree retention plan component, the more stringent tree retention plan component shall apply; provided, that the Planning Official may require a combination of tree plan components based on the nature of the proposed development activities. If the proposed activity is not clearly identified in this chapter, the Planning Official shall determine the appropriate tree retention plan requirements.

The chart in subsection (5) of this section sets forth the tree retention plan requirements for development activities and associated tree removal. Applicants for development are encouraged to confer with City staff as early in the design process as possible so that the applicable tree planting and retention concepts can be incorporated into the design of the subject property. The Planning Official may waive a component of the tree retention plan if the Planning Official determines that the information is not necessary.

3. Tree Retention Plan Review. Any proposed development of the subject property requiring approval through a building permit, land surface modification permit, and/or demolition permit, or Design Review, Process I, IIA or

IIB, described in Chapters 142, 145, 150 and 152 KZC respectively, shall include a tree retention plan to be considered as part of that process.

Based on the tree retention plan information submitted by the applicant and the Planning Official's evaluation of the trees relative to the proposed development on the subject property, the Planning Official shall designate each tree as having a high, moderate, or low retention value as defined in KZC 95.10, Definitions, for application towards the regulations in this chapter.

4. Tree Retention Plan Components. The tree retention plan shall contain the following information as specified in the chart in subsection (5) of this section, unless waived by the Planning Official:

a. A tree inventory containing the following:

- 1) A numbering system of all existing significant trees on the subject property (with corresponding tags on trees); the inventory must also include significant trees on adjacent property with driplines extending over the subject property line;
- 2) Limits of disturbance (LOD) of all existing significant trees (including approximate LOD of off-site trees with overhanging driplines);
- 3) Size (DBH);
- 4) Proposed tree status (trees to be removed or retained);
- 5) Brief general health or condition rating of these trees (i.e.: poor, fair, good, excellent, etc.);
- 6) Tree type or species.

b. A site plan depicting the following:

- 1) Location of all proposed improvements, including building footprint, access, utilities, applicable setbacks, buffers, and required landscaped areas clearly identified. If a short plat or subdivision is being proposed and the location of all proposed improvements cannot be established, a phased tree retention plan review is required as described in subsection (6)(a) of this section;
- 2) Accurate location of significant trees on the subject property (surveyed locations may be required). The site plan must also include the approximate trunk location and critical root zone of significant trees that are on adjacent property with driplines extending over the subject property line;
- 3) Trees labeled corresponding to the tree inventory numbering system;
- 4) Location of tree protection measures;
- 5) Indicate limits of disturbance drawn to scale around all trees potentially impacted by site disturbances resulting from grading, demolition, or construction activities (including approximate LOD of off-site trees with overhanging driplines);
- 6) Proposed tree status (trees to be removed or retained) noted by an 'X' or by ghosting out;
- 7) Proposed locations of any supplemental trees and any required trees in order to meet tree density or minimum number of trees as outlined in KZC 95.33.

c. An arborist report containing the following:

- 1) A complete description of each tree's health, condition, and viability;
- 2) A description of the method(s) used to determine the limits of disturbance (i.e., critical root zone, root plate diameter, or a case-by-case basis description for individual trees);

- 3) Any special instructions specifically outlining any work proposed within the limits of the disturbance protection area (i.e., hand-digging, tunneling, root pruning, any grade changes, clearing, monitoring, and aftercare);
 - 4) For trees not viable for retention, a description of the reason(s) for removal based on poor health, high risk of failure due to structure, defects, unavoidable isolation (windfirmness), or unsuitability of species, etc., and for which no reasonable alternative action is possible must be given (pruning, cabling, etc.);
 - 5) Describe the impact of necessary tree removal to the remaining trees, including those in a grove or on adjacent properties;
 - 6) For development applications, a discussion of timing and installation of tree protection measures that must include fencing and be in accordance with the tree protection standards as outlined in KZC 95.34; and
 - 7) The suggested location and species of supplemental trees to be used when required. The report shall include planting and maintenance specifications pursuant to KZC 95.50 and 95.51.
5. Tree Retention Plan. The applicant shall submit a Tree Retention Plan that includes the components identified in the following chart based on the proposed development activity.

TREE RETENTION PLAN

Development Activity	Minor ⁽¹⁾⁽³⁾ – Single-Family, or two attached, detached, or stacked dwelling units, and related demolition and land surface modification applications	Major ⁽²⁾⁽³⁾ Single-Family, or two attached, detached, or stacked dwelling units, and related demolition and land surface modification applications	Multifamily, Commercial, any other use other than residential, and related demolition and land surface modification applications	Short Plat, Subdivisions, cottages, carriage units, two/three-unit homes, and related demolition and land surface modification applications (see KZC 95.30(6)(a), Phased Review, for additional standards)
Required Components				
TREE INVENTORY AS DESCRIBED IN KZC 95.30(4)(a) FOR:				
All significant trees on the subject property		X	X	X
Significant trees potentially impacted by proposed development activity	X			
SITE PLAN AS DESCRIBED IN KZC 95.30(4)(b) TO INCLUDE:				
Surveyed tree locations if required by the Planning Official		X	X	
Surveyed tree locations				X
A final landscape plan showing retained trees			X	
REQUIREMENTS IN KZC 95.30(4)(c) SHALL BE PREPARED BY A QUALIFIED PROFESSIONAL AND APPLY TO:				
Significant trees within required yards or within 10 feet of any side property line		X		
Significant trees potentially impacted by proposed development activity as determined by the Planning Official			X	
Proposed removal of trees with a high retention value in required landscaping areas			X	
All significant trees				X
TREE RETENTION STANDARDS				

Development Activity	Minor ⁽¹⁾⁽³⁾ – Single-Family, or two attached, detached, or stacked dwelling units, and related demolition and land surface modification applications	Major ⁽²⁾⁽³⁾ Single-Family, or two attached, detached, or stacked dwelling units, and related demolition and land surface modification applications	Multifamily, Commercial, any other use other than residential, and related demolition and land surface modification applications	Short Plat, Subdivisions, cottages, carriage units, two/three-unit homes, and related demolition and land surface modification applications (see KZC 95.30(6)(a), Phased Review, for additional standards)
Required Components				
Applicant is encouraged to retain viable trees	X⁽⁴⁾			
Retain and protect trees with a high retention value to the maximum extent possible		X⁽⁴⁾	X⁽⁴⁾	X⁽⁴⁾
Retain and protect trees with a moderate retention value if feasible		X	X	X
Preservation and maintenance agreements pursuant to KZC 95.51 are required for all remaining trees on the subject property	X	X	X	X⁽⁵⁾
TREE DENSITY				
Tree density requirements shall apply as required in KZC 95.33		X		X
A minimum of two trees must be on the lot following the requirement set forth in KZC 95.33(4)	X			
LANDSCAPING				
Preserved trees in required landscaping areas shall apply toward required landscaping requirements			X	

(1) Applicable when new development, redevelopment, or development in which the total square footage of the proposed improvements is less than 50 percent of the total square footage of the existing improvements on the subject property.

(2) Applicable when new development, redevelopment, or development in which the total square footage of the proposed improvements is more than 50 percent of the total square footage of the existing improvements on the subject property.

(3) For lots created through a short subdivision, subdivision, or planned unit development with an approved Tree Retention Plan, the applicant must comply with the Tree Retention Plan approved with the short subdivision, subdivision, or planned unit development unless subsection (6)(a) of this section, Phased Review, applies.

(4) To retain trees with a high retention value, the applicant shall pursue, where feasible, applicable variations in the development standards of this code as outlined in KZC 95.32.

(5) Prior to short plat or subdivision recording.

6. Additional Tree Retention Plan Standards for Short Plats and Subdivisions.

a. Phased Review.

1) If during the short plat or subdivision review process the location of all proposed improvements, including the building footprint, utilities, and access, was not able to be established, the applicant may submit a Tree Retention Plan that addresses trees only affected by the known improvements at the time of application. Tree removal shall be limited to those affected areas.

2) A new Tree Retention Plan shall be required at each subsequent phase of the project as more information about the location of the proposed improvements is known subject to all of the requirements in this section.

3) Phased review of Tree Retention Plans is not permitted in the Holmes Point Overlay zone. In the HPO zone, subdivision or short plat applications shall provide a comprehensive review of Tree Retention Plans as outlined in subsections (2) through (5) of this section.

b. Modifications to Tree Retention Plan for Short Plats and Subdivisions. A Tree Retention Plan modification request shall contain information as determined by the Planning Official based on the requirements in subsection (5) of this section, Tree Retention Plan. The fee for processing a modification request shall be established by City ordinance.

For Tree Retention Plans approved during the short plat or subdivision review process that established the location of all proposed improvements, including the building footprint, utilities, and access, a modification to the Tree Retention Plan may be approved as follows:

1) Modification – General. The Planning Official may approve minor modifications to the approved Tree Retention Plan in which the minimum tree density credits associated with trees identified for retention are not decreased.

2) Modification Prior to Tree Removal. The Planning Official may approve a modification request to decrease the minimum number of tree density credits associated with trees previously identified for retention if:

- a) Trees inventoried in the original Tree Retention Plan have not yet been removed; and
- b) The Planning Official shall not approve or deny a modification pursuant to this section without first providing notice of the modification request consistent with the noticing requirements for the short plat.

3) Modification after Tree Removal. A modification request is required to decrease the minimum number of tree density credits associated with trees previously identified for retention after which trees inventoried in the original Tree Retention Plan have already been removed. Such a request may be approved by the Hearing Examiner only if the following are met:

- a) The need for the modification was not known and could not reasonably have been known before the tree retention plan was approved;
- b) The modification is necessary because of special circumstances which are not the result of actions by the applicant regarding the size, shape, topography, or other physical limitations of the subject property relative to the location of proposed and/or existing improvements on or adjacent to the subject property;
- c) There is no practicable or feasible alternative development proposal that results in fewer additional tree removals;
- d) The Hearing Examiner shall not approve or deny a modification pursuant to this section without the Planning Official first providing notice of the modification request consistent with the noticing requirements for the short plat and providing opportunity for comments for consideration by the Hearing Examiner; and
- e) Said comment period shall not be less than 14 calendar days.

(Ord. 4619 § 1, 2017; Ord. 4437 § 1, 2014; Ord. 4252 § 1, 2010; Ord. 4238 § 2, 2010; Ord. 4010 § 2, 2005)

95.32 Incentives and Variations to Development Standards

In order to retain trees, the applicant should pursue provisions in Kirkland's codes that allow development standards to be modified. Examples include but are not limited to number of parking stalls, right-of-way improvements, lot size reduction under Chapter 22.28 KMC, lot line placement when subdividing property under KMC Title 22, Planned Unit Developments, and required landscaping, including buffers for lands use and parking/driving areas.

Requirements of the Kirkland Zoning Code may be modified by the Planning Official as outlined below when such modifications would further the purpose and intent of this chapter as set forth in KZC 95.05 and would involve trees with a high or moderate retention value.

1. Common Recreational Open Space. Reductions or variations of the area, width, or composition of required common recreational open space may be granted.
2. Parking Areas and Access. Variations in parking lot design and/or access driveway requirements may be granted when the Public Works and Planning Officials both determine the variations to be consistent with the intent of City policies and codes.
3. Required Yards. Initially, the applicant shall pursue options for placement of required yards as permitted by other sections of this code, such as selecting one (1) front required yard in the RSX zone and adjusting side yards in any zone to meet the 15-foot total as needed for each structure on the site. The Planning Official may also reduce the front, side or rear required yards; provided, that:
 - a. No required side yard shall be less than five (5) feet; and
 - b. The required front yard shall not be reduced by more than five (5) feet in residential zones. There shall not be an additional five (5) feet of reduction beyond the allowance provided for covered entry porches;
 - c. Rear yards that are not directly adjacent to another parcel's rear yard but that are adjacent to an access easement or tract may be reduced by five (5) feet;
 - d. No required yard shall be reduced by more than five (5) feet in residential zones.
4. Storm Water. Requirements pertaining to stormwater may be varied if approved by the Public Works Official under KMC 15.52.060.
5. Additional Variations. In addition to the variations described above, the Planning Official is authorized to require site plan alterations to retain trees with a high retention value. Such alterations include minor adjustments to the location of building footprints, adjustments to the location of driveways and access ways, or adjustment to the location of walkways, easements or utilities. The Planning Official and the applicant shall work in good faith to find reasonable solutions.

(Ord. 4547 § 1, 2016; Ord. 4350 § 1, 2012; Ord. 4238 § 2, 2010)

95.33 Tree Density Requirement

The required minimum tree density is 30 tree credits per acre for single-family homes, cottages, carriage units, two/three-unit homes, short plats, and/or subdivisions and associated demolition and land surface modification. For individual lots in a short subdivision or subdivision with an approved Tree Retention Plan, the tree density shall be calculated for each lot within the short plat or subdivision. The tree density may consist of existing trees pursuant to the tree's retention value, supplemental trees or a combination of existing and supplemental trees pursuant to subsection (2) of this section. Existing trees transplanted to an area on the same site shall not count toward the required density unless approved by the Urban Forester based on transplant specifications provided by a qualified professional that will ensure a good probability for survival.

1. Tree Density Calculation. In calculating tree density credits, tree credits may be rounded up to the next whole number from a 0.5 or greater value. For the purpose of calculating required minimum tree density, public right-of-way, areas to be dedicated as public right-of-way, and vehicular access easements not included as lot area with the approved short plat shall be excluded from the area used for calculation of tree density.

Tree density calculation for existing individual trees:

- a. Diameter breast height (DBH) of the tree shall be measured in inches.
- b. The tree credit value that corresponds with DBH shall be found in Table 95.33.1. Existing native conifers (or other conifer species as approved by the Urban Forester) shall count 1.5 times credits for retention.

Table 95.33.1

Tree Density for Existing Significant Trees

(Credits per minimum diameter – DBH)

DBH	Tree Credits	DBH	Tree Credits	DBH	Tree Credits
3 – 5"	0.5				
6 – 10"	1	24"	8	38"	15
12"	2	26"	9	40"	16
14"	3	28"	10	42"	17
16"	4	30"	11	44"	18
18"	5	32"	12	46"	19
20"	6	34"	13	48"	20
22"	7	36"	14	50"	21

Example: a 7,200-square-foot lot would need five (5) tree credits ($7,200/43,560 = 0.165 \times 30 = (4.9)$ or five (5)). The tree density for the lot could be met by retaining one (1) existing 16-inch deciduous tree and one (1) existing 6-inch deciduous tree on site. The same 7,200-square-foot lot would meet the required five (5) tree credits by retaining one (1) existing 14-inch conifer.

2. Supplemental Trees Planted to Meet Minimum Density Requirement. For sites and activities requiring a minimum tree density and where the existing trees to be retained do not meet the minimum tree density requirement, supplemental trees shall be planted to achieve the required minimum tree density.
3. Tree Location. In designing a development and in meeting the required minimum tree density, the trees shall be planted in the following order of priority:
 - a. On-Site. The preferred locations for new trees are:
 - 1) In preserved groves, critical areas or their buffers.
 - 2) Adjacent to storm water facilities as approved by Public Works under KMC 15.52.060.
 - 3) Entrance landscaping, traffic islands and other common areas in residential subdivisions.
 - 4) Site perimeter – The area of the subject property that is within 10 feet from the property line.
 - 5) On individual residential building lots.
 - b. Off-Site. When room is unavailable for planting the required trees on site, then they may be planted at another approved location in the City.

c. City Forestry Account. When the Planning Official determines on-site and off-site locations are unavailable, then the applicant shall pay an amount of money approximating the current market value of the supplemental trees into the City forestry account.

4. Minimum Size and Tree Density Value for Supplemental Trees. The required minimum size of the supplemental tree worth one (1) tree credit shall be six (6) feet tall for Thuja/Arborvitae or four (4) feet tall for native or other conifers and 2-inch caliper for deciduous or broad-leaf evergreen tree. Additional credits may be awarded for larger supplemental trees. The installation and maintenance shall be pursuant to KZC 95.50 and 95.51 respectively.

(Ord. 4547 § 1, 2016; Ord. 4238 § 2, 2010)

95.34 Tree and Soil Protection during Development Activity

Prior to development activity or initiating tree removal on the site, vegetated areas, individual trees and soil to be preserved shall be protected from potentially damaging activities pursuant to the following standards:

1. Placing Materials near Trees. No person may conduct any activity within the protected area of any tree designated to remain, including, but not limited to, operating or parking equipment, placing solvents, storing building material or stockpiling any materials, or dumping concrete washout or other chemicals. During construction, no person shall attach any object to any tree designated for protection.
2. Protective Barrier. Before development, land clearing, filling or any land alteration, the applicant shall:
 - a. Erect and maintain readily visible temporary protective tree fencing along the limits of disturbance which completely surrounds the protected area of all retained trees, groups of trees, vegetation and native soil. Fences shall be constructed of chain link and be at least six (6) feet high, unless other type of fencing is authorized by the Planning Official.
 - b. Install highly visible signs spaced no further than 15 feet along the entirety of the protective tree fence. Said sign must be approved by the Planning Official and shall state at a minimum "Tree and Soil Protection Area, Entrance Prohibited" and provide the City phone number for code enforcement to report violations.
 - c. Prohibit excavation or compaction of soil or other potentially damaging activities within the barriers; provided, that the Planning Official may allow such activities approved by a qualified professional and under the supervision of a qualified professional retained and paid for by the applicant.
 - d. Maintain the protective barriers in place for the duration of the project until the Planning Official authorizes their removal.
 - e. Ensure that any approved landscaping done in the protected zone subsequent to the removal of the barriers shall be accomplished with machinery from outside the protected zone or by hand.
 - f. In addition to the above, the Planning Official may require the following:
 - 1) If equipment is authorized to operate within the protected zone, the soil and critical root zone of a tree must be covered with mulch to a depth of at least six (6) inches or with plywood, steel plates or similar material in order to protect roots and soil from damage caused by heavy equipment.
 - 2) Minimize root damage by hand-excavating a 2-foot-deep trench, at edge of critical root zone, to cleanly sever the roots of trees to be retained. Never rip or shred roots with heavy equipment.
 - 3) Corrective pruning performed on protected trees in order to avoid damage from machinery or building activity.
 - 4) Maintenance of trees throughout construction period by watering and fertilizing.
3. Grade.

- a. The grade shall not be elevated or reduced within the critical root zone of trees to be preserved without the Planning Official's authorization based on recommendations from a qualified professional. The Planning Official may allow coverage of up to one-half (1/2) of the area of the tree's critical root zone with light soils (no clay) to the minimum depth necessary to carry out grading or landscaping plans, if it will not imperil the survival of the tree. Aeration devices may be required to ensure the tree's survival.
 - b. If the grade adjacent to a preserved tree is raised such that it could slough or erode into the tree's critical root zone, it shall be permanently stabilized to prevent soil erosion and suffocation of the roots.
 - c. The applicant shall not install an impervious surface within the critical root zone of any tree to be retained without the authorization of the Planning Official. The Planning Official may require specific construction methods and/or use of aeration devices to ensure the tree's survival and to minimize the potential for root-induced damage to the impervious surface.
 - d. To the greatest extent practical, utility trenches shall be located outside of the critical root zone of trees to be retained. The Planning Official may require that utilities be tunneled under the roots of trees to be retained if the Planning Official determines that trenching would significantly reduce the chances of the tree's survival.
 - e. Trees and other vegetation to be retained shall be protected from erosion and sedimentation. Clearing operations shall be conducted so as to expose the smallest practical area of soil to erosion for the least possible time. To control erosion, it is encouraged that shrubs, ground cover and stumps be maintained on the individual lots, where feasible.
4. Directional Felling. Directional felling of trees shall be used to avoid damage to trees designated for retention.
5. Additional Requirements. The Planning Official may require additional tree protection measures that are consistent with accepted urban forestry industry practices.

(Ord. 4547 § 1, 2016; Ord. 4238 § 2, 2010)

95.40 Required Landscaping

1. User Guide. Chapters 15 through 56 KZC containing the use zone or development standards tables assign a landscaping category to each use in each zone. This category is either "A," "B," "C," "D," or "E." If you do not know which landscaping category applies to the subject property, you should consult the appropriate use zone or development standards tables.

Requirements pertaining to each landscaping category are located throughout this chapter, except that Landscaping Category E is not subject to this section.

Landscape Categories A, B, C, D, and E may be subject to additional related requirements in the following other chapters:

- a. Various use zone charts or development standards tables, in Chapters 15 through 56 KZC, establish additional or special buffering requirements for some uses in some zones.
- b. Chapter 85 KZC, Geologically Hazardous Areas, addresses the retention of vegetation on steep slopes.
- c. Chapter 90 KZC, Critical Areas, addresses vegetation within critical areas and critical area buffers.
- d. Chapter 110 KZC and Chapter 19.36 KMC address vegetation within rights-of-way, except for the I-405 and SR-520 rights-of-way, and the Cross Kirkland Corridor railbanked rail corridor or the Eastside Rail Corridor.
- e. KZC 115.135, Sight Distance at Intersections, which may limit the placement of landscaping in some areas.
- f. Chapter 22 KMC addresses trees in subdivisions.

2. Use of Significant Existing Vegetation.

- a. General. The applicant shall apply subsection KZC 95.30(3), Tree Retention Plan Procedure, and KZC 95.32, Incentives and Variations to Development Standards, to retain existing native trees, vegetation and soil in areas subject to the landscaping standards of this section. The Planning Official shall give substantial weight to the retained native trees and vegetation when determining the applicant's compliance with this section.
- b. Supplement. The City may require the applicant to plant trees, shrubs, and groundcover according to the requirements of this section to supplement the existing vegetation in order to provide a buffer at least as effective as the required buffer.
- c. Protection Techniques. The applicant shall use the protection techniques described in KZC 95.34 to ensure the protection of significant existing vegetation and soil.

3. Landscape Plan Required. In addition to the Tree Retention Plan required pursuant to KZC 95.30, application materials shall clearly depict the quantity, location, species, and size of plant materials proposed to comply with the requirements of this section, and shall address the plant installation and maintenance requirements set forth in KZC 95.50 and 95.51. Plant materials shall be identified with both their scientific and common names. Any required irrigation system must also be shown.

(Ord. 4551 § 4, 2017; Ord. 4547 § 1, 2016; Ord. 4476 § 3, 2015; Ord. 4408 § 1, 2013; Ord. 4238 § 2, 2010; Ord. 4121 § 1, 2008; Ord. 4097 § 1, 2007; Ord. 4037 § 1, 2006; Ord. 4030 § 1, 2006; Ord. 4010 § 2, 2005)

95.41 Supplemental Plantings

1. General. The applicant shall provide the supplemental landscaping specified in subsection (2) of this section in any area of the subject property that:

- a. Is not covered with a building, vehicle circulation area or other improvement; and
- b. Is not a critical area, critical area buffer, or in an area to be planted with required landscaping; and
- c. Is not committed to and being used for some specific purpose.

2. Standards. The applicant shall provide the following at a minimum:

- a. Living plant material which will cover 80 percent of the area to be landscaped within two (2) years. If the material to be used does not spread over time, the applicant shall re-plant the entire area involved immediately. Any area that will not be covered with living plant material must be covered with nonliving groundcover. Preference is given to using native plant species. See Kirkland Native Tree/Plant Lists.
- b. One (1) tree for each 1,000 square feet of area to be landscaped. At the time of planting, deciduous trees must be at least two (2) inches in caliper and coniferous trees must be at least five (5) feet in height.
- c. If a development requires approval through Process I, IIA or IIB as described in Chapters 145, 150 and 152 KZC, respectively, the City may require additional vegetation to be planted along a building facade if:
 - 1) The building facade is more than 25 feet high or more than 50 feet long; or
 - 2) Additional landscaping is necessary to provide a visual break in the facade.
- d. In RHBD varieties of rose shrubs or ground cover along with other plant materials shall be included in the on-site landscaping.
- e. If development is subject to Design Review as described in Chapter 142 KZC, the City will review plant choice and specific plant location as part of the Design Review approval. The City may also require or permit modification to the required plant size as part of Design Review approval.

(Ord. 4547 § 1, 2016; Ord. 4238 § 2, 2010)

95.42 Minimum Land Use Buffer Requirements

The applicant shall comply with the provisions specified in the following chart and with all other applicable provisions of this chapter. Land use buffer requirements may apply to the subject property, depending on what permitted use exists on the adjoining property or, if no permitted use exists, depending on the zone that the adjoining property is in.

LANDSCAPING CATEGORY	ADJOINING PROPERTY	*Public park or low density residential use or if no permitted use exists on the adjoining property then a low density zone.	Medium or high density residential use or if no permitted use exists on the adjoining property then a medium density or high density zone.	Institutional or office use or if no permitted use exists on the adjoining property then an institutional or office zone.	A commercial use or an industrial use or if no permitted use exists on the adjoining property then a commercial or industrial zone.
A		Must comply with subsection (1) (Buffering Standard 1)	Must comply with subsection (1) (Buffering Standard 1)	Must comply with subsection (2) (Buffering Standard 2)	
B		Must comply with subsection (1) (Buffering Standard 1)	Must comply with subsection (1) (Buffering Standard 1)		
C		Must comply with subsection (1) (Buffering Standard 1)	Must comply with subsection (2) (Buffering Standard 2)		
D		Must comply with subsection (2) (Buffering Standard 2)			
E					
Footnotes:		*If the adjoining property is zoned Central Business District, Juanita Business District, North Rose Hill Business District, Rose Hill Business District, Finn Hill Neighborhood Center, Houghton/Everest Neighborhood Center, Business District Core or is located in TL 5, this section KZC 95.42 does not apply.			

This chart establishes which buffering standard applies in a particular case. The following subsections establish the specific requirement for each standard:

1. For standard 1, the applicant shall provide a 15-foot-wide landscaped strip with a 6-foot-high solid screening fence or wall. Except for public utilities, the fence or wall must be placed on the outside edge of the land use buffer or on the property line when adjacent to private property. For public utilities, the fence or wall may be placed either on the outside or inside edge of the landscaping strip. A fence or wall is not required when the land use buffer is adjacent and parallel to a public right-of-way that is improved for vehicular use. See KZC 115.40 for additional fence standards. The land use buffer must be planted as follows:

- a. Trees planted at the rate of one (1) tree per 20 linear feet of land use buffer, with deciduous trees of two and one-half (2-1/2) inch caliper, minimum, and/or coniferous trees eight (8) feet in height, minimum. At least 70 percent of trees shall be evergreen. The trees shall be distributed evenly throughout the buffer, spaced no more than 20 feet apart on center.
- b. Large shrubs or a mix of shrubs planted to attain coverage of at least 60 percent of the land use buffer area within two (2) years, planted at the following sizes and spacing, depending on type:
 - 1) Low shrub – (mature size under three (3) feet tall), 1- or 2-gallon pot or balled and burlapped equivalent;
 - 2) Medium shrub – (mature size from three (3) to six (6) feet tall), 2- or 3-gallon pot or balled and burlapped equivalent;

- 3) Large shrub – (mature size over six (6) feet tall), 5-gallon pot or balled and burlapped equivalent.
 - c. Living ground covers planted from either 4-inch pot with 12-inch spacing or 1-gallon pot with 18-inch spacing to cover within two (2) years 60 percent of the land use buffer not needed for viability of the shrubs or trees.
2. For standard 2, the applicant shall provide a 5-foot-wide landscaped strip with a 6-foot-high solid screening fence or wall. Except for public utilities, the fence or wall must be placed on the outside edge of the land use buffer or on the property line when adjacent to private property. For public utilities, the fence or wall may be placed either on the outside or inside edge of the landscaping strip. A fence or wall is not required when the land use buffer is adjacent and parallel to a public right-of-way that is improved for vehicular use. See KZC 115.40 for additional fence standards. The landscaped strip must be planted as follows:
 - a. One (1) row of trees planted no more than 10 feet apart on center along the entire length of the buffer, with deciduous trees of 2-inch caliper, minimum, and/or coniferous trees at least six (6) feet in height, minimum. At least 50 percent of the required trees shall be evergreen.
 - b. Living ground covers planted from either 4-inch pot with 12-inch spacing or 1-gallon pot with 18-inch spacing to cover within two (2) years 60 percent of the land use buffer not needed for viability of the trees.
3. Plant Standards. All plant materials used shall meet the most recent American Association of Nurserymen Standards for nursery stock: ANSI Z60.1.
4. Location of the Land Use Buffer. The applicant shall provide the required buffer along the entire common border between the subject property and the adjoining property.
5. Multiple Buffering Requirement. If the subject property borders more than one (1) adjoining property along the same property line, the applicant shall provide a gradual transition between different land use buffers. This transition must occur totally within the area which has the less stringent buffering requirement. The specific design of the transition must be approved by the City.
6. Adjoining Property Containing Several Uses. If the adjoining property contains several permitted uses, the applicant may provide the least stringent land use buffer required for any of these uses.
7. Subject Property Containing Several Uses. If the subject property contains more than one (1) use, the applicant shall comply with the land use buffering requirement that pertains to the use within the most stringent landscaping category that abuts the property to be buffered.
8. Subject Property Containing School. If the subject property is occupied by a school, land use buffers are not required along property lines adjacent to a street.
9. Encroachment into Land Use Buffer. Typical incidental extensions of structures such as chimneys, bay windows, greenhouse windows, cornices, eaves, awnings, and canopies may be permitted in land use buffers as set forth in KZC 115.115(3)(d); provided, that:
 - a. Buffer planting standards are met; and
 - b. Required plantings will be able to attain full size and form typical to their species.

(Ord. 4637 § 3, 2018; Ord. 4636 § 3, 2018; Ord. 4495 § 2, 2015; Ord. 4238 § 2, 2010)

95.43 Outdoor Use, Activity, and Storage

Outdoor use, activity, and storage (KZC 115.105(2)) must comply with required land use buffers for the primary use, except that the following outdoor uses and activities, when located in commercial or industrial zones, are exempt from KZC 115.105(2)(c)(1) and (2)(c)(2) as stated below:

1. That portion of an outdoor use, activity, or storage area which abuts another outdoor use, activity, or storage area which is located on property zoned for commercial or industrial use.

2. Outdoor use, activity, and storage areas which are located adjacent to a fence or structure which is a minimum of six (6) feet above finished grade, and do not extend outward from the fence or structure more than five (5) feet; provided, that the total horizontal dimensions of these areas shall not exceed 50 percent of the length of the facade or fence (see Plate 11).
3. If there is an improved path or sidewalk in front of the outdoor storage area, the outdoor use, activity or storage area may extend beyond five (5) feet if a clearly defined walking path at least three (3) feet in width is maintained and there is adequate pedestrian access to and from the primary use. The total horizontal dimension of these areas shall not exceed 50 percent of the length of the facade of the structure or fence (see Plate 11).
4. Outdoor dining areas.
5. That portion of an outdoor display of vehicles for sale or lease which is adjacent to a public right-of-way that is improved for vehicular use; provided, that it meets the buffering standards for driving and parking areas in KZC 95.45(1); and provided further, that the exemptions of KZC 95.45(2) do not apply unless it is fully enclosed within or under a building, or is on top of a building and is at least one (1) story above finished grade.
6. Outdoor Christmas tree lots and fireworks stands if these uses will not exceed 30 days, and outdoor amusement rides, carnivals and circuses, and parking lot sales which are ancillary to the indoor sale of the same goods and services, if these uses will not exceed seven (7) days.

(Ord. 4547 § 1, 2016; Ord. 4238 § 2, 2010)

95.44 Internal Parking Lot Landscaping Requirements

The following internal parking lot landscape standards apply to each parking lot or portion thereof containing more than eight (8) parking stalls.

1. The parking lot must contain 25 square feet of landscaped area per parking stall planted as follows:
 - a. The applicant shall arrange the required landscaping throughout the parking lot to provide landscape islands or peninsulas to separate groups of parking spaces (generally every eight (8) stalls) from one another and each row of spaces from any adjacent driveway that runs perpendicular to the row. This island or peninsula must be surrounded by a 6-inch-high vertical curb and be of similar dimensions as the adjacent parking stalls. Gaps in curbs are allowed for stormwater runoff to enter landscape island.
 - b. Landscaping shall be installed pursuant to the following standards:
 - 1) At least one (1) deciduous tree, two (2) inches in caliper, or a coniferous tree five (5) feet in height.
 - 2) Groundcover shall be selected and planted to achieve 60 percent coverage within two (2) years.
 - 3) Natural drainage landscapes (such as rain gardens, bio-infiltration swales and bioretention planters) are allowed when designed in compliance with the stormwater design manual adopted in KMC 15.52.060. Internal parking lot landscaping requirements for trees still apply. Refer to Public Works Pre-Approved Plans.
 - c. Exception. The requirements of this subsection do not apply to any area that is fully enclosed within or under a building.
2. Rooftop Parking Landscaping. For a driving or parking area on the top level of a structure that is not within the CBD zone or within any zone that requires design regulation compliance, one (1) planter that is 30 inches deep and five (5) feet square must be provided for every eight (8) stalls on the top level of the structure. Each planter must contain a small tree or large shrub suited to the size of the container and the specific site conditions, including desiccating winds, and is clustered with other planters near driving ramps or stairways to maximize visual effect.
3. If development is subject to Design Review as described in Chapter 142 KZC, the City will review the parking area design, plant choice and specific plant location as part of the Design Review approval. The City may also

require or permit modification to the required landscaping and design of the parking area as part of Design Review approval.

(Ord. 4547 § 1, 2016; Ord. 4350 § 1, 2012; Ord. 4238 § 2, 2010)

95.45 Perimeter Landscape Buffering for Driving and Parking Areas

1. Perimeter Buffering – General. Except as specified in subsection (2) of this section, the applicant shall buffer all parking areas and driveways from abutting rights-of-way and from adjacent property with a 5-foot-wide strip along the perimeter of the parking areas and driveways planted as follows (see Figure 95.45.A):

- a. One (1) row of trees, two (2) inches in caliper and planted 30 feet on center along the entire length of the strip.
- b. Living groundcover planted to attain coverage of at least 60 percent of the strip area within two (2) years.
- c. Natural drainage landscapes (such as rain gardens, bio-infiltration swales and bioretention planters) are allowed when designed in compliance with the stormwater design manual adopted in KMC 15.52.060. Perimeter landscape buffering requirements for trees in driving and parking areas still apply. Refer to Public Works Pre-Approved Plans.

2. Exception. The requirements of this section do not apply to any parking area that:

- a. Is fully enclosed within or under a building; or
- b. Is on top of a building and is at least one (1) story above finished grade; or
- c. Serves detached dwelling units exclusively; or
- d. Is within any zone that requires design regulation compliance. See below for Design District requirements.

3. Design Districts. If subject to Design Review, each side of a parking lot that abuts a street, through-block pathway or public park must be screened from that street, through-block pathway or public park by using one (1) or a combination of the following methods (see Figures 95.45.A, B, and C):

- a. By providing a landscape strip at least five (5) feet wide planted consistent with subsection (1) of this section, or in combination with the following. In the RHBD Regional Center (see KZC Figure 92.05.A) a 10-foot perimeter landscape strip along NE 85th Street is required planted consistent with subsection (1) of this section.
- b. The hedge or wall must extend at least two (2) feet, six (6) inches, and not more than three (3) feet above the ground directly below it.
- c. The wall may be constructed of masonry or concrete, if consistent with the provisions of KZC 92.35(1)(g), in building material, color and detail, or of wood if the design and materials match the building on the subject property.
- d. In JBD zones:
 - 1) If the street is a pedestrian-oriented street, the wall may also include a continuous trellis or grillwork, at least five (5) feet in height above the ground, placed on top of or in front of the wall and planted with climbing vines. The trellis or grillwork may be constructed of masonry, steel, cast iron and/or wood.
 - 2) If the wall abuts a pedestrian-oriented street, the requirements of this subsection may be fulfilled by providing pedestrian weather protection along at least 80 percent of the frontage of the subject property.
- e. If development is subject to Design Review as described in Chapter 142 KZC, the City will review plant choice and specific plant location as part of the Design Review approval. The City may also require or permit modification to the required plant size as part of Design Review approval.

4. Overlapping Requirements. If buffering is required in KZC 95.42, Land Use Buffering Standards, and by this subsection, the applicant shall utilize the more stringent buffering requirement.

Perimeter Parking Lot Landscaping

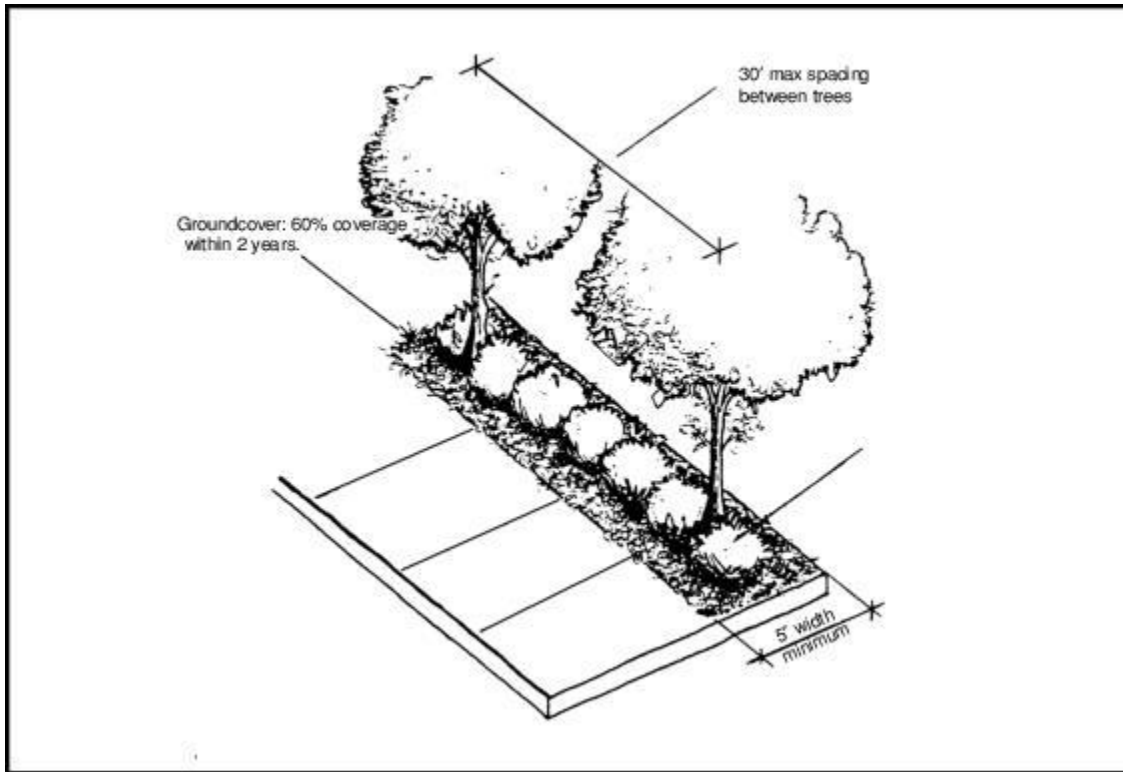


FIGURE 95.45.A

Perimeter Parking – Examples of Various Screen Wall Designs

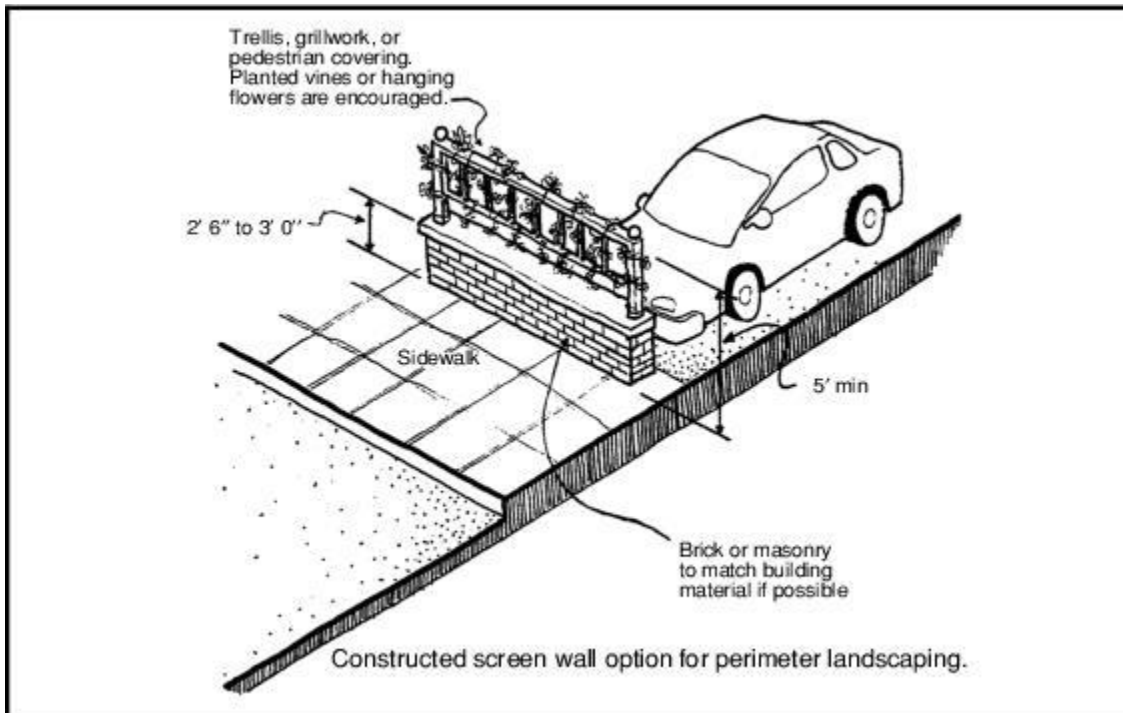


FIGURE 95.45.B

Perimeter Parking – Examples of Various Screen Wall Designs

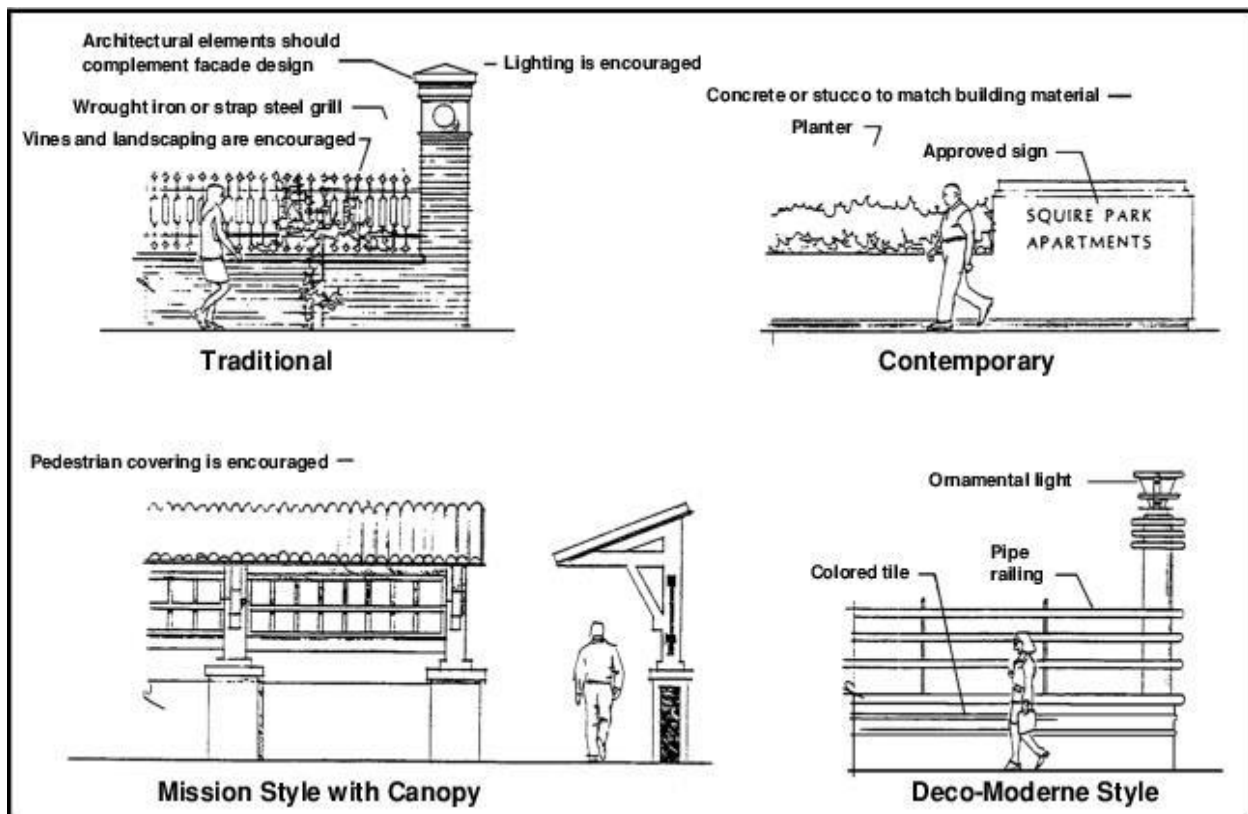


FIGURE 95.45.C

(Ord. 4547 § 1, 2016; Ord. 4238 § 2, 2010; Ord. 4010 § 2, 2005)

95.46 Modifications to Landscaping Standards

1. Modification to Land Use Buffer Requirements. The applicant may request a modification of the requirements of the buffering standards in KZC 95.42. The Planning Official may approve a modification if:

- The owner of the adjoining property agrees to this in writing; and
- The existing topography or other characteristics of the subject property or the adjoining property, or the distance of development from the neighboring property decreases or eliminates the need for buffering; or
- The modification will be more beneficial to the adjoining property than the required buffer by causing less impairment of view or sunlight; or
- The Planning Official determines that it is reasonable to anticipate that the adjoining property will be redeveloped in the foreseeable future to a use that would require no, or a less intensive, buffer; or
- The location of pre-existing improvements on the adjoining site eliminates the need or benefit of the required landscape buffer.

2. Modifications to General Landscaping Requirements.

- Authority to Grant and Duration.** If the proposed development of the subject property requires approval through Design Review or Process I, IIA, or IIB, described in Chapters 142, 145, 150, and 152 KZC, respectively, a request for a modification will be considered as part of that process under the provisions of this section. The City must find that the applicant meets the applicable criteria listed in subsections (2)(b) and (2)(c) of this section. If granted under Design Review or Process I, IIA, or IIB, the modification is binding on the City

for all development permits issued for that development under the building code within five (5) years of the granting of the modification.

If the above does not apply, the Planning Official may grant a modification in writing under the provisions of this section.

b. Internal Parking Lot Landscaping Modifications. For a modification to the internal parking lot landscaping requirements in KZC 95.44, the landscape requirements may be modified if:

- 1) The modification will produce a landscaping design in the parking area comparable or superior to that which would result from adherence to the adopted standard; or
- 2) The modification will result in increased retention of significant existing vegetation; or
- 3) The purpose of the modification is to accommodate low impact development techniques as approved by the Planning Official.

c. Perimeter parking lot and driveway landscaping. For a modification to the perimeter landscaping for parking lots and driveways, the buffering requirements for parking areas and driveways may be modified if:

- 1) The existing topography of or adjacent to the subject property decreases or eliminates the need for visual screening; or
- 2) The modification will be of more benefit to the adjoining property by causing less impairment of view or sunlight; or
- 3) The modification will provide a visual screen that is comparable or superior to the buffer required by KZC 95.45; or
- 4) The modification eliminates the portion of the buffer that would divide a shared parking area serving two (2) or more adjacent uses, but provides the buffer around the perimeter of the shared parking area.

(Ord. 4547 § 1, 2016; Ord. 4238 § 2, 2010)

95.47 Nonconforming Landscaping and Buffers

1. The landscaping requirements of KZC 95.41, Supplemental Plantings, KZC 95.43 Outdoor Use, Activity and Storage, KZC 95.44, Internal Parking Lot Landscaping, and KZC 95.45, Perimeter Landscape Buffering for Driving and Parking Areas, must be brought into conformance as much as is feasible, based on available land area, in either of the following situations:

- a. An increase of at least 10 percent in gross floor area of any structure; or
- b. An alteration to any structure, the cost of which exceeds 50 percent of the replacement cost of the structure.

2. Land use buffers must be brought into conformance with KZC 95.42 in either of the following situations:

- a. An increase in gross floor area of any structure (the requirement to provide conforming buffers applies only where new gross floor area impacts adjoining property); or
- b. A change in use on the subject property and the new use requires larger buffers than the former use.

(Ord. 4547 § 1, 2016; Ord. 4238 § 2, 2010)

95.50 Installation Standards for Required Plantings

All required trees, landscaping and soil shall be installed according to sound horticultural practices in a manner designed to encourage quick establishment and healthy plant growth. All required landscaping shall be installed in the ground and not in above-ground containers, except for landscaping required on the top floor of a structure.

When an applicant proposes to locate a subterranean structure under required landscaping that appears to be at grade, the applicant will: (1) provide site-specific documentation prepared by a qualified expert to establish that the design will adequately support the long-term viability of the required landscaping; and (2) enter into an agreement with the City, in a form acceptable to the City Attorney, indemnifying the City from any damage resulting from development activity on the subject property which is related to the physical condition of the property. The applicant shall record this agreement with the King County Recorder's Office.

1. Compliance. It is the applicant's responsibility to show that the proposed landscaping complies with the regulations of this chapter.
2. Timing. All landscaping shall be installed prior to the issuance of a certificate of occupancy, except that the installation of any required tree or landscaping may be deferred during the summer months to the next planting season, but never for more than six (6) months. Deferred installation shall be secured with a performance bond pursuant to Chapter 175 KZC prior to the issuance of a certificate of occupancy.
3. Grading. Berms shall not exceed a slope of two (2) horizontal feet to one (1) vertical foot (2:1).
4. Soil Specifications. Soils in planting areas shall have soil quality equivalent to Washington State Department of Ecology BMP T5.13. The soil quality in any landscape area shall comply with the soil quality requirements of the Public Works Pre-Approved Plans. See subsection (9) of this section for mulch requirements.
5. Plant Selection.
 - a. Plant selection shall be consistent with the Kirkland Plant List, which is produced by the City's Natural Resource Management Team and available in the Planning and Building Department.
 - b. Plants shall be selected and sited to produce a hardy and drought-resistant landscape area. Selection shall consider soil type and depth, the amount of maintenance required, spacing, exposure to sun and wind, the slope and contours of the site, and compatibility with existing native vegetation preserved on the site. Preservation of existing vegetation is strongly encouraged.
 - c. Prohibited Materials. Plants listed as prohibited in the Kirkland Plant List are prohibited in required landscape areas. Additionally, there are other plants that may not be used if identified in the Kirkland Plant List as potentially damaging to sidewalks, roads, underground utilities, drainage improvements, foundations, or when not provided with enough growing space.
 - d. All plants shall conform to American Association of Nurserymen (AAN) grades and standards as published in the "American Standard for Nursery Stock" manual.
 - e. Plants shall meet the minimum size standards established in other sections of the KZC.
 - f. Multiple-stemmed trees may be permitted as an option to single-stemmed trees for required landscaping provided that such multiple-stemmed trees are at least 10 feet in height and that they are approved by the Planning Official prior to installation.
6. Fertilization. All fertilizer applications to turf or trees and shrubs shall follow Washington State University, National Arborist Association or other accepted agronomic or horticultural standards.
7. Irrigation. The intent of this standard is to ensure that plants will survive the critical establishment period when they are most vulnerable due to lack of watering. All required plantings must provide an irrigation system, using either Option 1, 2, or 3 or a combination of those options. For each option irrigation shall be designed to conserve water by using the best practical management techniques available. These techniques may include, but not be limited to: drip irrigation to minimize evaporation loss, moisture sensors to prevent irrigation during rainy periods, automatic controllers to ensure proper duration of watering, sprinkler head selection and spacing designed to minimize overspray, and separate zones for turf and shrubs and for full sun exposure and shady areas to meet watering needs of different sections of the landscape.

Exceptions, as approved by the Planning Official, to the irrigation requirement may be approved xeriscape (i.e., low water usage plantings), plantings approved for low impact development techniques, established indigenous plant material, or landscapes where natural appearance is acceptable or desirable to the City. However, those exceptions will require temporary irrigation (Option 2 and/or 3) until established.

- a. Option 1. A permanent built-in irrigation system with an automatic controller designed and certified by a licensed landscape architect as part of the landscape plan.
 - b. Option 2. An irrigation system designed and certified by a licensed landscape architect as part of the landscape plan, which provides sufficient water to ensure that the plants will become established. The system does not have to be permanent if the plants chosen can survive adequately on their own, once established.
 - c. Option 3. Irrigation by hand. If the applicant chooses this option, an inspection will be required one (1) year after final inspection to ensure that the landscaping has become established.
8. Drainage. All landscapes shall have adequate drainage, either through natural percolation or through an installed drainage system. A percolation rate of one-half (1/2) inch of water per hour is acceptable.
9. Mulch.
- a. Required plantings, except turf or areas of established ground cover, shall be covered with two (2) inches or more of organic mulch to minimize evaporation and runoff. Mulch shall consist of materials such as yard waste, sawdust, and/or manure that are fully composted.
 - b. All mulches used in planter beds shall be kept at least six (6) inches away from the trunks of shrubs and trees.
10. Protection. All required landscaped areas, particularly trees and shrubs, must be protected from potential damage by adjacent uses and development, including parking and storage areas. Protective devices such as bollards, wheel stops, trunk guards, root guards, etc., may be required in some situations.

(Ord. 4551 § 4, 2017; Ord. 4547 § 1, 2016; Ord. 4491 §§ 3, 11, 2015; Ord. 4350 § 1, 2012; Ord. 4238 § 2, 2010; Ord. 4010 § 2, 2005)

95.51 Tree and Landscape Maintenance Requirements

The following maintenance requirements apply to all trees, including street trees, and other vegetation required to be planted or preserved by the City:

1. Responsibility for Regular Maintenance. Required trees and vegetation, fences, walls, and other landscape elements shall be considered as elements of the project in the same manner as parking, building materials, and other site details. The applicant, landowner, or successors in interest shall be responsible for the regular maintenance of required landscaping elements. Plants that die must be replaced in kind. It is also the responsibility of the property owner to maintain street trees abutting their property pursuant to KZC 95.21.
2. Maintenance Duration. Maintenance shall be ensured in the following manner except as set forth in subsections (3), (4) and (5) of this section:
 - a. All required landscaping shall be maintained throughout the life of the development. Prior to issuance of a certificate of occupancy, the proponent shall provide a final as-built landscape plan and an agreement to maintain and replace all landscaping that is required by the City.
 - b. Any existing tree or other existing vegetation designated for preservation in a tree retention plan shall be maintained for a period of five (5) years following issuance of the certificate of occupancy for the individual lot or development. After five (5) years, all trees on the property are subject to KZC 95.23 unless:
 - 1) The tree and associated vegetation are in a grove that is protected pursuant to subsection (3) of this section; or

2) The tree or vegetation is considered to be a public benefit related to approval of a planned unit development; or

3) The tree or vegetation was retained to partially or fully meet requirements of KZC 95.40 through 95.45, required landscaping.

3. Maintenance of Preserved Grove. Any applicant who has a grove of trees identified for preservation on an approved Tree Retention Plan pursuant to KZC 95.30(2) shall provide prior to occupancy the legal instrument acceptable to the City to ensure preservation of the grove and associated vegetation in perpetuity, except that the agreement may be extinguished if the Planning Official determines that preservation is no longer appropriate.

4. Maintenance in Holmes Point Overlay Zone. Vegetation in designated Protected Natural Areas in the Holmes Point Overlay Zone is to be protected in perpetuity pursuant to KZC 70.15(8)(a). Significant trees in the remainder of the lot shall be protected in perpetuity pursuant to KZC 70.15(8)(b).

5. Nonnative Invasive and Noxious Plants. It is the responsibility of the property owner to remove nonnative invasive plants and noxious plants from the vicinity of any tree or other vegetation that the City has required to be planted or protected. Removal must be performed in a manner that will not harm the tree or other vegetation that the City has required to be planted or protected.

6. Landscape Plans and Utility Plans. Landscape plans and utility plans shall be coordinated. In general, the placement of trees and large shrubs should adjust to the location of required utility routes both above and below ground. Location of plants shall be based on the plant's mature size both above and below ground. See the Kirkland Plant List for additional standards.

(Ord. 4551 § 4, 2017; Ord. 4437 § 1, 2014; Ord. 4238 § 2, 2010)

95.52 Prohibited Vegetation

Plants listed as prohibited in the Kirkland Plant List shall not be planted in the City or required to be retained.

For landscaping not required under this chapter, this prohibition shall become effective on February 14, 2008. The City may require removal of prohibited vegetation if installed after this date. Residents and property owners are encouraged to remove pre-existing prohibited vegetation whenever practicable.

(Ord. 4450 § 1, 2014; Ord. 4238 § 2, 2010; Ord. 4121 § 1, 2008)

95.55 Enforcement and Penalties

Upon determination that there has been a violation of any provision of this chapter, the City may pursue code enforcement and penalties in accordance with the provisions of Chapter 1.12 KMC, Code Enforcement.

(Ord. 4286 § 1, 2011; Ord. 4281 § 1, 2011; Ord. 4238 § 2, 2010; Ord. 4010 § 2, 2005)

95.57 City Forestry Account

1. Funding Sources. All civil penalties received under this chapter and all money received pursuant to KZC 95.33(3)(c) shall be used for the purposes set forth in this section. In addition, the following sources may be used for the purposes set forth in this section:

- a. Agreed upon restoration payments imposed under KZC 95.55 or settlements in lieu of penalties;
- b. Sale of trees or wood from City property where the proceeds from such sale have not been dedicated to another purpose;
- c. Donations and grants for tree purposes;
- d. Sale of seedlings by the City; and
- e. Other monies allocated by the City Council.

2. Funding Purposes. The City shall use money received pursuant to this section for the following purposes:
 - a. Acquiring, maintaining, and preserving wooded areas within the City;
 - b. Planting and maintaining trees within the City;
 - c. Establishment of a holding public tree nursery;
 - d. Urban forestry education;
 - e. Implementation of a tree canopy monitoring program; or
 - f. Other purposes relating to trees as determined by the City Council.

(Ord. 4238 § 2, 2010)

KIRKLAND TREE CODE SUMMARY

	REMOVAL SCENARIO	REVIEW OR PERMIT REQUIRED?	MISC.
PRIVATE PROPERTY	Remove 2 trees (regardless of condition)	No review, no permit Tree removal request recommended	Notification appreciated to avoid unnecessary Code Enforcement response
	Remove 3+ trees Considered hazard or nuisance	No review, no permit if...	Hazard or nuisance is obvious in a photo or other documentation
	Remove hazard or nuisance trees in critical areas	Yes, review and permit required	Arborist report, replacements may be required
	Emergency/urgent tree removal	No review, no permit	Contact Planning Dept.
	Prune or trim trees	No review, no permit	-Property owners are responsible for tree care -No topping allowed (>50% live crown removal is same as tree removal)
	Tree removal with development	Yes, included with land use or development permit	-Arborist report required for trees potentially impacted by development -Protection measures required on site
PUBLIC PROPERTY	ROW median, CKC, CBD trees maintained by the City. ROW trees maintained by adjacent property owner unless hazard conditions exist.	Yes, review and permit required	-Public Works staff may prune street trees by property owner request -Public Works staff may remove street trees at their discretion
	Prune or remove park trees	No permit required; review/service performed by request	-Staff may prune park trees by property owner request -Most hazard tree removal is contracted out

Holmes Point Overlay Code Amendments
Major Code/Requirement Comparison Table
June 13, 2018

SPECIFIC REQUIREMENTS			
POLICY OR CODE	Citywide	HPO – Existing	HPO – Proposed
Tree Canopy Cover			
<i>Overall Canopy Goal</i>	40%	same as citywide	60% (per Finn Hill N’hood Plan)
<i>Verify Projected Canopy Cover</i>	No	No	Yes, by Landscape Architect
Protected Natural Areas (PNA)			
<i>Designate & Protect in Perpetuity</i>	No	25% of each lot	25% of total development site
<i>Threshold for PNA Designation</i>	No	Based on <i>cost</i> of remodel	Based on <i>size</i> of remodel
Tree Retention & Planting			
<i>Total Trunk Size (i.e., Tree Credits) per acre</i>	30 tree credits/acre	30 tree credits/acre	50 tree credits/acre
<i>Limit or “Cap” Retained Tree Credits</i>	No	No	Yes
“High Retention Value” Trees	Retain to “maximum extent possible”	Retain to “maximum extent possible”	Must be retained
Additional Tree Protection			
<i>“Inner Critical Root Zone” Requirements</i>	No	No	Yes, testing & aftercare
<i>Identify Impacts to Neighbors’ Trees</i>	No	No	Yes, notification/authorization
Soil Amendments per Public Works	No	No	Yes
Tree Removal (No Development)	2 trees/12 months	Tree removal not allowed	2-4 trees based on lot size/ 5 years; or Forest Plan
Tree Removal Fines – note these changes to the Kirkland Municipal Code are citywide:			
<i>Civil Penalty Fine</i>	From \$1,000 up to \$20,000/tree depending on tree trunk size		
<i>Restoration Cost</i>	Unit cost for replacement tree(s) using regional industry standard per tree, depending on trunk size		
<i>Suspend/Revoke Business Licenses</i>	For repeat offenders		

Tree Canopy Data Collection

Taking a “top-down” approach

The top-down approach is used to determine the amount and distribution of tree canopy cover, potential planting space, and prioritizing planting needs. As it is aerial-based, it does not obtain data on individual trees, such as species, size, and condition. So the top-down approach is valuable for broad-scale mapping, planning, prioritizing, and monitoring land cover – as well as for providing information about canopy cover on private property – but not as well-suited to assessing ecosystem services of individual trees.

There are three common methods for assessing urban tree canopy cover. While all three will map estimated tree canopy and other cover types in an area, they differ greatly in process, resolution, costs, and accuracy. As a result, there are various advantages and disadvantages to each method, as outlined below, in order of increasing cost and accuracy.

- 1) **National Land Cover Database (NLCD) satellite imagery** – Free maps and data for entire contiguous 48 states showing estimated percentage of tree canopy and impervious land cover.

Advantages: The most recent NLCD data (2011) comes pre-loaded into **i-Tree Landscape** (www.itreetools.org/landscape) along with other data layers, including those acquired through Urban Tree Canopy (UTC) Assessments where available and various other base map layers. This allows mapping and planning tree cover distribution based on ecological and socio-economic factors. (For more on **i-Tree Landscape**, see **Part V, Constructing the Community Framework, Tools and Strategies for Engaging the Community.**)

Disadvantages: Low resolution (30-meter pixels, or segments) cannot detect individual trees.

♦ Available only in the U.S.

Accuracy: Typically underestimates tree cover in urban areas by approximately 10 percent.

Cost: None, other than small amount of staff time, if experienced with GIS.

Recommendation: Useful for cities and broader-scale regional analyses where canopy and land cover data are needed quickly and at little to no cost. ♦ Excellent engagement tool.

- 2) **Aerial photo interpretation** – Randomly generated points on digital aerial images are interpreted to determine cover type at each point center, resulting in estimates with a known degree of statistical error. Accuracy can be easily increased by sampling more points (see below).



Figure 5. Photo interpretation involves classifying random points within preselected cover classes (e.g., tree, impervious, water).

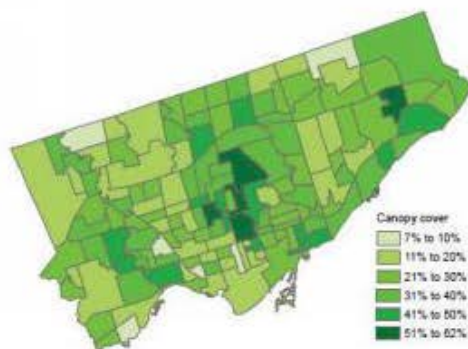


Figure 6. Neighborhood tree cover in Toronto, determined through photo interpretation

Advantages: The i-Tree Canopy program (www.itreetools.org/canopy) can be used to photo-interpret a statistically valid sample of cover points anywhere high-quality images are available in Google Maps. (This can also be done manually by GIS-experienced staff using other digital images supplied by municipal or other regional sources.) ♦ Allows quick assessment of land cover types (e.g., tree canopy, available planting space, impervious surfaces) and can produce analyses and maps by defined strata (e.g., neighborhoods, census blocks). ♦ Changes in land cover over time can be assessed by matching paired images from different dates.

Disadvantages: Cannot produce finely detailed maps of cover types, estimate full range of ecosystem services, or summarize data at multiple, finely defined scales. ♦ Available image quality may be poor in some locations.

Accuracy: A sample of 100 points (which can be interpreted in about 1 hour) will yield an estimate with a standard error of about 4.6 percent in an area with 30 percent canopy cover; increasing the sample to 1,000 points would reduce the error to 1.4 percent. ♦ To minimize errors introduced by misclassifying cover types, photo-interpreters must be trained and checked. Leaf-off imagery in particular can be difficult to interpret. ♦ Can also be useful for checking accuracy of other top-down methods.

Cost: Images are generally available for free or at low cost. ♦ Staff time depends on sample size, as noted above.

Recommendation: A good low-cost option for getting an initial top-down perspective on a city's urban forest and tracking change over time. Can be highly accurate, though not very detailed or flexible. Best method to estimate tree cover if you do not need to map it.

- 3) **High-resolution aerial or satellite imagery** – Automated techniques extract land cover features from high-resolution imagery (typically less than 1-meter pixels), yielding detailed maps of tree canopy and other cover types in a given area. (Source imagery for the entire United States is available from USDA.)

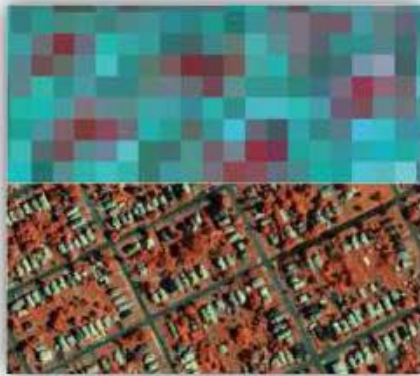


Figure 7. High-resolution (bottom) vs. 30-m NLCD imagery (top).



Figure 8. High-resolution land cover map.

Advantages: Data can be summarized at a broad range of scales (e.g., parcel to watershed), enabling user to relate tree canopy cover to a host of demographic, planning, and biophysical data. ♦ Among other purposes, can be used to locate and prioritize potentially available spaces to plant trees, and to monitor locations where cover is changing. ♦ Integrates well with GIS.

Disadvantages: Analysis and reporting requires highly trained personnel, specialized image analysis software, and significant time and effort. ♦ Requires additional modeling in order to estimate ecosystem services.

Accuracy: Accuracy varies but is typically 90 percent accurate for tree cover. ♦ Utilizing advanced remote-sensing technology, such as LIDAR (Light Detection and Ranging, or laser radar), and/or making manual corrections can increase the accuracy to over 95 percent.¹² ♦ Unless corrected, map inaccuracies can show false changes in tree cover over time.

Cost: Overall costs vary widely, depending on the size of the study area and the availability and quality of source data. ♦ Citywide assessments by professional consultants can cost anywhere from \$5,000 to \$60,000 or more.

Recommendation: Best method to map urban tree cover when expertise and financial resources are available; used for various Urban Tree Canopy (UTC) studies. For more information: www.nrs.fs.fed.us/urban/utc/.

