

Ed Murray, Mayor

SEATTLE CITY LIGHT

Transmission Vegetation Management Plan (TVMP)

2016 Revision: FAC 003-4

Transmission Vegetation Management Plan

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TVMP Applicability to FAC-003

Under federal law, City Light must comply with many complex and frequently updated electric reliability standards which cover City Light's power plant and high-voltage transmission operations. City Light must demonstrate continuous compliance, and performance against these standards and is subject to periodic audits by City Light's regulators: the Federal Energy Regulatory Commission (FERC), North American Electric Reliability Corporation (NERC) and Western Electricity Coordinating Council (WECC). NERC Reliability Standard FAC-003¹ *Transmission Vegetation Management* (FAC-003) speaks to vegetation management in the electric transmission rights-of-way. FAC-003 states that the purpose is *"to maintain a reliable electric transmission system by using a defense-in-depth strategy to manage vegetation located on transmission rights of way (ROW) and minimize encroachments from vegetation located adjacent to the ROW, thus preventing the risk of those vegetation-related outages that could lead to Cascading."* City Light developed the Transmission Vegetation Management Plan (TVMP) as a guide to document compliance with the latest version of NERC reliability standard FAC-003. For operational convenience and internal consistency, City Light also included all other aspects of our vegetation management plan for 115kV and 230kV transmission line ROW.

Per FAC-003, this standard applies to all electric transmission lines 200kV and above; or to any lower voltage lines identified as an element of a Major WECC Transfer Path in the Bulk Electric System (BES) or an element of an IROL. For City Light, FAC-003 only applies to our 230kV lines conductor clearance requirements. City Light does not have any Major WECC Transfer Path or elements of an IROL. City Light's 230kV transmission lines include: Skagit, Boundary, Eastside, Beacon, Duwamish-Creston, Duwamish-Delridge, Delridge-South and South Mass facilities.

¹ The latest version of NERC FAC-003 can be found at <http://www.nerc.com/pa/stand/Pages/ReliabilityStandardsUnitedStates.aspx?jurisdiction=United%20States>

INTRODUCTION

City Light is a municipally owned electrical utility with owned generation, transmission and distribution facilities. City Light serves a population area of 780,800 within a 131 square mile service area. City Light is dedicated to exceeding our customer's expectations in producing and delivering environmentally responsible, safe, low-cost and reliable power.

Transmission System

City Light owns and maintains 654 miles of transmission circuit miles. (See figure 1F, *Location of City Light's Transmission ROW Corridors*). There are four basic transmission systems.

City Light operates (4) 230 kV transmission circuits from City Light owned generation on the Skagit River in Skagit County, Washington. These circuits run from the Skagit Project to Bothell receiving substation, north of the City of Seattle.



City Light operates (3) 115 kV transmission circuits from City Light owned generation associated with Seattle Public Utilities watershed operations and dams at the Tolt River and Cedar Falls watersheds. These transmission lines interconnect at Puget Sound Energy substations and are not directly connected to City Light's transmission system. Also, City Light operates (6) 115 kV transmission circuits that feed various North Seattle substations.

City Light operates (3) 230 kV transmission lines connecting various receiving substations in the City to the Bonneville Power Administration (BPA) Maple Valley Substation and (2) 230 kV transmission lines connecting various City Light substations with the BPA's Covington Substation. In addition City Light owns and maintains (2) 230 kV circuits from Maple Valley across the eastern shores of Lake Washington, which ties BPA's Maple Valley and Sno-King substations.

City Light also operates (6) 230 kV transmission lines traversing ½ mile from the Boundary Dam and ROW, located on the Pend Oreille River, terminating at the BPA switchyard. These lines provide more than half of City Light's total energy generation.

Responsibilities

The Power Production Division is responsible for the Transmission Vegetation Management Plan on the Skagit Transmission line, north of the Sauk River up to the Skagit Hydroelectric facilities (37 miles). The Energy Delivery Operations Division, Vegetation Management unit, has the responsibility for the remaining portion of the Skagit Transmission line from the Sauk River south to the Bothell Substation (57 miles) and all other transmission lines, including Boundary. Vegetation Management's Plant Ecologist, assists this departmental unit in the planning, drafting and publication of the Transmission Vegetation Management Plan (TVMP).

Terrain and Vegetation

The transmission line system travels through a variety of terrains and a variety of vegetation conditions. In the rural areas of the state the transmission system traverses mature evergreen forests with a mix of deciduous and conifer trees. The dominant large tree species in these forested areas include Big Leaf Maple, Red Alder, Black Cottonwood, Douglas Fir, Western Hemlock, Western Red Cedar, Western Larch, Grand Fir and Lodgepole Pine. Of these, it is the Red Alder and Black Cottonwood that grow the fastest, especially in wetter than normal rainy seasons. Throughout the transmission line territory, the normal rainy season lasts from November to beginning of July.

Increasingly, suburban development is occurring along the entire transmission ROW. Sub-divisions and commercial developments now border more than half of the transmission system. However, in these areas often Hemlock and Douglas fir are left adjacent to the transmission line ROW with the intent of providing a buffer to the adjacent properties. These buffers are inherently unstable and prone to wind throw. In the direct service area, the transmission system is within an urban setting with fewer tall trees, but much more restricted transmission ROW and/or the transmission system itself is constructed in the street right of way and not in separate transmission ROW.

City Light Transmission Corridor Descriptions



City Light's transmission line ROW range from 300 feet wide to less than 40 feet in width, with one or more steel towers, cement, wood, or steel poles. These ROW differ in topography, vegetation, land-use and political jurisdiction. (See Figure 1F for the *Location of City Light's Transmission ROW Corridors*). Most of the urban ROW are City owned. The majority of City Light's other ROW are easement property; private landowners have granted City Light easements for construction, operation and maintenance of the transmission lines. There are no areas on the ROW that City Light does not have access for operation and maintenance responsibilities. Landowners retain the rights to engage in all activities that do not conflict with the transmission system (See appendix 1-A, *Real Property Use Guidelines*).

Skagit Corridor - 230kV



The Skagit ROW corridor is 94 miles long, averaging 300 feet in width, and passes primarily through rural and forested areas, although there has been a dramatic increase in suburban development adjacent to the ROW in Snohomish County in recent years. Twenty miles lie within the Ross Lake National Recreation Area (NRA) near the generating facilities on the upper Skagit River. The ROW is often used for agricultural crops and pastures in rural residential areas. The primary control effort needed on the Skagit ROW is tree removal. Average distance from ROW easement edge to tower centerline is 37.5 feet from the D and B circuits. BPA controls 75 feet of the 300 foot City Light ROW from the B side of City Light's ROW (see figure 2-F, *Side Clearances by Corridor*). On the ROW north of the Skagit River, the tower centerlines are 75 feet from ROW easement edge for both circuits. The limited side clearance for the D circuit south of the Skagit River restricts maximum allowable vegetation height near the ROW edge. For approximately 40 miles a double wood pole line (BPA or Snohomish County PUD) also lies within the outer 75 feet of the ROW adjacent to the B circuit; each utility is responsible for vegetation maintenance under and adjacent to their lines. In these areas the maximum allowable tree height is again severely restricted.

ROW maintenance activities adjacent to the Skagit Generation Facilities are subject to City Light's Skagit Relicensing commitments as laid out in the, *Skagit River Hydro. Project, No.553* (See appendix 22-A). Those commitments and requirements are the basis for work practices by the ROW crews headquartered at the Skagit under the Power Production Division.



Due to the narrow valley in the upper Skagit area, the transmission line splits into 2 ROW where it is not possible to place the two towers side by side within one ROW (approximately 11 miles long); access and maintenance are generally more difficult in this area (e.g., some areas are accessible only via boat).



Cedar Falls Corridor – 115 kV

The Cedar Falls line also lies predominantly in rural and forested areas. Approximately 9 miles of the ROW is within the boundaries of the City of Seattle watershed which is a closed watershed. However, in 2006, the City of Seattle and the Muckleshoot Indian Tribe reached an agreement (City of Seattle and Muckleshoot Indian Tribe Agreement, May, 2006) that provided for Tribal members to access the Cedar River watershed to engage in traditional activities and to exercise hunting and gathering rights reserved by their Treaty, (i.e. deer, elk, berries, bear grass and cedar trees).



This 30 mile single wood or cement pole line primarily has an east-west orientation. The ROW width varies on the nine miles from the powerhouse to Landsburg (watershed). From Landsburg to Fairwood, the width is 66 feet.



There is very little direct sunlight on the ROW within the watershed even during the

summer months due to the mature conifer forests immediately adjacent to the ROW. Outside of the watershed this ROW parallels the City of Seattle's water pipeline until Lake Youngs. Manual tree removal is also the major vegetation control technique utilized on the Cedar Falls ROW. Development is increasing rapidly in this area and much of the land adjacent to the line outside of the watershed will be all residential areas in the near future.

In 2000, the City of Seattle prepared a multi-species Habitat Conservation Plan (HCP), to comply with the federal Endangered Species Act and to address other related natural resource issues. Since City Light maintains and operates approximately 9 miles of their 115 kV Cedar Falls transmission line through the watershed, added emphasis is placed on vegetation management through this area now. Although this transmission ROW is narrow, City Light still implements the Wire Zone-Border Zone vegetation objective and industry accepted protocols on the vast majority of their transmission lines.

Integrated Vegetation Management (IVM) is the commonly used protocol here and on all other City Light transmission lines. In the Cedar Falls watershed, City Light is practicing this protocol by promoting desirable, stable, low-growing plant communities that will resist invasion by tall growing tree species through various methods. These include manual, mechanical and biological treatments. The choice of method used is based on effectiveness, environmental impact, site characteristics, safety concerns, economics, worker and public health. This IVM method since 2000 has resulted in shifting plant communities found on the current Cedar Falls ROW away from tall-growing species in favor of plant communities dominated by naturally occurring low-growth species. The Wire Zone-Border Zone concept, based on years of research has proven to be effective in reducing outages related to vegetation on the transmission ROWs. Other benefits include reduced long-term maintenance costs, improved habitat for wildlife, biodiversity and wildland fire mitigation.



Eastside (230 kV) and ABC (115 kV) Corridors

The ABC and Eastside lines lie primarily within suburban areas. Crown reduction and trimming efforts are greater on these ROW as a large portion of them are adjacent to or pass through residential areas (landscaped backyard situations). In 2010, additional emphasis for tree removal and replacement with compatible species was implemented on these ROW. This is the preferred option to repeated topping and trimming efforts.

The primary purpose of the Eastside Line is to provide safe transmission of electricity. There are portions of this line through the city of Bellevue that also provide multiple uses that benefit the community and the environment. These uses include but are not limited to recreational activities, trails, parks and open space native plant communities. At the request of Bellevue, in 2010, City Light developed a site specific “*Seattle City Light Vegetation Management and Maintenance Plan for Eastside Transmission Line Corridor through The City of Bellevue*” (See appendix 20-B). This is to address vegetation activities and practices in this city’s environmentally sensitive areas along this line. Implementation of this plan requires active and ongoing communication and coordination between City Light and Bellevue. The purpose and goal of this plan is to guide routine and emergency vegetation management through Bellevue that will still ensure the safe and reliable delivery of electricity. This plan is an amendment to the overall TVMP.

The Eastside line also crosses Bridle Trails State Park near Bellevue. Clearance work in this area is done in cooperation with the Park Ranger. In 2008, a site-specific Vegetation Management Plan was finalized and approved for City Light’s 1-mile stretch of transmission lines that traverse this State Park. That agreement is another amendment to City Light’s TVMP.



In suburban areas the ROW is used more often for athletic fields, trails, gardens, horse stables, pastures, and lawns than less populated rural areas.

Three towers span the width of the ABC ROW, which averages 150 feet. Tower centerline to ROW easement edge is only 37.5 feet for both outside towers. The Eastside line, designed to accommodate two towers, is 150 feet wide from the Bothell Substation to Mile 23 and 200 feet wide after mile 23. Only one tower line is constructed on this ROW; tower centerline is 37.5 feet from westerly edge of the ROW.

Tolt Corridor - 115 kV

The Tolt transmission line runs from the Tolt Watershed project to the Stillwater Substation, which is approximately nine miles. Five miles of this line is in the Tolt Watershed. This line follows the City of Seattle water pipeline. This shared ROW was not originally designed for a transmission line, and therefore is not a dedicated transmission line ROW with “danger tree” rights. Currently, the majority of vegetation maintenance involves brush work with occasional tree trimming within the ROW.

Urban Corridors: PNT (115 kV), Beacon (230 kV), Duwamish-Creston (230 kV), Duwamish-Delridge (230 kV), Delridge-South (230 kV), South-Mass (230 kV).

The primary vegetation control needed on the urban lines is grass mowing. Residential, commercial, and industrial areas lie adjacent to the ROW and playgrounds, paths, gardens and parking lots may extend beneath the transmission lines. As these areas are more highly visible to the public, a more groomed appearance is implemented on these ROW.

Boundary Corridor – 230 kV

The Boundary transmission line runs from the underground Boundary Dam powerhouse, 2,700 feet uphill, terminating at the BPA switchyard. Six 230 kV transmission lines traverse the length of the Boundary ROW. The Boundary ROW lies predominantly in a forested area, with rock outcrops and high rock cliffs. Manual and mechanical methods are recommended for the boundary ROW due to slope conditions and its close proximity to the Pend Oreille River; thus reducing chemical vegetation management options. Lying within the scenic reach of the Pend Oreille River, the ROW is also managed for aesthetics, as visitors and tourists view it from the Boundary House Vista Lookout, with sweeping views of transmission lines up and across rocky cliffs.

Access Roads

City Light's transmission ROW access roads have to be sufficiently free of vegetation so that all crews, equipment and vehicles can safely travel over them to all segments of the transmission electrical system for ROW maintenance work, electrical system repair and maintenance and emergencies. The roads are maintained to at least 4x4 accessibility.



The various types of work involved with road system maintenance include grading, spreading rock and gravel, water control, routine culvert maintenance and replacement, gate and barrier installation/repair and side-arm mowing.

Water

Water is a very important resource present within City Light's ROW. This resource provides:

- Hydro-electric power
- Fish and wildlife habitat
- Recreation
- Drainage and flood control
- Irrigation
- Drinking water
- Social and tribal values and use.

City Light's transmission lines and access roads cross numerous water resources including rivers, streams, wetlands and flood plains. City Light strongly emphasizes the protection of these water resources. Trees and shrubs often grow faster near water, and these areas need extra attention by City Light ROW crews to make sure vegetation does not grow into the transmission lines. In some cases, the transmission lines span well above deeper cut stream channels, allowing vegetation to exist unchanged.

Organization/Staffing

The Transmission Vegetation Management Plan (south of the Sauk River crossing), is assigned to the Vegetation Management Unit within the direction of the Energy Delivery Operations Division, (see figure 3F *EDO Vegetation Management & Energy Delivery Operation org. chart*); as part of the Energy Delivery Support Services Organizational Unit. There are two ROW crews typically, 6 crew members each (see figure 3F *EDO – Vegetation Management & Energy Delivery org. chart*). They are staffed with electrical workers, equipment operators and ROW grounds maintenance personnel. The ROW crews work continually to maintain the transmission ROW performing tree trimming, small tree removal and ROW vegetation control. City Light has one, in house, qualified 2-person tree trimming crew. They assist the ROW maintenance crews in tree removals along the transmission ROW's. Starting in January 2011, this same City Light in-house tree trimming crew began assisting the Powerline Clearance work group with tree trimming and removals within the distribution system. Qualified contract power line clearance crews, however, perform the major portion of the tree trimming and removals along the transmission ROW. Currently Asplundh Tree Expert and Kemp West are under contract to City Light to perform this work. City Light's in-house line crews perform transmission system repair and maintenance.



All personnel directly involved with the ROW Vegetation Management Plan, hold appropriate qualifications and training (see figure 3H-1, *City Light Employee's Job Descriptions, Resumes ROW*). ROW transmission maintenance from the Sauk River crossing north to the Skagit Generation is assigned to the Facilities Maintenance Group in the Power Production Division. They are staffed with ROW crews and road maintenance crews. Powerline Clearance qualified tree crews or qualified contract tree crews, under contract to City Light, can perform tree trimming and/or removals at the Skagit location.

TRANSMISSION VEGETATION MANAGEMENT PLAN

City Light's TVMP is designed for all City Light's ROW maintenance. This Management Program covers all of City Light's rights-of-ways regardless of transmission voltage for operational convenience. However, neither City Light nor the RRO expanded the scope of City Light FAC-003 compliance responsibilities beyond City Light's 230 kV system; only City Light's 230 kV system is subject to FAC-003.

It is intended for City Light's ROW crews and qualified contract crews involved in ROW maintenance activities implementing City Light's TVMP. This involves vegetation control, access and road maintenance, culvert and bridge maintenance and/or construction, revegetation and restoration of habitats. City Light has been implementing an existing, written ROW Maintenance Plan since 1990. Numerous new and revised regulatory issues required City Light to provide an updated written vegetation management program in 2014. (See appendix 2-A, *NERC Reliability Standard, FAC-003-4, Transmission Vegetation Management*).

City Light ROW crews work the transmission corridors daily. Transmission line crew chiefs constantly monitor vegetation growth, clearances, access roads, culverts, bridges, ROW uses, land-use/easement encroachments and vandalism to identify areas and prioritize types of vegetation needing control. Development of the TVMP is based on City Light's experience and emphasizes the anticipated rate of growth of vegetation, especially alder and cottonwood as the fastest growing species found on City Light's ROW's. (See appendix 24-A, *Seattle City Light Vegetation Management Rights-of-Way Tree Species and Growth Rate*). The overall TVMP program goal is to maintain the ROW on a 4 year cycle and include the following elements:

- The ROW crews maintain regular and ongoing contact with adjacent property owners and City Light's own Real Estate Management Section to assure that the uses of the ROW are consistent with the utility requirements(i.e. no buildings are erected, fences provide for access, etc.)
- Privately planted trees within the ROW are limited to no more than 12 feet in height and are trimmed or removed to maintain this clearance.
- ROW improvements continue to provide access to transmission towers for inspection and repair.
- Trees adjacent to the ROW are trimmed to the edge of the ROW and danger trees are thinned and removed as required and permitted. Most conifer trees do not require cycle trimming but deciduous trees are monitored and trimmed on an as needed basis rather than on a periodic basis.
- Low growing bush within the ROW is left as much as possible, but is cut to maintain roadway access.
- Any 'volunteer trees' that take root naturally within the ROW are removed before they exceed a height of 12 feet to ensure proper clearances.

- Roadways within the ROW are maintained in good repair to ensure that they will support 4 wheel drive pick up trucks for access to all towers within the transmission system.
- Trees adjacent to the ROW that have been trimmed excessively over the years are monitored and removed using contract power line clearance crews. In addition, trees that are identified as danger tree, i.e. those that could pose a potential hazard to the transmission system are removed after consultation and permission with the adjacent property owners.

The overall flow of work is seasonal. During the winter months, the crews are generally close into the service area to avoid areas of snow and excessively wet and soft ROW. When weather conditions are at their best, ROW work is scheduled for the forested areas and across the major portions of the transmission system. This allows for improved productivity and avoids the problems of soft soils and increased road repairs for routine activities.

The Skagit Operations Division operates on a similar basis as the Seattle based crews. Work is even more seasonal due to the higher elevations and winter weather conditions. Work is performed at lowest elevations first and moves to the higher elevations as snow recedes and access improves. Due to the shorter transmission line segment (approximately 30 miles) that the Skagit Operations Division is responsible for, they work across the transmission system continuously addressing emerging tree and brush problems annually.

The in-house 2 person tree trimming crew works across the transmission system also. The crew is shared by both north and south ROW crews and is made available to the Skagit Operations on an as needed basis. Starting in 2011, this crew became available to perform tree trimming on City Light's distribution system.

City Light also has qualified contract tree trimming crews that work on the transmission system. They take their work assignments from the Transmission Line Crew Chiefs. Currently in 2014, City Light's contract tree trimming crews are Asplundh, Kemp West and Davey Tree Surgery Co. All these contractors have currently negotiated to work for City Light's Vegetation Management Unit from 1/23/14 to 12/31/16. Under their contracts, they are required to employ only qualified and annually certified Powerline clearance personnel to perform work.

Annual Work Plan

An annual work plan was developed that outlined all 230 kV transmission vegetation ROW work to be accomplished. This work is summarized and organized by transmission line segments on an excel spreadsheet and updated regularly (see appendix 20-A, *230 kV NERC Reporting: Master List of Line Segments*). The responsible transmission line crew chiefs with their unit managers, set the overall annual goals and tracked accomplishments. City Light's annual work plan, documented work between 2011 and through the 4 year cycle ending in 2014 (see appendix 20-B, *Transmission Vegetation*

Management Activity 2011-2014 230 kV Reporting and appendix 20-D, *2011-2014 Annual Work Plan Summary – City Light Trans. Veg. Mgt.*.) The work documented was directly related to the 230 kV transmission system reliability and included manual clearing, mechanical clearing, brush removal, tree topping, danger tree removal and line patrol inspections. In 2011, the beginning of a new 4 year cycle, City Light began forecasting its work plan annually, instead of 4 years at a time, and tracked again on an excel spreadsheet(see appendix 20-D, *2011-2014 Annual Work Plan Summary – City Light Trans. Veg. Mgt.*).

The annual work plan (one calendar year) and its vegetation maintenance schedules are based on several parameters. The transmission line Crew Chiefs have 20 and 30 years electrical utility and vegetation maintenance experience, respectively. Both are journey level lineworkers and one a journey level Powerline clearance tree trimmer. First, this experience readily identifies transmission ROW areas needing little or no maintenance. These include but are not limited to urban concrete areas of roads and walkways, paved parking lots, business and industrial areas, etc. Then, their experience identifies other segments of the transmission ROW that need to be scheduled for maintenance. These transmission line Crew Chiefs utilize City Light's in-house or contract certified arborists to assist them in identifying and prioritizing vegetation maintenance. All 230 kV transmission ROW is highest priority and is scheduled accordingly. Adjustments to schedules may be implemented based on changes in anticipated tree growth (high growth), due to extreme weather conditions of above normal precipitation and subsequent warm weather growing seasons; easements and permit allocations, customer notifications, major storm events and emergency transmission maintenance, repair and access.

City Light's transmission line patrol inspections are performed by the North and South Transmission ROW Crew Chief and crews. Crews that are assigned to the Skagit Project, patrol the transmission system adjacent to the Skagit Generating plants. The entire transmission system is patrolled and inspected annually (once every calendar year), to assess the condition of the transmission; identify potential encroachments including new construction that could conflict with the safe operation of the transmission system; changes in vegetation/tree conditions and potential damage to transmission access roadways. The annual transmission line patrol and inspection is performed usually in the 4th quarter (Oct. through Dec.). The inspections are from the ground in vehicles and on foot, where access does not allow vehicular travel. This is an end-to-end vegetation management inspection of all 230 kV transmission lines with the primary outcome of this inspection to be an assessment of the Level 1 and Level 2 tree outage risks and Level 3 potential danger trees as well.

Transmission line patrol requests can thereby be generated from a variety of sources, including but not limited to, the System Operating Center (SOC), Service Requests, Trouble Tickets, and customer call-ins. And in case of an emergency, "*The Vegetation Management Call-Out Procedures*" (See appendix 25-A), will be implemented. The patrol inspection is documented on a "*Seattle City Light Transmission Line Patrol Report*" form (see appendix 30-A). During the inspections, any vegetation management and other related issues will be written down on this form. This information will then generate a written "*Seattle City Light Transmission Planned Action Item*" form (See appendix 30-B). This is transmission work that will be prioritized and distributed to the

appropriate crews to accomplish. After each planned action item is completed, the work is inspected in the field and verified completed and according to specifications by signing and dating the “Seattle City Light Transmission Action Item” form. The Crew Chiefs do not verify their own work. They verify each other’s for accountability. There are also additional qualified personnel to verify transmission work completed and to sign the appropriate form. The hard copies of both the “line patrol” and “action item” forms are compiled into notebooks and remain in Vegetation Management’s unit office. These forms are available for constant review and for planning purposes. Copies of the forms are also submitted timely to City Light’s Compliance Unit for review, regulatory compliance and record retention.

The communication protocols on the transmission ROW’s are performed between the transmission line crew chiefs and City Light’s SOC. This is accomplished via the 800 MH radios in City Light vehicles and cellular phones. These communication procedures are part of City Light’s Clearance Procedures (See appendix 31-A, *City Light System Operations, Clearance, Keep Open and Hold Open Procedures*). This is especially critical and is immediate communication to the OCSOC when vegetation issues pose an imminent threat to transmission line reliability or outages. Only qualified City Light employees, which include both transmission line Crew Chiefs, can request and hold a clearance.

City Light can implement RCW 64.12.035(Cutting or removing Vegetation-electric utility-liability) which outlines the procedures for cutting or removing vegetation that poses either an imminent or potential threat to our electric facilities.

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Department Policy and Procedure (DPP 500 P I-506)

A *City Light Departmental Policy and Procedure, DPP 500 P 506* (Appendix 3A), for the maintenance of City Light transmission ROW's' was initially established in 1983 and continues to set these goals:

- To maintain the integrity of the transmission system to ensure there are no outages due to interference with the conductors from vegetation or human-made objects.
- To provide access, where reasonable, to all structures in the transmission system.
- To utilize an integrated vegetation management (IVM) approach to vegetation control.
- To utilize maintenance methods which are legal, safe and economically acceptable to the utility industry, and generally acceptable to the public.
- To encourage compatible multiple use of the ROW where feasible.
- To maintain the ROW in cooperation with governmental agencies having jurisdiction over adjacent property.

Vegetation Maintenance

From an electric reliability viewpoint, there is an industry consensus as to how to maintain a transmission ROW. This basically requires managing vegetation so that it cannot grow into, or fall onto the energized lines. The following maintenance plan describes the routine maintenance work, primarily associated with vegetation control, which is carried out on City Light's ROW's. The management strategies presented in this plan were developed to provide guidelines for the protection of the electrical system, the workers, and the environment.

The ROW maintenance program at City Light uses a variety of methods to control vegetation and create diverse habitats. Methods of control include manual, mechanical, chemical, biological and cultural techniques; however, the use of herbicides is minimized in favor of other techniques. This integrated approach, Integrated Vegetation Maintenance (IVM) to ROW maintenance was implemented to provide the utility with a safe, environmentally and economically sound program. IVM is a Best Management Practice (BMP) strategy to cost-effectively control vegetation to maximize desirable effects and minimizing negative effects. The utility industry has had continuing success in applying an IVM approach for managing ROW vegetation.

The situations on the ROW that necessitate vegetation management are:

- Natural regeneration of power line incompatible tree species. Requires continuous, cyclic removal within and along the transmission ROW; before they become potential danger trees or imminent hazard trees.
- Tall-growing trees below the circuits that will grow upwards into the power lines must be removed.
- Tall-growing "danger trees" encroaching from the ROW edge that may fall into the conductors as a result of wind throw, disease, decay or unstable root support; must be removed where feasible and permissible. Encourage and create a predictable, low-growing vegetative community under and adjacent to the ROW. Low-growing species are compatible with power lines. They compete and inhibit establishment and spread of tall-growing incompatible species.



- Vegetation blocking access to the transmission electrical system (poles, towers and power lines) must be removed and controlled
- Control of noxious and invasive weeds

Wire Zone – Border Zone

Past practices in City Light's vegetation maintenance reflected clearing the ROW of all trees and shrubs creating a straight, cleared ROW swath. The edges of this swath, called "backlines", depicted a sharp 90° angle of vegetation to the ROW. City Light's ROW maintenance has improved and is now striving to be more selective, whenever feasible, by creating curved backlines and "feathered edges"; leaving compatible plant and tree species growing in the ROW. This concept is typically referred to as the Wire Zone-Border Zone and is based on years of research.



A low shrub-forb-grass, ROW cover type is shown on this wire zone and a taller shrub-forb-grass cover type is on the border zone. (Bramble, W.C., W.R. Byrnes, R.J. Hutnick and S.A. Liscinsky. 1991 Prediction of cover types of rights-of-way after maintenance treatments. *Journal of Arboriculture* 17:38-43.)

Integrated Vegetation Management

City Light implements this Wire Zone-Border Zone concept utilizing appropriate IVM techniques. This is accomplished by:

- Selectively removing and controlling tall-growing species with as little impact as possible to the native and other low-growing species. This continued vegetation removal, especially through a forested environment leads to an arrested stage of plant succession; thus allowing and promoting the plant/tree species that are low-growing to compete and reduce the number of larger and taller plant/tree species. Low growing shrubs decrease the sunlight that reaches the soil level, thereby preventing tree seed germination. Unwanted vegetation is removed which allows and encourages this more dense, stable, low-growing plant community which are compatible growing by power lines.

- Removing deciduous trees in such a manner as to prevent resprouting (e.g. time of year tree is cut, cut stump herbicide treatment, or mechanically shattering the root crown).
- Development of new plant communities by preparing a seedbed and seeding/planting with compatible species, emphasizing native plant species wherever feasible.



- Seeding and/or fertilizing existing or disturbed areas with compatible species.



- Encouraging land use practices which exclude tree growth (e.g., pastures, gardens, etc.) These vegetation management practices reduce the establishment and growth of many undesirable and incompatible tree and plant species. The most incompatible tree species on City Light's transmission ROW's include alder, cottonwood, maple and most conifer species. Once these incompatible tree species get established, they grow extremely fast and often break in windstorms, landing on or taking down the power lines creating power outages. The vegetation management practice implemented depends on the density of the problem species, the existing plant community, the terrain, environmental sensitivity and the ownership of the ROW

This Wire Zone- Border Zone concept has been proven to be effective in protecting the reliability of the transmission lines by eliminating trees or other incompatible vegetation

that potentially could grow into the wire zone; reducing outages . This would be the recommended ROW maintenance technique to be used wherever possible. However, there are many locations on City Light's transmission ROW where this would not be practical. Our transmission lines through the more urban areas with existing landscaping and numerous property lines, are not able to adapt the Wire Zone- Border Zone concept in its entirety.



However, City Light will continue to strive towards establishing and maintaining this Wire Zone-Border Zone vegetation maintenance concept, per ANSI A 300 (*Tree, Shrub, and Other Woody Plant Maintenance-Standard Practices, Integrated Vegetation*

Management, Electric Utility Rights-of-Way; see appendix 4-A). Using this concept means that City Light's ROW no longer have that 90° straight-line look to its ROW. This concept accomplishes other important vegetation management objectives at the same time:

- Improving wildlife habitat
- Wildland fire mitigation
- Reduced long term maintenance costs
- Aesthetically more pleasing and acceptable to an ever increasing higher public awareness



Trimming Clearances

The majority of the transmission ROW outside of the service territory is on easements that were obtained in the 1920's. Additional transmission easements were obtained in the

1940's. The majority of the transmission ROW are narrow by today's standards. In many areas the edge of the ROW to the nearest conductor is only sufficient to achieve the minimum clearances for the operating voltage.



In some areas the ROW provides minimal clearance to the edge of the ROW for the overhead 230kV-transmission system. Vegetation adjacent to the ROW is side trimmed to the edge of the ROW to ensure clearances are maintained. Within the ROW, trees are maintained to ensure proper clearance is maintained, either by controlling the type of trees planted by property owners, trimming/topping trees that grow above the 12' restriction or securing property owner's permission for removing the trees altogether.



Danger Trees

The single largest cause of electrical power outages on City Light's transmission lines are from trees or portions of trees which fall into the overhead power lines, especially during wind events. These trees and portions of trees are typically from a distance

located outside the normal ROW and outside of what would be trimmed or removed.



These trees break off or fall in their entirety into and across the transmission lines knocking them down and sometimes breaking the transmission pole/tower structures.



These trees are “danger trees”. They present a high risk to the transmission line’s reliability, the workers, and public safety. As defined by ANSI A300, a danger tree is “a tree on or off the ROW that could contact electric supply lines”.

The need is to develop priority procedures to allow City Light to take prompt, corrective action to mitigate these “danger trees”.



There are current guidelines and regulations that electric utilities utilize to work toward the mitigation of transmission line outages. The National Electric Safety Code (NESC) Rule 218 is the guideline most widely adopted and referenced for vegetation management programs. As required by law, City Light uses the National Electrical Safety Code (*NESC, 2007, Rule 218*– See appendix 4-B) as the basis for their tree clearing.

NESC 2007 Rule 218

Vegetation Management

1) General

- a. Vegetation that may damage ungrounded supply conductors should be pruned or removed. Vegetation Management should be performed as experience has shown to be necessary. Note: Factors to consider in determining the extent of vegetation management required include, but are not limited to: line voltage class, species' growth rates and failure characteristics, right-of-way limitations, the vegetation's location in relation to the conductors, the potential combined movement of vegetation and conductors during routine winds, and sagging of conductors due to elevated temperatures or icing.
- b. Where pruning or removing is not practical, the conductor should be separated from the tree with suitable materials or devices to avoid conductor damage by abrasion and grounding of the circuit through the tree.

At line crossings, railroad crossings and limited-access highway crossings the crossing span and the adjoining span on each side of the crossing should be kept free from overhanging or decaying trees or limbs that otherwise might fall into the line.

Electrical Clearances

NERC defines a Minimum Vegetation Clearance Distance (MVCD) which is derived from the Gallet Equation, a method of calculating a flash-over distance that is used in the design of high voltage transmission lines. The MVCD accounts for both voltages and line

altitudes; compliance with FAC-003 demands vegetation be maintained to avoid preventable encroachments into the MCVD, at all times. City Light has 230kV transmission lines from sea level up to 2,700 feet.

To meet these regulatory requirements, ensure the safety of the Public, protect against flash-over between conductors and trees and to prevent trees on the historically-managed right-of-way from falling into the conductors should they fail, City Light has defined Minimum Standing Vegetation Clearances (MSVCs). These clearances accommodate worst-case conditions such as maximum conductor displacement, span length, wire type, maximum vegetation growth rates, and assume a 2-year vegetation management cycle. City Light's expectation is that the MSVCs will hold for the duration of the management cycle; actual conductor-to-tree pruning distances will vary by species, accordingly. The MSVCs are the sum of:

- the maximum calculated conductor-displacement for a given span per City Light's *Conductor Movement Calculation Methodology* (Attachment 12F)
- the most conservative MVCD applicable to a given conductor, at altitude;
- a "Tree Growth Safety Buffer" based on the maximum growth rate of a Black cottonwood (*Populus trichocarpa*), the fastest-growing tree species found on City Light's ROWs (Appendix 24A);

For 230kV transmission lines Tables 1 and 2 detail City Light's MSVCs:

Table 1: Sag Clearances				
Span length (ft)	Max sag² (ft)	MVCD (ft)³	Tree Growth Safety Buffer (ft)⁴	MSVC (ft)
≤ 1500	15.8	4.3	6.0	26.1
> 1500	17.2	4.3	6.0	27.5
Boundary	20.6	4.3	6.0	30.9

Table 2: Swing Clearances				
Span length (ft)	Max swing (ft)	MVCD (ft)	Tree Growth Safety Buffer (ft)	MSVC (ft)
≤ 1500	14.4	4.3	6.0	24.7
> 1500	45.5	4.3	6.0	55.8
Boundary	41.9	4.3	6.0	51.9

Imminent Hazards

An imminent hazard to the general public health, safety or welfare exists when:

- "Vegetation has encroached upon electric facilities by overhanging or growing in such proximity to overhead electric facilities that it constitutes an electrical hazard under applicable electrical

² See Figure 12F for calculation methodology.

³ Per NERC FAC-003-4, MVCD Table.

⁴ Based on the maximum growth rate of Black cottonwood, *Populus trichocarpa*. See Appendix 24A.

construction codes or state and federal health and safety regulations governing persons who are employed or retained by, or on behalf of, an electric utility to construct, maintain, inspect and repair electric facilities or to trim or remove vegetation; or

- Vegetation is visibly diseased, dead or dying and has been determined by a qualified forester or certified arborist employed or retained by, or on behalf of, an electric utility to be of such proximity to electric facilities that trimming or removal of the vegetation is necessary to avoid contact between the vegetation and electric facilities” (see appendix 15-F, *RCW 64.12.035, Cutting or Removing Vegetation*).

The process for the immediate communication of vegetation conditions that present an imminent hazard or threat to the transmission lines is:

- Identify vegetation as an imminent hazard; all imminent hazards will be handled as emergency work
- The work will accomplish removing the hazard
- Transmission Line Crew Chief to call Power Dispatcher if clearance, hold opens or switching will be required
- Notify property owner if needed
- Mobilize crews and equipment
- Perform work and document on timesheets
- If permits are required due to tree removals, notify appropriate agency and personnel to acquire these and perform any necessary mitigation measures for full permit compliance

Mitigation measures might also have to be implemented to achieve sufficient clearances in the protection of the transmission lines where locations restrict attaining these sufficient clearances. Typically these restrictions are line to ground clearance in mountainous terrain. Mitigation measures could include:

- Changing the grade of the ground
- Line construction; changing line configuration; re-sagging the line.

Vegetation Methods and Removal

Vegetation control efforts on City Light's ROWs are achieved primarily through manual (chainsaws) and mechanical (mowers/cutters for grass and brush) methods.

- Mechanical clearing is utilized on a limited basis on City Light ROWs. Areas targeted for mechanical clearing are areas of high tree

density with accessible terrain, and areas where the machine will not damage compatible vegetation or damage adjacent property with flying debris, although new equipment developments are reducing this hazard. Several types of brush clearing machines are presently used.



Vegetation Management has a boom mower attached as a side-mount to a tractor. This machine is used primarily for roadside brush control but will occasionally, where terrain permits, be used for brush control on the ROW. Also there is the “slashbuster”, which is an attachment to the excavator that chips, grinds and mulches trees and shrubs. A tractor pulled rotary mower (6 ft swath) is also used on the ROWs to cut brush alder where the terrain permits. Presently, the Power Production Division does not use mechanical clearing for maintenance of the upper Skagit ROW.



- Majority of clearing efforts on City Light’s ROWs are done manually with chainsaws. The cut stems are chipped and broadcast or hauled off site.



Larger diameter stems are limbed and typically cut into firewood lengths and left on the ROW. Work may be restricted or prohibited during the summer months due to the State's fire precaution restrictions or shutdowns (see appendix 5-A, Industrial Fire Precaution Levels) for fire season and fire precaution levels. With the increase of landscaped suburban and urban areas along the ROWs, there has been an increase in the amount of tree topping and trimming that is done on the ROW.

- Routine mowing is done on approximately 270 acres of the Beacon Hill, Duwamish, and the PNT ROW's to control grass, shrubs and weeds. Hand held brush cutters are used in areas where the tractor mowers are not able to access. Annual labor hours are dependent on growing conditions which control the number of cuttings per year.



- Manipulation is an effort to alter vegetation in areas with dense stands of problem vegetation or to revegetate severely disturbed areas (typically seeding/fertilization efforts). These efforts are made in an attempt to eliminate or reduce future maintenance efforts and thus,

reduce long term costs for control. Seeding and fertilization of ROW areas without seedbed preparation is also under consideration for investigation.

- Herbicides are used only as an additional tool to help control deciduous tree stump resprouting in selective areas and to control invasive and noxious weeds. Spot application of approved herbicides is permitted by Departmental Policy and is the only application method utilized for herbicides on the ROW. Herbicides are presently used on a limited basis for control of deciduous stump sprouting and noxious weeds.

Noxious Weeds

Noxious weeds are non-native plants. Most were first introduced into the U.S. from Europe and Asia by escaping from gardens, arriving accidentally with straw, seeds, cargo or ship's ballast. Now these weeds are introduced, spread and transported by people, vehicles, livestock, wind, water and wildlife. They are destructive, competitive and difficult to control because of their aggressive growth and lack of natural enemies. These immigrant weed species invaded river valleys and crept up mountainsides.



They are now weeds that plague millions of acres of rangelands, pastures, wetlands and forested areas. This aggressive growth has cost over 140 billion dollars in lost production and environmental degradation in the U.S. In Washington State, the cost is in the millions with reduced crop yields, destroyed native and animal habitats, degraded wetlands, poisoned livestock, reduced land values and the harm to public health.

Noxious weeds are designated by Federal and State Laws. Noxious weeds on City Light's ROW's are controlled, as required, by Washington State Noxious Weed Control Regulations. Washington's Noxious Weed Law, RCW 17.10, and counties' weed lists, (see appendix 6A – 6H) mandates control of many weed species. "Control" is defined in WAC 16-750, as the prevention of all seed production. To help protect land and the natural resources, Washington State Noxious Weed Control Board adopts a State noxious weed list each year. The counties also adopt a county-specific noxious weed list. These lists, categorizes weeds into three major classes; A, B and C; according to the seriousness of the threat they pose to the state or county.

Disturbed areas, such as transmission ROW, often become infested with noxious weeds. They take advantage of any disturbed soils and lack of competing native vegetation in these areas. City Light is responsible for noxious weed control on property owned by City Light (fee owned) and works extensively with numerous county weed control districts(King, Snohomish, Skagit, Whatcom, Pend Oreille) to identify, control or eradicate noxious weed infestations. Common noxious weeds being currently targeted on City Light's ROW's include the following Noxious Weeds:

Tansy Ragwort



Knapweed



Knotweed



Tansy Ragwort on ROW

Giant Hogweed

Poison Hemlock



Control methods include an IVM approach, and include:

- Bio-controls



- Herbicides (careful and selective use of), using backpack sprayers or quart size spray bottles.
- Manual (hand pulling, digging).
- Clipping flower heads

- Black tarp coverings with mulch overlays
- Competitive Seeding/Planting
- Mowing large areas totally infested

There have been findings of knapweeds (*Centuarea*) in Whatcom County and City Light's ROW. Knapweeds are very invasive noxious weeds and are listed as a Class A noxious weed in Western Washington. Since the year 2000, City Light has participated in joint work parties, along Highway 20 in Whatcom County; pulling knapweeds.



This has been a cooperative effort involving City Light, National Park Service, U.S. Forest Service, noxious weed control agencies and concerned private citizens.

This will continue so as to control the spread of knapweed infestation, spreading across from Eastern Washington to Western Washington. Small infestations of knapweeds were also identified and controlled (hand pulled and bagged) on the Cedar Falls transmission line from 1997 on. Currently, no knapweeds have been identified on this transmission line.

Control of noxious weeds is not limited to herbicides. There is on-going and dynamic weed control methods for noxious weed on City Light's transmission ROWs, for tansy ragwort, dalmation toadflax, giant hogweed, and with emphasis recently on knotweed control. (See appendix 8A *Skagit Knotweed Working Group*).



City Light's Vegetation Management has been very active in noxious weed control since 1991 and continues today; utilizing an IVM approach. One successful method of control has been the use of biological control insects. City Light has purchased, collected and transplanted bio-control insects for years on tansy ragwort, leafy spurge, knapweeds and dalmation toadflax.



Biological Control of Weeds

- One of the most cost –effective weed management methods
- Once established, bio-control insects continue to attack weeds, month after month and year after year
- Effective; proven scientific record in attacking and feeding on weeds
- Only the target weed is attacked with non-target trees, shrubs, grasses and crops being unaffected
- Easy integrated weed control; release insects in weed specific areas; herbicides can also be used in same area, with precautions around release sites within the first 2 years. As insects expand their range and weed control, herbicide usage can decline or remain as an integrated method for a greater degree of weed control.

Scrutiny of herbicides to control vegetation has increased through the years. As a result, the City of Seattle adopted a Pesticide Reduction Program to promote environmental stewardship in City operations. (See appendix 7A for the *City of Seattle Pesticide Reduction Resolution*). As deciduous tree growth and resprouting is controlled on the ROW or alternative methods are found to control deciduous trees (e.g., mechanically shattering the roots crowns or selective seeding of existing ROW areas without seedbed preparation), the use of cut stump herbicide treatment will be reduced. However, it is still continually difficult to keep up with the growth of incompatible deciduous trees which resprout and grow quickly; endangering the reliability of our transmission lines and multiplies the quantity and frequency of vegetation maintenance, and challenges existing budgets.

Streams-Water Bodies

Improved streamside management techniques are presently being implemented by City Light. These areas will need to be inspected more frequently and will probably need to be maintained on a 1 - 2 year cycle, instead of a 3-4 year cycle, to allow for less impact on the riparian vegetation and provide a stable riparian vegetation zone for streamside areas. The management goal of riparian areas is to remove/or trim only danger trees, leaving remaining vegetation as undisturbed as possible. In recent years much work has been done on the ROW access roads to prevent road washing, including ditching and placement of culverts for proper hillside drainage. Such erosion control efforts reduce sediment runoff into streams. Culvert maintenance, primarily keeping the culverts clear of debris, is done as needed to allow free flow of water through the culverts. Recently, City Light is undertaking the upgrading of older and less efficient culverts and replacing them with bridges; allowing unrestricted flow of water, enhancing fish migration and habitat.

RIPARIAN ZONE MANAGEMENT PLAN



City Light's transmission lines ROW traverse across numerous streams and bodies of water throughout King, Snohomish, Skagit, Whatcom and Pend Oreille Counties.



The biological distinctive transitional areas between the water itself and the surrounding lands are called Riparian Zones. It can include stream banks, lake shores, beaches, gravel bars, flood plains, and side channels. The diverse vegetation that grows in these areas acts as a protective buffer between the land and the water.

The riparian zones and wetland areas on City Light's transmission ROW are the most significant fish and wildlife habitats on City property. Undisturbed riparian ecosystems normally provide abundant food, cover, and water, and often contain some special ecological features or combinations of features that are not often found in upland areas. Consequently, riparian ecosystems are extremely productive and have diverse habitat values for fish and wildlife.

The importance of riparian ecosystems can be attributed to specific biological and physical features. There are generally a predominance of woody plant communities associated with surface water and abundant soil moisture. The presence of live and dead vegetation, water bodies, and non-vegetated substrates leads to diverse structural features which result in many different types of wildlife habitats.

Fisheries

The wildlife group most directly affected by the quality of riparian habitat are the fisheries communities. Streamside vegetation provides habitat diversity in several ways. Overhanging vegetation or indirect root systems give fish hiding cover and provide a physical means of separation from each other. Vegetation shading controls the water temperature, which is vital to the survival of many resident and anadromous fish species. High populations and a large variety of terrestrial insects frequently inhabit riparian vegetation. These insects inadvertently fall into the water where they serve as food for fish. Stream-bank rooted vegetation enhances bank stability and dissipates flood energy. Sediment is trapped by vegetation instead of settling in streambed gravel and choking spawning beds and reducing aquatic insect production. Streamside vegetation also contributes to the stream energy cycle by providing organic litter from foliage drop, wind-throw, and bank cutting.

Bird Populations

Riparian areas are also extremely significant to bird populations. Many species of bird depend on riparian areas for nesting due to the partitioning of breeding habitat found near streams. Riparian habitats also attract a disproportionate number of migrating bird species. In comparison to surrounding uplands, riparian areas may attract up to ten times the variety of bird species in the spring and fourteen times the numbers in the fall.

Other Wildlife

Big game animals, smaller mammals, and other types of terrestrial wildlife are also affected by the quality of riparian areas. Riparian vegetation is usually distributed in long ROW that provide cover for drinking as well as protective pathways for migration and movements of animals between habitats. It is important for City Light to manage its riparian habitats in a manner which will benefit fish and wildlife as well as provide safe, reliable transmission of power across these areas.

Riparian Area Formation

Knowledge of riparian area formation can aid in management of these areas. Riparian systems have resulted from geomorphologic activity on landscape features. If the geologic forces that shape and mold riparian zones are considered, it is apparent that many riparian areas are rather dynamic features and are constantly in a state of flux and transition. Stream bank erosion, channel meandering and flooding are natural processes.



However, some unnatural causes have produced changes in riparian areas on some portions of City Light's ROW. Initial installation of the transmission line, road building, and vegetation maintenance have all caused some loss of riparian vegetation at stream-crossings.

SEATTLE CITY LIGHT STREAM CORRIDORS

Most streams on City Light's ROW have adequate vegetation to address the needs of fish and wildlife. The purpose of the Riparian Zone Management plan is to identify stream-crossings on City Light's Skagit line and to assign to them one of two prescription types which will ensure continued adequate riparian vegetation (See appendix 17A, *Vegetative Prescriptions*). Both prescriptions call for a 75-foot buffer on each bank of the stream. However, some small intermittent streams may only need a buffer of 25 feet on each bank. Examples of this type of stream would be small, intermittent streams with no populations of resident or anadromous fish and low water volume during flooding. All stream-crossings on the Skagit line have been evaluated and classified by location in a span (see appendices 17B – 17D, *Stream Crossings, Abbreviations, Planting Key*).

Vegetation

Successful re-vegetation is considered a key to restoring stream functions. In some cases, planting cannot be done without extensive stream channelization in areas with severe channel meandering.

If an area needs planting to provide vegetation, the following general recommendations apply: select native species adaptable to a broad range of water depths; give priority to commercially available species or species obtainable from local sources and select species with high food and cover value for fish and wildlife.

Maintenance

Adequate streamside vegetation under power lines can be achieved with proper vegetation maintenance techniques on naturally occurring or restored vegetation. Stump applications of herbicides to control re-sprouting of non-compatible species should not be used within 60 feet of open water areas or within 25 feet of intermittent streams. The safe use of herbicides will result in a high quality riparian zone due to less vegetation clearing disturbances.

Trees that present a hazard to transmission lines should also be mitigated for removal with manual labor as they reach a dangerous height. Revegetate with low-growing native species. If possible, a well-vegetated buffer strip should be maintained on top of the bank even if it is beyond the 25-75 foot buffer zones. This strip will prevent surface run-off from adjacent land which will cause sheet or fill erosion on the face of the bank. It also prevents vegetation on the face of the bank from being undermined from behind when the stream flow exceeds the capacity of the channel.

An increasing amount of attention is being placed on Washington State's riparian zones. New philosophies and techniques are needed to consider the whole stream system in order to treat not only immediate erosion problems, but to help alleviate future erosion and flooding problems. Management techniques employed must also consider other demands placed on the stream system such as aesthetics, fish and wildlife habitat, and recreation opportunities. Hopefully, the management techniques presented here can help maintain the current quantity of vegetation present at most of City Light's stream-crossings, and help reverse the deterioration of those with inadequate amounts of vegetation.

Aesthetics

Aesthetics are becoming an important management consideration in visually sensitive areas on the ROW. A major area of aesthetic concern is the Ross Lake National Recreation Area (NRA). Also, as part of the Skagit River Hydroelectric Project relicensing(1991), a major revegetation project was implemented in 1994-2004, on seven “target sites” on City Light’s transmission ROW; the goal being to enhance the visual aesthetics of the ROW. This was a cooperative effort between Vegetation Management crews and staff, Skagit crews and Environmental Affairs. Another major area of aesthetic concern is the Boundary Dam and ROW. Aesthetic issues are also a major concern for vegetation maintenance efforts on City Light's urban ROWs.

Research



City Light sponsored research and investigations (wetlands project and grasslands research) indicate that major efforts to reshape the landscape or vegetation is too costly for either the level of control needed or the amount of control gained from these efforts. Instead, it has been recommended that existing wetlands be carefully maintained to provide the tree control, wetland communities on the ROW naturally provide, and that seeding efforts be focused on selected ROW areas without seedbed preparation.

City Light will continue to monitor the various control methods used. The issue demanding the greatest level of effort is deciduous tree control. Monitoring efforts will compare cut stump sprouting control between cut stump herbicide treatment, mechanical control (with and without cut stump treatment) and routine manual control. Efforts will also continue to investigate grass seeding efforts to control tree invasion on the ROW; seeding and fertilization of areas without extensive seedbed preparation will be the primary focus of future efforts.

Public Education

ROW maintenance staff is involved with the public on a daily basis, addressing specific concerns of individual property owners and City Light's safety requirements; especially if it pertains to tree/powerline conflicts. The goal of ROW maintenance is to educate the public on the proper selection and placement of trees on the ROW. In 2010, City Light produced 2 new brochures, "*Living & Working Near High Voltage Powerlines*" (See appendix 9B) and "*Native Plants For Power lines*" (See appendix 9-A). These both emphasized City Light's obligation to safely manage vegetation near the transmission lines on the ROW; so that vegetation cannot grow into or fall onto these power lines. City Light is also working with the public and property owners with "*The Urban Landscape Tree Certificate*" program (see figure 8F). Certificates are issued to property owners in mitigating their tree removal on City Light's transmission ROW. This program is contracted through the Washington State Nursery and Landscape Association and the certificates are redeemable for any plant, shrub or compact tree specie that matures at a height of less than 12 feet. This facilitates and supports the right plant in the right place and supports our guidelines for the protection and reliability of the transmission electrical system, the workers and the environment

Garbage Control/Vandalism

Efforts continue to limit access to the ROW in order to limit dirt bike and 4x4 use of the ROW which has been causing considerable erosion problems. Access is also barricaded to prevent garbage dumping on the ROW which has increased dramatically in the past few years. Many of the gates and barricades installed in the past few years to limit access have been vandalized by those who continue to attempt to gain access to the ROW for these purposes. Garbage dumping problems and disposal costs are expected to increase.



BEST MANAGEMENT PRACTICES (BMP's)

City Light's BMP's were developed and implemented to allow the utility to safely maintain their transmission ROWs while protecting the environment. BMP's are ever changing strategies and measures applied to reduce, prevent or avoid adverse environmental and customer impacts. They are accepted by leading industry organizations to achieve specific objects that are both economical and feasible. BMP's are influenced and changed by new objectives, technology, laws, programs, research and public opinion.

In September 2010, City Light's Vegetation Management Unit received a "Transmission Rights-of-Way Programmatic Clearing Permit for Unincorporated King County (See appendix 29A)". This permit includes additional procedures and BMP's required from King County. It authorizes City Light to perform routine electrical line vegetation clearance and maintenance on the ROW and immediate adjacent properties within unincorporated King County. In addition, all clearing shall follow City Light's Transmission Vegetation Management Plan with its BMP's. The following BMP's are applicable to all City Light transmission lines.

Vegetation Management BMP's

- City Light's ROW Crews work the transmission corridors daily.
- Transmission line Crew Chiefs (North and South) constantly monitor vegetation growth, clearances, access roads, culverts, bridges, ROW uses, encroachments, and vandalism.
- Identify areas and prioritize types of vegetation needing control.
Determine existing land uses such as agricultural, residential, commercial, etc.
Examine potential constraints on vegetation control such as critical or sensitive areas (see appendices 16A – 16G, *Western WA. Riparian Management Zone, Wetland Typing System, General Definitions, King County Critical Areas, SMC 25.09.320 Trees and Vegetation, SMC 25.09.040 Permits, Critical Areas, Exemptions, King County Wetland Considerations*). If problematic notify City Light's Plant Ecologist, and/or the Environmental Division for necessary permitting issues and mitigation procedures (See appendices 23-A, *City Light Vegetation Management Permit Acquisition Procedure* and appendix 26-A, *Planning, Permits, Customer Notification and Documentation*). There are several permitting exemptions; i.e. routine brush/tree sapling removal in unincorporated King County is allowed and categorical exemptions per WAC 197-11-800.
- Notify property owners of upcoming ROW maintenance activity
- Schedule maintenance before vegetation is inside the minimum safe distance for a non-electrical worker to cut next to or under energized lines as regulated by *OSHA Standards* (see appendix 10A).
- Record and document all ROW contacts in the "*Right-of-Way Vegetation Maintenance Plan Contact Log Book*" (see figure 10F)
- Achieve a four cycle; new cycle began 2011 through 2014

Control all trees and brush within 20 feet of any electrical tower or poles.



- Selectively remove “danger trees,” with owner’s permission that could grow, fall, or lean into the transmission lines from the area next to the ROW. Tree removal is contingent on:
 1. Overall condition/health of the tree; hazard trees are higher priority for immediate vegetation maintenance (i.e. dead, dying, diseased, leaning towards powerlines).



2. Stability of the ground surrounding the tree
3. Location and proximity of tree to power lines (tree underneath, if not removed will need trimming more frequently than trees alongside the power lines).
4. Growth rate of trees; faster growing deciduous versus slower growing conifers.
5. Available water; faster growth of trees with increased water supply

6. Reliability and priority of powerline; higher voltage and power grid connections have higher impact on customers if have tree related outage.

- If removal is not designated, the topping and/or side trimming must be accomplished to achieve adequate line clearance.
- Cut stumps are cut horizontally to the ground to prevent personal injuries and vehicle tire damage
- Limbs are trimmed flush to tree trunk as possible
- Downed woody debris is either chipped and broadcast (sprayed back out onto the ROW) or removed off site in chip truck. Large woody debris can be cut and left for property owner
- Replant or reseed any bare areas left after vegetation maintenance activity. Use native plant species whenever feasible.



- Native plants provide hardy, drought resistant, and a low maintenance environment. Once established, native plants save time and money by reducing or eliminating the need for fertilizers, pesticides, supplemental watering and maintenance. They also reduce water run-off and can significantly reduce flooding.



Wildlife

- The maintained linear nature of the ROW benefits wildlife habitat. City Light's transmission corridors provide miles of "edge" habitat (where different plant communities and habitats meet; a sharp contrast between what is in the ROW and what is outside). Edges provide shelter in the forested habitat next to the ROW and food in the open area within the ROW.
- Promote retaining as many compatible native plant species on the ROW's, as long as they do not interfere with access to the electrical transmission system and do not encroach or jeopardize electrical clearance requirements. Native plants provide food at different times of the year in the form of flowers, seeds and fruit. It is these same native plants that also provide nesting sites and cover to wildlife from predators and inclement weather.



- ROW's are used as travel lanes between habitat patches; ideal wildlife grazing which leads to increased quantity of early successional and low-growing plant communities.
- Control of invasive and noxious weed species promotes biodiversity; by allowing native plant species to survive and propagate.
- Deer and elk especially attracted to more nutritious grass maintained and grass seeded corridors.



Noxious and Invasive Weeds

- Manual removal of weeds by cutting, digging or pulling and removing them from infested site to approved disposal site.
- Implement weed control actions timely, as needed to protect resources.
- Shading out weeds by increasing number of desirable plants and/or planting over weeds.
- More frequent mowing cycles, if feasible, to reduce weed seed production.
- Altering vegetative technique, timing and/or multiple uses of the ROW to control weed infestations (eliminating grazing permits on ROW to allow compatible plants to outgrow and outshade noxious weeds like tansy ragwort; which is shade intolerant.)
- Use accepted and approved bio-control insects to control noxious weed infestations and seed production.
- Follow other BMP's for weed species as established by local county noxious weed board programs, including King, Snohomish, Skagit, Whatcom and Pend Oreille counties.
- Leave no bare ground where weed seeds can re-infest. Replant or seed with appropriate species as soon as possible or next best planting time of fall or spring; whichever comes first. Use weed free seed.



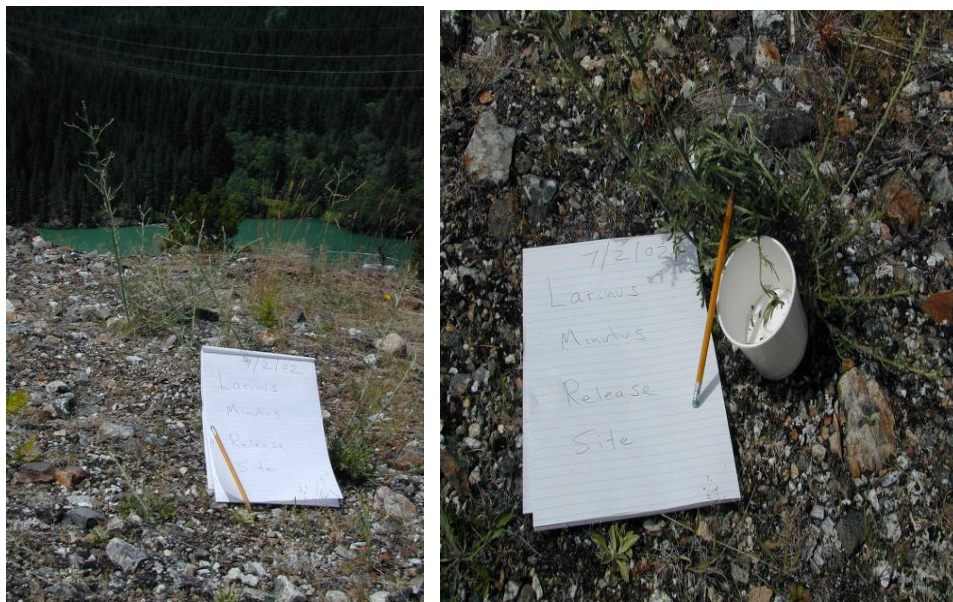
- Combine manual, mechanical, bio-control insects and selective herbicide use for optimum weed control(i.e. manual cutting/bending knotweed stems), followed up months later with an herbicide application; bio-control insect releases on Tansy Ragwort, followed up months later with manual pulling or removal of surviving flower heads and seeds; bio-control insects for Leafy spurge, timed with subsequent herbicide applications).
- Cleaning/washing vehicles and tools; especially before and after traveling from the west side to the east side of Washington State during projects ;(i.e. Eastern Washington being highly infested with knapweeds as compared to lower infestations in Western Washington). Vehicle under-carriages, tires, and radiators are prime locations to catch and harbor noxious weed seeds and plant parts and distribute them in large areas. Keep vehicles out of weed infestations, if feasible.
- Checking gravel and rock supply vendors for clean and weed free rock.
- Checking in-house stockpiles of rock and gravel for noxious weed infestation and to treat with herbicides to eradicate weeds and not use for maintenance,

construction or other projects; eliminating the possibility of spreading the infestation.

- Solicit budget funds for mapping/mapping system of noxious and invasive weeds (GIS).

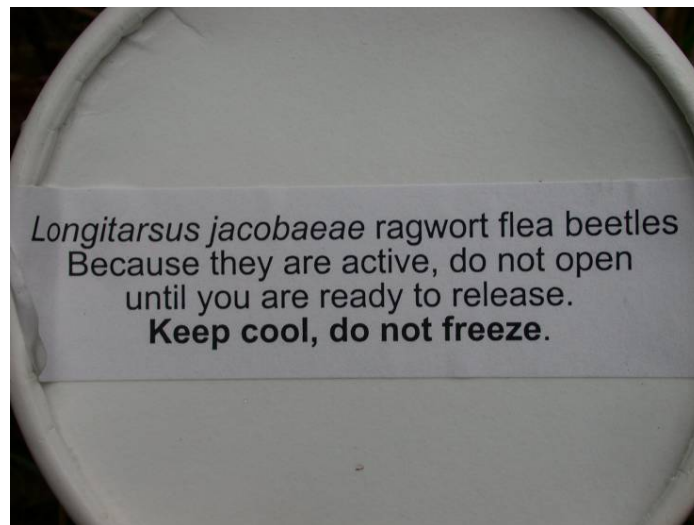
Biological Control of Weeds

- Use as part of an IVM approach.
- Support innovative methods, tools (weed wrenches) and most current bio-controls approved and available.
- Encourage and increase bio-control use for large and scattered weed infestations.
- Monitor key weed species response to released biocontrol insects.



- Conduct ongoing weed surveys to detect new weed infestations before they spread (early detection-rapid response).
- Solicit budget funds for purchases of bio-control insects; potential new bio-control for scotch broom that affects entire plant (broom gall mite) and current bio-controls that just target scotch broom seeds.

- Collect, purchase and release bio-controls annually on weed infestations to get established.



- Increase public awareness of weed problems through workshops and pamphlets.
- Ongoing training of staff; continued education through field events and county sponsored workshops.
- Endorse strategy of prevention, early detection and rapid response, control and management and restoration.

BMP's within sensitive areas

Procedures:

- Identify vegetation control needed.
- Verify current ownership and make contact.
- Verify type and extent of sensitive area through maps and local, city, county and state personnel.
- Allow enough lead time to acquire any necessary permits (i.e. *Depart. Of Environmental Services Clearing and Grading* (see figure 9F), Hydraulic Permit Approval (HPA), *JARPA* (see appendix 18A – 18B) for major ROW maintenance, repair or construction that will have substantial disturbance.



- Assess possible negative impacts to sensitive area and design mitigation plan to implement in a timely manner; in accordance and with approval from responsible permitting agency or group.
- Schedule vegetation maintenance; including labor, materials, and equipment.
- Perform vegetation maintenance
- Implement mitigation plan (i.e. revegetation, restoration).



- Photo document before, during and after vegetation maintenance.
- Plant Ecologist to assist in designing, planning and implementing mitigation and restoration activities.

Streams, wetlands and associated buffers:

- Identify the natural water resource that could affect or constrain vegetation maintenance activities.
- Identify vegetation control needed. If required, mitigate transmission line clearance with appropriate agency or county.



- Trim or crown reduction to acquire adequate line clearance between vegetation and powerlines. This can however, reduce the 4 year cycle in half. No trees are to be removed in sensitive areas without permits/permission from responsible jurisdiction and property owner; unless it is an emergency.
- Be familiar with and adhere to specific counties' sensitive area ordinances

- Minimize impacts to surrounding vegetation and trees, ground cover, soil disturbance and aesthetic values.
- Leave large woody debris on site or as directed by property owner and/or responsible jurisdiction.
- Small woody debris may be left and/or chipped on site, or chips removed by truck.
- Utilize arboriculturally approved pruning standards, and Safety Standards; ANZ133.1 (see appendix 11A, *American National Standard for Arboricultural Operations Safety Requirement*).
- Mitigate and restore with revegetation if needed to maintain ground cover, wildlife habitat, erosion control, canopy cover for stream shade and temperature control. Select native low-growing plant species appropriate for the site considering factors of genetic integrity, topography, soil composition, moisture, available light and wildlife habitat.



- Plant Ecologist to assist in designing, planning and implementing mitigation and restoration activities.
- No herbicides are allowed in stream or riparian zone areas unless through special permits, Non Point Discharge Elimination Permit(NPDES – See appendix 12A, *Water Permitting 101*), to mitigate noxious weed control.
- Plant Ecologist to assist in designing, planning and implementing mitigation and restoration activities.

- Photo document before, during and after vegetation maintenance

BEFORE:



AFTER:



Steep slopes and landscape hazard areas:

- Identify vegetation control needed.



- Trim or crown reduction to acquire adequate line clearance between vegetation and powerlines. No trees are to be removed in sensitive areas without permits/permission from responsible jurisdiction and property owner; unless it is an emergency.
- Minimize impacts to surrounding vegetation and trees, ground cover, soil disturbance and aesthetic values
- Leave large woody debris on site or as directed by property owner and/or responsible jurisdiction
- Small woody debris may be left and/or chipped on site, or chips removed by truck
- Utilize arboriculturally approved pruning standards.



- Mitigate, if needed, with geo-tech consultant on slope stability, soil and bank erosion, potential loss of tree-root systems; which regulate absorption of water.
- Revegetate all bare areas with compatible low-growing species. Select native low-growing plant species appropriate for the site considering factors of genetic integrity, topography, soil composition, moisture, available light and wildlife habitat.
- Mitigate excessive deciduous re-sprouting and/or noxious weed control with selective use of herbicides; following all Washington State licensing, labeling and posting requirements and obtaining current property owner's permission.

Herbicides:

- City Light is committed to using the safest effective herbicide(s) available and monitoring herbicide use.
- All pesticide applicator's are licensed or under the direct supervision of a pesticide applicator.
- All areas selected for application will be inspected prior to application by the plant ecologist or transmission line Crew Chief to ensure no environmentally sensitive areas will be affected. This also affects herbicides applied by qualified City Light contractors.
- City Light and City Light contractors will document all herbicide spraying on the transmission ROW's using the "*City of Seattle Pesticide Application Form*" (See appendix 7-M) and submit copies to Vegetation Management for database entry.
- No herbicides will be used within 60 feet of any open water areas or within 25 feet of intermittent streams (50 foot buffer for noxious weed control, unless acquire NPDES permit)
- No spraying will be done if wind speed is greater than 5 mph or if rain appears likely.
- Cut stump treatment will be done within one hour after cutting.
- Only target species will be sprayed.
- Local residents will be notified as appropriate.
- Areas will be posted after herbicide application informing the public of the chemical used, the date and method of application, who to contact for further information, and a warning against use of the area or consumption of any plant material in the spray area (see appendix 7F, *Pesticide Application Sign*).
- All herbicides are stored properly in approved locations. Power Production Division has a storage area at Newhalem. Vegetation Management uses storage areas at Bothell Substation and at South ROW Storage Area on East Marginal Way South and 112th Avenue South in Tukwila.



- Empty containers are disposed of properly (containers are triple rinsed and punctured) and rinse water is used as spray. Newhalem has an authorized wash area which may be used.
- Appropriate safety equipment is provided for herbicide application (coveralls, boots, goggles, gloves, aprons and respirators if required).

OUTAGE RESPONSE

Since the ROW easements were negotiated some time ago, City Light has limited ability to trim trees that could be potential hazards outside of the ROW. Generally the system is trimmed to withstand sustained windstorms of approximately 40 mph with minimal damage. When winds exceed 40 mph, tall Douglas Fir and Hemlock trees can be uprooted and fall into the transmission system. Each of our transmission corridors have different storm response work practices associated with restoration and public safety.



The 230 kV transmission lines from the Skagit and the Eastside line have a significant exposure to wind damage. Both ROW crews and line crews from the service centers are called in the event of a transmission outage. The normal practice is to patrol the line for damage and have the line crews make repairs. While repairs are underway, the remainder of the line is patrolled to identify other downed trees.

The 115 kV transmission systems from the Cedar Falls and Tolt River generating plants are in very narrow transmission corridors and are also within restricted watersheds. In significant wind storms trees are often uprooted and repairs are required. Work practices are similar to the Skagit lines for crew repair and patrol.

The majority of the 230 kV lines from BPA's Maple Valley and Covington Substations cross suburban residential and commercial property. The exposure is less in these areas because there is nearby property owners who can more readily identify and report problem trees.

The in-city transmission system is less vulnerable to storm damage. The urban forest possess limited exposure to the transmission system. The major effort is to monitor the health of the limited number of tall trees that could fall into the transmission system.

MAINTENANCE CYCLE

Competing Interests and Obstacles

City Light implements a 4 year transmission line vegetation maintenance cycles. A cycle is generally the time it takes to complete identified trimming or removal of certain trees and vegetation on the entire transmission electrical system. The vegetation maintenance cycle in the plan sets the overall work plan goals. However, conditions on the ROW are continually changing and implementation of the plan must remain flexible to address these changing conditions. The vegetation maintenance cycle is affected by a list of influences that are often uncontrollable and unpredictable. These influences include:

Water: More water available, the faster the trees grow. Drought and increased rainfall have a significant impact on vegetation maintenance cycles; tree growth slowed vs. rapid growth and re-growth.

Environmental: Diseased trees, for example, infested from various root rots like laminated root rot, present along City Light's ROW's. Removing these dead and dying trees (hazard trees) near the power lines take precedence over routine vegetation maintenance cycle work, thereby possibly extending the cycle.



Budgeting: The need to balance available resources with priorities unanticipated when budgets were established (for example, large storm events, equipment failure, etc). Vegetation management continues to be a high operational priority at City Light.

Cultural and Regulatory Influences: City Light is not able to do whatever it feels is appropriate regarding trees. City Light does not own most of the trees and must adjust the time and resources to adapt to new legal requirements and or changing industry standards. For example, more communities are adopting newer tree ordinances with specific language for tree trimming, removal and permitting. This results in time consuming additional requirements and could slow approvals and extend the vegetation maintenance process requirements in order to achieve regulatory compliance and reliability needs.

Competing Interests: Increasing significant problem of competing interests when it comes to performing required vegetation maintenance work on transmission lines. City Light has an obligation to manage vegetation near the transmission line in order to provide safe and reliable electrical service.

This objective appears to be in conflict with various interests on local, state and federal law. Vegetation adjacent to the transmission line is a threat to service reliability and this same vegetation is viewed by numerous other agencies as primarily intended for landscaping, buffer zones (view, noise, dust) wildlife habitat, a community resource like a park or trail system, timber supply, etc. For these agencies or groups of people, the necessity of keeping the transmission lines clear of vegetation is subservient to their own.

Individual Property Owners: Many refuse to allow City Light the right to perform necessary tree work (especially tree removal) in and along the transmission corridor. This increases the likelihood of tree-related outages and/or fires. Since City Light does not own the majority of their transmission corridors, but have easement rights, many private property owners landscape and plant the wrong or inappropriate tree in the wrong place (under the transmission lines). The majority of the trees City Light's ROW crews manage and perform routine maintenance on, year after year, are planted in the wrong place. At maturity, these trees will cause tree-line conflict and possibly tree-related outages.

City Light is committed to removing obstacles to effective vegetation maintenance along the transmission corridor ROW's. This includes at minimum:

- Maintain and utilize the "Wire Zone – Border Zone" concept whenever feasible.
- Renegotiate easements rights that do not grant adequate clearance and vegetation management/maintenance rights.
- Full exercise of existing easement provisions and rights to be able to acquire adequate tree/line clearances.
- Planning ahead (including allowances for addition lead time to secure needed permission in a timely and predictable fashion).
- Maintain and increase financial resources dedicated solely to transmission vegetation maintenance on the ROW's for labor equipment, permits, training, tree certificate program, public education (literature, pamphlets, and notifications).
- Solicit neighboring cities and counties for support of City Light's ROW Vegetation Management plan.
- Secure management's support for the higher priority of ROW vegetation maintenance on City Light transmission corridors.

RELIABILITY RELATED REVISION HISTORY

Rev No.	Date	Description	By	Approved By
0	2011	<ul style="list-style-type: none">- Original Document- Revisions for compliance with FAC-003-1	Marie Swanson, Plant Ecologist	Brent Schmidt, Energy Delivery Support Services Manager
1	June 2014	<ul style="list-style-type: none">- Removed clearance 1 and 2 distances, added MVCD and new clearance distances for compliance with FAC-003-4- Added updated work plan- Added <i>Conductor Movement Methodology</i> and other revisions to figures and appendices	Marie Swanson, Plant Ecologist	Brent Schmidt, Energy Delivery Support Services Manager
2	September 28, 2016	<ul style="list-style-type: none">- Revisions for compliance with FAC-003-4.	Holly Mouser, Management Systems Analyst Assistant	

LIST OF FIGURES

SEATTLE CITY LIGHT

Transmission Vegetation Management Program

LIST OF FIGURES

June 2014

- 1F Location of Seattle City Lights Transmission ROW Corridors
- 2F Side Clearances by Corridor
- 3F Vegetation Management & EDO Director's Org. Charts
 - 3G Skagit Organizational Chart
 - 3H-1 SCL Employees' Job Descriptions, Resumes
 - 3H-2 Contractor's Qualifications
 - 3H-3 SCL & Contractors Vegetation Management Personnel Training Log
- 4F Wire Zone – Border Zone
- 5F Influence of Line Sway and Sag on ROW Vegetation Clearance
- 6F Allowable Limits of Tree Height Growth on a 240 KV Transmission Corridor
 - 6G Allowable Limits of Tree Height – Eastside Transmission Line
 - 6H Tree Removal/Trimming Criteria
- 7F Canyon Situation –Typical Clearing Conditions
- 8F Urban Landscape Tree Certificate
- 9F Department of Environmental Services (DDES)
- 10F ROW Vegetation Maintenance Plan, Contact Log Book
- 11F SCL Construction Guideline Tree Clearances D9-80
- 12F Conductor Movement Calculation Methodology, June 16, 2014

LIST OF APPENDICES

SEATTLE CITY LIGHT

Transmission Vegetation Management Plan

- 1A Real Property Use Guidelines
- 2A NERC Reliability Standard, FAC 003-4
- 3A Departmental Policy, DPP 500 P 506
- 4A ANSI A 300 (Tree, shrub, and other woody plant maintenance – Standard Practices, Integrated Vegetation Management, Electric Utility Rights-of-Way).
- 4B NESC 2007, Rule 218
- 5A Industrial Fire Precaution Levels
- 6A Washington Noxious Weeds
 - 6B RCW 17.10 Weed Laws
 - 6C RCW 16.750 Weed List
 - 6D King County Noxious weed List
 - 6E Snohomish County Noxious Weed List
 - 6F Skagit Country Noxious Weed List
 - 6G Whatcom County Noxious Weed List
 - 6H Pend Oreille County Noxious Weed List
- 7A City of Seattle Pesticide Reduction Resolution
 - 7B Pesticide Use Reduction Strategy
 - 7C City of Seattle’s Office of Sustainability and Environment
 - 7D Work Practice Guidelines
 - 7E Application Signage Requirements
 - 7F Application Sign
 - 7G Fact Sheet
 - 7H Pesticide Usage Summaries
 - 7I Pesticide Tier Tables
 - 7J Pesticide Application Records
 - 7K Insecticides, Fungicide and Rodenticide Act
 - 7L Washington Pesticide Application Act
 - 7M City of Seattle Pesticide Application Form
- 8A 2006 Skagit Knotweed Working Group

- 9A Native Plants For Power Lines
 - 9B Living & Working Near High Voltage Powerlines
- 10A OSHA Standards
- 11A ANSI Z133.1 American National Standard for Arboricultural Operations Safety Requirement
- 12A Water Permitting 101 (NPDES)
- 14B Powerline Clearance Proposed Budget thru 2013; including transmission crews
- 15A WAC 296-155-428 General Requirements
 - 15B Electrical Safety-Related Work Practices
 - 15C WISHA Act
 - 15D WAC 296-45 Safety Standards for Electrical Workers
 - 15E Disposition of Danger Trees
 - 15F RCW 64.12.035 Cutting or Removing Vegetation
 - 15G WISHA Permissible Distance Limits
 - 15H Operational Requirements
 - 15I Construction Guidelines Management Zone
- 16A Western Washington Riparian Management Zone
 - 16B Wetland Typing System
 - 16C General Definitions
 - 16D King County Critical Areas Review
 - 16E SMC 25.09.320 Trees and Vegetation
 - 16F SMC 25.09.040 – 25.09.220 Permits, Critical Areas, Exemptions
 - 16G King County Wetland Considerations
- 17A Vegetative Prescriptions
 - 17B Stream Crossings
 - 17C Abbreviations
 - 17D Planting Key
- 18A Introduction to JARPA (Joint Aquatic Resources Permit Application Form)
 - 18B JARPA Form
- 20A 230 kV NERC Reporting: Master List of Line Segments
 - 20B Transmission Vegetation Management Activity; 230 kV NERC Reporting 2011-2014 (Work Plan: Work Accomplishments) – City Light Transmission Line Patrol Summary
 - 20D 2011- 2014 Annual Work Plan Summary
 - 20F Transmission System Imminent Threat Reporting Memo (2009)
 - 20G Internal FAC-003 Veg. Outage Reporting Procedure

- 21A City Light's Vegetation Management Plan for Bridle Trails State Park
 - 21B City Light's Vegetation Management & Maintenance Plan for Eastside Transmission Line Corridor
 - 21C Agreement For Use of the City of Seattle Transmission Line Easement Right-of-Way (Wilburton Park)
- 22A Skagit River Hydroelectric Project, Settlement Agreement on Recreation And Aesthetics
- 23A City Light's Vegetation Management Permit Acquisition Procedure
- 24A Tree Species Growth Rate Chart
- 25A Vegetation Management Call-Out Procedures
- 26A Planning, Permits, Customer Notification and Documentation
- 28A Contract Tree Work, Planning, Inspection
- 29A Transmission ROW Programmatic Clearing Permit for Unincorporated King County
- 30A City Light Transmission Line Patrol Report Form
 - 30B City Light transmission Planned Action Item Form
 - 30C Veg. Mgt. Activity Summary (sign-off sheet)
- 31A City Light Systems Operations, Clearance, Keep Open & Hold Open Procedures
 - 31B Qualified City Light Personnel for Systems Operations Procedures
- 32 FAC-003 R5.

APPROVAL SIGNATURES

Reviewed and Approved by

Manager Support Services Brent Schmidt
(Procedure Owner)

Date: 9/29/16

Brent Schmidt