B O N N E V I L L E   P O W E R   A D M I N I S T R A T I O N

Keeler-to-Tillamook Transmission Line Rebuild Project

Draft Environmental Assessment

October 2013

DOE/EA-1931

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1.1 Introduction

The Bonneville Power Administration (BPA) is a federal agency that owns and operates more than 15,000 miles of high-voltage transmission lines. The transmission lines move most of the Pacific Northwest's high-voltage power from facilities that generate the power to utility customers throughout the region. BPA has a statutory obligation to ensure that its transmission system has sufficient capability to serve its customers while maintaining a system that is safe and reliable. The Federal Columbia River Transmission System Act directs BPA to construct the improvements, additions, and replacements to its transmission system necessary to maintain electrical stability and reliability, and to provide service to BPA's customers (16 United States Code [U.S.C.] 838b(b-d)).

BPA is proposing to rebuild 57.8 miles of its existing 59.7-mile-long Keeler to Tillamook transmission lines. This would include 10.5 miles of the Keeler-Forest Grove No. 1 transmission line, and 47.3 miles of the Forest Grove-Tillamook No. 1 transmission line[1]. The aging, 115-***kilovolt*** (kV)[2] transmission lines require replacement of their wood poles, ***conductors***, and other components.

This Environmental Assessment (EA) was prepared for this proposal by BPA pursuant to regulations implementing the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 *et seq*.), which requires federal agencies to assess the impacts that their actions may have on the environment. BPA prepared this EA to determine if the Keeler to Tillamook Transmission Line Rebuild Project (Rebuild Project or Proposed Action) would cause effects of a magnitude that would warrant preparing an Environmental Impact Statement (EIS), or whether it is appropriate to prepare a Finding of No Significant Impact (FONSI).

1.2 Need for Action

BPA needs to take action to ensure the integrity and reliability of the existing Keeler to Tillamook transmission lines (Figure 1-1). The eastern portion of the lines, the 10.5-mile Keeler-Forest Grove No. 1 transmission line, is located between the BPA Keeler ***Substation*** and the BPA Forest Grove Substation in Washington County, Oregon. The western portion of the lines, the 47.3-mile Forest Grove-Tillamook No. 1 transmission line, is located between the BPA Forest Grove Substation in Washington County, Oregon, and the BPA Tillamook Substation in Tillamook County, Oregon. The transmission lines are old, physically worn, and structurally unsound in places. These transmission lines serve BPA's utility customers, who in turn serve communities in western Oregon.

[1] The Keeler-Forest Grove No. 2 transmission line is not part of the Proposed Action.
[2] Technical terms that are in ***bold, italicized typeface*** are defined in Chapter 6, *Glossary and Acronyms*.

The Keeler to Tillamook transmission lines were originally built in the 1950s. The original ***conductor*** has never been replaced and does not meet current National Electrical Safety Code (NESC) standards. In general, wood poles for transmission lines are expected to have a service life of 55 to 60 years, at which point they are usually replaced due to age, rot, or other forms of deterioration. Today, the existing wood-pole ***structures*** and conductors have exceeded their service life and show normal deterioration due to age. In addition, the bases of some structures have been undermined because the underlying soils are unstable. The poor condition of the existing transmission lines creates risks to public and worker safety and may lead to outages that would adversely affect power deliveries to BPA's customers in western Oregon.

In addition to these structural issues, there is a need to provide better access to the transmission lines. Some structures do not have permanent ***access roads*** to reach them, which makes normal and emergency maintenance difficult, and at times unsafe. Other roads need to be improved to ensure that the lines can be accessed during proposed construction of the Rebuild Project, as well as year round for maintenance.

1.3 Purposes of Action

Purposes are defined here as goals to be achieved while meeting the need for the Proposed Action. BPA has identified the following purposes that it will use to evaluate the alternatives:

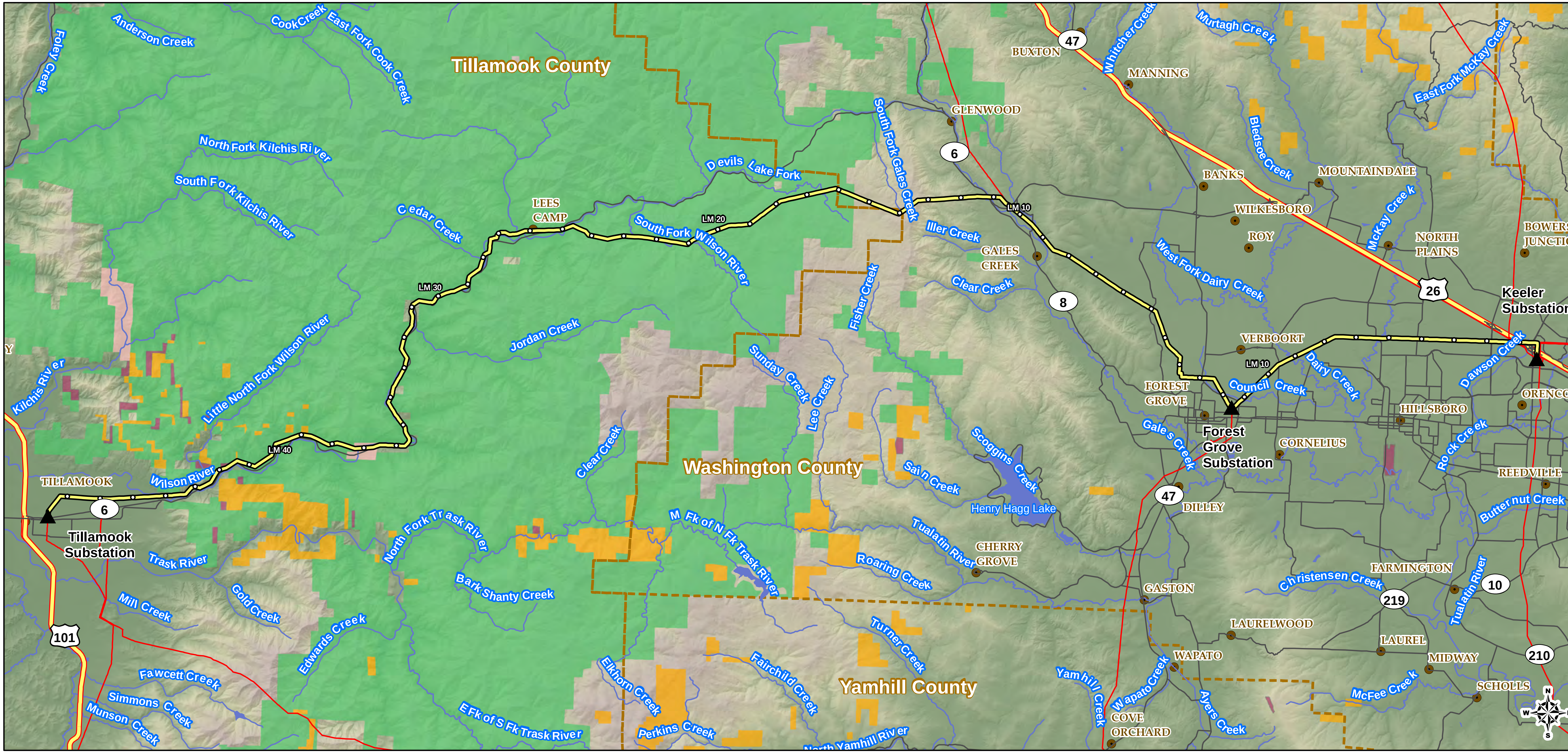
- Meet transmission system public safety and reliability standards set by the NESC.
- Minimize environmental impacts.
- Continue to meet BPA's contractual and statutory obligations.
- Demonstrate cost-effectiveness.

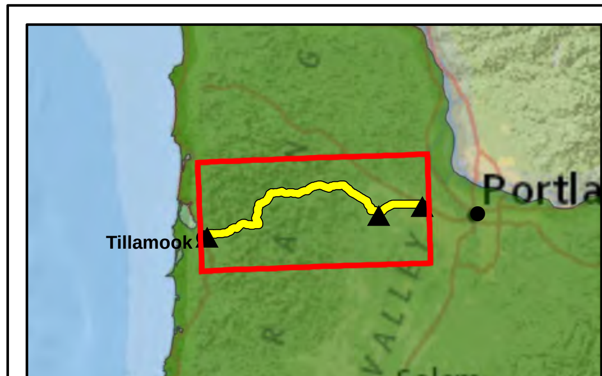
1.4 Public Involvement and Issue Summary

On August 20, 2012, BPA sent a letter to people potentially interested in or affected by the proposed Rebuild Project, including adjacent landowners, public interest groups, local governments, tribes, and state and federal agencies. The letter explained the proposal, the environmental process, and how to participate. The public letter was posted on the project website at: www.bpa.gov/go/keelertillamookrebuild.

BPA identified two tribes that have a potential interest in the Proposed Action, based on their historic or current use of the land in the project area: the Confederated Tribes of Grand Ronde and the Confederated Tribes of Siletz Indians. BPA requested information from the consulting tribes on known ***cultural resources*** in the project area. BPA provided information on the project and cultural resources for review by Tribal cultural resources specialists.

To solicit comments and describe the project, BPA held two public scoping meetings in Forest Grove and Tillamook, Oregon, in September 2012. The scoping comment period for the Rebuild Project began on August 20, 2012, and BPA accepted comments on the project from the public until September 24, 2012.





Legend

- ▲ BPA Substation
- ∘ Line Mile (LM)
- Keeler - Tillamook No. 1 Transmission Lines
- BPA Transmission Lines
- Cities or Towns
- River
- County Boundary

Land Ownership

- BLM
- City or County
- Oregon Department of State Lands
- Tillamook State Forest

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BPA Regional Geodatabase 2013
Print Date: October 22, 2013

Keeler to Tillamook 115-kV Transmission Line Rebuild Project

Figure 1-1

Proposed Transmission Line and Vicinity

1 inch = 3 miles
0 1.5 3 6 Miles

BONNEVILLE POWER ADMINISTRATION

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A total of 24 people attended the scoping meetings; 12 attended the Forest Grove meeting and 12 attended the meeting in Tillamook. Comments were provided during the meetings, and written comments were also received from 16 individuals and agencies. Comments received during the scoping period were considered in preparation of the EA and can be found in their entirety on the project website.

BPA has been working with the Tillamook People's Utility District (PUD) regarding work planning and outage scheduling for construction. BPA has requested Tillamook PUD input into structure access and design considerations where the PUD has ***underbuild*** distribution facilities (the lines feeding a neighborhood or home) located on BPA structures, for approximately 10.1 miles of the Forest Grove-Tillamook No. 1 transmission line. To date, Tillamook PUD has provided BPA with future growth expectations and rebuild plans for the next 20 years.

Comments were received on the following topics:

- **Alternatives.** Several comments included requests that some portions of the existing ***right-of-way*** (ROW) be relocated or located underground to accommodate future development or to allow for better use of private property.
- **Land Use, Recreation, and Transportation.** Some comments raised concern about the existing line transecting vacant developable land in the cities of Forest Grove and Hillsboro. Comments were expressed about potential impacts related to access constraints on private property. Some comments asked about impacts on farmland and crop damage compensation. One commenter expressed concern about whether the ROW would prevent the addition of a planned hazelnut farm near or within the ROW.
- **Vegetation.** A number of commenters raised concerns about the potential for tree removal on their property. Comments were also received about existing mature trees and whether they would be removed or remain in place.
- **Geology and Soils.** Several comments raised concerns about soil erosion and landslide potential on steep slopes that could result from tree and vegetation removal during construction.
- **Visual Quality.** One comment suggested that visible transmission structures be made artistic in some way.
- **Cultural Resources.** One comment mentioned a pioneer cemetery near the Tillamook Substation.

These topics are addressed in the appropriate sections of the EA.

BPA is releasing this Draft EA for review and comment. The Draft EA is posted on the project website (www.bpa.gov/go/keelertillamookrebuild). During the review period, BPA will accept comments orally, via e-mail, and by letter. After considering comments received during the review period, the EA will be revised if necessary and finalized, with a decision on how to proceed.

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Chapter 2
Proposed Action and Alternatives

This chapter describes the Proposed Action, the No Action Alternative, and alternatives considered but eliminated from detailed study. This chapter also compares the Proposed Action and the No Action Alternative to the project purposes, as well as the potential environmental impacts of each of these two alternatives.

2.1 Proposed Action

The Proposed Action is to rebuild 10.5 miles of BPA's Keeler-Forest Grove No. 1 transmission line, and 47.3 miles of BPA's Forest Grove-Tillamook No. 1 transmission line. Activities would include construction of new permanent and temporary access roads, improvement to some existing access roads, removal of some ***danger trees***, conductor replacement, and the replacement of all wood-pole structures over 10 years of age.

The existing transmission line extends west from BPA's Keeler Substation, in Washington County, Oregon, to BPA's Forest Grove Substation, in the city of Forest Grove, Oregon, and ends at BPA's Tillamook Substation in Tillamook County, Oregon. About 10.1 miles of the Forest Grove-Tillamook No. 1 transmission line has a 12-kV distribution underbuild owned and operated by Tillamook PUD (Figure 2-1). Under the Proposed Action, the Tillamook PUD distribution line would be transferred to the new wood-pole structures.

Each structure is designated by a unique number based on the distance from the Keeler or Forest Grove Substation (the designated start point for each transmission line) and the number of structures within a given mile. For example, in the first mile from the Keeler Substation, there are ten wood-pole structures. The first structure is designated as structure 1/1, the second structure is structure 1/2, and so on, up to the tenth structure, which is designated as structure 1/10. Numbering in Line Mile (LM) 2 begins with structure 2/1.

The rebuilt transmission line would be similar to the existing Keeler to Tillamook transmission lines in design and appearance. At some locations along the lines, existing structures would be removed and not replaced, new structures would be installed that do not currently exist, structures would be moved from the existing ***centerline***, and structures would be moved to different locations but along the existing centerline and within the ROW easement. These activities are necessary to ensure the integrity, reliability, and safety of the electrical transmission system. Specifically:

- Existing structures 35/6 and 45/9 on the Forest Grove-Tillamook No. 1 transmission line would be removed and not replaced.
- Proposed structure 1/10 on the Keeler-Forest Grove No. 1 transmission line and structures 28/1 and 35/3 on the Forest Grove-Tillamook No. 1 transmission line are new structures where no previous structure existed.
- Existing structure 35/5 on the Forest Grove-Tillamook No. 1 transmission line would be moved approximately 20 feet east of the existing centerline to avoid the Wilson River ***floodplain***. This structure is renumbered as proposed structure 35/6.

- Structure 35/7 on the Forest Grove-Tillamook No. 1 transmission line would also be moved about 40 feet east of the existing centerline to avoid the Wilson River floodplain, but the structure number would not change.
- Two single pole structures, 2/5 and 46/1 on the Forest Grove-Tillamook No. 1 transmission line, would be replaced as two-pole structures. Eleven rebuilt structures would be changed from the two-pole design to a three-pole design (see Figure 2-2).
- BPA is considering whether to replace some wood-pole structures on the Forest Grove-Tillamook No. 1 transmission line with steel monopole or H-frame structures.
- 69 structures would be moved 5 feet or more ahead or back along the centerline. Of these, 25 would be moved 10 feet or more ahead or back along the centerline.
- 68 existing wood-pole structures on the Keeler to Tillamook transmission lines would not be rebuilt for this project because they are under 10 years of age.

The changes to the line would stay within the existing transmission line corridor and would not require the acquisition of any new land rights. All other replacement poles would be built either on the same footprint as the existing poles, or within a few feet of the existing poles, within BPA's existing ROW easement. The main elements of the existing and rebuilt transmission lines are compared in Table 2-1.

Figure 2-1. Existing Forest Grove-Tillamook No. 1 Transmission Line

View looking west along State Route (SR 6) near structure 36/2. Note the existing 12-kV distribution underbuild owned and operated by Tillamook PUD.

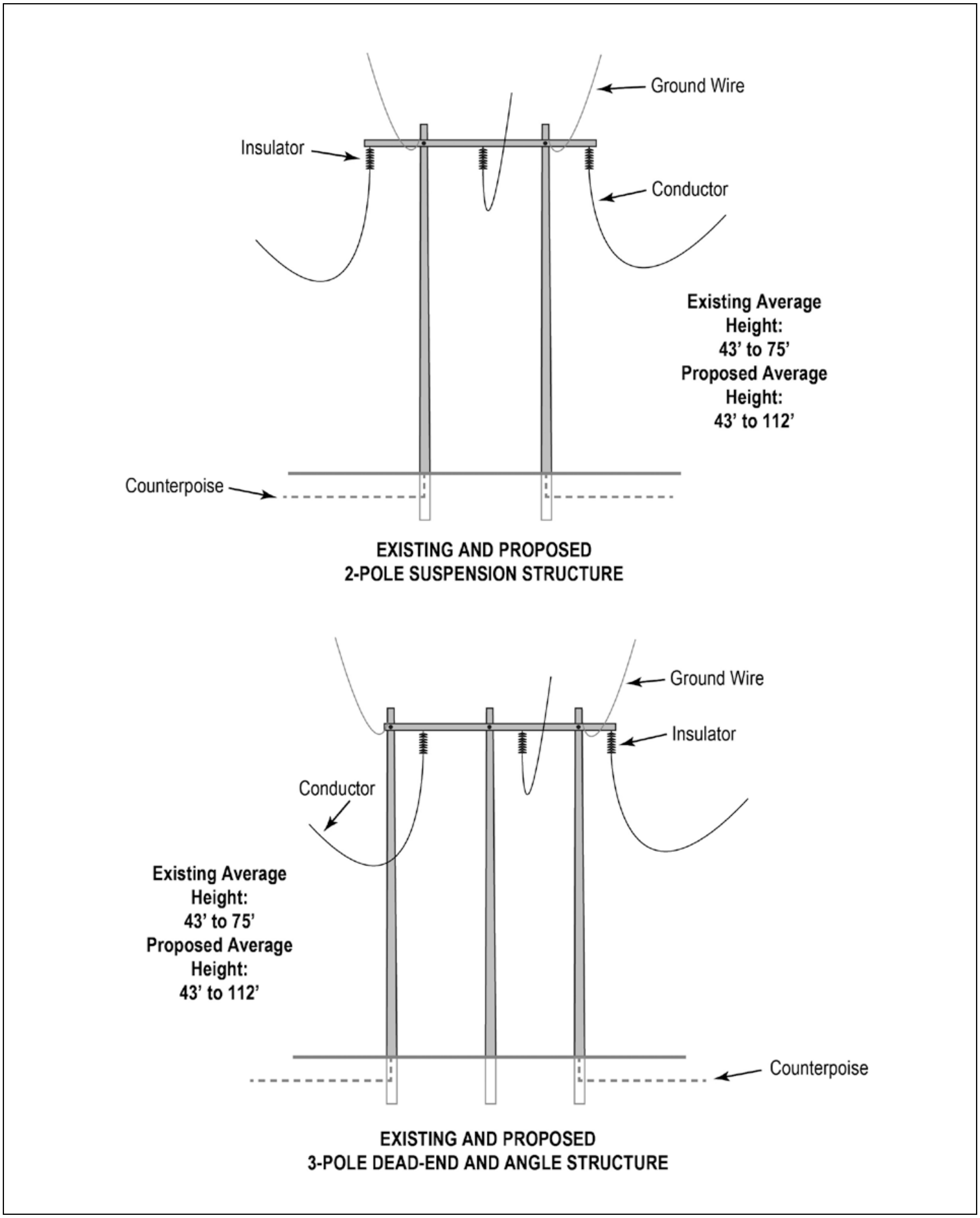


Figure 2-2. Steel and Wood Pole Structure Types

Table 2-1. Existing and Rebuilt Transmission Line Elements

Project Element	Existing Transmission Line	Rebuilt Transmission Line
Operating Voltage	115 kV	115 kV
Corridor Length	59.7 miles	59.7 miles
ROW Width [a]	100 feet	100 feet
Wood-pole structures (total)	535	536
Single-pole structures	157	157
Two-pole structures	309	302
Three-pole structures	69	77
Steel pole structures [c]	1	1
Lattice-steel structures	12	12
Total structures	**548** [b]	**549** [b]
Tillamook PUD underbuild	10.1 miles	10.1 miles
Structure height range (above ground)		
Wood structures	43 to 75 feet	43 to 112 feet
Lattice-steel structures	90 to 145 feet	no change; 90 to 145 feet
Conductor diameter (in inches)	Keeler-Forest Grove: 0.927 Forest Grove-Tillamook: 0.642	Keeler-Forest Grove: 0.951 Forest Grove-Tillamook: 0.835

[a] BPA has a ***pole line easement*** only on 6.6 miles of the Forest Grove-Tillamook No. 1 transmission line. Pole line easements have no associated ROW width.

[b] The totals do not include three substation dead-end structures, which would not be replaced as part of this project.

[c] BPA is considering whether to install some steel pole structures; if adopted, some of the wood poles could instead be steel poles. See Section 2.1.8, *Steel Pole Replacement*, for additional details.

The Proposed Action would involve the following activities:

- Removal of existing wood-pole structures and conductors.
- Installation of replacement wood-pole structures and associated components.
- Installation of conductors, ***ground wire***, and ***counterpoise***.
- Improvement and reconstruction of some existing access roads.
- Construction of permanent access roads.
- Use of temporary and permanent ***travel routes.***
- Release of some existing access roads[3].
- Establishment of temporary ***staging areas*** for storage of materials.
- Removal of some vegetation, including some danger trees.
- Revegetation of areas disturbed by construction activities.

[3] Previously acquired access road easement rights that are released are returned back to the underlying fee owner. Once the release is completed, BPA has no rights to use that road in the future.

Each of these activities is described in detail in the remaining portions of this chapter. The Proposed Action activities are summarized in Table 2-2.

Table 2-2. Proposed Rebuild Project Activities

Proposed Activity	Quantity
Transmission Line Rebuild Activities	
Number of wood-pole structures removed [a]	484
Number of structures installed: [b]	
Wood, single pole	154
Wood, two-pole	258
Wood, three-pole	72
Total unchanged structures	65
Total structures (new + unchanged)	**549** [c]
Net number of new structures compared to existing conditions	+1
Number of new structures outfitted with guy wires	138
Conductors	3 per line
Access Road Work	
New construction	1.13 miles
Improvements or reconstruction	18.94 miles
Total length of access roads [d]	110 miles
Acquisition of access roads or travel route easement	46.47 miles
Release access roads easement	0.26 mile
Temporary travel routes (Route of Travel)	89.08 miles
Culverts installation	20
Bridge installation or replacement	3
Vegetation Management	
Removal of danger trees	2,666
Removal of vegetation within the ROW	As needed
Removal of vegetation along existing access roads	As needed

[a] 53 wood-pole structures would not be replaced as part of the Rebuild Project because they are under 10 years old.

[b] BPA is considering whether to install some steel pole structures; if adopted, some of the wood poles could instead be steel poles. See Section 2.1.8, *Steel Pole Replacement*, for additional details.

[c] Does not include three substation dead-end structures not replaced as part of this project.

[d] This total includes all roads used by BPA exclusively for access to the transmission line. This total includes new, improved, and reconstructed roads; it does not include project-specific travel routes (89.08 miles) or public roads that may be used as the primary road for access to isolated structures. Roads released as a result of the Proposed Action (0.26 mile) are also not included in this total.

2.1.1 Existing Transmission Line and Right-of-Way

The existing transmission line consists of 535 wood-pole structures and 13 steel structures (12 lattice-steel structures and one steel monopole or H frame structure; see Table 2-1 and Figure 2-3). For a wood-pole transmission line, there is an average of nine structures within a 1-mile section.

Structure replacement would generally occur within the existing 100-foot-wide transmission line ROW, with the exception of two structures (35/5 and 35/7) of the Forest Grove-Tillamook No. 1 transmission line to avoid the Wilson River floodplain. The existing ROW is located on 37.7 miles of private land. The ROW also crosses lands managed by the Oregon Department of Forestry (ODF) on Tillamook State Forest (approximately 18.1 linear miles), and the Bureau of Land Management (BLM) (approximately 0.2 linear miles of access road).

Tillamook PUD has about 10 miles of 12-kV distribution underbuild on BPA-owned wood-pole structures on the Forest Grove-Tillamook No. 1 transmission line between structures 27/1 and 37/1 (Figure 2-1). BPA would coordinate with Tillamook PUD to ensure that existing wires are replaced or transferred to new structures to ensure continued reliability and safety.

2.1.2 Transmission Line Structures

A total of 484 existing wood-pole structures would be replaced. Twelve existing lattice-steel towers and one steel pole structure would remain in place and be part of the new line. About 52 wood-pole structures that were replaced in the last 10 years would not be replaced and remain a part of the new line. In general, the existing structures would be replaced with structures of essentially the same design—two-pole or three-pole—and with similar structural components (i.e., structure cross arms, ***insulators***, and ***dampers***). All wood structures would have the same general appearance but would vary in size depending on their function.

Most (258) of the proposed structures would be two-pole suspension structures (Figure 2-2), which are used in straight alignments or where turning angles between structures are generally less than 15 degrees. They are composed of two wood poles, because they do not have to withstand the stresses created by angles in the conductor.

Seventy-two structures would be three-pole structures, either angle or dead-end (Figure 2-2). ***Angle structures*** would be located at points where the line changes direction, generally at angles of 15 degrees or greater. ***Dead-end structures*** would be placed at intervals along the transmission line to independently carry the weight and tension of the conductors. Dead-end structures could be used on a straight alignment, at angles greater than 15 degrees, or on very long spans, such as river crossings.

The heights of the new wood-pole structures would be slightly taller than heights of existing structures, changing from a range of 43 to 75 feet to a range of 43 to 112 feet above ground. Structure heights at particular locations would depend on terrain, the length of the span, clearance requirements, and other factors. Many rebuilt structures would be taller in order to keep the operating temperature of the line to 100 degrees Celsius. Current standards also require larger clearance distances between the transmission line and the Tillamook PUD underbuild. There must be at least 9 feet of clearance between the transmission conductor and the distribution line. The proposed new conductor on the line is larger in diameter and is heavier than the existing conductor.

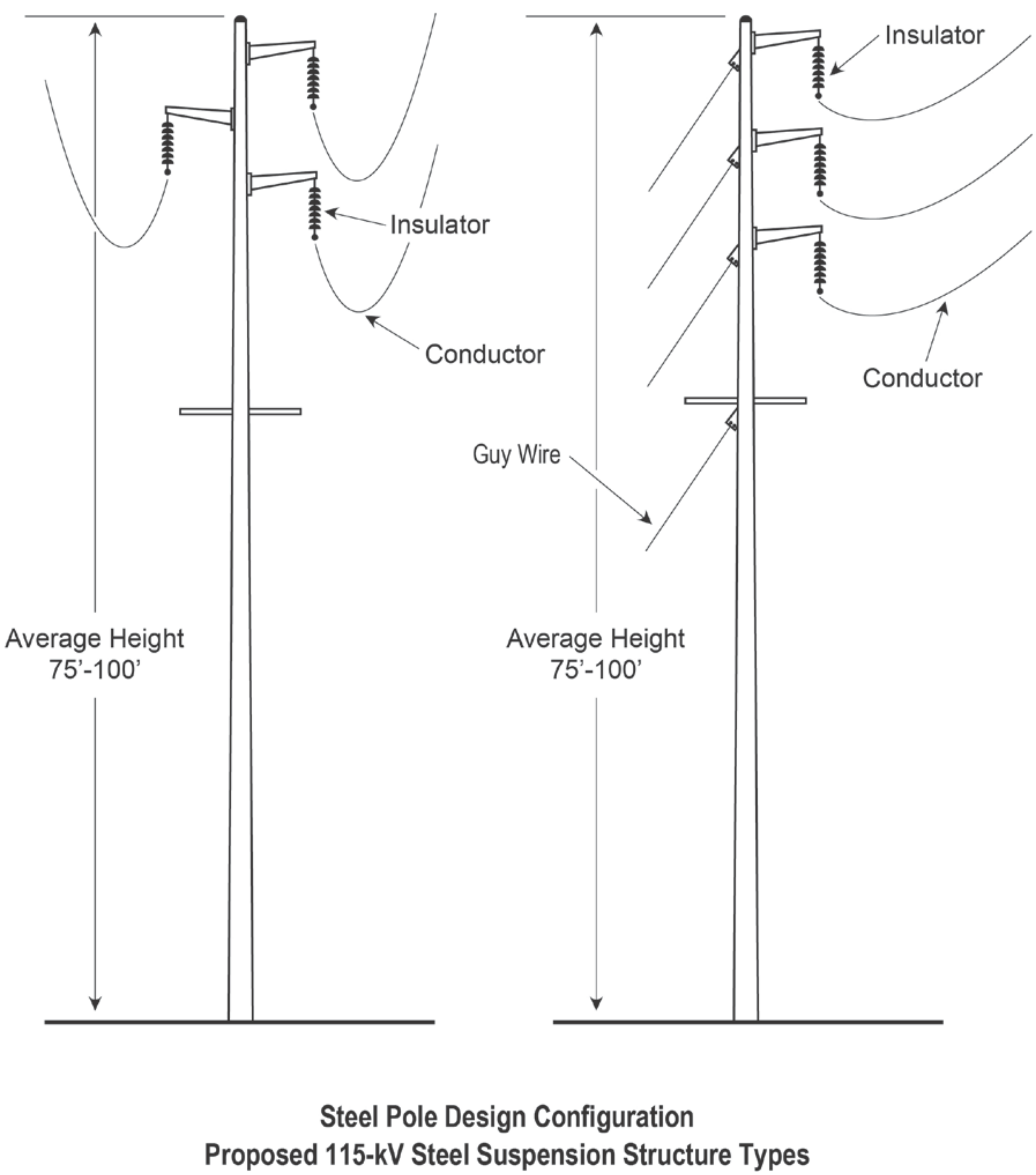


Figure 2-3. Steel Pole Structure Types

The larger conductor has the potential to sag much more than the existing conductor, so pole heights must be increased to meet minimum ground-to-conductor clearance requirements.

Guy wires and ***guy anchors*** would be installed to support new structures. Guy wires would connect the wood-pole structures to the ground to provide extra support and stability.

2.1.3 Conductors, Overhead Ground Wires, and Counterpoise

Conductors

Alternating-***current*** transmission lines, like the Keeler to Tillamook transmission lines, require three conductors to make a complete ***circuit***. The existing conductors would be removed and new ones attached using ceramic insulators. Insulators keep conductors a safe distance from other parts of the structure and prevent electricity in the conductors from moving to other conductors, the structure, or the ground. The existing conductor has a diameter of 0.927 inch on the Keeler-Forest Grove line and 0.642 inch on the Forest Grove-Tillamook line. The proposed conductor would be larger, with a diameter of 0.951 inch for the Keeler-Forest Grove line and 0.835 inch for the Forest Grove-Tillamook line. For the first few years after installation, the new conductor would be more reflective than the existing until it naturally weathers and dulls.

Overhead Ground Wire

Overhead ground wires are used for lightning protection. If lightning strikes, the overhead ground wire takes the charge instead of the conductors. Overhead ground wire would be replaced and installed approximately 0.5 mile from the Keeler and Forest Grove substations, and about 0.7 mile from the Tillamook Substation.

Counterpoise

A system of underground wires, or counterpoise, is attached to some structures for additional lightning protection. The counterpoise takes the lightning charge from the overhead ground wire and dissipates it into the earth. The wires are laid out horizontally from structures within the ROW and buried in the ground. Counterpoise would only be located where overhead ground wire is present. Typically, at each of the structures, the trench in which the counterpoise is buried would be excavated by a small backhoe and would measure approximately 30 inches deep by 24 inches wide and vary in length from 15 feet to 100 feet.

2.1.4 Access Roads

Transmission line structures would be accessed from existing roads where possible. Roads leading to the vicinity of the transmission line are generally multiuse roads (e.g., residential access, country roads) used by a variety of individuals for various purposes. Existing access roads within the ROW were generally created for BPA use.

Access road work would be needed to improve access to most of the structure sites for construction and ongoing operation and maintenance activities. This work would include existing road improvements or reconstruction (18.94 miles), new road construction (1.13 mile), and acquisition of easements for existing access roads/routes (46.47 miles). The new road construction total includes numerous short lengths of ***spur road*** that would extend from existing roads to structure locations. Access would also involve the use of temporary travel routes (89.08 miles) through farm fields or existing non-public roads. BPA would acquire easements for those lengths of travel route that extend off the ROW. For temporary routes through fields or non-public roads, these easements would be temporary (i.e., expire after construction is complete), and BPA would compensate landowners for any crop damage during construction.

The project would also involve the release of 0.26 mile of previously acquired access road easement rights back to the underlying fee owner. Once the release is completed, BPA would have no rights to use the released roads in the future.

The roadway system is being inventoried to determine the best location(s) for gates to discourage unauthorized access to the transmission line corridor. Approximately 29 new gates are proposed at this time. In addition, there are approximately 131 existing gates along the existing access road network. Some of these existing gates may need to be replaced as part of the project.

Three bridges would need to be installed or replaced and approximately 20 ***culverts*** installed, replaced, or upgraded in locations along the proposed access roads/routes to provide better drainage during rain and snow events. New, replacement, and upgraded culverts and bridges would be designed to applicable local regulations (generally a conveyance of the 25-year storm event). All culverts not replaced would be inspected and cleared of debris.

2.1.5 Construction Activities

The construction schedule for the Proposed Action depends on the completion and outcome of the environmental review process. If the Proposed Action is implemented, construction would likely begin in April 2014. All major construction activities would likely be completed by January 2015. Project construction activities are described below.

Up to six work crews would be working along the entire transmission line on any given day. Crews would be working up to 10 hours per day, 6 days per week, for approximately 8 months. Each crew would consist of four to six contractor employees with a small number of support trucks delivering materials (wood poles, string, or conductor) and equipment (cranes, backhoes, excavators, tensioners, or pullers) to the work site. Typically, only one crew would be working at any given site; however, up to two crews could work at the pulling and tensioning site. As a result, up to 36 contractor employees could work along the entire corridor with up to 12 employees at a work site.

During construction, ***best management practices*** (BMPs) would be implemented to minimize construction-related ***erosion*** and the potential for introducing construction-related materials (e.g., oil, hazardous materials) into waterways and other sensitive habitats (e.g., ***wetlands*** and fish-bearing streams).

Removal of Existing Structures

Removal of existing structures would involve excavating around the structure base and using a boom crane to pull the structure out of the ground. Excavated poles would be hauled off site using a line truck. Some shrubs and small trees in the ROW might need to be cleared to allow equipment and machinery to access the structures, as well as danger trees removed outside the ROW (see Section 2.1.6, *Vegetation Management*).

The conductors and overhead ground wire would be removed by reeling the wires onto large spools using a large truck called a puller. The puller would be set up with empty reels to hold the old conductors as they are reeled in. Once removed, the old conductors would be delivered to a metal salvage location to be recycled.

Installation of Replacement Structures

Structure replacement would include all components of the structure (cross arms, insulators, guy wires, and dampers), although components that are in good condition may be reused.

Replacement structures would be brought to the structure sites from the staging areas by flatbed truck and, generally, installed in the same ground holes from which the existing structures were removed. The existing holes would be reaugered to about 10 feet deep in the ground using an auger on a drill rig. The replacement poles would be lifted by crane or helicopter into position and placed into the holes. Holes would be backfilled with excavated material and gravel, as required. At most structure sites, any additional soil removed by the auger that is not used for backfilling would be spread evenly around the structure base for stability. At structure sites in sensitive areas, the augered soil would be removed from the site and disposed of in an appropriate fill or waste disposal site.

At most structure sites (i.e., two-pole suspension structures), structure replacement could temporarily disturb an area up to 50 feet by 100 feet per structure (about 0.1 acre) within the previously disturbed ROW. The disturbance area for replacement of three-pole wood structures could be larger (approximately 100 feet by 100 feet, or 0.2 acre) because ***pulling and tensioning*** of the new conductors would generally occur near these structures. In or near sensitive habitats, disturbance areas would be reduced to 50 feet by 50 feet (approximately 0.06 acre) where possible. Staking or flagging would be installed in these areas to restrict vehicle and equipment access to designated routes and areas to protect these sensitive habitats.

Guy wires and guy wire anchors to support new structures would be installed, as required. If guy wires are present at a structure site and need to be replaced, a hole would be excavated at the location of the guy wire anchor and the old guy wire would be cut off. Depending on the location, the underground guy wire anchor would be left or removed. Holes for new guy wire anchors would be dug with a backhoe. Depending on the height, design, and location of the new structure, a new guy wire anchor could be placed in the same location as the old anchor and set in crushed rock. The remainder of the guy wire anchor hole would be backfilled with onsite material.

Equipment used for removing and installing wood poles and other structure components would include flatbed trucks, line trucks with boom cranes, backhoes, augers, and bucket trucks. All trucks and equipment would be restricted to operating within the access roads and travel routes established for the project.

Installation of Conductors, Ground Wire, and Counterpoise

The existing conductor does not meet current standards. It is made of copper and replacement parts are no longer manufactured. The proposed conductors would be made of aluminum and steel and would have a higher electrical ***capacity*** than the existing conductors. The appearance of the conductors would, however, be similar, although the new conductor could be slightly more reflective for the first few years until it naturally weathers and dulls.

The conductor would be installed by setting up a pulling and tensioning site at the beginning and end of each identified pulling section. Typically, pulling sections are lengths along the ROW that are no more than

25 structures long. Conductor pulling and tensioning sites would be needed approximately every 2 to 4 miles depending on the length of each span and the terrain.

After the equipment (puller and tensioner) is set up, a ***sock line*** (usually a rope) would be strung through all the structures. This stringing would be done using a helicopter or by workers on the ground. The sock line would be connected to a hard line (typically a small stranded steel wire), which would be connected to the new conductor and pulled through the structures. Once in place, the new conductor would be tensioned and sagged in place and securely clipped into all of the structures. The tensioner is a large piece of equipment that has many drums that the new conductor is fed through to get the proper tension.

At the same time that the conductors are replaced, overhead ground wire would be removed and replaced, and counterpoise would be replaced, if needed. Overhead ground wire would be replaced and installed approximately 0.5 mile from the Keeler and Forest Grove substations, and about 0.7 mile from the Tillamook Substation. To take the lightning charge from the overhead ground wire and dissipate it into the earth, a series of wires called counterpoise would be buried in the ground at the base of the towers. Aluminum wires would be buried at the base of the structure, extending between the wood poles and from 6 to 18 inches to the outside of the poles where they would connect to a 5/8-inch ground rod. Ground rods help dissipate a lightning charge into earth. They typically measure 10 feet in length and would be placed entirely underground in a vertical orientation. Generally, one counterpoise wire would be buried per structure.

The placement of counterpoise wires would be adjusted to avoid sensitive areas, if possible. The wires would be buried approximately 30 inches below the ground surface using a small backhoe. In areas where bedrock is at or near the surface, the wires would be laid on the surface and buried with loose aggregate.

Access Road Work

As described above, roadway improvements and reconstruction would be needed along 18.94 miles of existing roads to provide suitable access for transmission line equipment. Improvements to access roads could involve: ***blading*** to shape existing road surfaces and turnouts; placement of surfacing aggregate to maintain or restore existing road surfacing; cleaning existing ditches and culverts; replacing or installing culverts; replacing or installing bridges; and installing ***water bars*** and ***drain dips*** as needed to manage ***stormwater runoff***. Reconstruction of existing roads could involve light grading and blading to shape existing road surfaces and turnouts; placement of surfacing aggregate; installation or replacement of drainage structures such as culverts and drain dips to manage stormwater runoff; reshaping of roadway ditches, and culvert inlets and outlets; and vegetation maintenance or removal.

Work associated with the 1.13 miles of proposed new road construction could include grading operations consistent with establishing a road base; removal of vegetation within the roadway prism or along the proposed roadway; placement of road sub-base and surfacing aggregate; installation of drainage structures such as culverts and drain dips to manage stormwater runoff; and construction of roadway ditches, and culvert inlets and outlets.

The 89.08 miles of travel routes across fields (temporary travel routes) would be used in their existing condition with the least impact necessary to allow travel during construction and facilitate restoration of the area back to the existing condition (field) after construction activity. Gates proposed along temporary travel routes would remain in place as permanent features. Installation of improvements, including drainage features (such as culverts and drain dips) and any surface improvements to facilitate travel during construction, would be determined based on conditions encountered at the time of construction and would be temporary in nature. Temporary improvements would be removed, and BPA would work with the landowner to return the area to its previous condition and determine any compensation that may be needed for crop damage.

Road work would occur prior to and concurrent with structure replacement. Most roads would be constructed to a finished 14-foot width, although some areas would be wider to allow vehicles to negotiate curves or bends in the road and to accommodate cut and fill slopes associated with the improvements. The analysis in this EA assumes a potential disturbance width of 20 feet for all proposed road new construction, and improvements and reconstruction of existing roads. Table 2-3 provides a list of equipment that could be used for access road work.

Table 2-3. Equipment Used in Access Road Work

Equipment Type	Equivalent Caterpillar Model	Fuel Type
Bulldozers	D5K	Diesel
Excavators (large and small)	328D LCR	Diesel
Dump trucks	NA	Diesel
Crane (300,000 pounds)	NA	Diesel
Road grader	12M	Diesel
Roller compacter	CP56	Diesel
Backhoe	450E	Diesel
Work trucks	NA	Diesel/gas

An excavator could be used to remove some of the smaller shrubs growing at the immediate road surface edge. Soil disturbance and removal would be minimized as much as possible during vegetation removal (see Section 3.6.3, *Mitigation – Proposed Action [Vegetation]*). The use of an excavator is preferred to large mowers or brush cutters (e.g., brush hogs) for removing vegetation because they are too large for the size of the roads and are not as precise as excavators. Any larger limbs growing into the roadway would be cut manually with a chainsaw.

Establishment of Staging Areas

Up to three temporary staging areas would be established along or near the ROW, with one located on BPA-owned land at the Keeler Substation. Staging areas would be used to store and stockpile new and removed materials, as well as other construction-related equipment. The size of the staging areas would be based on the types of sites available for lease and the size needed to accommodate materials and equipment. Each staging area could be up to 10 acres in size. Staging areas would be established within 10 miles of the transmission line, if possible, to minimize travel time. Staging areas are generally existing large, level, paved sites in commercial or industrial areas. If these types of areas are not available or feasible, disturbed or common habitat types outside of sensitive habitat areas would be used for staging areas. Once the staging areas are identified, BPA would complete any required site-specific environmental review.

2.1.6 Vegetation Management

Restoration of Areas Disturbed by Construction

All areas disturbed by construction activities, except permanent road surfaces, would be reseeded with a predominantly native seed mix or a seed mix agreed upon with landowners. The original grade and drainage patterns in sensitive areas would be restored to the extent practicable.

Danger Tree Removal

Some danger tree clearing would occur as part of the Proposed Action. A danger tree is a tree located along a transmission line corridor that is a current or future hazard to the transmission line. Danger trees can be either stable or unstable. A tree would be identified as a danger tree if it could make contact with BPA facilities or come close enough to cause an electrical arc should it fall, bend, or grow within the space that could be occupied by the conductor, either when at rest or when swinging as a result of winds. Vegetation removal would ensure that lines do not sag too close to vegetation and that tree limbs do not fall or bend into the conductor. When vegetation comes too close to conductors, the electricity can jump (arc) from the line to the vegetation. This can be very dangerous to any animal life in the surrounding area and can cause fires and ***outages***.

Danger trees would be felled with a chainsaw, and branches would generally be lopped and either scattered or chipped. If chipped, the chips would be broadcast. How trees are felled and disposed of depends on the location of the trees and agreements with landowners.

Tillamook State Forest is currently experiencing high levels of laminated root rot, *Phellinus weirii*, which has infected trees adjacent to the ROW throughout the Forest Grove District (pers. comm., Marsey, 2013). Infected trees are susceptible to falling into the transmission facilities. A total of 2,666 danger trees have been identified between 50 and 100 feet from the centerline of the transmission line ROW and include trees showing signs of *Phellinus* infection (pers. comm., Canaday, 2013). Appendix A summarizes the location, species, and diameters of danger trees by line mile. BPA would discuss danger tree removal activities with landowners prior to removal.

2.1.7 Operation and Maintenance

Ongoing operation and maintenance of the rebuilt transmission line would be essentially the same as for the existing line. The transmission line would continue to be operated at the current voltage (115 kV). BPA would conduct routine, periodic inspection and maintenance. A typical maintenance activity on wood-pole structures is insulator replacement. Although emergency repairs may also be needed, the rebuilt line is anticipated to require emergency maintenance less frequently and on a smaller scale than currently required.

Vegetation would be cleared periodically during ongoing operation and maintenance to maintain access to structures, control ***noxious weeds***, and keep vegetation at a safe distance from the conductor. This vegetation management could include removal of trees determined to be danger trees, as described above. Vegetation maintenance would be guided by the program identified in BPA's Transmission System Vegetation Management Program Final Environmental Impact Statement and Record of Decision (BPA 2000). The vegetation management program includes ongoing consultation with landowners and others concerning vegetation management activities. Vegetation management methods could include manual methods (e.g., hand pulling, clipping, and using chainsaws), mechanical methods (e.g., using roller-choppers and brush hogs), and chemical methods (herbicide use).

2.1.8 Steel Pole Replacement

BPA is considering whether to replace some wood-pole structures on the Forest Grove-Tillamook No. 1 transmission line with steel monopole or H-frame structures (see Figure 2-2 for similar H-frame design and Figure 2-3 for monopole steel pole design). Steel structures are costlier in the short-term, but offer long-term maintenance advantages over wood-pole structures. Replacing select wood-pole structures with steel poles would address several ongoing issues along the line, including:

- Extensive woodpecker damage that has led to premature and ongoing replacement of wood-pole structures;
- Structures where crews must use helicopters or ford the Wilson River to gain maintenance and emergency access to the line;
- Structures that would be over 100 feet in height under the Proposed Action and would require extensive road building to transport to higher elevation areas (steel poles could be delivered in sections, avoiding the need for large turnout areas to transport tall wood-pole structures); and
- Poles located along “The Narrows” neighborhood between towers 36/2 and 36/18 where yearly brush management has been a challenge for field crews.

Initially BPA identified about 245 poles that met the above criteria. After evaluating the feasibility of replacing those structures, four priority categories were developed to further refine the list and minimize total project costs. Those structures were identified by priority: lack of access areas, class H4 and H5 poles (heavier duty structures that take more tension than suspension poles), poles over 100 feet in height, and poles in The Narrows neighborhood (Table 2-4). Under these criteria, up to 61 structures could be replaced with steel poles, with a total increase in project costs estimated at $61,000.

Table 2-4. Structure Locations, Height, and Criteria for Steel Pole Replacement [a,b]

Criteria	Structure Location [c]
Access	29/7, 29/8, 30/11-30/12, 35/13-35/15, 36/1
Class H4 and H5 poles	28/14, 29/1, 29/6, 29/9, 30/2, 30/7, 30/13-30/15, 33/1, 33/7, 34/6, 34/13-34/15, 35/1, 36/13
Poles over 100 feet tall	27/6, 28/5, 28/10, 29/1, 29/5, 29/6, 29/8, 29/9, 30/6, 30/13, 31/2, 31/9, 32/2, 32/3, 32/10, 33/7, 34/4, 34/5, 34/9, 34/13, 34/14, 35/1, 35/3, 35/4, 35/6, 35/7, 35/9, 36/13, 36/14, 39/2, 41/8
Location along “The Narrows” neighborhood	36/2-36/18

[a] Some poles meet multiple criteria.

[b] All structures would be steel monopoles with the exception of towers 29/9 and 39/2, which would be designed as two-pole H-frame steel, and structures 29/8 and 41/8, which would be designed as three-pole H-frame steel (see Figure 2-2).

[c] All structures located on Forest Grove-Tillamook No. 1 transmission line.

2.2 No Action Alternative

Under the No Action Alternative, BPA would not rebuild the transmission line and would continue to operate and maintain the existing transmission line in its current state. Construction activities associated with the Proposed Action would not occur. The line structures would likely continue to fail intermittently, the ability of BPA to provide reliable electric service to its customers in the area would be adversely affected, and the safety concerns that prompted this proposal for action would persist.

BPA would continue to attempt to maintain the existing lines as the aged wood poles and cross arms further deteriorate. Due to the condition of the lines, the No Action Alternative would likely result in more frequent maintenance activities within the corridor than under the Proposed Action. It might be possible to plan some of this maintenance, but the majority of repairs would likely occur on an emergency basis as various parts of the line continue to deteriorate. Emergency repair activities could affect vegetation, wildlife, soils, water quality, and other natural resources in the immediate vicinity. Downed lines resulting from structure failures would have a high potential for causing fires and also present a public safety hazard.

Given the poor condition of some of the roads, the road work proposed under the Proposed Action would likely occur as an operation and maintenance project in the future, independent of rebuilding the transmission line. Future operation and maintenance under the No Action Alternative would also involve removal of the danger trees identified in Appendix A. Additional danger tree removal could occur as *Phellinus* infection spreads and creates larger areas of concern adjacent to the transmission line ROW (pers. comm., Canaday, 2013).

2.3 Alternatives Considered but Eliminated from Detailed Study

BPA considered the option of removing larger portions of the existing transmission line and building a new line in a new corridor, based on comments from landowners, the City of Hillsboro, and the City of Forest Grove.

The City of Hillsboro identified industrial properties within the existing Keeler-Forest Grove No. 1 and No. 2 transmission line corridor as their next major expansion opportunity within their existing Urban Growth Boundary (UGB). The sites include the 534-acre Evergreen Site, and the 146-acre Shute Site, both located south of U.S. Highway 26 (US 26) and west of Brookwood Parkway. The city requested in scoping and through additional discussions with BPA staff that BPA consider double circuiting its Keeler-Forest Grove Nos. 1 and 2 lines on larger steel towers to minimize BPA's ROW footprint and open up portions of non-buildable land that is bisected by BPA lines. The City of Forest Grove also indicated their interest in developing a mixed-use/transit-oriented development on a parcel that is currently crossed by the transmission line near the Forest Grove Substation.

BPA determined that constructing the transmission line in a new corridor would result in much greater environmental impacts (e.g., through vegetation clearance, wildlife habitat disturbance, property effects, and visual impacts) as compared to simply rebuilding the transmission line within the existing ROW. Building a new transmission line in a new corridor also would be significantly more expensive than the Rebuild

Project. Finally, through environmental analysis conducted for the Proposed Action, no major issues have been identified that would merit rerouting the Keeler to Tillamook transmission lines. Potential rerouting alternatives thus were considered but eliminated from further study.

If the cities of Hillsboro and Forest Grove wish to continue to pursue the option of rerouting BPA transmission lines, they can submit a formal Land Use Application (LUA) to BPA. The LUA would begin an internal evaluation process to determine the merits of the proposals as a separate project. Any changes to BPA's lines or infrastructure would be at the applicant's expense and would require additional environmental review.

2.4 Comparison of Alternatives

Table 2-5 summarizes the stated purposes of the Proposed Action (see Section 1.3, *Purposes of Action*) and compares the potential for the Proposed Action and No Action Alternative to meet those purposes. A detailed comparison of the environmental impacts of the Proposed Action and No Action Alternative is presented in Table 2-6, based on the results of the full analysis as presented in Chapter 3, *Affected Environment and Environmental Consequences.*

Table 2-5. Comparison of the Proposed Action and No Action Alternative

Purpose	Proposed Action	No Action Alternative
Meet transmission system public safety and reliability standards set by NESC	The rebuilt transmission line would continue to operate at 115 kV. New structures and associated equipment would provide more reliability during routine operation and severe weather as unplanned outages and emergency repairs due to deteriorating components would be reduced. Access road work would ensure that emergency repairs are done quickly and efficiently to maintain transmission system reliability.	While the existing transmission line would continue to operate at 115 kV, outdated and physically worn structures and associated equipment would pose a greater risk for outages and unreliable service. Emergency response times could be increased by access roads that are in poor condition and may hinder transmission system reliability.
Minimize environmental impacts	Construction-related environmental impacts would be minimized by designing the project to avoid sensitive resources, where possible, and to minimize potential adverse impacts through the mitigation measures prescribed in Chapter 3 of this EA.	There would be no construction-related environmental impacts; however, maintenance impacts would increase as existing structures and roads deteriorate and require additional maintenance. Impacts could occur during emergency maintenance without the benefit of planned environmental review and mitigation. Emergency repairs could impact vegetation, wildlife, soils, water quality, and other resources, and any downed lines resulting from structure failures would have a high potential for causing fires and also present a public safety hazard.
Continue to meet BPA's contractual and statutory obligations	The rebuilt transmission line would maintain system reliability and subsequent power delivery to BPA's customers in western Oregon.	The existing line would continue to deteriorate and threaten system reliability and subsequent power delivery.
Demonstrate cost-effectiveness	Environmental review, design and engineering, and construction costs are estimated at $17,695,138. Over the long term, the project would reduce maintenance costs.	Construction costs would be avoided, but maintenance costs related to ongoing repairs could increase to maintain the deteriorating line and could be higher over time than under the Proposed Action.

Table 2-6. Summary of Impacts of the Proposed Action and No Action Alternative

Environmental Resource	Proposed Action	No Action Alternative
Land Use, Recreation, and Transportation	New easements for access roads would be acquired on private lands, and BPA would work with affected landowners during easement acquisition to provide appropriate compensation. Acquisition of new easements is expected to have a **low impact** on land ownership. BPA would swap pole lines easements on ODF lands to reroute a portion of the line out of the Wilson River floodplain, resulting in **no** impact on land ownership. Construction and operations and maintenance activities would mostly result in **low** impacts on Land Uses as the Proposed Action would replace an existing transmission line. Potential conflicts between the transmission line and local, proposed developments may restrict land uses in specific locations, resulting in **moderate** impacts. The Proposed Action would temporarily impact recreation during construction and maintenance activities. Potential impacts would result from short-term closures and are expected to be **low to moderate**. The Proposed Action would result in improved road access to the transmission line structures through a combination of new, improved, and reconstructed roads. New easements on existing roads would also be acquired where needed. These activities would temporarily impact transportation through short-term traffic delays during construction. Overall, impacts on transportation are expected to be **low**.	Under the No Action Alternative, there would be no construction related impacts on Land Use, Transportation or Recreation. Short-term impacts from operation and maintenance would occur periodically, and depending on the location, could result in **moderate** impacts; e.g., a structure replacement adjacent to recreation sites.

Table 2-6. Summary of Impacts of the Proposed Action and No Action Alternative

Environmental Resource	Proposed Action	No Action Alternative
Geology and Soils	The Proposed Action includes ground-disturbing activities associated with structure replacement and access road improvements that occur on soils with moderate to severe ***erosion potential***. Areas of the Coast Range are prone to landslides, which have previously impacted structures and access roads along the transmission line. Most structures would be replaced in the same location, which would have a **low** impact on geology and soils. New structures, and structures that are moved from their original location, would potentially increase erosion in areas of new ground disturbance. Similarly, new access roads would result in disturbance to soils, potentially increasing soil erosion. Impacts on geology and soils from these ground-disturbing activities would result in a **moderate** impact. While future landslides have the potential to impact structures and access roads, potential impacts will be mitigated through a geotechnical review of the engineering design. Additional measures (i.e., anchors, guy wires, etc.) would be implemented where the geotechnical review indicates the area is susceptible to landslides. Overall, the impact from landslides is expected to be **low**.	Under the No Action Alternative, impacts on geology and soils would be similar to existing conditions. Maintenance activities would likely increase over time in response to continued deterioration of the structures and potentially result in increased ground disturbance for structure replacement. Overall, there would be a **low to moderate** impact on geology and soils as increased soil ***compaction*** and erosion could result over time with increased maintenance.

Table 2-6. Summary of Impacts of the Proposed Action and No Action Alternative

Environmental Resource	Proposed Action	No Action Alternative
Fish	The Proposed Action includes in-water work in fish bearing streams and could include short-term **moderate** impacts on fish species including Endangered Species Act (ESA)-listed Oregon Coast (OC) coho salmon, Upper Willamette River (UWR) steelhead, and Essential Fish Habitat. Proposed culvert/bridge crossings for access roads could occur in up to six locations in aquatic habitat that may support ESA-listed fish species These locations would be finalized during ESA consultation. Structure removal and replacement would not occur in fish-bearing streams, and direct impacts on fish are not expected. Indirect impacts from structure removal and replacement are considered **low** and could include sedimentation and turbidity and noise and vibration disturbance. Access roads could increase stormwater runoff, and sediment that may eventually be delivered to fish-bearing streams following multiple storm events, but these impacts would be minimized through the implementation of BMPs (see Section 3.4.3). Staging and tensioning areas would occur on existing roadways and previously disturbed areas. Approximately 846 danger trees would be removed within 100 feet of 25 OC coho salmon-bearing streams, and 30 danger trees would be removed within 100 feet of four UWR steelhead-bearing streams. Danger tree removal could decrease cover and shading along these streams but not likely affect stream temperature. These construction-related impacts on fish including ESA-listed OC coho salmon and UWR steelhead and Essential Fish Habitat are considered **moderate**. Operation and maintenance activities that could affect fish species include vegetation management (e.g., trimming, limbing in riparian areas), structure repairs, and maintenance of access roads and culverts. These activities would have a **low impact** on fish including ESA-listed OC coho salmon and UWR steelhead and Essential Fish Habitat. Overall, these impacts on fish including ESA-listed OC coho salmon and UWR steelhead and Essential Fish Habitat is considered **moderate**.	Under the No Action Alternative, impacts on fish would be similar to existing conditions. Operation and maintenance activities could include short-term increases in noise or vibrations, and the release of sediment into fish-bearing waters that may disturb fish movement and behavior when activities occur adjacent to fish-bearing streams. Emergency repairs would likely be more frequent when compared with the Proposed Action and could occur outside of the appropriate in-water work window. Overall, impacts on fish including ESA-listed OC coho salmon and UWR steelhead and Essential Fish Habitat under the No Action Alternative are expected to be **low** to **moderate**.

Table 2-6. Summary of Impacts of the Proposed Action and No Action Alternative

Environmental Resource	Proposed Action	No Action Alternative
Wildlife	Effects associated with structure removal and replacement and removal of wildlife habitat include construction-related noise disturbance, disruption of movement, and incidental wildlife mortality on general wildlife would be **low** to **moderate**, on ESA-listed species would be **low**, and on migratory birds would be **moderate**. Use of staging and tensioning areas could cause long-term soil compaction and reduced soil productivity and native species diversity, and would have a **low** impact on wildlife including federally protected species. An estimated 2,666 danger trees would need to be removed as part of the Proposed Action. The impacts of danger tree removal on wildlife species including the northern spotted owl, bald eagle, and migratory birds would be **moderate**. Danger trees would be removed from marbled murrelet ***recruitment habitat*** and ***capable habitat***, but no trees will be removed from marbled murrelet ***critical habitat***. Impacts on marbled murrelets would be **moderate**. Removal of danger trees would have **no impact** on the Oregon silverspot butterfly, Fender's blue butterfly, or streaked horned lark because these species are not closely associated with forested habitats. The rebuilt transmission line would likely require less maintenance work; mitigation measures would be in place to minimize the spread of noxious weeds and encourage the recovery of native habitat, and the risk for collision and electrocution for birds would be **low** because of the use of avian-safe designs. Because of these factors, the operation and maintenance impacts on wildlife, including federally protected species, are considered **low**, with likely less impact than the current transmission line. Overall, impacts on wildlife under the Proposed Action are expected to be **low** to **moderate**. Impacts would be greater than the No Action Alternative in the short term but less in the long term.	Under the No Action Alternative, impacts on wildlife would mainly result from vegetation clearing and disturbance activities associated with ongoing maintenance, operation, and emergency repairs. Ongoing operation and maintenance would result in **low** to **moderate** impacts on wildlife species because the danger trees identified in Appendix A would be removed as part of the No Action Alternative (see Section 2.2). Other maintenance actions, including repairs, could also occur in areas or during times of year where impacts on nesting bird species may occur. Maintenance activities are expected to have **low** impacts on wildlife. Emergency repairs could also occur in areas or during times of year where impacts on nesting bird species may occur. For a variety of bird species, impacts would be **moderate.** Routine maintenance and operation activities that have the potential to affect ESA-listed wildlife species would be evaluated separately and on a case-by-case basis. Impacts would be avoided or minimized through consultation with the U.S. Fish and Wildlife Service (USFWS). Unanticipated damage and subsequent emergency repairs to the transmission line could impact ESA-listed species. BPA would follow the USFWS ESA emergency response process. Overall, impacts on wildlife under the No Action Alternative are expected to be **low** to **moderate**.

Table 2-6. Summary of Impacts of the Proposed Action and No Action Alternative

Environmental Resource	Proposed Action	No Action Alternative
Vegetation	Vegetation within the existing transmission line ROW has been previously disturbed by past construction and maintenance. Under the Proposed Action, temporary impacts on vegetation would include clearing/crushing from structure removal and replacement, access road work, and staging and tensioning sites. New road construction (1.13 miles) outside of the existing ROW would permanently remove vegetation. As such, impacts on vegetation from infrastructure are expected to be **low**. Approximately 2,666 danger trees have been identified for removal. The presence of root pathogens in the Tillamook State Forest adjacent to the transmission line has increased the amount of danger trees that would be removed. As such, the removal of danger trees would have a **low to moderate** impact on vegetation. Two rare plant populations (Nelson's checker-mallow) have been identified in the project area. With mitigation (i.e., travel route avoidance, temporary transplanting; see Section 3.6.3), impacts on rare plants are expected to be **low**.	Under the No Action Alternative, impacts on vegetation would continue to occur from ongoing maintenance activities, including mowing, brushing, and trimming within the ROW, and control of noxious weeds. Danger trees would be removed as indicated by maintenance surveys; however, the presence of root rot pathogens may increase the amount of danger tree removal over time. Maintenance activities are expected to occur similar to current levels and would therefore have a **low to moderate** impact on vegetation.

Table 2-6. Summary of Impacts of the Proposed Action and No Action Alternative

Environmental Resource	Proposed Action	No Action Alternative
Floodplains, Waterways, and Water Quality	Ground disturbance and vegetation removal within 100 feet of streams associated with structure installation/replacement and tensioning sites could result in temporary, localized increases in turbidity. Impacts on stream function and water quality would be temporary and l**ow**. Direct and indirect short- and long-term impacts on stream functions (hydrology and water quality) associated with the construction and operation of new access roads and work trails within 100 feet of streams, including stream crossings that could require in-water work, would be **low to moderate.** Indirect short- and long-term impacts associated with the removal of danger trees in riparian areas (including buffers) adversely affect habitat and water quality functions (structural diversity, erosion and sediment control, bank stabilization, stream shading and water temperature). Impacts would **low to moderate** depending on existing conditions and the number and location of trees to be removed. Direct and indirect short-term impacts on floodplains may result from ground disturbance and vegetation removal associated with structure installation/replacement and access road reconstruction in or within 100 feet of floodplains. Two structures would be moved out of the Wilson River floodplain. Overall, impacts would be **low**. Direct and indirect short- and long-term impacts on floodplains associated with the removal of danger trees in or within 100 feet of floodplains would be **low**. The potential for direct and indirect short-term impacts on streams, water quality, and floodplains associated with maintenance or repair of structures or access roads, and vegetation management and danger tree removal activities in or within 100 feet of streams or floodplains could result in temporary losses of stream or floodplain function. These impacts would be **low**.	Under the No Action Alternative, impacts on floodplains, waterways, and water quality would continue from ongoing maintenance activities. Maintenance and emergency repair activities would occur infrequently, but may increase as existing structures deteriorate. Impacts would range from **low to moderate** depending on the type, location, and extent of maintenance or emergency repair work necessary.

Table 2-6. Summary of Impacts of the Proposed Action and No Action Alternative

Environmental Resource	Proposed Action	No Action Alternative
Wetlands	Direct and indirect short-term impacts from ground disturbance and vegetation removal in wetlands and wetland buffers associated with structure installation/replacement and access road improvement/construction, could temporarily affect soils, vegetation, or hydrology could result in a temporary loss of wetland function (primarily water quality and habitat functions) until vegetation is restored or regenerates. Impacts would be **low**. Direct and indirect short-term impacts from temporary improvements to and use of temporary travel routes within wetlands and wetland buffers could temporarily affect soils, vegetation, or hydrology and result in a temporary loss of wetland function (primarily water quality and habitat functions) until temporary improvements are removed and areas are restored to pre-construction conditions, a **low** impact. Indirect temporary and permanent impacts on wetlands could result from vegetation removal, ground disturbance, and the placement of road fill in wetland buffers associated with construction of about 81.5 linear feet (0.04 acre) of new access road. Potential indirect temporary impacts on water quality functions in adjacent wetlands would be **low** through implementation of BMPs (see Section 3.8.3). Potential indirect long-term impacts on water quality in wetlands would be **moderate** as the new roads would be a continuous long-term source of erosion and sediments to adjacent wetlands. Direct and indirect long-term impacts on wetlands associated with the removal of danger trees within wetlands and wetland buffers would reduce structural diversity and could result in some loss of water quality and habitat functions depending upon the location and extent of tree removal in these areas. Impacts would **moderate**. Potential for direct and indirect impacts on wetlands associated with maintenance or emergency repair of structures or access roads, and vegetation management and danger tree removal activities in wetlands and wetland buffers could result in a temporary loss of wetland function. Maintenance activities would occur infrequently and would have **no to low** impacts on wetlands depending on the type, location, and extent of maintenance/repair work, and wetland conditions.	Under the No Action Alternative, impacts on wetlands would continue from ongoing maintenance activities. Potential for direct and indirect impacts on wetlands associated with maintenance or emergency repair of structures or access roads, and vegetation management and danger tree removal activities in wetlands and wetland buffers could result in a temporary loss of wetland function. Maintenance activities would occur infrequently, but may increase as existing structure deteriorate. Impacts would range from **none to low** impacts on wetlands depending on the type, location, and extent of maintenance or emergency repair work, and wetland conditions.

Table 2-6. Summary of Impacts of the Proposed Action and No Action Alternative

Environmental Resource	Proposed Action	No Action Alternative
Visual Quality	Existing structures would be replaced with proposed structures of the same material and similar heights. Short-term visual impacts would occur during construction activities as a result of work crews, additional traffic, and construction equipment. Because the transmission line spans a large area, with different viewer groups and sensitivities, impacts on visual quality would be **low to moderate**, depending on the specific location of construction at a given time.	Under the No Action Alternative, existing structures would not be replaced and would not affect the visual quality along the transmission line. Due to aging infrastructure, maintenance operations may increase and would result in increased site specific short-term visual impacts from the presence of work crews, additional traffic, and equipment. Overall, there would be a **low** impact on visual quality as a result of maintenance activities.
Air Quality and Climate Change	Temporary increases in vehicle emissions would be generated during construction activities. However, the overall impact on air quality is expected to below **low**, as no standards would be exceeded (see Section 3.10.2). An estimated 4,869 metric tons of ***greenhouse gases*** (GHG) emissions (***carbon dioxide equivalents***) would be generated by construction activities. Compared to federal reporting requirements for GHGs, the contributions of the Proposed Action would have a **low** impact on climate change.	Under the No Action Alternative, there would be no impacts on air quality or climate change from construction activities. Potential increases in vehicle emissions may occur from maintenance, as the aging structures may require more frequent maintenance over time and impacts would be **low**.
Socioeconomics and Public Services	Minor positive impacts on local economy from construction-related spending are expected. Any construction-related disruption of agricultural production would be temporary and landowners would be compensated for revenues lost from crop damage. Some short-term impacts on property value and salability could occur on an individual basis during construction; however, there would be no appreciable impacts on property values over the long term. Short-term impacts on public services could occur from increased construction traffic. No effects on ***environmental justice populations*** (low-income or minority populations) would occur. Impacts would be **low**.	Under the No Action Alternative there would be no temporary increase in employment and spending from construction, no disruption of agricultural production or crop damage, and no short-term impacts on property values. Impacts would be **low** and limited to short-term impacts on public services during maintenance and emergency repairs to the existing transmission line from traffic. No impacts on environmental justice populations would occur.
Cultural Resources	Potential impacts on known and previously undocumented archaeological resources during construction would be **low** to **moderate** depending on the extent of the disturbance and loss, and these impacts would be minimized with implementation of avoidance and mitigation measures (see Section 3.12.3).	Under the No Action Alternative, potential impacts on known and previously undocumented archaeological resources during maintenance and emergency repair activities would be **low** to **moderate**, depending on the extent of the disturbance and loss.

Table 2-6. Summary of Impacts of the Proposed Action and No Action Alternative

Environmental Resource	Proposed Action	No Action Alternative
Noise, Public Health, and Safety	Temporary noise impacts from construction equipment, truck traffic, and helicopter use would occur. Construction noise levels would noticeably exceed ambient levels temporarily in areas where noise sensitive receptors, including residences, are present. Construction noise impacts would be **moderate**. Periodic, short-term noise impacts from helicopter use during routine inspection patrols and from equipment used during maintenance activities would occur. Noise impacts from inspection and maintenance activities would be **low.** Transmission line audible ***corona*** noise levels would not change from existing conditions, and remain below regulatory thresholds both during normal and stormy or humid weather conditions. Corona noise would have a **low** impact. Public health and safety risks associated with the use of construction and heavy equipment, construction traffic, potential aircraft hazards, worker proximity to high-voltage transmission lines, and potential exposure to hazardous materials would occur. Mitigation measures would reduce potential public health and safety impacts during construction to **low** (see Section 3.13.3). Ground-level electromagnetic fields (EMF) would decrease slightly within the ROW in a few areas where pole heights would be increased. No changes are expected beyond the ROW. EMF emissions would continue to conform to applicable EMF regulations for transmission lines. Overall, EMF impacts would be **low.**	Under the No Action Alternative, periodic, short-term noise impacts from helicopter use during routine inspection patrols and from equipment used during maintenance activities would occur. The frequency of maintenance activities may increase due to aging infrastructure. Overall, noise impacts from periodic inspection and increased, but short-term, maintenance activities would be **low.** EMF exposures during maintenance and operation would remain similar to existing conditions. Impacts would be **low**.

Chapter 3
Affected Environment and Environmental Consequences

3.1 Introduction

This chapter includes an analysis of the potential impacts of the Proposed Action and the No Action Alternative on the human and natural environment. Each section of this chapter includes a description of the potentially affected environment for a specific resource, an analysis of the impacts on that resource, and the mitigation measures that would reduce those impacts. The term “project area” is used in this EA to describe the area in the immediate vicinity of the Proposed Action.

Direct, ***indirect***, and ***cumulative impacts*** are considered. Direct impacts are those that are caused by the Proposed Action and occur at the same time and place. Indirect impacts are those that are caused by the Proposed Action, but would occur later in time or farther away in distance, but are reasonably foreseeable. Cumulative impacts are impacts that result in incremental impact of the action when considered along with other past, present, and reasonably foreseeable future actions. Other such actions near the project area, including actions being conducted or proposed by BPA in addition to this Proposed Action, that are considered in the cumulative impact analysis are identified and described in Appendix B, *Cumulative Impacts*.

To evaluate the impacts associated with construction, operation, and maintenance of the Proposed Action, the impact levels were characterized as high, moderate, low, or no impact. In addition, beneficial impacts are noted where applicable.

Each resource section includes the following primary subsections:

- Affected Environment
- Environmental Consequences—Proposed Action
- Mitigation Measures—Proposed Action
- Unavoidable Impacts Remaining After Mitigation—Proposed Action
- Cumulative Impacts—Proposed Action
- Environmental Consequences—No Action Alternative

3.2 Land Use, Recreation, and Transportation

3.2.1 Affected Environment

This section describes existing general land use, recreation, and transportation patterns in the project area.

Land Ownership

The ROW crosses land owned by the BLM, the State of Oregon, local municipalities, and private landowners. Table 3.2-1 summarizes miles of transmission line and project access roads by landowner type. Approximately 20.2 miles (34.9 percent) of the transmission line crosses public land, and the remaining 37.7 miles (65.1 percent) crosses private land. About 47.9 miles (43.6 percent) and 62 miles (56.4 percent) of the access roads are located on public and private lands, respectively. Approximately 18.3 miles of the existing Forest Grove-Tillamook No. 1 transmission line are within the Tillamook State Forest, managed by ODF. Tillamook State Forest is managed primarily out of two ODF district offices: (1) the Forest Grove District Office (which is responsible for managing the eastern portion of Tillamook State Forest), and (2) the Tillamook District Office (which is responsible for managing the western portion of the Tillamook State Forest). ODF is responsible for implementing an active forest management program and providing a range of public recreational opportunities (e.g., hiking, camping, off-highway vehicle [OHV] use, hunting, fishing) in Tillamook State Forest. The existing transmission line also crosses several smaller parcels of BLM-managed lands in the vicinity of Tillamook State Forest. These lands are managed out of the Salem District Office of the BLM and subject to the 1995 Resource Management Plan, which indicates they should be managed to "maintain healthy, functioning ecosystems" (BLM 1995). The existing transmission lines and associated access roads cross approximately 0.1 mile and 0.03 mile of BLM lands, respectively.

The transmission line ROW through the Tillamook State Forest passes through 85 privately owned parcels. The largest private landowner in the area is Stimson Lumber Company (more than 75 percent of private lands in the Tillamook State Forest vicinity are owned by Stimson).

Table 3.2-1. Landowner Types in the Project Area

Landowner Type	Miles [a]	
	Transmission Line	Access Roads
Private	37.7	62.0
Public	20.2	47.9
Federal (BLM)	0.1	0.03
State	19.1	46.4
Local	1.0	1.5

[a] Approximate mileage of existing transmission line and access roads are summarized by landowner type.

Land Use

Data from the U.S. Geological Survey (USGS) National Land Cover Database (NLCD) (Fry et al. 2011) were used to derive general land use types based on land cover types. The translation from land cover (i.e., vegetation and other natural and constructed features that cover the land's surface) to land use (i.e., human activities on the land) is not a perfect crosswalk and subject to interpretation, but is commonly used to glean an overall indication of land uses (Anderson et al. 1976). Cover types are commonly associated with general land use types, but may not capture more location-specific land uses. Furthermore, some land use types are not easily derived from cover types. For example, recreational uses often span across many land cover types (e.g., forest, range, open water, etc.). Despite the challenges of using cover type to derive land use, cover types are nonetheless useful in helping to establish general indicators of land uses.

The NLCD cover types along the ROW were combined into six land use categories: (1) Developed, (2) Agricultural, (3) Forest, (4) Grassland, (5) Open Space, and (6) Wetlands and Open Water (additional detail for wetlands and water can be found in Section 3.7, *Waterways, Water Quality, and Floodplains,* and Section 3.8, *Wetlands*). Table 3.2-2 lists these primary land use types, the land cover types associated with each land use, and the acres and percent for each land use along the ROW. These land uses are shown on Figure 3.2-1. Each of the primary land use types (except wetlands and open water) is described below in more detail. Two additional land use types, recreation and transportation, are also presented below (these land uses are not included in Table 3.2-2 as they tend to cross multiple cover type-derived land uses).

Table 3.2-2. Land Use and Cover Types.

Land Use [a]	Cover Types	Acres [c]
Developed (e.g., residential, business, industrial, etc.)	Developed, Low Intensity Developed, Medium Intensity Developed, High Intensity	3,331.0 (8%)
Agricultural	Pasture/Hay Cultivated Crops	10,961.5 (26%)
Forest (e.g., timber production, ecosystem management, recreation, etc.)	Deciduous Forest Evergreen Forest Mixed Forest Shrub/Scrub	22,867.2 (54%)
Grassland (e.g., ecosystem management, recreation, etc.)	Grassland/Herbaceous	1,263.7 (3%)
Open Space (e.g., ecosystem management, recreation, etc.)	Open Space	2,549.5 (6%)
Wetlands and Open Water [b]	Wetlands Open Water	1,671.9 (4%)

Source: Fry et al. 2011.

[a] Land uses are general categorizations based on cover types contained the NLCD. Detailed definitions of each cover type can be found in Anderson et al. (1976).

[b] Wetlands and open water are generally not included in the land use analysis. Wetlands are addressed separately in Section 3.8, *Wetlands*. Acres of wetlands identified in Section 3.8 may be different than those listed in Table 3.2-2 since they are based on field verification and delineation.

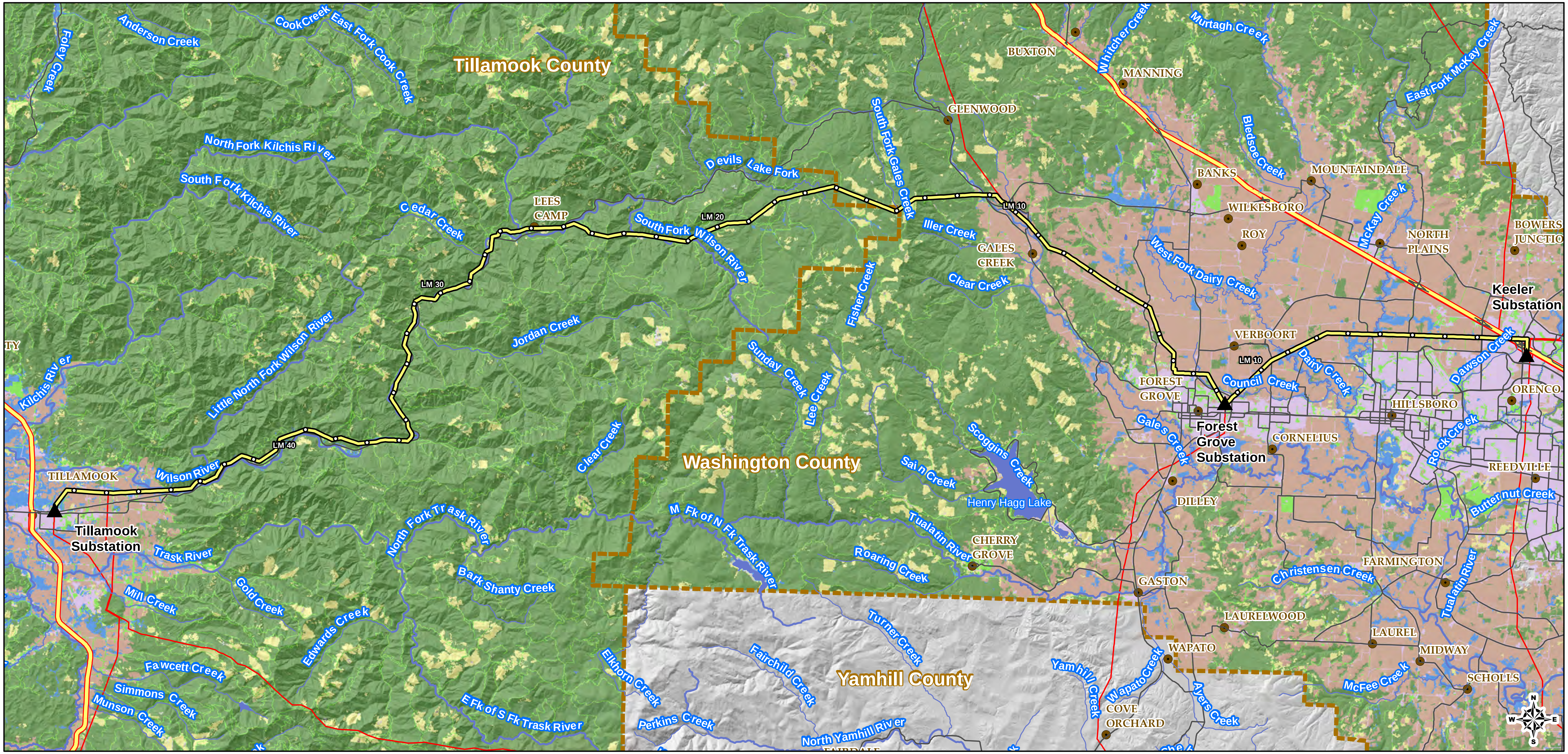
[c] Percent of total is based on 0.5-mile buffer around each side of the transmission line centerline. This area of assessment was used to provide a means of comparison for land use and cover types near the project area. Total does not add up to 100 percent due to rounding.

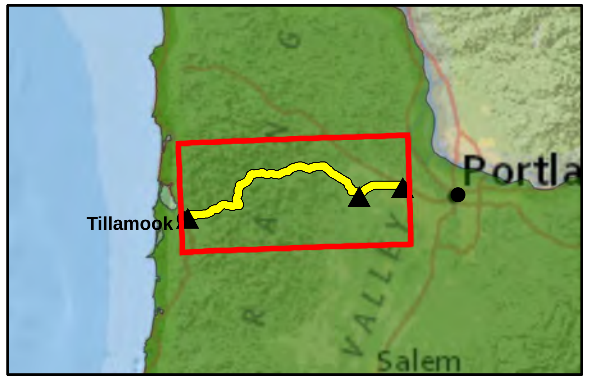
Developed (Residential / Industrial / Commercial)

The "developed" land use type includes areas where the majority of land is covered by built structures. This land use type includes cities, towns, shopping centers, industrial and commercial complexes, academic institutions, transportation (major transportation corridors are addressed separately below) and utility infrastructure, and other built features (Anderson et al. 1976). The transmission line ROW passes through developed lands that are primarily located in the communities of Hillsboro, Forest Grove, and Tillamook. In these communities, residential, industrial, commercial, and institutional development abuts the existing transmission line corridor. The largest concentrations of developed lands in and near the project corridor include the following:

- **North Hillsboro Industrial Area** – Keeler Substation to the crossing of NE Brookwood Parkway (structures 1/1 – 2/9 on the Keeler-Forest Grove No. 1 transmission line). This area primarily includes industrial complexes and uses (near structures 1/1 – 1/2 and 2/3 – 2/9), commercial business and restaurants (near structures 1/1 – 1/2 and 2/3 – 2/9), transportation (near structures 1/1 – 1/3 and 2/1 – 2/3) and utility infrastructure (including the existing transmission line), and religious institutions (near structure 1/11), as well as some residential (near structures 1/6 – 1/8), park/open space (near structures 1/3 – 1/6 and 2/2 – 2/3), and agricultural uses (near structures 2/3 – 2/9).
- **Forest Grove** – Forest Grove Substation to Forest Grove High School (primarily inclusive of structures 1/1 – 3/5 on the Forest Grove-Tillamook No. 1 transmission line). This area primarily includes industrial uses (near structures 11/4 – 11/5 on the Keeler-Forest Grove No. 1 transmission line), residential and commercial businesses/restaurants (near the Forest Grove Substation and structures 11/7 [Keeler-Forest Grove No. 1], 1-1 [Forest Grove-Tillamook No. 1], and 2/7 – 3/5 [Forest Grove-Tillamook No. 1]), academic (near structures 3/3 – 3/5 [Forest Grove-Tillamook No. 1]), transportation [near structures 11/5 [Keeler-Forest Grove No. 1] and 1/5 – 1/6 [Forest Grove-Tillamook No. 1]) and utility (including the existing transmission line), and agricultural uses (near structures 1/1 – 3/5 [Forest Grove-Tillamook No. 1]).
- **Tillamook** – Tillamook Substation vicinity (Forest Grove-Tillamook No. 1 transmission line structures 47/5 – 47/6). This area primarily includes residential, industrial, and transportation and utility uses adjacent to the Tillamook Substation.

In addition, the project crosses through ***unincorporated*** portions of both Washington and Tillamook counties near developed areas associated primarily with low-density rural residences, farms, and other agricultural land uses. In particular, the transmission line passes through The Narrows community along SR 6 adjacent to structures 36/1 – 37/1 (Forest Grove-Tillamook No. 1).





Legend

- ▲ BPA Substation
- ° Line Mile (LM)
- Keeler - Tillamook No. 1 Transmission Lines
- BPA Transmission Line
- ● Cities or Towns
- River
- County Boundary

Land Use/Cover Type

- Wetlands and Open Water
- Open Space
- Developed (Residential/Commercial)
- Forest
- Grassland
- Agriculture

Keeler to Tillamook 115-kV Transmission Line Rebuild Project

Figure 3.2-1

Land Use and Land Cover

1 inch = 3 miles

0 1.5 3 6 Miles

BONNEVILLE POWER ADMINISTRATION

Sources:
BPA Regional Geodatabase 2013; Fry et. al. 2011
USGS National Hydrography Data 2010
Print Date: October 22, 2013

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Agricultural

The ROW crosses agricultural lands in both Washington and Tillamook counties. Agricultural lands generally include lands that are used for food and/or fiber production and generally include the following cover types (Anderson et al. 1976):

- Cropland (row crops) and pasture.
- Orchards, groves, vineyards, nurseries, and ornamental horticulture areas.
- Confined feeding operations.
- Other agricultural lands.

Per U.S. Department of Agriculture (USDA) census information, most of the agricultural uses along the ROW fall within the first two agricultural cover types listed above (cropland and pasture; and orchards, groves, vineyards, nurseries, and ornamental horticulture areas). There are about 127,984 acres of agricultural lands in Washington County, representing approximately 27.6 percent of the land base in the county (USDA 2007a; U.S. Census Bureau 2013a). Most of the agricultural lands in Washington County are classified as croplands (72.37 percent), with field and seed crops, forage (e.g., hay), wheat, hazelnuts, and nursery stock as the top crop items (USDA 2007a). In Washington County, agricultural lands are located primarily between LM 3 and LM 10 (Keeler-Forest Grove No. 1) and LM 3 to 10 (Forest Grove-Tillamook No. 1).

In 2007, there were about 37,780 acres of agricultural land in Tillamook County, representing a little more than 5 percent of the land base in the county (USDA 2007b; U.S. Census Bureau 2013b). Most agricultural lands in Tillamook County are either cropland (46.9 percent) or pasture (36.2 percent). The primary crops include forage, Christmas trees, vegetables, and flowers (USDA 2007b). Agricultural lands are located primarily between LM 44 and 47 of the project (Forest Grove-Tillamook section).

The Farmland Protection Policy Act (FPPA) requires federal agencies to minimize the extent to which their programs contribute to the unnecessary and irreversible conversion of prime farmland, unique farmland, and land of statewide or local importance to non-agricultural uses. Farmland subject to the FPPA requirements does not have to be currently used for cropland. It can be forestland, pastureland, cropland, or other land, but not water or urban built-up land. In Washington County, there are 86,632 acres of prime farmland. Approximately 8.86 miles of transmission lines and 5.82 miles of access roads are located on prime farmland in Washington County. There is no designated prime farmland in Tillamook County.

Forest

The portion of the ROW that crosses the Coast Range is characterized primarily as forestlands. As noted in Table 3.2-2, there are about 22,867 acres of forestland within a 0.5-mile buffer on either side of the transmission line centerline. This area includes the following cover types (and acreage):

- Evergreen forest (9,523.0 acres).
- Mixed forest (7,977.2 acres).
- Scrub/shrub (3,226.5 acres).
- Deciduous forest (2,140.6 acres).

A majority of the forested lands are part of the Tillamook State Forest, managed by ODF. The remaining acreage (about 3,953.2 acres) of forested lands is in private ownership. The private forestlands are used for timber production and harvest, as well as residential sites.

The Coast Range mountains, including areas currently in Tillamook State Forest, were ravaged by large forest fires from 1933 through 1951. The fires resulted in the loss of 355,000 acres of forest and led to a forest restoration project that included the planting of 72 million seedlings (ODF 2013a). The "Tillamook Burn" area was designated as Tillamook State Forest in 1973. Management of this 364,000-acre (about 19,000 acres are within the area of assessment) State Forest by ODF is guided by the 2001 (revised in 2010) Northwest Oregon State Forests Management Plan (ODF 2010a). This plan presents management strategies for all ODF lands in northwestern Oregon, including the Tillamook State Forest. It calls for a structure-based management approach that "is designed to produce and maintain an array of forest stand structures across the landscape," and in particular focuses on sustainable timber production, ecosystem functions (diverse habitats, properly functioning aquatic systems, etc.), and diverse recreation opportunities (ODF 2010a). Recreation in the Tillamook State Forest is described in additional detail in the *Recreation* section below.

Grasslands

There are approximately1,263 acres of grasslands in the area of assessment (Table 3.2-2). These lands are scattered throughout the length of the ROW and are not concentrated within a specific area. Grasslands are dominated by herbaceous cover, in particular grasses and ***forbs***. Areas designated as grasslands are typically used for grazing, ecosystem functions, and recreation, among other uses. Grasslands appear on lands that are owned by the BLM, State of Oregon (ODF), local jurisdictions, or private entities, and the management of public grasslands falls under the respective comprehensive plans for those agencies/entities (see Chapter 4, *Consultation, Review, and Permit Requirements*).

Open Space

Open space areas have few constructed facilities and are commonly dominated by maintained vegetation (e.g., lawns, plantings, etc.). These areas may include parks, golf courses, undeveloped land, and other areas that are maintained for erosion control and other ecosystem functions, as well as aesthetics. Approximately 2,549 acres of lands are classified as open space in the area of assessment. These areas, including designated recreation sites (addressed in additional detail in the *Recreation* section below), are on lands owned by the BLM, State of Oregon (ODF), local jurisdictions, or private entities, and the management of public open space falls under the respective comprehensive plans for those agencies/entities (see Chapter 4, *Consultation, Review, and Permit Requirements*).

Recreation

Unlike the previous land use types that are associated with NLCD cover types, recreation may occur as a separate land use (e.g., designated parks, trails, etc.) or in conjunction with other land uses and cover types, as noted above. The ROW crosses through and near several designated public recreation areas.

In the cities of Hillsboro and Forest Grove, the project area is within or passes adjacent to four park and recreation areas. Rock Creek Powerline Park (managed by the Tualatin Hills Park & Recreation District) is an approximately 24-acre park characterized by open space and unstructured recreation activities, though nearby soccer fields provide organized sports and other recreation opportunities. The Rock Creek Powerline

Park complex is comprised of a series of parks and use areas that are generally aligned along an east-west oriented transmission line corridor in northern Hillsboro. The Keeler-Forest Grove No. 1 transmission line crosses through the western portion of Rock Creek Powerline Park. The Gordon Faber Recreation Complex (managed by Hillsboro Parks & Recreation) is a 90-acre park primarily used for organized sports and events. The Keeler-Forest Grove No. 1 transmission line crosses a portion of the parking lot of the Gordon Farber Recreation Complex. Hondo Dog Park (managed by Hillsboro Parks & Recreation) is a 3.75-acre off-leash dog park adjacent to the Gordon Faber Recreation Complex, but not crossed by the transmission line. Forest Grove High School Sports Fields (managed by Forest Grove School District) is a recreation area primarily used for organized sports and events. The Forest Grove-Tillamook No. 1 transmission line parallels the eastern boundary of these athletic fields, but does not cross the site.

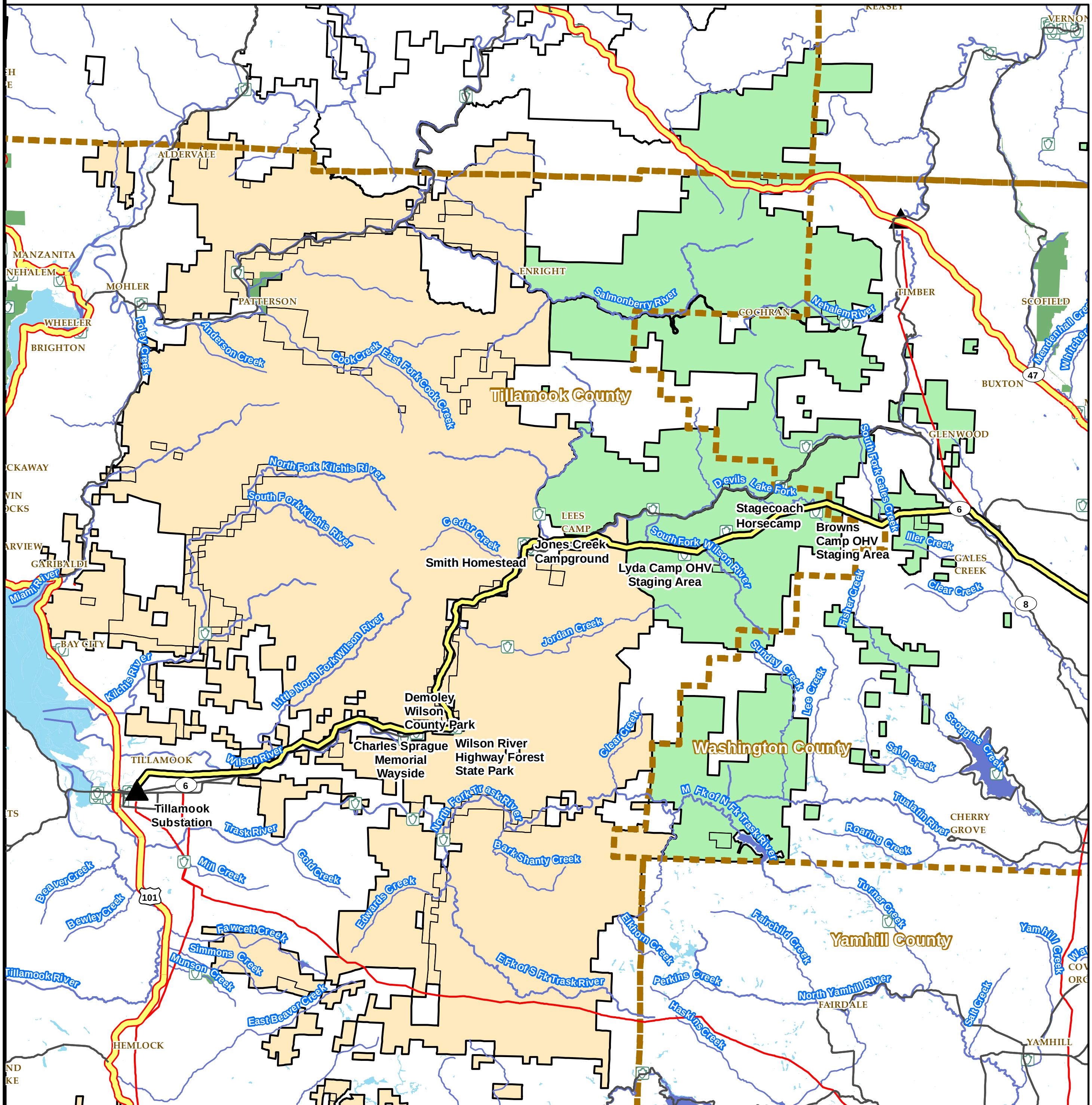
Northwest of Forest Grove near the junction of SR 6 and SR 8, the project crosses Dorman Pond. This pond is located between structures 11/7 and 11/9 on the Forest Grove-Tillamook No. 1 transmission line. Structure 11/8 is located along the northern shoreline of the pond in the small, unpaved parking area. This 8-acre pond is stocked by the Oregon Department of Fish and Wildlife (ODFW) and provides public fishing opportunities for trout, crappie, bass, and catfish (ODFW undated).

Tillamook State Forest

After crossing Dorman Pond, the Forest Grove-Tillamook No. 1 transmission line continues to the west where it crosses into the Tillamook State Forest. The 364,000-acre State Forest is jointly managed by the ODF Forest Grove and Tillamook District Offices. Each District Office, as well as the Tillamook Forest Center, prepares annual estimates of recreation use within the State Forest. In particular, the Forest Grove and Tillamook District Offices estimated annual overnight use at more than 17,000 visitors in 2010 (the latest year for which estimates are available) across both District Offices (ODF 2010b, 2010c). The Northwest Oregon State Forest Management Plan indicates that about 75 percent of recreation use in the Tillamook State Forest is overnight use (ODF 2010a). Given overnight use estimates, day use likely accounts for about 4,250 visitors on an annual basis (25 percent of 17,000). In total, overnight and day use within the Tillamook State Forest is estimated to be over 21,000 visitors annually. Additionally, in 2012 more than 46,000 people visited the Tillamook Forest Center (ODF 2012). Some of the visitors to the Tillamook Forest Center may also be overnight or day users.

The Tillamook State Forest provides a range of recreation opportunities, including hiking, equestrian use, OHV use, driving for pleasure, boating, camping (designated campgrounds and dispersed camping), hunting, fishing, target shooting, and picnicking, among other activities. Additionally, the Tillamook Forest Center, an interpretive and educational center that opened in April 2006, is also located in the Tillamook State Forest along SR 6. This center provides educational opportunities for visitors to learn more about the natural, cultural, and historic resources of the Tillamook State Forest. The transmission line is located on the eastern side of SR 6, across the highway from the Tillamook Forest Center, and to the south of the center. Approximately 19,000 acres of the State Forest are within the area of assessment, and about 18 miles of the existing transmission line crosses the State Forest, including several designated recreation sites and use areas. Figure 3.2-2 provides an overview of these designated sites and use areas.

Public use and recreation management is guided by both the Northwest Oregon State Forests Management Plan (ODF 2010a) and the Tillamook Comprehensive Recreation Management Plan (updated and renamed the Tillamook State Forest Recreation Action Plan by ODF in 2000).



Keeler to Tillamook 115-kV Transmission Line Rebuild Project

Figure 3.2-2

Tillamook State Forest Vicinity

This product was made for informational and display purposes only and was created with best available data at time of production. It does not represent any legal information or boundaries. Sources: BPA Regional Geodatabase 2013; USGS GNIS 2009

Legend

- BPA Substation
- Keeler - Tillamook No. 1 Transmission Lines
- BPA Transmission Lines

Recreation Sites

- Public Park or Campground
- Oregon State Park

Tillamook State Forest

- Forest Grove District
- Tillamook District

1 inch = 5 miles

0 2.5 5 10 Miles

BONNEVILLE POWER ADMINISTRATION

The Northwest Oregon State Forests Management Plan calls for the continued implementation of the Tillamook State Forest Recreation Action Plan. The Action Plan includes eight primary topic areas that generally call for improved recreation facilities (e.g., campgrounds, trails, educational/informational signs, etc.), the provision of high quality recreation experiences, and the protection of resources. There are no specific objectives or actions associated with the existing transmission line (see Chapter 4, *Consultation, Review, and Permit Requirements)*. The eight primary topic areas include:

- Recreation management, monitoring, and policy development.
- Public safety and law enforcement.
- Public information, education, and communications.
- Volunteers and partnerships.
- OHV trail facilities planning, development, and maintenance.
- Non-motorized trail facilities planning, development, and maintenance.
- Camping facilities planning, development, and operations.
- Recreation opportunities on rivers and lakes.

The transmission line crosses or passes near the following designated recreation sites in or in the vicinity of the Tillamook State Forest:

- Browns Camp OHV Staging Area.
- Stagecoach Horse Camp.
- Lyda Camp OHV Staging Area.
- Smith Homestead.
- Jones Creek Campground.
- Charles Sprague Memorial Wayside.
- Wilson River Highway Forest State Park.
- Demoley Wilson County Park.

Transportation

US 26 and SR 6, SR 47, and SR 8 are the primary vehicular transportation roadways in the project area (see Figure 3.2-1), though multiple local roads also provide access along and to the Rebuild Project. Several of these roads are also used by pedestrians and bicyclists. The Keeler-Forest Grove No. 1 transmission line crosses the Southern Pacific Railroad between LM 8 and LM 9. The Portland-Hillsboro Airport is located to the south of the transmission line, generally between structures 3/5 and 4/8 on the Keeler-Forest Grove No. 1 transmission line.

The project crosses US 26 twice near the Keeler Substation. Traffic volumes along this portion of US 26 are high, with average daily traffic (ADT) estimated at between 30,001 and 50,000 vehicles (ODOT 2010). Near these crossings (in particular heading east toward metropolitan Portland), traffic volumes can increase substantially to more than 75,000 vehicles per day.

The project crosses SR 47 three times near the City of Forest Grove. Traffic volumes near these three crossings range from 15,001 to 20,000 ADT. West of Forest Grove, the project crosses SR 6 twice near its junction with SR 8. The project crosses and parallels SR 6 throughout the western portion of Tillamook State Forest and continues to parallel the highway until its western terminus at the Tillamook Substation. Traffic volumes on SR 6 range from 2,501 to 5,000 vehicles per day (ODOT 2010).

The project passes near SR 8 in two locations: (1) near the junction of State Routes 6 and 8, and (2) in Forest Grove near the intersection with SR 47. At the first location, traffic volumes are similar to SR 6 (approximately 2,501 to 5,000 vehicles per day). At the second location, traffic volumes are similar to SR 47 (approximately 15,001 to 20,000 vehicles per day). Traffic volumes on SR 8 increase substantially from Forest Grove toward Beaverton, with volumes ranging from 30,001 to 50,000 vehicles per day between Cornelius and Beaverton (ODOT 2010).

In addition to motorized transportation, the area has several pedestrian and bicycle routes. These designated routes are within Washington County and identified in the 2010 Washington County Pedestrian & Bike Plan (Washington County 2010). Tillamook County does not have a comprehensive pedestrian or bicycle plan. The Washington County pedestrian system, which includes sidewalks and off-street trails, is primarily sited within developed, urban areas (e.g., Hillsboro, Forest Grove, etc.). Portions of the pedestrian system cross the transmission line at various locations, and an off-street trail is sited along and adjacent to the transmission line ROW generally between structures 2/6 and 5/2 on the Forest Grove-Tillamook No. 1 transmission line. The Washington County bicycle system is similarly oriented to the more developed, urban areas of the county (bicycle routes in these areas are referred to as urban bikeways), but does include several rural roads that are also used as rural bikeways. Some of these designated bikeways in Washington County are crossed by the transmission line.

3.2.2 Environmental Consequences–Proposed Action

Land Ownership

Approximately 46.47 miles of new access road easements would be acquired on private lands. BPA would work with affected landowners during easement acquisition to provide appropriate compensation (see Section 3.2.3, *Mitigation – Proposed Action)*. Underlying land ownership would not change, and considering the proposed mitigation, acquisition of new easements is expected to have a **low** impact.

BPA would acquire new pole line easements on LM 35 of the Forest Grove-Tillamook No. 1 transmission line to allow for three structures to be moved out of the Wilson River floodplain. Approximately 40 feet of new pole line easements would be needed on land owned by ODF. BPA would exchange the abandoned pole line easement for existing structures for the proposed alignment, resulting in **no** impact on land ownership in this area.

Approximately 2,666 danger trees would be removed as part of the proposed project. Danger tree removal on forestlands (both public and private forestland) would occur within and adjacent to the transmission line ROW. Danger trees within the ROW would be a permanent removal in accordance with BPA's vegetation management requirements. Danger trees outside of the ROW would be allowed to regrow but would not be allowed to become danger trees in the future. BPA would work with specific landowners prior to tree removal to obtain access and provide compensation as appropriate. Land ownership would not change. Therefore, the removal of danger trees on public or private land is expected to have a **low** impact.

Land Use

The impacts from the construction, operation, and maintenance of the proposed project are described for each land use crossed by the ROW. Table 3.2-3 provides an overview of both short- and long-term impacts (listed as acres of impact for each land use type) that are anticipated from the proposed project.

Developed

Short-Term/Temporary Impacts: During the active construction timeframe (April through December 2014), construction activities would be evident in more densely developed and rural residential communities between Forest Grove and Hillsboro, and east of Tillamook. People living, working, and traveling near the project would be temporarily exposed to and experience construction-related impacts from noise, dust, and traffic delays. Impacts would vary depending on the density and type of development in those areas and their proximity to the transmission lines and roads. While the total construction timeframe is approximately 9 months, temporary construction impacts at any one structure location would only occur for a few days. Potential impacts on local businesses or residences would be short term in duration. Specific impacts such as noise or air quality considerations are described in Sections 3.13 and 3.10, respectively. In total, approximately 21.5 acres of developed lands would be temporarily impacted by the Proposed Action. These impacts would be temporary and intermittent, resulting in a **low** impact.

Table 3.2-3. Short- and Long-term Land Use Impacts

Land Use Type	Permanent Impacts (acres)			Temporary Impacts (acres)		
	Access Roads [a]	Structures [b]	Permanent Total	Access Roads [c]	Structures [d]	Temporary Total
Developed	0.03	0.01	0.04	17.7	4.1	21.5
Agricultural	0.3	0.04	0.34	50.8	17.7	68.5
Forest	0.8	0.03	0.83	97.5	30.2	127.7
Grassland	0.0	0.01	0.01	11.2	3.2	14.4
Open Space	1.7	0.01	1.71	66.0	10.9	76.9
Wetlands [e]	0.03	0	0.03	5.0	2.2	7.2

[a] Based on20-foot width of permanent impact for new roads.

[b] Calculated a 50 × 100 feet for one- and two-pole structures and 100 × 100 feet for three-pole structures that are new or moved from the previous location.

[c] Estimated a 20-foot width of temporary impact for reconstructed/improved roads and temporary travel routes.

[d] Assumed 50 × 100 feet for one- and two-pole structures and 100 × 100 feet for three-pole structures that are replaced at the same location.

[e] Impacts on wetlands are calculated using a 50 x 50 foot area, and are described separately in Section 3.8*, Wetlands.*

Long-Term/Permanent Impacts: The Proposed Action would result in very minimal long-term changes to existing developed land uses since the Rebuild Project would replace an existing transmission line. About 0.04 acre of developed lands would be permanently impacted by the proposed structures and new access roads.

The project crosses several vacant, developable parcels in Hillsboro and Forest Grove. Specifically, the line crosses several large industrial properties in Hillsboro and a vacant property north and west of the Forest

Grove Substation in Forest Grove. While the presence of the transmission lines does not preclude these parcels from being developed, it may restrict the types of uses or siting of uses on these parcels. The alignment of the transmission line in Hillsboro bisects two private developable industrial properties that the city has identified as its next major expansion option within the existing Urban Grown Boundary. The sites include the 534-acre Evergreen Site, and the 146-acre Shute Site, both located south of US 26 and west of Brookwood Parkway. BPA's existing ROW creates strips of non-buildable land by bisecting these properties. Additionally, the City of Forest Grove has indicated an interest in developing a mixed-use/transit-oriented development on the parcel that is currently crossed by the transmission line near the Forest Grove Substation. Realignment of the existing ROW falls outside the scope of this project (see Section 2.3, *Alternatives Considered but Eliminated from Detailed Study*); however, the cities of Hillsboro and Forest Grove can submit a formal request to BPA under a separate project. Because the ROW is already existing and the cities have the option of pursuing ROW realignment options at their expense, permanent impacts on land use from the proposed project would be **low to moderate** in these two locations.

In total, including the sites in Hillsboro and Forest Grove, the transmission lines would only permanently impact a small portion of the total developed land base in the area of assessment (0.04 acre of permanent impact compared to a total of 3,331 developed acres in the land use assessment area), from new structures and access roads where non currently exist. This impact is considered **low**.

Agricultural

Short-Term/Temporary Impacts: The Proposed Action has the potential to result in direct temporary impacts on agricultural land from the disturbance of soils and livestock and inconvenience to ranchers and farmers. In total, approximately 68.5 acres of agricultural lands would be impacted by the project. Of this total, approximately 17.7 acres of agricultural land would be impacted by structure removal and replacement and approximately 50.8 acres of agricultural land would be affected by access road improvements, reconstruction, and temporary travel routes, during the planned construction timeframe. Table 3.2-3 (*Short- and Long-Term Land Use Impacts)* shows details about the impacts on agricultural land. A portion of construction activities may occur during the growing season and could temporarily displace crops and other farming activities within the transmission line ROW. Given the temporary nature of construction-related impacts and planned mitigation measures (Section 3.2.3, *Mitigation—Proposed Action*), and small area of disturbance, construction activities are expected to result in short-term, **low** impacts on agricultural land.

During construction, temporary travel routes would be established on the ROW to travel from pole to pole where existing dedicated access is not available. Temporary travel routes across agricultural fields would be used with the least impact necessary to allow for travel during construction. Landowners would be compensated for any resulting crop loss, and temporary travel routes would be restored to their existing conditions after construction. As such, temporary travel routes and associated access are anticipated to result in short-term, **low** impacts on agricultural lands.

Long-Term/Permanent Impacts: Where the project corridor crosses agricultural land, crops are planted under the transmission line within the ROW, except for a small clearing in the immediate vicinity of each tower that BPA maintains for operation and maintenance purposes. Towers that are relocated from their current location would result in additional permanent conversion from agricultural use. However, existing structure locations could potentially be converted back to agricultural use after the structure is removed, resulting in minor overall changes to agricultural lands. In total, 0.34 acre of agricultural lands would permanently be impacted from the proposed project by structure replacement and access roads, a small fraction of the total area of agricultural lands in Washington and Tillamook counties (127,984 and 37,780 acres, respectively). As such, long-term impacts on agricultural land from the proposed project are expected to be **low**.

Forest

Short-Term/Temporary Impacts: During construction, a total of approximately 127.7 acres of forestlands would temporarily be impacted by the Rebuild Project from structure removal and replacement, access road reconstruction and improvements, and temporary travel routes. Of this total, approximately 30.2 acres would be temporarily impacted by vegetation clearing for structure removal and replacement. Vegetation impacted by construction activities would be allowed to regrow post-construction. Any danger trees removed outside of the ROW would be allowed to regrow, but could be removed in the future if they become danger trees again. The temporary construction-related impacts associated with the Proposed Action are expected to be **low**.

The Proposed Action would require 33 miles of access road improvements and reconstruction on forestlands. Since these are existing access roads, construction activities (e.g., grading or adding material to the existing road bed) would temporarily impact approximately 97.5 acres of forestland. The area impacted would be small compared with the overall forestland area and would occur on existing roads, thus, temporary impacts associated with access road improvements on forestlands would be **low**.

Long-Term/Permanent Impacts: With the exception of the pole changes in LM 35 of the Forest Grove-Tillamook No. 1 transmission line, the Proposed Action would be within the existing transmission line ROW, and most towers would be replaced in the same location. Permanent impacts on land use on forestlands are anticipated to affect about 0.83 acre. The rerouted transmission line ROW in Tillamook State Forest (structures 35/5 and 35/7 of the Forest Grove-Tillamook No. 1 transmission line) would be moved about 40 feet east of the existing centerline to avoid the floodplain. As noted previously, this modification would exchange the pole line easement for existing structures and would not impact land use. Additionally, the Proposed Action would also require 0.3 mile of new access roads on forestlands, which would require the removal of approximately 0.8 acre of vegetation within the road alignment. Given the small area of disturbance associated with road construction compared with the overall forestland area, permanent impacts associated with new and improved access road construction on forestlands would be **low**.

The Proposed Action also includes the removal of approximately 2,666 danger trees. Appendix A includes a list of potential danger trees, primarily Douglas-fir (*Pseudotsuga menziesii*) and red alder (*Alnus rubra*), to be removed. Danger trees scheduled to be removed include trees affected by the presence of a root pathogen in the forest stands of the Tillamook State Forest. The removal of danger trees would not cause a substantial loss of forest cover or a substantial change in land uses in the area, as much of the forest is already managed for timber; however, several large groups of trees would be removed under the Proposed Action. Their removal would occur during the construction phase of the Proposed Action and would result in long-term, permanent impacts since these trees would not be replaced or allowed to regrow within the ROW. The removal of large groups of danger trees on forestlands would also remove these trees from timber production or as wildlife habitat, and is considered a **moderate** impact.

Grasslands

Short-Term/Temporary Impacts: During construction, approximately 14.4 acres of grasslands would be temporarily impacted by the Proposed Action for structure removal and replacement, access road improvements and reconstruction, and temporary travel routes. These impacts would include vegetation clearing, grading, or adding material to the existing road bed. Impacts on grasslands would be temporary, intermittent, and confined to a small area, and thus, a **low** impact.

Long-Term/Permanent Impacts: Construction of new structures would result in 0.01 acre of permanent impacts on grasslands. No new roads would be constructed on grasslands as part of the Proposed Action. The long-term impacts are confined to a small area and would not preclude other uses in the area or substantially reduce the overall amount of grasslands. Impacts are expected to be **low**.

Open Space

Short-Term/Temporary Impacts: During construction, approximately 76.9 acres of open space would be temporarily impacted by the Proposed Action for structure removal and replacement, access road improvements and reconstruction, and temporary travel routes. Open space along the ROW generally includes undeveloped land, designated recreation sites, and other areas that are maintained for erosion control and other ecosystem functions. These lands are owned by the BLM, ODF, local jurisdictions, or private entities. Impacts on open space would include vegetation clearing as well as temporary disruptions to recreation (described below). Other construction activities would include grading or adding material to the existing road bed. In general, these impacts would temporarily and intermittently affect open space land uses. Additionally, these impacts would generally be focused in a small area of the total open space area along the ROW. As such, impacts from the Proposed Action on open space land uses are anticipated to be **low**.

Long-Term/Permanent Impacts: As stated above, open space generally includes undeveloped land, designated recreation sites, and other areas that are maintained for erosion control and other ecosystem functions. Construction of new structures and access roads would result in a total of 1.71 acres of permanent impacts on open space. Since these long-term impacts are confined to small footprints within the existing transmission line corridor, and generally do not preclude other uses in the vicinity or substantially reduce the amount of open space in the area, the impacts are expected to be **low**.

Recreation

Short-Term/Temporary Impacts: Recreation in areas directly crossed by the Proposed Action would be restricted from use during construction. Rock Creek Powerline Park and the informal parking/access area along the northern shoreline of Dorman Pond would likely experience short closures or limited access during construction. A portion of the Gordon Faber Recreation Complex parking lot would also be closed while the existing structures in this location are replaced. Recreation areas adjacent to the transmission line ROW would not be subject to temporary closures, but would experience other types of disturbances from construction activities, including additional traffic and delays, noise, dust, and visual distractions. Since access to recreation areas would be disrupted during construction activities, but would be limited to certain recreation areas and would not occur concurrently, short-term impacts on recreation are expected to be **low to moderate**.

Long-Term/Permanent Impacts: Given the alignment and area of the transmission line ROW, as well as the fact that the Proposed Action is replacing an existing transmission line, the long-term impacts from the Proposed Action on recreation are anticipated to be low. As noted in Table 3.2-3, only about 0.8 acres of forestlands would permanently be impacted by the Proposed Action. While the permanent removal of danger trees may detract from the recreation experience of some visitors, the improvement of access roads open to public use may benefit other visitors. Additionally, no recreation areas would be permanently impacted by the Proposed Action where transmission lines do not already exist. As such, permanent impacts from the Proposed Action on recreation are **low**.

Tillamook State Forest

Tillamook State Forest is the largest public recreation area crossed by the ROW. Construction activities would temporarily detract from the recreation visitor experience, but would be of short duration and likely impact a small number of recreationists at any given time during the active construction timeframe (April through December 2014). Visitors to Tillamook State Forest participating in recreation activities along and in the vicinity of the Forest Grove-Tillamook No. 1 transmission line, including at the designated sites listed in Section 3.2.1, *Affected Environment (Recreation)*, would experience construction-related temporary closures, the presence of work crews and heavy equipment, noise, dust, and other visual distractions. These disturbances would particularly impact OHV use, since several OHV routes cross or are sited on the transmission line ROW and are shared in some instances with BPA access roads. Hikers, equestrians, overnight visitors, hunters, and others in the vicinity of the transmission line ROW would experience similar disturbances. Both the Tillamook Forest Center and the Jones Creek Campground are near the re-routed section of transmission line in the Wilson River floodplain. Users at both of these sites may be subject to additional disturbances from construction-related activities, including the potential loss of power at the Tillamook Forest Center for a portion of the construction timeframe that would require the use of a generator. Additionally, since the ROW parallels SR 6 through the western portion of Tillamook State Forest, recreationists (including those driving to a destination in the State Forest and those driving for pleasure) would experience some lane closures and traffic delays. These impacts would be temporary and **moderate**.

Over the long-term, while the permanent removal of some large groups of danger trees may detract from the recreation experience of some visitors in the Tillamook State Forest, the improvement of access roads open to public use may benefit other visitors. Permanent impacts from the Proposed Action on recreation in Tillamook State Forest would be **low**.

Transportation

Short-Term/Temporary Impacts: A cumulative total of approximately 19 miles of access roads would be reconstructed or improved resulting in approximately 41.6 total acres of temporary impacts during construction. The Proposed Action would also result in short-term, site-specific transportation impacts from construction-generated traffic. During construction, there would be minor increases in traffic on roadways needed to access the ROW, as well as potential lane or road closures near transmission line segments adjacent to or at road crossings. The increase in daily traffic volume would be low, in particular compared to the existing traffic volumes on area roadways. Up to 36 construction employees are expected to be working along the entire ROW at one time, with up to 12 employees at any single work site (see Section 2.2.5, *Construction Activities*). Any traffic delays associated with lane/road closures would be temporary and are not expected to substantially degrade traffic flow in the area. Traffic increases and lane/road closures would shift based on the construction schedule such that no one location would experience traffic increases or closures for more than a few days at a time. Construction-related traffic impacts may result in short-term traffic slowing or delays, a **moderate** impact. Impacts may be further minimized through the implementation of various mitigation measures identified in Section 3.2.3, *Mitigation—Proposed Action*.

In areas where the pedestrian or bicycle network is bisected by or co-located with the transmission line ROW, temporary disruptions to pedestrian/bicycle travel would be expected. These disruptions would be similar to vehicular disturbances and may include temporary closures, detours, and delays. These types of pedestrian/bicycle effects would shift based on the construction schedule such that no one location would experience impacts for more than a few days at a time. Similar to vehicular impacts, these pedestrian/bicycle impacts are expected to be **moderate**.

Long-Term/Permanent Impacts: BPA would acquire an additional cumulative total of 46.47 miles of easements for access roads (Table 2-2). New easements would be acquired for access on existing roads, some of which may require minor improvements during construction. Access roads within the ROW are generally for BPA use, and public access is discouraged (through the placement of gates and appropriate signage), though some access roads can have shared rights with the underlying landowner. Roads outside of the ROW are generally open to a variety of public uses. Routine operation and maintenance of the transmission line and access roads would be similar to that currently performed. As such, permanent impacts on transportation associated with operation and maintenance activities would be **low**.

Environmental Consequences—Steel Pole Replacement

The steel pole design replacement (as described in Section 2.1.8) would result in land use impacts similar to those described above for the Proposed Action. Impacts on land use, recreation, and transportation would be slightly lower in areas where a narrower access road turning radius could be constructed because steel poles would be delivered in sections while wood poles must be delivered in one piece. Steel poles would require less frequent routine maintenance over the long term because they are more durable and last longer than wood poles, and therefore potential impacts from maintenance activities to transportation and recreation would be reduced.

3.2.3 Mitigation—Proposed Action

The following mitigation measures would be implemented to reduce or eliminate impacts on land use, recreation, and transportation from the Proposed Action:

- Plan and conduct construction activities to minimize temporary disturbance, displacement of crops, and interference with agricultural activities.
- Install barriers, gates, and postings at appropriate access points and, at the landowner’s request, to minimize or eliminate public access to project facilities.
- Contact and provide a schedule of construction activities to all potentially affected landowners.
- Compensate landowners for damage to property or crops, as appropriate (see Section 3.11.3, *Mitigation—Proposed Action [Socioeconomics and Public Services]*).
- Compensate landowners at fair market value for any new land rights acquired for ROW or access road easements (see Section 3.11.3, *Mitigation—Proposed Action [Socioeconomics and Public Services]*).

- Limit ground-disturbing activities to designated work areas, including structure sites, access roads, pulling/tensioning sites, and staging areas. As needed, stake or flag water resources, wetlands, or other sensitive areas prior to construction to avoid impacts.
- Use BMPs to limit erosion and the spread of noxious weeds (see Section 3.6.3, *Mitigation—Proposed Action [Vegetation]*).
- Decommission temporary roads according to the requirements and BMPs of the appropriate land management agency or landowner (see Section 3.6.3, *Mitigation—Proposed Action [Vegetation]*).
- Restore compacted cropland soils as close as possible to pre-construction conditions using tillage (see Section 3.3.3, *Mitigation—Proposed Action [Geology and Soils]*).
- Remove and stockpile topsoil separately in croplands. Where select backfill is used around tower poles, cover in native topsoil to the extent possible (see Section 3.3.3, *Mitigation—Proposed Action [Geology and Soils]*).
- Revegetate disturbed areas after construction, with the exception of those areas required to remain clear of vegetation to ensure the safety of the transmission line and access to structures.
- Coordinate the routing and scheduling of construction traffic with the Oregon Department of Transportation (ODOT) and county/municipal road staff.
- Coordinate construction activities and timing with ODF staff to ensure that recreation users are minimally affected during peak seasons.
- Employ traffic-control flaggers and post signs warning of construction activity and merging traffic for short interruptions of traffic as necessary during construction.
- Conduct noise-generating construction activities only during normal daytime hours (i.e., between the hours of 7:00 a.m. to 5:00 p.m. Monday to Friday, and 8:00 a.m. to 5:00 p.m. Saturday), to the extent possible (see Section 3.13.3, *Mitigation – Proposed Action [Noise, Public Health, and Safety])*.

3.2.4 Unavoidable Impacts after Mitigation—Proposed Action

Unavoidable short-term impacts on land use, recreation, and transportation would include the disruption of existing recreation, farming, and grazing activities, and traffic delays and interruptions along the ROW access roads, conductor pulling sites, and staging areas during construction. Unavoidable long-term impacts on land use and recreation would include danger tree removal along the transmission ROW, tree and brush removal for construction of new access roads, and the restriction of incompatible land uses in areas with new transmission line ROWs and roads. Unavoidable long-term impacts on transportation include potential traffic delays from operation and maintenance activities.

3.2.5 Cumulative Impacts—Proposed Action

The principal ongoing and future activities that can be reasonably assumed to cumulatively affect land use, recreation, and transportation are proposed development, agricultural uses, and timber harvest practices. Other reasonably foreseeable future projects in the vicinity of the Proposed Action that could affect land use, recreation, and transportation are listed and described in Appendix B.

Tillamook State Forest would be subject to timber harvest. Forest management plans do limit timber production; however, disturbance to recreation opportunities (e.g., OHV use) would be subject to ODF timber sales and may result in permanent or temporary impacts specific to each sale.

Several of these future projects would occur within the UGBs of the communities crossed by the ROW (Hillsboro, Forest Grove, Washington County). Utility infrastructure projects, including the Proposed Action, and commercial/industrial projects would add to the continued urbanization of these communities, and could impact agricultural uses of land. Some disturbances to developed (residential/business) land uses would be anticipated from these future projects; however, given the small area of influence that would be temporarily disturbed by the Proposed Action, its contribution to cumulative impacts would be **low**.

The future ODF timber sale activities may occur within the same timeframe as construction of the Proposed Action. In tandem, these temporary actions would have short-term, **moderate** impacts on land uses along the ROW, in particular recreation. Temporary closures of roads and/or recreation areas, noise, visual disturbances, traffic, and other impacts would likely affect recreation during the construction timeframes of these actions.

3.2.6 Environmental Consequences–No Action Alternative

Under the No Action Alternative, replacement of the existing transmission line structures would not occur. Impacts on existing land uses would be the same as existing conditions, with **no** or **low** impact on land use. Initially, operations and maintenance activities would be similar to those currently performed on the transmission lines. Over time, as the condition of the transmission lines continues to deteriorate, the frequency and magnitude of maintenance activities would result in intermittent traffic delays and new impacts on land use and recreation. Unexpected outages and service interruptions could disrupt power currently provided by the transmission line, a **moderate** impact.

3.3 Geology and Soils

3.3.1 Affected Environment

This section addresses geology, geologic hazards, and soils that may be affected by, or that may affect, the Proposed Action.

Geology

The Proposed Action is within the Willamette Valley and Coast Range physiographic regions in Oregon. The Willamette Valley lies in the lowlands between the Coast Range to the west and the Cascade Range to the east. The valley is characterized by unconsolidated material derived from deposits made by the Missoula Floods and underlain by volcanic materials (Balster and Parsons 1968; Minervini et al. 2003). The Oregon Coast Range is characterized by relatively short (generally around 4,000-foot) mountain peaks that stretch from the Pacific Coast approximately 40 miles inland. These mountains are the result of the ***subduction*** of the Juan de Fuca ***tectonic*** plate beneath the North American plate. Geology of the Coast Range is comprised of interspersed volcanic (i.e., Tillamook Volcanics formation) and oceanic-derived materials (Magnum 1967; Wells et al. 1994). The region is drained by many small ***tributaries*** of larger streams and rivers, particularly the segments in the Coast Range. The gradient of the small tributaries is fairly steep in the upper reaches of each ***watershed***, decreasing gradually to the main rivers that flow either to the Pacific Ocean west of the Coast Range, or the Willamette River to the east.

Geologic Hazards

Landslides occur throughout the Coast Range and present a considerable hazard for the transmission line. Landslide activity in 2011 within the project area damaged structures, access roads, and caused an outage (BPA 2011). Landslides are a common hazard in Oregon and can result in costly damage to infrastructure (Wang et al. 2002; Hofmeister et al. 2002). In general, landslides occur on steep terrain; however, any area is prone to sliding depending on slope, precipitation, and the cohesion between soil layers. Heavy precipitation and subsequent soil saturation can lead to a loss of soil cohesion that results in a landslide. Oregon has mapped historic landslides and deposits throughout the state following major landslides in 1996 and 1997 that followed severe storms (DOGAMI 2009, 2011). Twenty-two landslides that occurred between 1973 and 2011 have been documented near the project area, with most occurring in the Coast Range between LM 17 and LM 42 of the Forest Grove-Tillamook segment. Statewide Landslide Information Database for Oregon (SLIDO) data are displayed in Figure 3.3-1, which shows the mapped locations of known landslides and landslide deposits near the project area (DOGAMI 2011).

While the Rebuild Project is in a relatively low seismic activity zone, earthquakes in the area are most commonly associated with ***crustal faults*** and the Cascadia Subduction Zone (Oregon Partnership for Disaster Resilience 2012). The Proposed Action crosses 14 mapped faults, most of which are in the Coast Range (USGS 2006). Subduction zones can produce infrequent, major earthquakes of higher magnitude than crustal faults, as well as tsunamis. The project ROW, including the western end by the Tillamook Substation, is outside the tsunami inundation zone (DOGAMI 1995).

A common hazard associated with earthquakes is ***liquefaction***. Liquefaction occurs when soil becomes soft and liquid-like during very strong ground shaking associated with an earthquake. Wet or low-lying areas with ***unconsolidated sediment*** are generally more susceptible to liquefaction. Conversely, bedrock areas are less susceptible to liquefaction. Liquefaction hazards have been mapped by the Oregon Department of Geology and Mineral Industries (DOGAMI) in the vicinity of Tillamook (DOGAMI 1999). The western end of the project ROW, approximately 2 miles of transmission line and including the Tillamook Substation, is located in a high potential liquefaction zone (DOGAMI 1999). No other liquefaction hazard mapping has been completed near the project area.

Soils

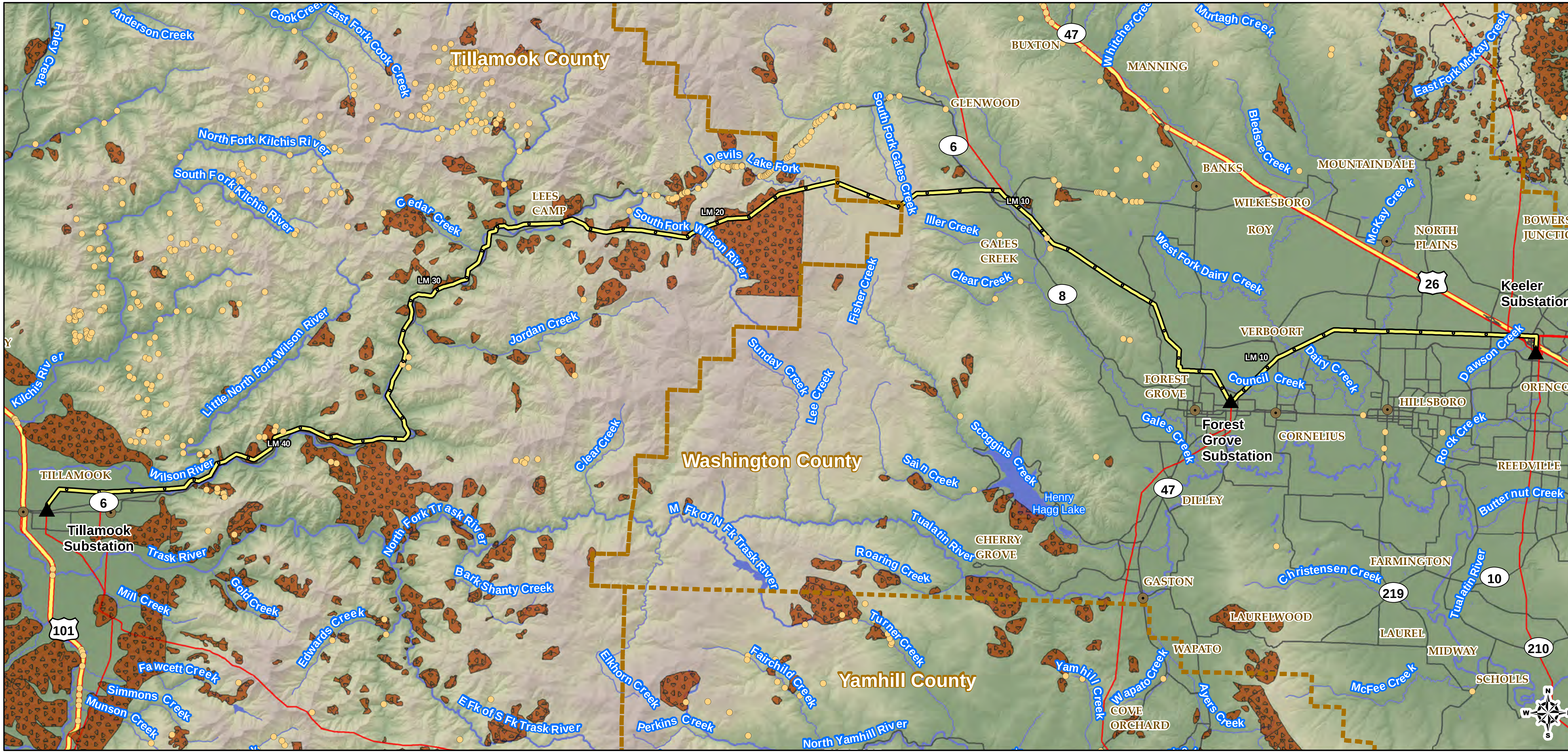
The Proposed Action passes through three general soil units: the Willamette Valley Lowland, the Coast Range Mountains, and the Tillamook/Wilson River Lowland. The Willamette Valley Lowland includes the Keeler-Forest Grove No. 1 transmission line and a portion of the Forest Grove-Tillamook No. 1 transmission line from the Forest Grove Substation to LM 8. Dominant soil map units in this area are primarily silt ***loams*** on gentle slopes typically less than 20 percent (NRCS 1982). These soils are derived from the Missoula Flood deposits and tend to be poorly drained (Minervini et al. 2003). Soils in this area generally support agriculture, and residential and urban development.

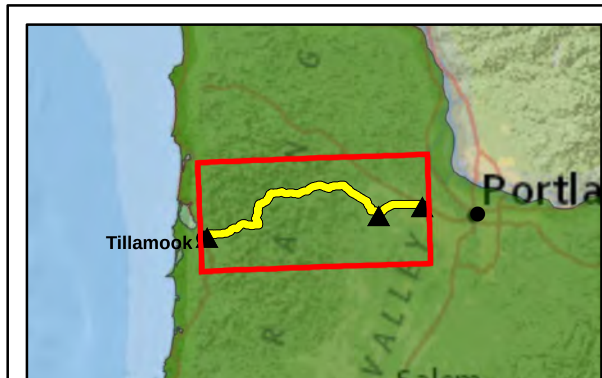
The Coast Range Mountains stretch from LM 8 to LM 43 on the Forest Grove-Tillamook No. 1 transmission line. Soils in this area are derived largely from the Tillamook Volcanic formation, and are associated with very steep slopes interspersed with rocky outcrops (Wells et al. 1994). The majority of the soil map units are derived from ***colluviums*** and range from silt loams to very gravelly silt loams (NRCS 1982, 2012). Soils in this area generally support forests and timber production.

The Tillamook/Wilson River Lowland continues from LM 43 of the Forest Grove-Tillamook No. 1 transmission line to the Tillamook Substation at the western end of the project. Dominant soil map units in the Tillamook/Wilson River Lowland are primarily silt or sandy loams on gentle slopes typically less than 12 percent (NRCS 2012). Soils in this area generally support agriculture and grazing.

Soil Erosion Hazards

Soils in the project area have been evaluated for ***erosion potential*** (Figure 3.3-2). The Natural Resources Conservation Service (NRCS) considers slope and soil properties such as cohesion, drainage, and organic content in determining soil erosion hazard classes of soils. Generally, coarse-grained soils on level to low-slope ground that are well drained have low erosion hazard potential. Conversely, fine-grained soils on steep slopes that are poorly drained have the greatest erosion hazard potential. Erosion hazard potential is described in this analysis as slight, moderate, or severe, approximated using the NRCS Erosion Hazard (off-road/off-trail) rating. A rating of slight indicates that little or no erosion is likely; moderate indicates that some erosion is likely, that roads or trails may require occasional maintenance, and that simple erosion control measures are needed; and severe indicates that significant erosion could be expected, that roads or trails require frequent maintenance, and that erosion-control measures or mitigation are needed for unsurfaced roads and trails. An assessment of the soil erosion hazard near the Proposed Action was conducted by using a 300-foot buffer around the components of the Proposed Action. About 53 percent of this area is comprised of soils categorized as having a slight risk of erosion. About 27 percent of soils are classified as severe to very severe. Those soils tend to be located in the Coast Range on steep slopes. Table 3.3-1 summarizes the existing soil erosion hazards.





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Print Date: October 22, 2013

Legend

- BPA Substation
- Line Mile (LM)
- Keeler - Tillamook No. 1 Transmission Lines
- BPA Transmission Line
- Cities or Towns
- River
- County Boundary
- Historic Landslide Point
- Landslide Deposits

Keeler to Tillamook 115-kV Transmission Line Rebuild Project

Figure 3.3-1

Occurrences of Known Landslides in the Project Vicinity

1 inch = 3 miles

0 1.5 3 6 Miles

BONNEVILLE POWER ADMINISTRATION

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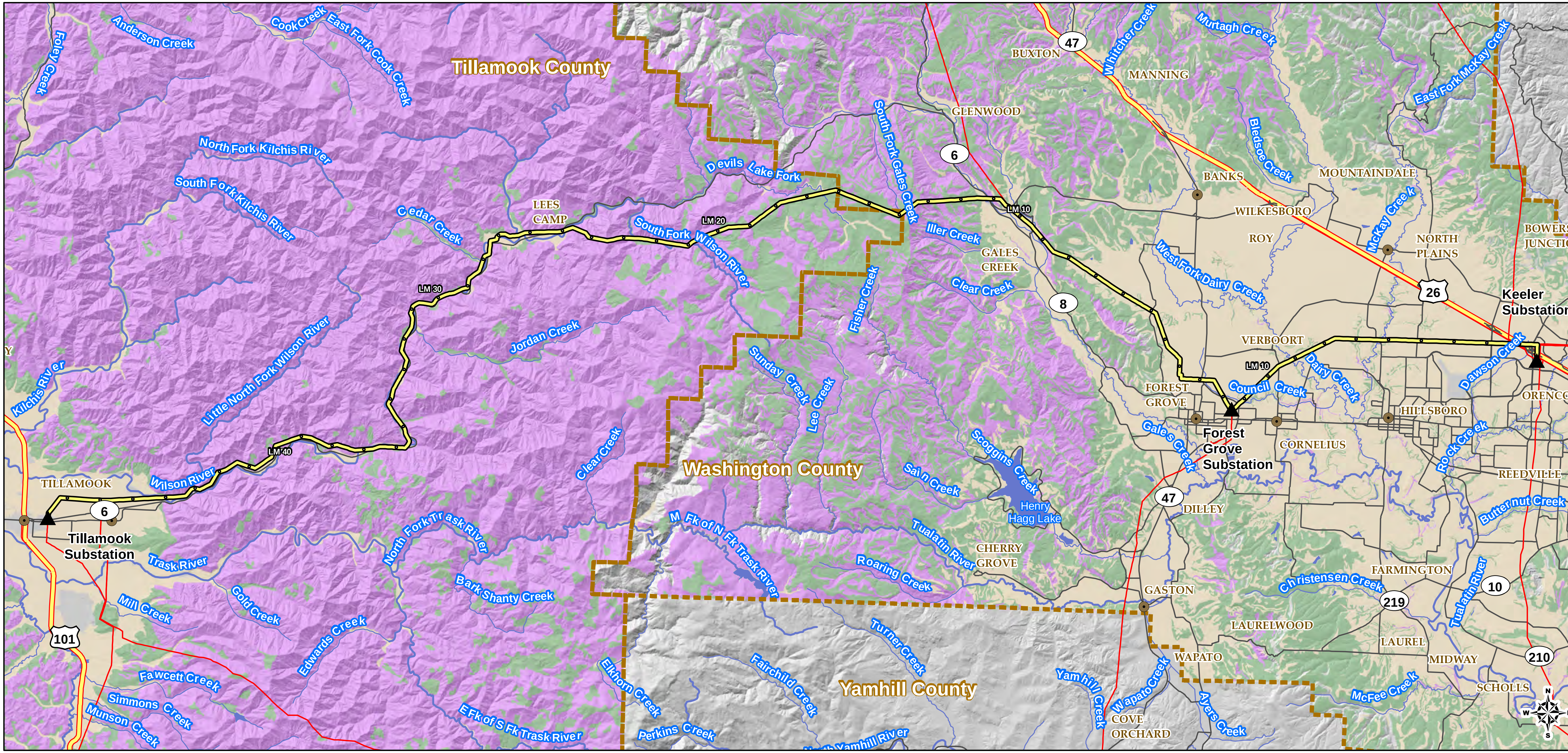

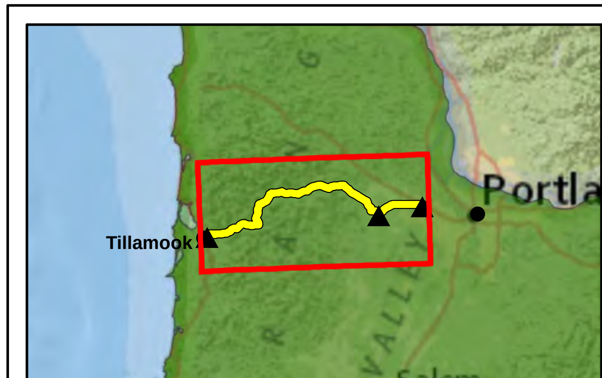

Legend

- ▲ BPA Substation
- • Line Mile (LM)
- Keeler - Tillamook No. 1 Transmission Lines
- BPA Transmission Line
- Cities or Towns
- River
- County Boundary

Erosion Hazard Rating

- Slight
- Moderate
- Severe; Very severe

Keeler to Tillamook 115-kV Transmission Line Rebuild Project

Figure 3.3-2

Erosion Hazard Potential

1 inch = 3 miles

0 1.5 3 6 Miles

BONNEVILLE POWER ADMINISTRATION

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Table 3.3-1. Summary of Soil Erosion Hazards

Soil Erosion Hazard Rating	Percent of Total [a]
Not rated	<1%
Slight	53%
Moderate	19%
Severe/Very Severe	27%

Source: NRCS 1982, 2012.

[a] Percent of total is based on 300-foot buffer around the Proposed Action features. This area of assessment was used to provide a means of comparison for soil erosion hazards near the project area.

3.3.2 Environmental Consequences–Proposed Action

The Proposed Action could result in direct and indirect impacts on soils from structure removal and installation, conducting access road work, danger tree removal, and ongoing operation and maintenance activities. Direct impacts could occur as a result of direct soil disturbance, leading to loss of soils or soil compaction. Indirect impacts on soils could occur as a result of vegetation removal that could lead to increased erosion over time. Finally, geologic hazards such as landslides or seismic activity could impact structures and other features of the Proposed Action.

Structure Removal and Replacement

Structure replacement would require the use of heavy equipment (e.g., boom crane and line truck) to replace a pole. Equipment operation has the potential to disturb soils in the immediate vicinity of the structure by exposing soils, making soils more susceptible to erosion, or by compacting soils and decreasing permeability. All structures would be located within the existing cleared ROW. Most structures are located on soils with slight to moderate erosion potential. Where structures are proposed on soils with severe erosion potential, mitigation measures such as working during dry weather for construction would be implemented to minimize actual erosion risk (see Section 3.3.3).

For this analysis, a disturbance envelope of 0.1 acre for a one- or two-pole structure and 0.2 acre for a three-pole structure was assumed. Disturbance areas include areas for equipment, pole, and anchor placement. In total, approximately 69 acres of potential soil disturbance for structure removal and replacement would occur under the Proposed Action (Table 3.3-2). A majority of structures (approximately 479) would be replaced within the same footprint as the existing structures on previously disturbed soils. Soil disturbance associated with replaced structures would be temporary and occur during construction. Following structure installation, the excavated soils would be spread evenly around the structure and stabilized to minimize future erosion. New structures (three in total), or structures that move from the original location (69 total) represent new areas where prior soil disturbance from structures has not occurred. The amount of permanent impacted acreage from the new and relocated structures is approximately 0.1 acre.

Because the soils around the new and relocated structures may not have been previously disturbed the new disturbance would likely result in soil compaction from equipment operation and a subsequent loss of soil productivity. Similar to structures that are replaced, excavated soils would be spread evenly around the structure and stabilized to minimize future erosion. Because most of the structure replacement would occur on previously disturbed soils, and the soils would be stabilized to minimize future erosion following construction, impacts on soil erosion are expected to be **low to moderate** as a result of the Proposed Action.

Table 3.3-2. Summary of Structure Impacts by Soil Erosion Potential

Soil Erosion Potential Rating	Number of Structures	Temporarily Impacted Acreage	Permanently Impacted Acreage
Not rated	2	0.48	0
Slight	310	35.08	0.07
Moderate	100	13.31	0.01
Severe/Very Severe	137	19.37	0.02
Total	**549**	**68.24**	**0.1**

The use of heavy equipment would result in increased soil compaction in the immediate vicinity where equipment is used. Compaction of soils by heavy equipment degrades soil structure by reducing the pore space within soils. Pore spaces contribute to the retention of moisture and gas exchange, which are important for respiration and other metabolic functions of soil organisms. Compaction would be localized and is not expected to significantly increase or permanently alter the soils' ability to infiltrate water or increase stormwater runoff. Peak construction activities would be conducted during the dry season as much as possible to minimize soil compaction. Direct impacts from soil compaction would be localized and largely temporary. Prior to the completion of construction activities, structure locations, access routes, and staging areas would be inspected to determine if any areas of excessive compaction are present. Ripping compacted areas to promote infiltration and gas exchange would be done prior to final site stabilization measures. As a result of equipment use and structure replacement, direct impacts on soils are expected to be **low to moderate.**

Indirect impacts from project construction could include minor ***sheet erosion*** and the creation of some small channels. If soils were left bare or were slow to revegetate, minor gullying and other erosion could occur. Eroded soils could enter nearby ***surface waters*** and degrade water quality. The risk of erosion would be highest on steep slopes during heavy rainfall. With the implementation of BMPs and mitigation (see Section 3.3.3, *Mitigation – Proposed Action*), including conducting peak construction work during the dry season and site stabilization following construction, indirect impacts on soils would be **low to moderate**.

Geologic hazards, including landslide areas, exist throughout the project area, and several landslides have been mapped near the ROW (DOGAMI 2011; Figure 3.3-1). Structure placement in landslide hazard areas can be problematic, because earth movement can compromise the integrity of the structure or change the alignment of the conductor, which could put an unacceptable structural load on the conductor. The potential for a landslide to affect the integrity of a structure depends on the quality of soils, the amount of moisture in the soils, the amount of surface water flowing across the site, the steepness of slopes, and whether guy wires are present. Design of the Proposed Action takes into account structural loading, and structures would not be placed in landslide hazard areas to the extent practical. Where engineering requirements indicate that poles are needed in these areas, additional measures would be incorporated into the design based on site-specific geotechnical analysis, such as those presented in Section 3.3.3, *Mitigation – Proposed Action*. Because of additional engineering measures for structures that may be susceptible to landslides, impacts on soils and geologic hazards are expected to be **low**.

Access Roads

Proposed new access road construction (cumulatively 1.13 miles) would require clearing and grading of approximately 2.83 acres in total (Table 3.3-3), commonly with a bulldozer. New road construction would occur on soils rated as slight to severe erosion potential. New road construction would remove the upper, most portion of the soil within a 20-foot width to establish a drivable surface. Within the 20-foot wide corridor, direct disturbance to soils would increase the potential for erosion until final stabilization of the road bed is completed. Erosion associated with construction and the subsequent use of access roads would have the greatest impact in areas where roads are located in a severe erosion hazard area, cross creeks and streams, or are located in areas with steep slopes (greater than 30 percent). Indirectly, new road surfaces would create additional runoff during storm events and could locally increase erosion around the new road. Incorporating the mitigation measures identified in Section 3.3.3, *Mitigation – Proposed Action*, would reduce potential erosion and subsequent sediment delivery to adjacent waters. Because of the relatively small amount of new construction, and the incorporation of mitigation measures into the Proposed Action's design, impacts from proposed access roads are expected to be **low to moderate**.

Table 3.3-3. Summary of Road Impacts by Soil Erosion Hazard Potential

Erosion Hazard Potential	Permanent Impact [a] (acres)	Temporary Impacts [b] (acres)
Not Rated	0.00	1.16
Slight	2.16	102.21
Moderate	0.37	61.24
Severe/Very Severe	0.30	83.93
Totals	**2.83**	**248.54**

[a] Permanent impacts are derived from new road construction.

[b] Temporary impacts are derived from improved or reconstructed roads, and temporary travel routes.

The Proposed Action crosses several geologic faults, steep slopes, and known landslides. BPA would design the access roads to account for potentially unstable slopes where needed. As a result, impacts on roads from geologic hazards, including landslides, are expected to be **low to moderate**.

Under the Proposed Action, a total of approximately 18.94 miles of existing roads would be improved and reconstructed. This would generally occur on soils with a slight or moderate potential for erosion as shown on Table 3.3-3. A small section of the improved and reconstructed access roads would occur on soils rated as having severe/very severe erosion potential. Improving road access may require the use of a road grader to smooth surfaces, or importing rock to provide a drivable surface. There would be **low** impacts on soils as a result of road improvements because these areas have been previously disturbed by road construction. Short-term impacts from temporary increases in erosion may occur during grading activities when the ground is disturbed. Additionally, road improvements would include the construction of three new bridges and approximately 20 culverts would be installed, replaced, or upgraded, which would result in temporary increases in construction-related erosion. Incorporating the mitigation measures identified in Section 3.3.3, *Mitigation – Proposed Action*, is expected to reduce erosion associated with road improvements. Therefore, impacts on soils are expected to be **low.**

A total of approximately 89.08 miles of temporary travel routes would be used to access structures where no formal roads exist. The use of temporary travel routes between structures would have the potential to increase erosion by compacting or exposing soils. Loss of plant cover and movement of soil disrupt biological functions, including nutrient retention and recycling, thus, reducing productivity, at least temporarily. Temporary travel routes would be approximately 20 feet in width and located within the existing cleared ROW. Impacts from temporary travel routes would be minimized by conducting work when the ground is not saturated and by limiting the number of times equipment passes over an area. Therefore, impacts on soils from temporary access routes are expected to be **moderate**.

Staging and Tensioning Areas

Staging and tensioning areas would be located in previously disturbed areas to the extent practicable, and avoid landslide hazard areas and areas with a high potential for erosion. In general, staging and tensioning areas would be relatively flat and used to stockpile materials and store equipment. No ground disturbance would occur to establish a staging area. The Keeler Substation would serve as one staging area for the project; up to two additional temporary staging areas may be utilized during project construction. BPA would conduct the necessary site-specific environmental review on any other additional temporary staging areas. Because staging and tensioning areas would likely be located on previously disturbed areas and no new disturbance would occur, impacts on soils are expected to be **low**.

Potential impacts associated with staging and tensioning areas would include compaction from heavy equipment degrading soil structure and reducing pore space. Implementation of mitigation measures would reduce construction-related impacts on soil (see Section 3.3.3, *Mitigation – Proposed Action)*. Impacts from staging and tensioning areas are expected to be **low** to **moderate**.

Danger Tree Removal

Approximately 2,666 danger trees are expected to be removed within 100 feet from the centerline of the ROW. Direct effects on soils would be negligible during tree removal, as the danger trees and other vegetation would be cut above ground and the roots would be left in place. Indirect effects of danger tree removal on soils could include increasing soil exposure to erosive rain if adequate ground cover is not present. These impacts would be similar to those under existing conditions from maintenance and are considered **low**.

Operation and Maintenance

Operation and maintenance activities would be similar to existing conditions and include incidental repairs to structures or access roads, which could cause localized soil disturbance. Most vegetation management activities (e.g., trimming, limbing, or brushing) are non-ground disturbing and would not impact underlying soils. In general, operation and maintenance activities would have a **low** direct impact on soils because they would be confined to small, localized areas dispersed along the length of the transmission line corridor.

To assess the potential for geologic hazards to affect the transmission line, BPA maintenance crews would continue to conduct annual visits to survey for landslide activity or other effects associated with geologic hazards as part of routine operation and maintenance of the line. As a result, impacts from geologic hazards are expected to be **low**.

Environmental Consequences–Steel Pole Replacement

The use of steel poles would have similar impacts as wood poles. Compared to wood structures, a higher level of compaction may be needed around the base of a steel pole for stability. However, the disturbance footprint for a steel pole would not exceed the limits assumed for wood poles (0.1 acre for one- or two-pole structures, and 0.2 acre for three-pole structures). In the long term, the more durable steel poles would require less frequent routine maintenance compared to wood poles and extend the anticipated lifecycle of the transmission line, likely resulting in lower impacts on soils and geology than wood poles.

3.3.3 Mitigation–Proposed Action

The following mitigation measures would be implemented to reduce or eliminate impacts on soils and impacts from geological hazards in the project area:

- Restore compacted cropland soils as close as possible to pre-construction conditions using tillage. Break up compacted soils where necessary by ripping, tilling, or scarifying before seeding.
- Remove and stockpile topsoil separately in croplands. Where select backfill is used around tower poles, cover in native topsoil to the extent possible.
- Avoid and minimize construction on steep or unstable slopes, if possible.
- Locate structures or access roads outside of previously active landslides, or other geologic hazard areas, where possible.
- Contact BPA geotechnical specialists if geotechnical issues, such as new landslides, arise during construction.
- Conduct peak construction activities during the dry season (between June 1 and November 1), as much as possible, to minimize erosion, sedimentation, and soil compaction.
- Develop and implement a Stormwater Pollution Prevention Plan (SWPPP) to control erosion and sedimentation.
- Install sediment barriers and other suitable erosion and runoff control devices prior to ground-disturbing activities at construction sites to minimize off-site sediment movement where the potential exists for construction activities to impact surface water or wetlands.
- Design temporary and permanent access roads to control runoff and prevent erosion by using low grades, drain dips, water bars, etc., or a combination of these methods.
- Where existing roads show signs of slumping or erosion, reinforce roads during reconstruction.
- Retain existing low-growing vegetation where possible, and minimize the use of clearing/grubbing to preserve the roots of low-lying vegetation (see Section 3.6.3, *Mitigation–Proposed Action [Vegetation]*).
- Use BMPs to limit erosion and the spread of noxious weeds (see Section 3.6.3, *Mitigation–Proposed Action [Vegetation]*).
- Use appropriate seed mixes, application rates, methods, and timing to revegetate disturbed areas (see Section 3.6.3, *Mitigation–Proposed Action [Vegetation]*).

- Leave erosion and sediment control devices in place until all disturbed sites are revegetated and erosion potential has returned to pre-project conditions (see Section 3.6.3, *Mitigation–Proposed Action [Vegetation]*).
- Locate staging areas in previously disturbed or graveled areas where practicable (see Section 3.6.3, *Mitigation–Proposed Action [Vegetation]*).
- Use local rock sources for road construction where practicable (see Section 3.10.3, *Mitigation–Proposed Action [Air Quality]*).

3.3.4 Unavoidable Impacts after Mitigation–Proposed Action

Unavoidable short-term impacts on soils would include soil compaction, topsoil removal and exposure, and increased levels of erosion due to construction activities. Long-term impacts would result from normal sedimentation from road surfaces, and soil compaction and loss of soil productivity due to relocated structures and new access road construction. Construction of new roads and structures in previously undisturbed areas would result in unavoidable soil impacts within the road edges and the immediate footprint of the structure. These impacts would decrease as disturbed areas revegetate over time.

3.3.5 Cumulative Impacts–Proposed Action

The principal ongoing and future activities that can be reasonably assumed to cumulatively affect soils are agricultural practices, including farming and grazing activities, and timber harvest. Agricultural activities continually disturb soils during the planting and harvest cycle. Timber harvest is planned in the Tillamook State Forest. Forest management plans limit timber production; however, soil disturbance could occur during timber harvest. Other reasonably foreseeable future projects in the vicinity of the project area that could affect soils and geology are listed and described in Appendix B.

Past activities that have affected geology and soils include landslides that impact the transmission corridor. As recently as 2011, BPA has repaired structures and access roads following major landslides within the ROW (BPA 2011). Landslides will continue to occur in the project area and may result in additional damage and repairs to the line. The Proposed Action would include additional engineering for roads and structures based on geotechnical recommendations, and would have a low cumulative impact on the frequency of landslides near the Proposed Action.

Past wildfires in 1933, 1939, and 1945 have burned large portions of Tillamook State Forest adjacent to the project area (ODF 1997). Wildfires result in large areas of burned soils, which reduce vegetation production and subsequently increase erosion in burned areas. Over the long term, erosion rates return to natural levels as vegetation recolonizes the burned area through active restoration and natural regeneration. The Proposed Action would reduce the likelihood of fires along the ROW through the removal of vegetation that is too close to conductors and by replacing deteriorating structures.

Cumulative impacts on soils in conjunction with the Proposed Action could lead to increased erosion during ground-disturbing activities. ODF timber harvests adjacent to the ROW would include construction of haul roads and landings, which could result in localized soil disturbance. Similarly, expansion of the Intel campus in Hillsboro could result in short-term increases in erosion during construction. Improvement of the access roads associated with BPA's Boyer-Tillamook transmission line and relocating the Tillamook PUD underbuild could also create additional erosion during construction activities. These projects would likely implement site-specific erosion and sediment control BMPs to minimize erosion. Therefore, cumulative impacts on soils are expected to be **low**.

3.3.6 Environmental Consequences–No Action Alternative

Under the No Action Alternative, the existing transmission line would not be rebuilt; therefore, the impacts related to the construction of the Rebuild Project would not occur. Operation and maintenance activities would continue and would be similar to existing conditions, as described in Section 2.1.7, *Operation and Maintenance*. Maintenance activities would likely increase as existing structures deteriorate, and more structure repair and replacement could be required. Maintenance of access roads would be needed, and the road work under the Proposed Action would likely need to take place as an operations and maintenance activity. Danger trees would be removed as part of routine line maintenance as they would still pose a threat to infrastructure. The maintenance activities would result in **low to moderate** impacts on soils, including erosion and compaction, similar to the impacts described above for the Proposed Action.

3.4 Fish

3.4.1 Affected Environment

Federal statutes that protect fish include the Endangered Species Act (ESA)(16 U.S.C. 1531 *et seq.*) and the Magnuson-Stevens Fishery Conservation Management Act (MSA) (16 U.S.C. § 1801 *et seq.*). Each of these federal statutes is described in Chapter 4, *Consultation, Review, and Permit Requirements*.

The affected environment includes fish species known to occur or that are likely to occur given the presence of suitable habitat and known distribution in the surface waters crossed by the transmission line ROW and access roads, plus surface waters within 100 feet of the Proposed Action. Information on fish habitats was collected from the Oregon Biodiversity Information Center (ORBIC) data (ORBIC 2012), Dairy Creek watershed analysis (BLM 1999), Gales Creek watershed assessment project (TRWC 1998), Wilson River watershed analysis (ODF 2008), and field investigations. Field investigations included a general reconnaissance-level inventory in March 2013, and a wetland delineation (Turnstone 2013a) that began in December 2012 and was completed in June 2013. BPA is preparing a biological assessment for the impacts of the Proposed Action on ESA-listed fish and wildlife. The biological assessment includes measures to minimize the impacts of the Proposed Action on ESA-listed species, and these measures are incorporated by reference into this EA (BPA 2013b).

General Fish Species

The Proposed Action crosses several watersheds with fish-bearing waterways, located in the Dairy Creek, Gales Creek, and Wilson River watersheds. The existing transmission lines span several waterways, including: Dairy Creek, McKay Creek, Gales Creek, Wilson River, Little North Fork Wilson River, Jones Creek, Wolf Creek, and Hughey Creek. These waterways are characterized in Section 3.7, *Waterways, Water Quality, and Floodplains*. ***Riparian*** buffers along these waterways are described in Section 3.6, *Vegetation*. Additional information on streams and other waters is provided in the Keeler to Tillamook wetland delineation report (Turnstone 2013a).

Anadromous fish species in the area include coho salmon (*Oncorhynchus kisutch*), Chinook salmon (*O. tshawytscha*), chum salmon (*O. keta*), steelhead (*O. mykiss*), and coastal cutthroat trout (*O. clarkii*). Pacific lamprey (*Entosphenus tridentatus*) and western brook lamprey (*Lampetra richardsoni*) are also present. Resident species that likely occur in the area include rainbow trout (*O. mykiss*), white crappie (*Pomoxis annularis*), longnose dace (*Rhinicthys cataractae*), speckled dace (*R. osculus*), prickly sculpin (*Cottus asper*), reticulate sculpin (*C. perplexus*), torrent sculpin (*C. rhotheus*), and redside shiner (*Richardsonius balteatus*).

The ODFW maintains a sensitive species list in accordance with Oregon Administrative Rule (OAR) 635-100-0040, which is designed to provide a positive, proactive approach to species conservation. State sensitive fish species documented in the project area are Oregon Coast (OC) winter-run steelhead (***state vulnerable***), OC spring-run Chinook salmon (***state critical***), Pacific Coast chum salmon (state critical), Pacific lamprey (state vulnerable), and western brook lamprey (state vulnerable) (ORBIC 2012).

Federally Listed Fish Species

Fish species listed under the ESA that potentially occur in the area of assessment were determined from the federal listing status of species and critical habitats maintained by the National Marine Fisheries Service

(NMFS) (NMFS 2012). Table 3.4-1 summarizes federally listed fish species that may occur in the vicinity of the Proposed Action. Proposed and candidate fish species do not occur in the area. BPA is preparing a biological assessment that will address OC coho salmon and Upper Willamette River (UWR) steelhead, as well as federally listed wildlife species (as addressed in Section 3.5, *Wildlife*).

Table 3.4-1. Federally Listed Fish Species in the Vicinity of the Proposed Action

Common Name (*Scientific Name*)	Federal Status	Oregon Status	Potential for Occurrence
Coho salmon (*Oncorhynchus kisutch*) Oregon Coast ESU	Threatened	SV	Present. Devil's Lake Fork, Deyoe Creek, Cedar Creek, Fox Creek, North Fork Little Wilson River, Hughey Creek, South Fork Wilson River, and Wilson River.
Steelhead (*Oncorhynchus mykiss*) Upper Willamette River DPS, winter run	Threatened	SV	Present. Gales Creek, South Fork Gales Creek, McKay Creek, and Dairy Creek.
Sources: NMFS 2012; ORBIC 2012; USFWS 2013a, 2013b; StreamNet 2013. DPS = ***Distinct Population Segment***, ESU = Evolutionarily Significant Unit, SV =ODFW ***sensitive vulnerable***.			

Oregon Coast Coho Salmon

NMFS listed the OC coho salmon as a threatened species on February 11, 2008 (73 Federal Register [FR] 7816). NMFS designated ***critical habitat*** for OC coho salmon on February 11, 2008 (73 FR 7816). The OC coho salmon Evolutionarily Significant Unit (ESU) includes all naturally spawned populations of coho salmon in Oregon coastal streams south of the Columbia River and north of Cape Blanco (63 FR 42587).

There is some variation in the run timing between Oregon watersheds, but adults generally start to migrate into rivers at the first fall ***freshet***, usually in late October or early November. A delay in rain can delay river entry considerably. Once in the stream, some coho may spend up to 2 months in freshwater before spawning. Spawning usually occurs from November through January and may continue into February. Spawning generally occurs in tributaries with gradients of 3 percent or less (Laufle et al. 1986). Juvenile coho salmon commonly rear for at least 2 years in small streams less than 5 feet wide and occasionally in larger ponds and lakes (Pollock et al. 2004). Studies of stream habitat use indicate that there is a velocity threshold for rearing fry and juveniles (Beecher et al. 2002).

The Forest Grove-Tillamook No. 1 segment of the transmission line spans OC coho salmon critical habitat over segments of Devil's Lake Fork (17/1–17/2), Deyoe Creek (17/6–17/7), Elliot Creek (19/4–19/5), Cedar Creek (28/8–28/9), Fox Creek (35/5–35/6, North Fork Little Wilson River (43/2–43/3), and Hughey Creek (44/5–44/6). The transmission line crosses the South Fork Wilson River three times between structures 21/3 and 23/2. The transmission line also crosses the mainstem Wilson River 23 times between structures 25/5 and 44/1.

Upper Willamette River Steelhead

NMFS originally listed UWR steelhead as threatened on March 25, 1999 (64 FR 14517), and reaffirmed their threatened status on January 5, 2006 (71 FR 834). NMFS designated critical habitat for UWR steelhead on September 2, 2005 (70 FR 52488). The Distinct Population Segment (DPS) includes all naturally spawned populations of steelhead below natural and manmade impassable barriers in the Willamette River and its tributaries upstream from Willamette Falls to the Calapooia River.

Native UWR steelhead are a late-migrating winter group that enters freshwater in January and February (Howell et al. 1985). UWR steelhead generally do not ascend to their spawning areas until late March or April, which is late compared to other West Coast winter steelhead. As with steelhead populations, the majority of juvenile smolts outmigrate to marine waters after 2 years. Adults return to their natal rivers to spawn after spending 2 years in the ocean. Spawning typically occurs from April to June, although some variations may occur on a local scale or in a particular year. Juvenile steelhead are present year round. Steelhead typically spawn in small tributaries rather than large, mainstem rivers and tend to prefer higher gradients (Busby et al. 1996). Steelhead juveniles are highly territorial and commonly occupy faster flowing water such as ***riffles***. Older and larger juveniles stay in deeper water and keep close to cover (Bisson et al. 1988).

The existing transmission line spans UWR steelhead critical habitat over segments of Gales Creek (11/6–11/7, Forest Grove-Tillamook No. 1) and South Fork Gales Creek (14/4, Forest Grove-Tillamook No. 1). Suitable habitat is mapped in McKay Creek (near structure 6/3, Keeler-Forest Grove No. 1) and Dairy Creek (9/2, Keeler-Forest Grove No. 1).

Essential Fish Habitat and the Pacific Salmon Fishery

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law [PL] 104-267), requires federal agencies to consult with NMFS on activities that may adversely affect ***Essential Fish Habitat*** (EFH). The Pacific Fishery Management Council (PFMC) has designated EFH for the Pacific salmon fishery, ground fish, and coastal ***pelagic*** fisheries (PFMC 2012). Of these, only species associated with the Pacific salmon fishery occur within and near the project area. The Pacific salmon fishery in this designation includes all streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon in Oregon, except above the impassable barriers identified by PFMC. The Pacific salmon fishery includes Chinook, coho, and pink salmon (*O. gorbuscha*) in its designation, of which Chinook and coho salmon are potentially present in the area (ORBIC 2012, StreamNet 2013).

EFH includes segments of McKay Creek (near structure 6/3-6/4, Keeler-Forest Grove No. 1), Dairy Creek (9/2–9/3, Keeler-Forest Grove No. 1), Gales Creek (11/6–11/7, Forest Grove-Tillamook No. 1), South Fork Gales Creek (14/3–14/4, Forest Grove-Tillamook No. 1), Devil's Lake Fork (17/1–17/2, Forest Grove-Tillamook No. 1), Deyoe Creek (17/6–17/7, Forest Grove-Tillamook No. 1), Elliot Creek (19/4–19/5, Forest Grove-Tillamook No. 1), Cedar Creek (28/8–28/9, Forest Grove-Tillamook No. 1), Fox Creek (35/5–35/6, Forest Grove-Tillamook No. 1), North Fork Little Wilson River (43/2–43/3, Forest Grove-Tillamook No. 1), and Hughey Creek (44/5–44/6, Forest Grove-Tillamook No. 1). The Forest Grove-Tillamook No. 1 transmission line crosses EFH in the South Fork Wilson River three times between structures 21/3 and 23/2 and the mainstem Wilson River 23 times between structures 25/5 and 44/1.

3.4.2 Environmental Consequences–Proposed Action

Construction Impacts

As described in Section 2.1.5, *Construction Activities,* construction impacts related to the following activities have the potential to affect fish: structure removal and replacement; use and development of access roads (including potential culvert/bridge work in fish-bearing streams), staging areas and pulling/tensioning sites; and danger tree removal.

Structure Removal and Replacement

General Fish Species

Under the Proposed Action, structure removal and replacement would not occur in fish-bearing streams, and direct impacts on fish are not expected. However, approximately 146 structures are within 100 feet of water resources, and 56 are located in the 100-year floodplain (see Section 3.7, *Waterways, Water Quality, and Floodplains*). Removal and replacement of these structures have the potential for indirect impacts on fish species. Indirect impacts could include sedimentation and turbidity and noise and vibration disturbance.

Sedimentation and turbidity are primary contributors to the degradation of salmon habitat (Bash et al. 2001). Elevated suspended sediment and turbidity in fish-bearing streams above background levels can cause stress by impairing the ability of fish to locate predators, find prey, defend territories, or by interfering with gill functions. Increased stress can compromise the effectiveness of the immune system, thereby affecting mortality rates (USFWS 1998). Increased stress can also affect blood physiology, thereby decreasing immunological competence, growth, and reproductive success. However, erosion control activities including BMPs (see Section 3.4.3, *Mitigation – Proposed Action*) would contain overland flow and prevent sediment from entering fish habitat. If sediment does reach fish habitat, it is expected to be a small pulse and temporary in duration.

Sound pressure waves generated by in-water construction activities have the potential to injure and even kill fish and disturb or alter their behavior (Popper and Hastings 2009a, 2009b). In general, sound pressure levels exceeding established thresholds for injury to fish are only possible with in-water pile driving, which is not required for this project. The aquatic noise and vibration disturbance generated by the removal and replacement of structures within 100 feet of fish-bearing streams is not expected to exceed background ambient underwater noise levels.

Natural cover in the riparian buffer to fish-bearing streams is an essential element for fish foraging, migration, and rearing. Natural cover is generally limited to disturbed vegetation that is primarily reed canarygrass (*Phalaris arundinacea*) and Himalayan blackberry (*Rubus armeniacus)*. In sensitive habitats, including riparian areas, removal and replacement of structures would be limited to a disturbance footprint of 50 feet by 50 feet. Impacts on riparian areas are described in Section 3.6, *Vegetation*. Overall, these indirect impacts on fish species from structure removal and replacement would be mitigated through the implementation of BMPs (See Section 3.4.3, *Mitigation – Proposed Action)* and considered **low**.

Federally Listed Fish Species

Structure removal and replacement would not occur in OC coho salmon or UWR steelhead habitat, so direct impacts from the Proposed Action are not expected. There are 24 structures within 100 feet of OC coho salmon-bearing streams (NMFS 2012, ORBIC 2012, StreamNet 2013). Major waterways where OC coho salmon are documented include Devil's Lake Fork, Deyoe Creek, Cedar Creek, Fox Creek, North Fork Little Wilson River, Hughey Creek, South Fork Wilson River, and Wilson River. There are four structures within 100 feet of UWR steelhead-bearing streams. Waterways where UWR steelhead are documented include Gales Creek, South Fork Gales Creek, McKay Creek, and Dairy Creek.

Removal and replacement of structures within 100 feet of these waterways has the potential for indirect impacts on OC coho salmon and UWR steelhead. Indirect impacts could include sedimentation and turbidity, noise and vibration disturbance, and riparian vegetation loss. Erosion control activities including BMPs would contain overland flow and prevent sediment from entering the habitat of ESA-listed fish species; aquatic noise and vibration disturbance generated by the removal and replacement of structures within 100 feet of coho salmon and UWR steelhead habitat is not expected to exceed background ambient underwater noise levels; and removal and replacement of structures in sensitive natural resource areas such as riparian buffers would have a reduced disturbance footprint of 50 feet by 50 feet. Overall, impacts on OC coho salmon and UWR steelhead from structure removal and replacement would be mitigated through the implementation of BMPs (See Section 3.4.3, *Mitigation – Proposed Action)* and considered **low**.

Essential Fish Habitat

Under the Proposed Action, structure removal and replacement would not occur in EFH, and direct impacts on EFH are not expected. However, there are 28 structures within 100 feet of EFH waterways. Major waterways include Devil's Lake Fork, Deyoe Creek, Cedar Creek, Fox Creek, North Fork Little Wilson River, Hughey Creek, South Fork Wilson River, Wilson River, Gales Creek, South Fork Gales Creek, McKay Creek, and Dairy Creek. The removal and replacement of 28 structures within 100 feet of these waterways has the potential for indirect impacts on EFH. Indirect impacts could include sedimentation and turbidity, noise and vibration disturbance, and riparian vegetation loss. Similar to effects on OC coho salmon and UWR steelhead, impacts on EFH and the Pacific salmon fishery from structure removal and replacement would be mitigated through the implementation of BMPs (See Section 3.4.3, *Mitigation – Proposed Action)* and considered **low**.

Access Roads

General Fish Species

The Proposed Action would include five new access roads (with a combined total length of 0.1 mile) and improvements/reconstruction to 50 existing access roads (with a combined total length of 1.36 miles) within 100 feet of streams delineated in the area of assessment. Appendix D (see Table D-2, *Proposed Access Roads within 100 feet of Streams)* lists access road work and impacts that would occur within 100 feet of fish-bearing streams. Approximately 27 of the access roads are within 100 feet of fish-bearing streams. Up to six culverts or bridge installations/repairs within fish-bearing streams are expected, and these likely would require in-water work (Table 3.4-2).

Table 3.4-2. Summary of Culvert/Bridge Repair within Fish-Bearing Streams

Access Road [a]	Waterway ID [b]	Stream Name [c]	Repair Information [d]	ESA Listed Fish Potentially Present [e]
009-053 to 9/5 (FGT)	012813A_W7	Little Beaver Creek	Remove existing culvert and install bridge	UWR Steelhead
015-010 to 15/3 (FGT)	020513A_W3	Unnamed tributary to Devil's Lake Fork	Culvert replacement	OC Coho Salmon
016-030 to 16/4 (FGT)	020613A_W5	Unnamed tributary to Devil's Lake Fork	Culvert replacement	OC Coho Salmon
017-055 to 17/6 (FGT)	020813A_W4	Unnamed tributary to Deyoe Creek	Culvert replacement	OC Coho Salmon
033-070 to 33/7 (FGT)	022813A_W3	Stanley Creek, Unnamed tributary to Stanley Creek	Bridge installation	OC Coho Salmon

FGT = Forest Grove-Tillamook No. 1 transmission line.
[a] OTAK 2013.
[b] Turnstone 2013a.
[c] ORBIC 2012.
[d] OTAK 2013.
[e] ORBIC 2012, StreamNet 2013.

Construction activities would increase turbidity and sedimentation in these fish-bearing streams. Sedimentation and turbidity are primary contributors to the degradation of ***salmonid*** habitat. High levels of turbidity can reduce feeding efficiency and food availability, clog gillrakers, and erode gill filaments of salmonids (Bash et al. 2001).

In addition, construction of the new and improvements/reconstruction to existing access roads within 100 feet of streams would increase stormwater runoff, and sediment may eventually be delivered to fish-bearing streams following multiple storm events, indirectly impacting fish. With the implementation of mitigation measures, impacts on fish from access road construction and improvements/reconstruction would be considered **moderate**.

Federally Listed Fish Species

Under the Proposed Action, the new access road, existing roadway improvements, and proposed stream crossing could occur in four OC coho salmon bearing streams and one UWR steelhead bearing stream (Table 3.4-2). These roadway improvements may require in-water work, work site isolation, and fish handling. Work site isolation, fish exclusion, and fish handling pose inherent risks to fish, especially if the activity involves electroshocking to capture and relocate fish in the construction area. The contractor would minimize risks by ensuring that a qualified biologist oversee the fish exclusion activities and follow guidance outlined in the guidelines for electrofishing waters containing salmonids listed under the ESA (NMFS 2000). Work site isolation could cause a temporary increase in turbidity downstream during the installation and removal of the ***cofferdam***, but this is expected to be of short duration. Turbidity and construction-related erosion will be minimized but not eliminated from project-related construction. Effects on OC coho salmon and UWR steelhead from turbidity, work site isolation, and fish handling related to culvert replacement and bridge installation necessary for access road construction would be **short term** and considered a **moderate** impact. The project BMPs and mitigation measures, along with the terms and conditions expected to be required by NMFS, would reduce adverse effects on the species.

Essential Fish Habitat

Under the Proposed Action, the majority of new access roads and existing roadway improvements would not occur in EFH, except for the five crossings listed in Table 3.4-2. These streams are also EFH streams. Similar to effects on OC coho salmon and UWR steelhead, there would be **short-term, moderate impacts** on EFH and the Pacific salmon fishery.

Staging and Tensioning Areas

General Fish Species

Keeler Substation would serve as one staging area for the project; up to two additional temporary staging areas may be utilized during project construction. Temporary material and equipment staging and tensioning areas would be located above the ordinary high water mark (OHWM) of waterways and outside of environmentally sensitive areas. Staging and tensioning areas would occur on previously disturbed areas and have **no** impact on fish.

Federally Listed Fish Species

Under the Proposed Action, staging areas and tensioning sites would occur outside of ESA-listed fish habitat and have **no** impact on federally listed OC coho salmon or UWR steelhead.

Essential Fish Habitat

Under the Proposed Action, staging areas and tensioning sites would occur outside of EFH and have **no** impact on EFH and the Pacific salmon fishery.

Danger Tree Removal

General Fish Species

Appendix A includes a list of potential danger trees, primarily Douglas-fir and red alder, to be removed in the project area. Danger trees outside of the ROW would be allowed to regrow, but would be again be removed if they become danger trees in the future. Danger trees within the ROW would not be allowed to regrow, per BPA’s vegetation management policies. Approximately 1,024 danger trees would be removed near (up to 100 feet from) fish-bearing streams. Because danger trees would be cut and roots would not be disturbed, erosion would be minimal and sediment is not expected to reach streams. Nonetheless, the removal of danger trees along streams could decrease cover and shading along portions of these streams but not likely affect stream temperature. The impact of danger tree removal on fish is considered **moderate**.

Federally Listed Fish Species

Oregon Coast Coho Salmon

Under the Proposed Action, approximately 846 danger trees would be removed near (up to 100 feet from) 25 OC coho salmon-bearing streams. The majority of these danger trees (536 trees) would be removed at two locations near Devil's Lake Fork (Waterway ID 020613A_W1) and Bear Creek (Waterway ID 030713A_W9) on the Forest Grove-Tillamook No. 1 transmission line. Approximately 200 of these danger trees are willows (*Salix* spp.) with a diameter at breast height (dbh) of 1 foot.

The majority of the danger trees to be removed near OC coho habitat are localized and surrounded by mixed conifer forest; the Devil's Lake Fork and Bear Creek are functioning properly for temperature, and the removal of danger trees could result in a loss of shade but would not likely increase stream temperature. Therefore, the impact of danger tree removal on OC coho salmon is considered **moderate**.

UWR Steelhead

Under the Proposed Action, approximately 30 danger trees would be removed near (up to 100 feet from) three UWR steelhead-bearing streams: Dorman Pond (Waterway ID 011013A_W1), an unnamed tributary to McKay Creek (Waterway ID 011613A_W8), and Dairy Creek (Waterway ID 011713A_W8). No danger trees would be removed within 100 feet of UWR steelhead critical habitat. Similar to OC coho, removal of danger trees along streams could decrease cover and shading along portions of these streams but would not likely affect stream temperature. The impact of danger tree removal on UWR steelhead is considered **moderate.**

Essential Fish Habitat

A total of 876 danger trees (including 200 small willows) would be removed within 100 feet of 28 EFH streams. Similar to effects on OC coho salmon and UWR steelhead, the removal of danger trees along streams could decrease cover and shading along portions of these streams but not likely affect stream temperature as other vegetation will remain providing stream cover. Impacts on EFH and the Pacific salmon fishery from danger tree removal are considered **moderate**.

Operation and Maintenance Impacts

General Fish Species

Operation and maintenance activities that could affect fish species include vegetation management (e.g., trimming, limbing in riparian areas), structure repairs, and maintenance of access roads and culverts. Under the Proposed Action, the rebuilt transmission line would likely require less maintenance work, compared with the existing transmission line, due to the newer condition of the facilities and structures once they are installed. Because 47 structures are within 100 feet of fish-bearing streams, operation and maintenance activities associated with emergency repair to the transmission line connected to these structures could include short-term increases in noise or vibrations or the release of sediment into fish-bearing waters that may disturb fish movement and behavior when activities occur adjacent to fish-bearing streams. Impacts on fish from operation and maintenance activities are considered **low**.

Federally Listed Fish Species

As described in Section 3.4.1, *Affected Environment*, the Forest Grove-Tillamook No. 1 transmission line spans several waterways where OC coho salmon are present, including the Wilson River. The Forest Grove-Tillamook No. 1 transmission line and the Keeler-Forest Grove No. 1 transmission line span waterways, including Gales Creek, McKay Creek, and Dairy Creek, where UWR are present. Under the Proposed Action, the rebuilt transmission line would likely require less maintenance work, and maintenance near OC coho salmon and UWR steelhead habitat would be reduced. Release of sediment during maintenance activities is expected to be prevented from reaching this habitat by implementation of BMPs (See Section 3.4.3, *Mitigation – Proposed Action*) but could occur. Impacts on OC coho salmon and UWR steelhead from operation and maintenance activities are expected to be **low**.

Essential Fish Habitat

As described in Section 3.4.1, *Affected Environment*, the Forest Grove-Tillamook No. 1 transmission line and the Keeler-Forest Grove No. 1 transmission line span EFH for the Pacific salmon fishery. Under the Proposed Action, the rebuilt transmission line would likely require less maintenance work, and maintenance near EFH would be reduced. Release of sediment during maintenance activities is expected to be prevented from reaching this habitat by implementation of BMPs (see Section 3.4.3, *Mitigation – Proposed Action)* but could occur. Impacts on EFH from operation and maintenance activities are expected to be **low**.

Steel Pole Replacement

BPA is considering whether to use steel pole structures instead of wood at some locations (see Section 2.1.8, *Steel Pole Replacement*). The use of steel poles would not change the project impacts on fish resources because construction impacts would be similar to those for wood poles. Less maintenance activities may be required at steel pole locations compared to wood because steel poles are more durable, resulting in potentially less disturbance to fish over time.

3.4.3 Mitigation–Proposed Action

The following mitigation measures would be implemented to reduce or eliminate impacts from the Proposed Action on fish and their habitat:

- Design and construct culverts or bridges for access roads in a manner that allows fish passage.
- Prepare and implement Spill Prevention and Response Procedures (SPRP).
- Prepare and implement an SWPPP to prevent stormwater contamination, control sedimentation and erosion, and comply with the requirements of the Clean Water Act (CWA) (33 U.S.C. 1251 *et seq*.) for the construction site operator's activities.
- Install BMPs properly to minimize or eliminate the delivery of sediments from pole replacement activities into nearby streams.
- Conduct all construction activities in fish-bearing streams according to ODFW and NMFS in-water work guidelines or approved in-water work extension for streams identified as having ESA-listed fish species.

- Apply herbicides according to the BPA Transmission System Vegetation Management Program EIS and Record of Decision (DOE/EIS-0285) and label recommendations (see Section 3.6.3, *Mitigation–Proposed Action [Vegetation]*).
- Retain existing low-growing vegetation where possible ((see Section 3.6.3, *Mitigation–Proposed Action [Vegetation]*).
- Maintain erosion controls near water bodies.
- Cease project construction near stream courses under high flow conditions
- Isolate in-stream work areas from surface waters to prevent sediment-laden water from impacting waters outside the work area and to protect fish resources.
- Dewater identified in-water work areas and relocate fish outside of the construction zone before in-water work begins. NMFS and ODFW shall be notified in case of fish kills.
- Screen all pump intakes and operate and maintain according to fish screen criteria (ODFW 2006; NMFS 1995, 1996).
- Remove fish from in-water work area prior to dewatering and release to suitable habitat as near to the capture site as possible.
- Handle all fish with extreme care, keeping fish in the water to the maximum extent possible during seining and transfer.

3.4.4 Unavoidable Impacts after Mitigation–Proposed Action

Unavoidable impacts on fish would be associated with construction-related erosion and potential release of sediment to fish-bearing streams, construction noise and activity, loss of riparian buffer (described in Section 3.6, *Vegetation*), and stress from work site isolation and fish handling. Soil from access roads, cleared areas, structure excavation, stockpiles, or other construction sources might enter streams and increase sediment load, increase sediment deposition, or reduce available food organisms. Fish injury (e.g., gill abrasion, clogging) could occur from construction sediments entering streams. Individual fish could be disturbed from equipment operating near streams. Construction activities in and adjacent to fish-bearing streams (i.e., structure removal/replacement, replacing and tensioning overhead transmission lines) could disturb fish movement and disrupt mobility. Vegetation removal within or adjacent to streams (e.g., for access road construction, culvert placement, or danger tree removal) could degrade adjacent fish habitat from loss of stream shading. Five bridge and culvert replacements associated with access road improvements in fish-bearing streams could impact fish. These road improvements may require in-water work, work site isolation, and fish handling.

3.4.5 Cumulative Impacts–Proposed Action

Biodiversity has been reduced in the Willamette Valley and Coast Range ***ecoregions*** by the loss and fragmentation of sensitive native habitats. Timber harvest, agriculture, recreational and commercial fishing, urbanization, and weed-control activities that expose and disturb the ground surface near streams are responsible for most of the past and ongoing impacts on fish habitat along the ROW. Other reasonably foreseeable future projects in the vicinity of the Proposed Action that could affect fish are listed and described in Appendix B. The Proposed Action would cumulatively impact fish and their habitats through temporary disturbance during construction and the permanent removal of small areas of stream shading by removal of danger trees. The incremental contribution of the Proposed Action to cumulative impacts associated with past, present, and reasonably foreseeable future actions on fish and their habitat is considered **low.**

3.4.6 Environmental Consequences–No Action Alternative

Under the No Action Alternative, the transmission line would not be rebuilt and no construction impacts would occur. Impacts on fish would be similar to the impacts described for ongoing operation and maintenance of the Proposed Action. Operation and maintenance activities that could affect fish species include vegetation management (e.g., trimming, limbing in riparian areas), structure repairs, and maintenance of access roads and culverts. Clearing of riparian vegetation and danger trees adjacent to waterways would be similar to effects under the Proposed Action. Under the No Action Alternative, the transmission line would likely require more maintenance work, compared with a rebuilt transmission line, due to the older deteriorating condition of the facilities and structures. Operation and maintenance impacts could include short-term increases in noise or vibrations, and the release of sediment into fish-bearing waters that may disturb fish movement and behavior. Emergency repairs near ESA-listed OC coho salmon and UWR steelhead and EFH would likely be more frequent when compared with the Proposed Action and could occur outside of the appropriate in-water work window. BPA would work with NMFS to evaluate the urgency of the repairs such as immediate threat to public safety and determine appropriate BMPs on a case-by-case basis. Overall, impacts on fish under the No Action Alternative are expected to be **low** to **moderate**.

3.5 Wildlife

3.5.1 Affected Environment

Several federal statutes protect wildlife, including the ESA, Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d), and Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712). Each of these federal statutes is described in Chapter 4, *Consultation, Review, and Permit Requirements*. This section only addresses wildlife; fish resources are described in Section 3.4, *Fish*.

The affected environment includes wildlife species known to occur in and near the project area or that are likely to occur given the presence of suitable habitat and known distribution. Photographs of representative habitats in the project area are presented in Figure 3.5-1, for context. Information on wildlife habitats was collected from ORBIC data (ORBIC 2012), Dairy Creek watershed analysis (BLM 1999), Gales Creek watershed assessment project (TRWC 1998), Wilson River watershed analysis (ODF 2008), and field investigations. Field investigations included a general reconnaissance-level inventory in March 2013; a wetland delineation (Turnstone 2013a) that began in December 2012 and was completed in June 2013; and a 2-year protocol survey for the marbled murrelet (*Brachyramphus marmoratus*) and northern spotted owl (*Strix occidentalis caurina*), with year 1 completed in 2012 and year 2 completed in 2013 (Turnstone 2012, 2013c). BPA is preparing a biological assessment for the impacts of the Proposed Action on ESA-listed fish and wildlife. The biological assessment includes measures to minimize the impacts of the Proposed Action on ESA-listed species, and these measures are incorporated by reference into this EA (BPA 2013c).

General Wildlife Species

The project area is located in the Willamette Valley and Coast Range ecoregions and includes a variety of wildlife habitat types (EPA 2003). The project area is primarily a managed ROW. Outside of the managed ROW, habitats include mixed conifer forest, managed timberlands, oak woodlands, riparian and wetland communities, and agricultural lands (habitat types are described in Section 3.6, *Vegetation,* wetlands are described in Section 3.8, *Wetlands)*. Wildlife habitats in the area also include mixed low to medium density suburban and rural environments and are described in Section 3.2, *Land Use, Recreation, and Transportation*.

Wildlife habitat within the existing ROW is managed as a shrub and herbaceous community in accordance with BPA's vegetation management program (BPA 2000). Mixed conifer forest is prevalent between the Forest Grove and Tillamook substations (LM 12 to 44 of the Forest Grove-Tillamook No. 1 section), and includes areas where the transmission line crosses the Tillamook State Forest. Mixed conifer forest is also located on small parcels managed by the Oregon Department of State Lands and ODFW, located near LM 26 of the Forest Grove-Tillamook No. 1 transmission line. Tillamook County lands include scattered parcels along the Wilson River between river mile (RM) 8 and RM 15, from LM 35 to 43 of the Forest Grove-Tillamook No. 1 transmission line. Riparian and wetland areas are common throughout the area. Agricultural lands and scattered Oregon white oaks (*Quercus garryana*) are located between the Keeler Substation and the eastern slope of the Coast Range. Oak woodlands have declined and been converted to agriculture or suburban environments (Johnson and O'Neil 2001) between the Keeler Substation and the eastern slope of the Coast Range. Low to medium density suburban environments in the area consist of business park developments in Hillsboro and commercial areas in Forest Grove.

On Jackson School Road, at structure 5/2 (Keeler-Forest Grove No. 1 is on right). Clover cover/seed crop, access road in ROW. Adjacent habitats include remnant oaks and conifers.

At structure 22/4 (Forest Grove-Tillamook No. 1), disturbed grasslands, blackberry, Scotch broom in foreground, transmission line crosses over hazelnut orchards, and vineyards in background.

At structure 23/7 (Forest Grove-Tillamook No. 1), disturbed grasslands in ROW. Adjacent to the ROW 15–20 year-old Douglas-fir.

Structure 44/3 (Forest Grove-Tillamook No. 1) in background. Typical access road and disturbed grasses and forbs in the ROW. Adjacent habitats are 40–50 year-old Douglas-fir forest.

At structure 54/2 (Forest Grove-Tillamook No. 1). Transmission line crosses over the Wilson River. Blackberry thicket under lines. Danger trees on right, small alder trees marked with orange paint.

Structure 55/5 (Forest Grove-Tillamook No. 1) in background. ROW is pasturelands used for cattle grazing. Coast Range in background. Forest hillsides mostly red alder and western hemlock.

Figure 3.5-1. Photos of Representative Habitat Types in the Project Area

Large and medium size mammals that could forage in the ROW include black bear (*Ursus americanus*), black-tailed deer (*Odocoileus hemionus columbianus*), and elk (*Cervus elephus*). Small mammals in the ROW are mainly ground-dwelling species which include deer mice (*Peromyscus maniculatus*). Bats are also documented in the area including the Townsend's big-eared bat (*Corynorhinus townsendii*) (ORBIC 2012). Wildlife associated with the mixed conifer forest frequently move between riparian and wetland habitats. The riparian and wetland areas in the ROW also provide habitat for amphibians; common species include the Pacific treefrog (*Pseudacris regilla*) and rough-skinned newt (*Taricha granulose*). The northern red-legged frog (*Rana aurora*) is documented in the area (ORBIC 2012). Wildlife species in agricultural lands are mostly birds and small mammals that use these areas in conjunction with adjacent habitats. Common birds in the area are described in the *Migratory Birds* section, below.

ODFW maintains a sensitive species list in accordance with OAR 635-100-0040, which is designed to provide a positive, proactive approach to species conservation. State sensitive wildlife species documented in the area include the Townsend's big-eared bat (state critical) and northern red-legged frog (state vulnerable) (ORBIC 2012). Additional information on ***special-status*** wildlife species, including likely occurrence in the area, is provided in Appendix C.

Federally Protected Wildlife Species

County-wide species lists of federally protected wildlife for Washington and Tillamook counties are compiled by the U.S. Fish and Wildlife Service (USFWS 2013a, 2013b). Species listed for these counties include the western snowy (coastal) plover (*Charadrius alexandrinus nivosus*), short-tailed albatross (*Phoebastria albatrus*), sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), and olive (Pacific) Ridley sea turtle (*Lepidochelys olivacea*). These are all coastal, marine, and pelagic species and are not documented in the project area (ORBIC 2012), and no suitable habitat for these species is present; thus, these species are not considered further in this EA. Information on ESA candidate species red tree vole (*Arborimus longicaudus*) and fisher (*Martes pennanti*), which are not likely to occur in the project area, is provided in Appendix C. Additional information is included in the biological assessment BPA is preparing as part of its ESA consultation with USFWS.

ESA-listed wildlife species could potentially occur in the project area are summarized in Table 3.5-1. BPA completed protocol surveys for the marbled murrelet and northern spotted owl in 2012 and 2013 and prepared a biological assessment to address the impacts of the Proposed Action on marbled murrelet and northern spotted owl. Other ESA-listed wildlife species that could potentially occur include: the Oregon silverspot butterfly (*Speyeria zerene hippolyta*), Fender's blue butterfly (*Icaricia icarioides fenderi*), and streaked horned lark (*Eremophila alpestris strigata*). Other ***special-status species*** include wildlife protected under the Bald and Golden Eagle Protection Act.

Table 3.5-1. Federally Protected Wildlife Species in the Project Area

Common Name (*Scientific Name*)	Federal Status	Oregon Status	Potential for Occurrence
Federally Listed and Proposed Species			
Marbled murrelet (*Brachyramphus marmoratus*)	Threatened	LT	Present. Detected during the 2012 and 2013 surveys.
Northern spotted owl (*Strix occidentalis caurina*)	Threatened	LT	Moderate to Low. Suitable habitat is present. Three known historic sites are in the area. No detections during the 2012 and 2013 surveys.
Oregon silverspot butterfly (*Speyeria zerene hippolyta*)	Threatened	None	Low. No salt-spray meadow habitat in the area.
Fender's blue butterfly (*Icaricia icarioides fenderi*)	***Endangered***	None	Low. Native prairie habitat is degraded. No host plant detected during the 2013 rare plant survey.
Streaked horned lark (*Eremophila alperstris strigata*)	Threatened	SC	Low. Suitable habitat is degraded but present in the area. No known records.
Special-Status Species			
Bald eagle (*Haliaeetus leucocephalus*)	Protection under Bald and Golden Eagle Protection Act	LT	Present. Known nest sites in the area.

Sources: USFWS 2013a, 2013b; ORBIC 2012; Turnstone 2013b and 2013c.

LT = listed threatened, SC = ODFW state critical.

Marbled Murrelet

The USFWS originally listed the marbled murrelet as threatened on October 1, 1992 (55 FR 45328). Subsequent 5-year reviews in 2004 (McShane et al. 2004) and 2009 (USFWS 2009) did not change its listing status. The USFWS designated critical habitat for the marbled murrelet on May 24, 1996 (61 FR 26257), and revised it on October 5, 2011 (77 FR 61599). The marbled murrelet spends the majority of its time on the ocean, loafing and feeding, but comes inland up to 50 miles to nest in forest stands with old-growth forest characteristics (McShane et al. 2004). The nesting period is from April 1 to September 15 (Evans Mack et al. 2003). Two historical records of marbled murrelet subcanopy behavior, which indicates occupancy of a forest stand, were observed in 1993 and 1999 within the vicinity of the project area (ORBIC 2012). The ROW crosses over marbled murrelet designated critical habitat between LM 41 and 42 (Forest Grove-Tillamook No. 1 transmission line). Seven structures on the Forest Grove-Tillamook transmission line are located within critical habitat: 41/4, 41/7, 41/8, 41/9, 42/1, 42/2, and 42/3. Suitable habitat for marbled murrelet was identified in the vicinity of the project area using protocols recommended by the USFWS. Surveys for marbled murrelets were conducted in 2012 and 2013, using the Pacific Seabird Group (PSG) survey protocol (Turnstone 2012, 2013c). Murrelets were detected in three suitable habitat areas.

Northern Spotted Owl

The USFWS originally listed the northern spotted owl as threatened on June 26, 1990 (55 FR 26114). Subsequent 5-year reviews in 2004 (SEI 2004) and 2011 (USFWS 2011) did not change its status. The USFWS designated critical habitat for the northern spotted owl on January 18, 1992 (57 FR 1796), and revised it on December 4, 2012 (77 FR 71875). Northern spotted owls live in forests characterized by dense canopy closure of mature and old-growth trees, abundant logs, standing snags, and live trees with broken tops (SEI 2004). The nesting period is from March 1 to September 30 (USFWS 2012). There are three historical records of northern spotted owl nesting sites in the project area (ORBIC 2012). The ROW crosses designated critical habitat for northern spotted owl between LM 20 and 23, and LM 39 to 42 of the Forest Grove-Tillamook No. transmission line. Six structures are located within critical habitat: 39/7, 41/3, 41/4, 41/5, 42/1, and 42/2 of the Forest Grove-Tillamook No. 1 transmission line. Suitable habitat for the northern spotted owl was identified in the area using protocols recommended by the USFWS. Spotted owl surveys were conducted in 2012 and 2013, following the 2-year USFWS survey protocol (USFWS 2012). Northern spotted owls were not detected during the six protocol visits each year (Turnstone2013c).

Oregon Silverspot Butterfly

The USFWS listed the Oregon silverspot butterfly as threatened and designated critical habitat on July 2, 1980 (45 FR 44935). Critical habitat for the Oregon silverspot butterfly is not designated in the area. Central to the life cycle of the Oregon silverspot butterfly is the abundance of the caterpillar host plant, the early blue violet (*Viola adunca*). Field studies have demonstrated that female butterflies select areas with high violet densities for egg-laying (USFWS 2001, Damiani 2011). Plants that provide nectar to adult butterflies include yarrow (*Achillea millefolium*), pearly everlasting (*Anaphalis margaritacea*), Pacific aster (*Aster chilensis*), Canada goldenrod (*Solidago canadensis*), tansy ragwort (*Senecio jacobaeae*), and edible thistle (*Cirsium edule*). Females lay eggs among the salt-spray meadow vegetation near the violet host plant, usually in late August and early September. The larvae emerge sometime in early spring and begin to feed on the violet leaves. Adult emergence starts in July and extends into September (USFWS 2001). No suitable habitat was identified in the area, and BPA has not conducted surveys for Oregon silverspot butterfly.

Fender's Blue Butterfly

The USFWS listed the Fender’s blue butterfly as endangered on January 25, 2000 (65 FR 3875) and designated critical habitat on October 31, 2006 (71 FR 63862). Critical habitat for the Fender’s blue butterfly is not designated in the area. Fender's blue butterfly occurs in native prairie ***upland*** habitats, typically dominated by red fescue (*Festuca rubra*) and/or Idaho fescue (*F. idahoensis*). The butterfly uses three lupine species as larval food plants: Kincaid's lupine (*Lupinus sulphureus kincaidii*), sickle-keeled lupine (*L. albicaulis*), and spur lupine (*L. arbustus*). The life cycle of a Fender's blue butterfly begins in late spring or early summer when an adult female deposits an egg on the underside of a lupine leaflet. The egg soon hatches and the larva feeds on lupine leaflets. The larva drop to the ground in mid-June or July where it goes into hibernation for the fall and winter. In the following March or April, the larva begins to feed on fresh lupine leaflets again and emerges as a butterfly in May, and the cycle begins again (USFWS 2006). Surveys for Fender’s blue butterfly host and nectar plants completed in May and June of 2013 identified potential habitat for this species in the area, based on the presence of prairie remnants and nectar species (Turnstone

2013b). A total of seven areas were identified as potential Fender's blue butterfly habitat, although no larval host plants were encountered. The species may occupy habitat within 1.2 miles of lupine patches (USFWS 2006). Potential habitat areas predominantly occur in the eastern reach of the transmission line corridor, and are associated with relatively undisturbed woodland corridors adjacent to the ROW. In the Coast Range, potential habitat is associated with wetlands.

Streaked Horned Lark

The USFWS added the streaked horned lark to the candidate list on October 30, 2001 (66 FR 54808). On October 11, 2012, the USFWS announced a proposal to list the streaked horned lark under the ESA (77 FR 61937) and on October 3, 2013, the USFWS listed the streaked horned lark as threatened (78 FR 61452). The streaked horned lark is endemic to the Pacific Northwest and is a subspecies of the wide-ranging horned lark. Horned larks are birds of wide open spaces where there are no trees and few or no shrubs. The streaked horned lark nests on the ground in sparsely vegetated sites dominated by grasses and forbs. The streaked horned lark nests in a broad range of habitats, including native prairies, coastal dunes, fallow and active agricultural fields, wetland mudflats, sparsely vegetated edges of grass fields, recently planted Christmas tree farms with extensive bare ground, moderately to heavily grazed pastures, gravel roads or gravel shoulders of lightly traveled roads, airports, and dredge deposition sites in the lower Columbia River. Nesting begins in late March and continues into late July. The nest consists of a shallow depression built in the open or near a grass clump and lined with fine dead grasses. Incubation is only 11 days, and the young are able to fly within 9 to 12 days after hatching. There are no records of the streaked horned lark in the area. However, the subspecies is known to breed in the Willamette Valley, and often shifts its breeding sites as suitable habitat becomes available (USFWS 2012). Potential breeding habitat within the area includes agricultural fields, sparsely vegetated edges of grass fields, recently planted Christmas tree farms, moderately to heavily grazed pastures, and gravel roads and shoulders along the Keeler-Forest Grove No. 1 transmission line.

Bald and Golden Eagles

Administered by the USFWS, the Bald and Golden Eagle Protection Act provides for the protection of the bald eagle (*Haliaeetus leucocephalus*) and the golden eagle (*Aquila chrysaetos*) by prohibiting, except by permit, the taking, possession, and commerce of such birds. Golden eagles are not likely to occur in the area as preferred golden eagle habitat, including large open hunting areas with cliffs and rock outcrops, is not present; these areas are more typical habitats in eastern Oregon (Isaacs 2011), and there are no documented occurrences within 2 miles (ORBIC 2012) of the project area. Records indicate that three bald eagle nest sites occur in the project area along the Wilson River and Gales Creek, with the closest documented nest approximately 0.5 mile from the project area (ORBIC 2012).

Migratory Birds

The MBTA prohibits persons, unless by permit, "to pursue, take, or kill…any migratory bird, or any part, nest or egg of any such bird." Direct and indirect acts are prohibited under this definition, although harassment and habitat modification are not included unless they result in the direct loss of birds, nests, or eggs. The MBTA protects all native species of birds (over 800 species in North America) not including upland game birds. The current bird checklists for Washington and Tillamook counties include over 250 species of birds (East Cascades Audubon Society 2013).

Common bird species in the urban and suburban environments include: American crow (*Corvus brachyrhynchos*), American robin (*Turdus migratorius*), song sparrow (*Melospiza melodia*), and dark-eyed junco (*Junco hyemalis*). Waterways in the area provide habitat for native waterfowl including mallard (*Anas platyrhynchos*) and common merganser (*Mergus merganser*). Riparian forests adjacent to emergent wetlands and agricultural pasture provide foraging opportunities for raptors and songbirds. Common birds in the mixed conifer forests include northern flicker (*Colaptes auratus*), red-breasted nuthatch (*Sitta canadensis*), and Pacific wren (*Troglodytes pacificus*).

Migratory birds nest not only on tree branches and in tree and snag cavities, but also among shrubs and downed vegetation, on open ground, and on cliffs. Many nests, if not most, are well camouflaged or otherwise almost undetectable. While adult birds can usually escape construction activities, their eggs and chicks are unable to move. Incidental bird observations were collected during the general reconnaissance-level inventory in March 2013, at which time species presence was evaluated based on habitat association.

3.5.2 Environmental Consequences–Proposed Action

Construction Impacts

Structure Removal and Replacement

General Wildlife Species

Under the Proposed Action, structure removal and replacement would impact approximately 68.3 acres in total, on managed ROW vegetation and associated wildlife habitat in the immediate vicinity of each structure and could result in incidental wildlife mortality in the managed ROW. Temporary effects on wildlife species associated with structure removal and replacement include construction-related noise disturbance and disruption of movement.

Effects of the Proposed Action on wildlife include temporary disruption of wildlife, such as deer and elk that travel along or cross the ROW during construction, and potential incidental mortality of some amphibians and small mammals during construction.

Bear, elk, and deer are all most active at night, or during the early morning or late evening hours. However, some individual animals may be active during the day at certain times of the year. Elk and deer generally have established daily travel routes to specific water sources (or access points), which they visit early in the morning and again late in the evening. Although the majority of construction activities would take place during daylight hours when these species are less active, some wildlife traveling along or crossing the ROW would be disrupted along segments where construction activities are taking place, as wildlife are likely to avoid the immediate area and use alternative routes. In the long term, wildlife would continue to use the surrounding area for breeding, foraging, and dispersal. Structure removal and replacement would potentially result in **low to moderate** impacts on wildlife.

Federally Protected Wildlife Species

Construction impacts have the potential to affect federally protected species. Preliminary effects for ESA listed, proposed, and candidate wildlife species are summarized in the EA, and the Final EA will include results from consultation with the USFWS on marbled murrelet, northern spotted owl, Oregon silverspot butterfly, and Fender's blue butterfly surveys. This information will also be part of the biological assessment

BPA provides to USFWS. Additional measures to minimize impacts on ESA-listed species may be developed during the ESA consultation process with the USFWS and would be implemented as part of the Proposed Action.

Marbled Murrelet: Seven structures are planned for removal and replacement within marbled murrelet critical habitat. These structures, although in critical habitat, are located in areas that do not provide nesting habitat and are in the existing managed ROW. Construction-related disturbance consists of human presence and increased noise from the use of heavy equipment to remove and install pole structures within 0.25 mile of suitable habitat. Additionally, the habitat along the Wilson River valley serves as a flight corridor for marbled murrelet movement between nesting and foraging areas. Marbled murrelets potentially nesting in the vicinity of the project, or that fly through the Wilson River flight corridor, may experience temporary elevated levels of disturbance. Within 0.25 mile of sites occupied by marbled murrelets, BPA would follow daily dawn/dusk timing restrictions during the entire marbled murrelet breeding period (April 1 to September 15), as required by the USFWS. These restrictions would limit the use of heavy equipment to the period from 2 hours after sunrise to 2 hours before sunset, when marbled murrelets are less vulnerable to disturbance. Additionally, pole removal and replacement activities would not occur within 100 yards of occupied habitat during the critical breeding period (April 1 to August 5). To the extent feasible, work would not be conducted near suitable habitat during the critical breeding period. All construction noise would be episodic and temporary. Further evaluation of structure removal and replacement on marbled murrelet critical and suitable habitat was evaluated as part of BPA's ESA consultation with the USFWS. With timing restrictions in place, impacts on marbled murrelets from structure removal and replacement would likely be **low**.

Northern Spotted Owl: Six structures are planned for removal and replacement within spotted owl critical habitat. However, there are no suitable spotted owl nest trees in the managed ROW. Forest stands adjacent to the ROW do provide dispersal and foraging habitat, but the surrounding area lacks intact stands of large diameter conifers. Removal and replacement of structures would result in temporary increases in sound and human activity. Northern spotted owls that forage or nest in the vicinity of the Proposed Action may experience temporarily elevated levels of disturbance. However, increases in sound and human activity would be of short duration.

No structure work would occur within 35 yards of documented owl home ranges during the critical nesting period (March 1 to July 7). Most replacement structures would be 5 to 15 feet taller than existing structures, but some replacement structures would be up to 30 feet taller than existing structures. The increased structure height could increase the risk of northern spotted owls colliding with structures, especially for resident northern spotted owl who are accustomed to existing structure heights.

Further evaluation of structure removal and replacement on spotted owl critical and suitable habitat was evaluated during ESA consultation with the USFWS. Impacts on northern spotted owls from structure removal and replacement would likely be **low**.

Oregon Silverspot Butterfly: No suitable habitat was identified in the area. BPA is consulting with the USFWS to avoid impacts on the Oregon silverspot butterfly, and **no** impacts are expected.

Fender's Blue Butterfly: Based on the surveys for Fender's blue butterfly habitat, potential habitat for the species occurs in the area, although larval host plants were not observed. Therefore Fender's blue butterflies are unlikely to be affected by structure removal and replacement. As part of the ESA consultation process, if any necessary measures to avoid or minimize impacts on habitat are identified, these measures will be implemented as part of the Proposed Action; thus, impacts are expected to be **low**.

Streaked Horned Lark: Potential habitat for the streaked horned lark is present along the Keeler-Forest Grove No. 1 transmission line, although there are no known records of this species in the project area. Under the Proposed Action, structure removal and replacement may disturb streaked horned lark habitat. Because the streaked horned lark is a ground-nesting bird, pre-construction nest surveys within potential habitat and vegetation clearing outside of the nesting period would occur. Additional measures to minimize impacts on streaked horned larks may be developed during the ESA consultation process with the USFWS and would be implemented as part of the Proposed Action. Provided that no nests are present and nests/breeding birds are avoided, impacts on the streaked horned lark from structure removal and replacement would be **low**.

Bald Eagle: All known nest sites are beyond 0.5 mile of any construction area; thus, disturbance to nesting bald eagles is not expected because of the distance to these nests and the presence of vegetative screening between the construction sites and the nests. Under the Proposed Action, construction activities could displace foraging eagles. This impact would be temporary and considered **low**.

Migratory Birds: Migratory birds may move away from the corridor during structure construction. However, suitable habitats in the area are connected to and contiguous with similar habitats that extend beyond the construction areas; these species would temporarily relocate to these nearby areas during construction. Tree removal, modification of vegetation, and short-term habitat disturbance would have short- and moderate term adverse effects on wildlife. With the implementation of mitigation measures (See Section 3.5.3, *Mitigation – Proposed Action*), impacts on migratory birds are considered **moderate**.

Access Roads

General Wildlife Species

New access road construction, approximately 1.13 miles (2.8 acres), would require the removal of existing herbaceous vegetation within the managed ROW (2.5 acres), agricultural land (0.2 acre), and a small portion of forested areas (<0.01 acre). Access road reconstruction/improvement, approximately 18.9 miles (41.6 acres), would affect existing low quality vegetation (e.g., nonnative grasslands) that has grown up in or along the edges of existing road beds. Impacts on vegetation would include limbing or mowing to maintain a 20-foot wide travel way for equipment. Temporary impacts (i.e., road reconstruction/improvement and temporary access routes) would impact the following wildlife habitats: managed ROW (80.2 acres), mixed conifer forest (74.3 acres), agricultural lands (22.2 acres), wetland/riparian (12.8 acres), and oak woodlands (1.0 acre).

Effects on wildlife species from the removal of wildlife habitat associated with new and improvement of existing access road construction include noise disturbance, disruption of movement, and incidental wildlife mortality. Noise associated with construction activities would be limited in duration. During construction, the Proposed Action would result in temporary disturbance to wildlife and disruption of wildlife travel. In addition, there is potential for incidental mortality of some wildlife with limited mobility, such as amphibians and small mammals. Roads also fragment wildlife habitat. Wildlife communities depend on mobility across the landscape from place to place for foraging, breeding, and for rearing young (Beier and Loe 1992, Trombulak and Frissell 2000). The spread of noxious and invasive plant species during construction of new and improvement of existing access roads could have a long-term effect on wildlife habitat quality through degradation and fragmentation (Westbrooks 1998).

Impacts on wildlife from access road construction and improvement would be **low**.

Federally Protected Wildlife Species

Construction of new access roads and improvement of existing roads have the potential to affect federally protected species. Preliminary effects for ESA listed, proposed, and candidate wildlife species are summarized in the EA, and the Final EA will include results from consultation with the USFWS on marbled murrelet, northern spotted owl, Oregon silverspot butterfly, and Fender's blue butterfly surveys. This information will also be included in the biological assessment BPA provides to USFWS. Additional measures to minimize impacts on ESA-listed species may be developed during the ESA consultation process with the USFWS and would be implemented as part of the Proposed Action.

Marbled Murrelet: No new access roads would be constructed in marbled murrelet critical habitat. However, access road work would occur within 0.25 mile of suitable marbled murrelet habitat so noise associated with this work may disturb nesting murrelets if present. Additionally, marbled murrelets flying between nesting and foraging areas could be disturbed. Increases in sound and human activity would be temporary and episodic. Road construction and improvement work would be subject to the same timing restrictions as pole removal and replacement, which would limit disturbances within 0.25 mile of occupied habitat during the breeding season to daylight hours, when marbled murrelets are less vulnerable to disturbance. In addition, work would not be conducted within 100 yards of occupied habitat, and would be avoided near suitable habitat during the critical breeding period. On well-traveled roads, road brushing and maintenance would not pose a risk to nesting marbled murrelets because murrelets typically show little reaction to vehicle traffic in state parks and along logging roads, where nests were located approximately 230 feet from the road (McShane et al. 2004). This work would not be subject to timing restrictions. Generally, murrelets have appeared to respond to human disturbance only when confronted at or very near a nest (Long and Ralph 1998). Impacts on marbled murrelets from access roads would likely be **low**.

Northern Spotted Owl: There are no new access roads within spotted owl critical habitat. However, construction of access roads would result in temporary increases in sound and human activity. Access road work within 0.25 mile of documented sites and estimated owl home ranges includes road reconstruction with roadside brushing, and possible gate replacement or installation. A minimal amount of access road work (approximately 0.4 mile) would occur within 0.25 mile of documented sites and estimated owl home ranges during the spotted owl nesting period. Northern spotted owls would be potentially disturbed, but noise and activity impacts during construction would also be temporary and sporadic, typically not lasting for more than 5 consecutive days. Impacts on northern spotted owls from access road construction would likely be **low**.

Oregon Silverspot Butterfly: No suitable habitat was identified in the area. BPA is consulting with the USFWS to avoid impacts on the Oregon silverspot butterfly; however, **no** impacts are expected.

Fender's Blue Butterfly: Based on the surveys for Fender's blue butterfly habitat, potential habitat for the species occurs in the project area, although larval host plants were not observed. Therefore, Fender's blue butterflies are unlikely to be affected by access road construction and upgrade. During the ESA consultation process, if any necessary measures to avoid or minimize impacts on habitat are identified, these measures will be implemented as part of the Proposed Action; thus, impacts are expected to be **low**.

Streaked Horned Lark: Potential habitat for the streaked horned lark is present along the Keeler-Forest Grove No. 1 transmission line, although there are no known records of this species in the project area. Under the Proposed Action, access road construction may disturb streaked horned lark habitat. Because the streaked horned lark is a ground-nesting bird, pre-construction nest surveys within potential habitat and vegetation clearing outside of the nesting period would occur. Additional measures to minimize impacts on streaked horned larks may be developed during the ESA consultation process with the USFWS and would be implemented as part of the Proposed Action. Provided that no nests are present and nests/breeding birds are avoided, impacts on the streaked horned lark from construction and improvement of access roads are considered **low**.

Bald Eagle: All known nest sites are beyond 0.5 mile of any road construction area so disturbance to nesting bald eagles is not expected because of the distance to these nests and the presence of vegetative screening between the road construction sites and the nests. Under the Proposed Action, construction activities could displace foraging eagles. This impact would be temporary and considered **low**.

Migratory Birds: Migratory birds may move away from the corridor during construction of new and improvement to existing access roads. However, these habitats in the area are connected to and contiguous with similar habitats that extend beyond the construction areas; many species would temporarily relocate to these nearby areas during construction. Tree removal, modification of vegetation, and short-term habitat disturbance would have short- and moderate term adverse effects on wildlife. With the implementation of mitigation measures (See Section 3.5.3, *Mitigation – Proposed Action*), impacts on migratory birds are considered **moderate**.

Staging and Tensioning Areas

General Wildlife Species

In general, staging areas would be located in flat areas that have been previously disturbed or developed. Keeler Substation would serve as one staging area for the project; up to two additional temporary staging areas may be utilized during project construction. Effects on wildlife species associated with staging and tensioning areas include noise disturbance, disruption of movement, and incidental wildlife mortality. Noise associated with construction activities would be limited in duration. During construction, the Proposed Action would result in temporary disturbance to wildlife and disruption of wildlife travel. Use of staging and tensioning areas could cause long-term soil compaction and reduced soil productivity from construction equipment that could reduce native species diversity, increase noxious weed species, and reduce wildlife habitat quality and quantity. Effects from staging and tensioning areas on wildlife would be **low**.

Federally Protected Wildlife Species

Because staging areas would be located in flat areas that have been previously disturbed or developed in low quality wildlife habitat areas, effects on federally protected wildlife species would be unlikely and limited to noise disturbance and disruption of movement. Effects from staging areas and tensioning sites on federally protected wildlife species would be **low**.

Danger Tree Removal

General Wildlife Species

Danger tree removal would directly impact wildlife and wildlife habitat through the removal of trees and tall shrubs. An estimated 2,666 trees, averaging between 50 and 100 feet from the centerline of the transmission line ROW, would need to be removed as part of the Proposed Action. Danger trees outside of the ROW would be allowed to regrow, but could be removed if they become danger trees in the future. Danger trees inside the ROW would be permanently removed as required by BPA's vegetation management policies. Appendix A, *Danger Tree Data,* includes a list of potential danger trees, primarily Douglas-fir and red alder, to be removed as part of the Proposed Action. Most danger trees are in areas that are currently managed for timber; however, there would be a reduction in habitat availability from tree removal. Some danger trees that would be removed are located in riparian areas. Wildlife, especially nesting birds, could be temporarily displaced by the removal of danger trees. Danger tree removal would not be conducted until after August 15 to minimize displacement of nesting birds. Because most of the project area is forested, it is unlikely that nesting habitat would be limited by the availability of suitable trees for use as roosts, perches, nests, or foraging locations. Thus, the impacts of danger tree removal on wildlife species would be **moderate**.

Federally Protected Wildlife Species

Danger tree removal has the potential to affect federally protected species. Preliminary effects for ESA listed, proposed, and candidate wildlife species are summarized in the EA and the final EA would include results from consultation with the USFWS on marbled murrelet, northern spotted owl, Oregon silverspot butterfly, and Fender's blue butterfly. This information will also be part of the biological assessment BPA provides to USFWS. Additional measures to minimize impacts on ESA-listed species may be developed during the ESA consultation process with the USFWS and would be implemented as part of the Proposed Action.

Marbled Murrelet: Danger tree removal would not occur within marbled murrelet critical habitat, but would occur in both occupied and unoccupied suitable nesting habitat. Any modification to standing forest structure and downed woody material that contribute the development of suitable habitat could indirectly affect the marbled murrelet. No occupied nesting trees would be removed, but danger trees would be removed from ***recruitment habitat*** and ***capable habitat***, which may provide nesting habitat for the species in the future (Turnstone 2013c). A total of 21 danger trees were identified in marbled murrelet recruitment habitat and capable habitat. Eleven of these trees would be felled, but alternative actions have been identified for the remaining danger trees to preserve habitat components, including side limbing, girdling, and topping. The impact on marbled murrelets from modifying suitable habitat through the removal and modification of danger trees would be **moderate**.

Northern Spotted Owl: Danger tree removal may occur within suitable northern spotted owl habitat and may affect foraging and dispersal. Seven conifer trees would be removed within suitable habitat for northern spotted owl (Turnstone 2013c). Trees range in size from 18 to 24 inch dbh and are Douglas-fir and hemlock (*Tsuga heterophylla*). Canopy cover within suitable habitat would remain above 60 percent, and no nest trees would be removed. Further evaluation of tree removal on spotted owl critical habitat will be evaluated during ESA consultation with the USFWS. The impacts of danger tree removal on spotted owls would be **moderate**.

Oregon Silverspot Butterfly: Oregon silverspot butterfly habitat is associated with salt-spray meadows; danger tree removal would not occur in this habitat. BPA is consulting with the USFWS to avoid impacts on the Oregon silverspot butterfly; however, **no** impacts from danger tree removal would occur since danger tree removal would occur outside suitable habitat for the Oregon silverspot butterfly.

Fender's Blue Butterfly: Fender's blue butterfly is associated with upland prairie, wetland prairie, and oak savanna habitat with an absence of dense canopy vegetation. Danger tree removal would not occur in this habitat. As described previously, oak woodlands in the area are small tree stands and degraded as a result of adjacent agricultural, residential, and commercial developments and are not suitable habitat for Fender's blue butterfly. BPA is consulting with the USFWS to avoid and minimize impacts on the Fender's blue butterfly. BPA will re-evaluate impacts and identify any necessary mitigation, but it is likely that **no** impacts from danger tree removal would occur because danger tree removal would occur outside the species' habitat.

Streaked Horned Lark: Because the streaked horned lark is a ground-nesting bird of sparsely vegetated habitats in flat, treeless landscapes, removal of danger trees is unlikely to affect nesting habitat. However, pre-construction nest surveys and vegetation clearing outside of the nesting period in potential habitats would be implemented as part of the Proposed Action. **No** impact on the streaked horned lark from danger tree removal is expected.

Bald Eagle: All known nest sites are beyond 0.5 mile of danger tree removal; disturbance to nesting bald eagles is not expected because of the distance to these nests and the presence of vegetative screening between the danger tree removal and the nests. Under the Proposed Action, danger tree removal could displace foraging eagles. This impact would be short-term and considered **low**.

Migratory Birds: Removal of 2,666 trees, modification of vegetation, and short-term habitat disturbance would have short-term adverse effects on migratory birds. Removal and cutting of vegetation could result in the destruction or removal of active nests; injury or mortality to nesting birds, eggs, or young; or disturbance that interferes with breeding success. These impacts would be avoided or minimized by timing danger tree removals so that they are outside the migratory bird breeding period. With the implementation of appropriate mitigation measures (see Section 3.5.3, *Mitigation – Proposed Action*), impacts on migratory birds and other wildlife are considered **moderate**.

Operation and Maintenance Impacts

Operation and maintenance activities that could affect wildlife species include vegetation management (e.g., trimming, limbing), structure repairs, and maintenance of access roads.

General Wildlife Species

Impacts on wildlife from operation and maintenance of the transmission line are generally related to the temporary disturbance of wildlife caused by maintenance equipment and human presence. Maintenance activities include inspections conducted by people in vehicles or on foot, vegetation clearing, use of herbicides, and other disturbances. In addition, populations of noxious weeds are present in the project area (see Section 3.6, *Vegetation*), and measures to limit the establishment and spread of these species are included in the Proposed Action.

In addition, transmission lines in general pose a risk for bird collision (Meyer 1978, APLIC 2012) and electrocution (APLIC 2006). The existing Keeler to Tillamook transmission lines have been in place since the 1950s, and most birds have likely habituated to the location of the existing structures. Some bird guilds are more prone to collisions with transmission lines, especially the ground wires at the top of the structures (Meyer 1978, James and Haak 1979, Beaulaurier 1981). Migratory waterfowl have the highest incidence of mortality from collision with transmission lines, particularly near wetlands, feeding areas, or open water (Stout and Cornwell 1976). Concern over raptor electrocutions has resulted in the development of avian-safe design guidelines for new transmission lines (APLIC 2012, APLIC and USFWS 2005). Research indicates that most avian electrocutions occur on low-voltage transmission lines (4 to 69 kV) that have a small separation distance between conductors. The Keeler-Tillamook No. 1 transmission line is a 115-kV transmission line with a relatively long separation distance between conductors, and avian electrocutions have not been documented.

Because the Proposed Action is replacing an existing transmission line, the potential long-term threat to resident and migratory birds from collision would not change substantially from existing conditions. Some poles would be replaced with taller poles from 75 feet to 112 feet. While birds do occasionally collide with transmission lines and poles, research indicates that the risk of collision may be largely related to the location of the line relative to bird concentration areas (APLIC and USFWS 2005). Similarly, the potential for impact on birds from electrocution would not change substantially from existing conditions because of the use of avian-safe designs. The risk for bird collisions and electrocution is considered **low**. Overall, operation and maintenance impacts on wildlife are considered **low**.

Federally Protected Wildlife Species

Under the Proposed Action, operation and maintenance effects on federally listed, proposed, candidate, and special-status wildlife species would be similar to general wildlife. The rebuilt transmission line would likely require less maintenance work and include mitigation measures to minimize the spread of noxious weeds and encourage native habitat development, and the risk for collision and electrocution would be **low** because of the use of avian-safe designs, such as adequate clearances to accommodate a large bird between energized and/or grounded parts (APLIC and USFWS 2005). Because of these factors, the operation and maintenance impacts on federally listed, proposed, candidate, and special-status wildlife species are considered ***low,*** with less impact than the current transmission line.

Steel Pole Replacement

BPA is considering whether to use steel pole structures instead of wood at some locations (see Section 2.1, *Proposed Action*). The use of steel poles would not change the project impacts on wildlife construction impacts would be similar to wood poles. Fewer maintenance activities may be required at steel pole locations because of their increased durability compared to wood, resulting in potentially less disturbance to wildlife over time.

3.5.3 Mitigation–Proposed Action

The following mitigation measures would be implemented to reduce or eliminate impacts from the Proposed Action on wildlife and their habitat:

- Complete consultation with USFWS prior to construction to ensure that appropriate mitigation measures are implemented to protect listed species that potentially occur in the ROW.
- Daily restrictions should occur within the northern spotted owl critical habitat during the critical and late nesting periods from March 1 to September 30, where construction activities would not begin until 2 hours after sunrise and would end 2 hours before sunset.
- Daily restrictions should occur within marbled murrelet critical habitat and in occupied stands during the breeding period from April 1 to September 15, where activities would not begin until 2 hours after sunrise and would end 2 hours before sunset.
- Seasonal restrictions include avoiding road maintenance on less-traveled roads, the use of chainsaws or heavy equipment, and other activities that may disturb nesting northern spotted owls during the critical nesting period from March 1 to July 7, or may disturb nesting marbled murrelets during the critical nesting period from April 1 to August 5. Road maintenance on well-traveled roads is not restricted.
- Conduct site restoration as soon as possible following construction; grade disturbed areas to match surrounding topography; and plant with suitable native vegetation during the appropriate season.
- Identify active raptor nest sites by consulting with ODFW and/or the USFWS and conduct raptor nesting surveys, if required.
- Mark the rebuilt transmission line with bird flight diverters over any major water bodies (such as the Wilson River) that may be a potential flyway for migratory bird species (waterfowl) where appropriate.
- Avoid disruptive construction activities within 330 feet of active bald eagle nests during their critical nesting period (January–June). However, the closest known nest is more than 0.5 mile away from the ROW.
- Conduct pre-construction surveys for nesting streaked horned larks in suitable nesting habitat.
- Schedule danger tree removal between August 15 and March 1 to avoid or minimize impacts on migratory birds.
- Conduct nesting bird pre-construction surveys prior to danger tree removal.
- Leave small portions of cut and felled danger trees in upland and wetland areas as additional habitat/structure for wildlife, particularly small mammals and amphibians, where appropriate.
- Top, trim, or girdle danger trees to create snags where practical (e.g., in higher quality habitat areas) to reduce impacts on wildlife species, such as small mammals, reptiles, and amphibians.
- Minimize and avoid unnecessary ground-disturbance and clearing activities, particularly in sensitive habitats.
- Use maps, flagging, or signs to identify sensitive areas (e.g., wetlands) prior to construction so that construction crews can avoid unintentional impacts on wildlife habitat.
- Retain existing low-growing vegetation where possible, and minimize the use of clearing/grubbing to preserve the roots of low-lying vegetation (see Section 3.6.3, *Mitigation–Proposed Action [Vegetation]*).

- Avoid snag and large tree removal to the extent possible (see Section 3.6.3, *Mitigation–Proposed Action [Vegetation]*).
- Ensure that all equipment has standard sound-control devices (see Section 3.13.3, *Mitigation–Proposed Action [Noise, Public Health, and Safety]*).
- Conduct noise-generating construction activities only during normal daytime hours (i.e., between 7:00 a.m. and 7:00 p.m.) to the extent possible and in accordance with any timing restrictions for ESA-listed wildlife (see Section 3.13.3, *Mitigation–Proposed Action [Noise, Public Health, and Safety]*).
- Initiate discussions with local fire districts and work with the districts and other appropriate entities to develop fire and emergency response plans (see Section 3.13.3, *Mitigation–Proposed Action [Noise, Public Health, and Safety*).

3.5.4 Unavoidable Impacts after Mitigation–Proposed Action

Unavoidable impacts on wildlife and their habitat in the project area would be associated with construction noise and activity, and the temporary and permanent loss of vegetation associated with construction and maintenance work. Implementation of the Proposed Action would affect general wildlife and wildlife habitat. Construction, operation, and maintenance activities for the project could cause wildlife disturbance, displacement, injury, and mortality. Indirect impacts on wildlife would occur from the loss of habitat, habitat fragmentation, and potential for the spread of noxious species.

3.5.5 Cumulative Impacts–Proposed Action

Biodiversity has been reduced in the Willamette Valley and Coast Range ecoregions by the loss and fragmentation of sensitive native habitats, such as old-growth forest and wetland prairie habitats (Johnson and O'Neil 2001). Timber harvest, agriculture, recreational and commercial fishing, urbanization, and weed-control activities that expose and disturb the ground surface near streams are responsible for most of the past and ongoing impacts on wildlife habitat and resources along the ROW. Other reasonably foreseeable future projects in the vicinity of the project area that could affect wildlife are listed and described in Appendix B.

The Proposed Action would cumulatively impact wildlife and their habitats through temporary disturbance during construction and permanent removal of small areas of wildlife habitat. The incremental contribution of the Proposed Action to cumulative impacts associated with past, present, and reasonably foreseeable future actions on wildlife and their habitat is considered **low.**

3.5.6 Environmental Consequences–No Action Alternative

Under the No Action Alternative, impacts on wildlife would mainly result from vegetation clearing and disturbance activities associated with ongoing maintenance, operation, and emergency repairs. Ongoing operation and maintenance would result in **low** to **moderate** impacts on wildlife species. Other maintenance actions, including repairs, could also occur in areas or during times of year where impacts on nesting bird species may occur. Danger trees would be selectively cleared. Danger tree removal areas provide perching, nesting, and foraging opportunities for a variety of bird species. Other maintenance actions, including emergency repairs, could also occur in areas or during times of year where impacts on nesting bird species may occur. For a variety of bird species, impacts would be **moderate** without mitigation measures applied. Routine maintenance and operation activities that have the potential to affect ESA-listed wildlife species would be evaluated separately on a case-by-case basis. Impacts would be avoided or minimized through consultation with the USFWS. Unanticipated damage and subsequent emergency repairs to the transmission line could impact ESA-listed species. BPA would follow the USFWS ESA emergency response process. Overall, impacts on wildlife under the No Action Alternative are expected to be **low to moderate**.

3.6 Vegetation

3.6.1 Affected Environment

To provide appropriate context, and as the existing ROW is subject to routine maintenance and vegetation management, the vegetation area of assessment includes the project area plus a 300-foot buffer. A 300-foot buffer is appropriate to capture the area of potential vegetation impact that may result from the Proposed Action.

The ROW passes through three vegetation zones: the Sitka spruce zone in the west, Western hemlock zone through the Coast Range, and the Willamette Valley zone in the east (Franklin and Dyrness 1988). Many land uses are present, ranging from rural residential to agriculture to managed forest, which have affected the composition of vegetation communities. Development and land use activities tend to modify species composition by removing native species in favor of ornamental or non-native species, such as in commercial or residential areas. In the case of agriculture, vegetation is cultivated as pasture or commodity crops. Managed forests include timber harvest units that range in condition from recently cleared to regenerating, to mature forest.

BPA is preparing a biological assessment for the impacts of the Proposed Action on ESA-listed plant species (BPA 2013b). The biological assessment includes measures to minimize the impacts of the Proposed Action on ESA-listed species, and these measures are incorporated by reference into this EA.

Vegetation Communities

Available vegetation community data were obtained and reviewed from the following sources:

- Oregon Gap Analysis Program (GAP) (Kagan et al. 1999).
- Oregon Ecological Systems Classification (ORNHIC 2010).

Data were then ground-truthed during field surveys conducted in March 2013. Where appropriate, data were edited if field observations did not match existing vegetation classification. Table 3.6-1 displays the vegetation communities present along the ROW.

Vegetation communities vary in terms of condition and quality. Vegetation within the ROW has been affected by prior disturbance and is subject to periodic cutting and maintenance by BPA, prior disturbance, or active management (i.e., timber harvest or agriculture). As a result, vegetation is generally in poor condition and of low quality. Exceptions to this occur in riparian areas, where additional vegetation layers may be present (e.g., shrubs that provide increased diversity and structure). Areas adjacent to the ROW range more dramatically in condition and quality from low to high depending on adjacent land uses. Better condition and quality vegetation is generally found in Tillamook State Forest in stands of native forest that have not been recently harvested. Moderate condition/quality vegetation is present in regenerating stands where shrub species dominate. Low condition/quality habitat tends to be present adjacent to residential and commercial developments.

Table 3.6-1. Existing Vegetation Communities

Vegetation Type	Area (acres) [a]
Vegetated Areas	
Mixed coniferous forest	1,486.7
Managed forest	84.0
Riparian forest and wetland communities	435.0
Oregon white oak woodland	19.8
Agricultural lands	1,351.7
Managed ROW	701.7
Non-Vegetated Areas	
Developed lands	567.9
Water	3.1
Total	**4,650.0**

Source: AECOM geographic information system (GIS).

[a] Acreage is calculated as the project area plus a 300-foot buffer.

Mixed Coniferous Forest

Mixed coniferous forest is abundant between the Keeler and Tillamook substations (Forest Grove-Tillamook LM 12 to 44), and includes areas where the transmission line crosses the Tillamook State Forest. Western hemlock is the dominant species, and other common tree species include Douglas-fir and Sitka spruce (*Picea sitchensis*). The forest understory is variable, including pockets of shrubs and herbaceous cover. Shrub cover can be very dense, consisting of salal (*Gaultheria shallon*), red elderberry (*Sambucus racemosa*), and tree saplings, or lacking where harvest activities have occurred. Common herbaceous species in this community include sword fern (*Polystichum munitum*) and bracken fern (*Pteridium aquilinum*).

Managed Forest

A portion of the mixed coniferous forest is subject to timber harvest. Timber harvests can change one or more factors of the overall vegetation community, such as species composition, age structure, or stand structure depending on the type of harvest method. For this analysis, managed forest refers to portions of the mixed coniferous forest that have been recently harvested according to remotely sensed data (ORNHIC 2010). Tillamook State Forest, managed by ODF, covers approximately 32 percent of the vegetation area of assessment and contains most of the mapped managed forest area. Forest lands are managed under the Northwest Oregon State Forests Management Plan to achieve a balance among resources, including timber production, natural, and recreational (ODF 2010a). The ROW is adjacent to numerous harvest areas between LM 14 and 16 (Forest Grove-Tillamook No. 1 transmission line) that are in various stages of regeneration, from recently cleared to predominantly shrub to early forest. The forest species composition is similar to the mixed coniferous forest described above. Recent timber sales out of the Forest Grove and Tillamook districts have listed Douglas-fir, western hemlock, western redcedar (*Thuja plicata*), Sitka spruce, and red alder as the commonly harvested species (ODF 2013b).

Riparian Forest and Wetland Communities

Riparian and wetland areas are common along and adjacent to the ROW. Typical riparian tree and shrub species include red alder, willows, vine maple (*Acer circinatum*), salmonberry (*Rubus spectabilis*), thimbleberry (*Rubus parviflorus*), and red elderberry. Common herbaceous species in wet areas include skunk cabbage (*Lysichiton americanus*), ladyfern (*Athyrium* spp.), bulrush (*Scirpus* spp.), and slough sedge (*Carex obnupta*). See Section 3.8, *Wetlands,* for more information concerning potential impacts on wetlands and streams.

Oregon White Oak Woodland

Oregon white oak woodlands were observed at several locations between the Keeler Substation and the eastern foothills of the Coast Range. Most oak stands were small and degraded as a result of adjacent agricultural, residential, and commercial developments. Other common species observed with oak include Oregon ash (*Fraxinus latifolia*), red alder, and Douglas-fir.

Agricultural Lands

Agricultural lands are present at both the east and west ends of the ROW. In the west, near Tillamook, agricultural lands are predominantly a mix of upland and wetland pasture grasses used for grazing. In the eastern end of the project, between the Keeler and Forest Grove substations, agricultural lands are a mixture of crops and pasture grasses. In Washington County, typical crops include wheat, grass seed, orchards, and nurseries (USDA 2007a). The primary crops in Tillamook County include forage, Christmas trees, vegetables, and flowers (USDA 2007b).

Managed ROW

Vegetation within the existing ROW has been modified from natural conditions and is managed to provide access to the transmission line and structures. Where the transmission line crosses forested lands, trees have been removed in accordance with BPA's vegetation management program (BPA 2000), resulting in a managed shrub and herbaceous community. Typical vegetation in the managed ROW consists of native and non-native grasses (e.g., *Agrostis* spp.), forbs (e.g., *Trifolium* spp.), ferns (e.g., sword fern, bracken fern), and small shrubs (e.g., salal). In steeper drainages, the transmission line spans forested areas, typically red alder and scattered conifers, where the topography provides sufficient vertical separation of the transmission line and the tops of trees.

Special-Status Plant Species

Special-status plant species have been identified for protection and management under the federal ESA or state laws. Two special-status plant species listed under the ESA are known to occur in Washington and Tillamook counties: Nelson's checker-mallow (*Sidalcea nelsoniana*) and Kincaid's lupine (*Lupinus sulphureus* ssp. *kincaidii*) (USFWS 2013a, 2013b). There is no designated critical habitat for these species along the ROW or within 300 feet of the Proposed Action activities. Several state-listed species potentially occur in the area (ORBIC 2010). Table 3.6-2 lists the special-status plant species with the potential to occur in the area.

Table 3.6-2. Special-Status Plant Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Listing	Habitat
Nelson's checker-mallow	*Sidalcea nelsoniana*	Federal/State Threatened	Inhabits gravelly, wet soils. Once an undisturbed wet prairie species, now it is found primarily where remnant patches of native grassland species still occur, often where prairie merges with deciduous woodland. Moist grassy areas from valley bottomlands to mid-elevation, open meadows in Douglas-fir, hemlock-type forested communities.
Kincaid's lupine	*Lupinus sulphureus* ssp. *kincaidii*	Federal/State Threatened	Grasslands and open woodlands at low elevations in the Willamette and Umpqua valleys.
White rock larkspur	*Delphinium leucophaeum*	State Endangered	Inhabits dry roadside ditches and cliffs, moist rocky slopes, and lowland meadows, dirt at cliff bases, and especially rocky (basaltic) ledges. The plant grows in undisturbed sites, at elevations from 125 to 200 feet.
Coast Range fawn-lily	*Erythronium elegans*	State Threatened	Meadows, rocky cliffs, brushlands, and open coniferous forests. Edges of sphagnum bogs, or open moist coastal meadows.
White-topped aster	*Sericocarpus rigidus*	State Threatened	Occurs in open grasslands (undisturbed and disturbed) at low elevations, from about 150 to 250 feet, in the Willamette Valley ecoregion.
Source: USFWS 2013a, 2013b; ORBIC 2010.			

Surveys for special-status plants were conducted during 2013 (Turnstone 2013b). One federal/state threatened species, Nelson's checker-mallow, was found within the ROW of the Forest Grove-Tillamook segment. Two populations of Nelson's checker-mallow were observed within the ROW. One population was observed between structures 7/4 and 7/5, and the other between structures 17/1 and 17/2.

Noxious Weeds

Noxious weeds are non-native plants that have been designated as undesirable plants by federal and state laws. Weeds displace native species; decrease plant species diversity; degrade habitat for rare species and wildlife; decrease productivity of farms, rangelands, and forests; create unattractive areas dominated by single species; and impair the full use of the landscape by wildlife and humans. The Oregon Weed Board classifies noxious weeds in the following categories (ODA 2012):

- "A" list designated weeds are weeds of known economic importance that occur in the state in small enough infestations to make eradication or containment possible. The recommended action for infestations is eradication or intensive control when and where found.
- "B" list designated weeds are weeds of economic importance that are regionally abundant but may have limited distribution in some counties. Recommended control actions are limited to intensive control at the state, county, or regional level as determined on a site-specific, case-by-case basis.
- "T" list weeds are priority species for prevention and control by the Noxious Weed Control Program because they pose an economic threat to the state of Oregon.

A review of available noxious weed information from the Oregon Department of Agriculture (ODA) (WeedMapper) indicates that several noxious weed species may be present in or adjacent to the project area (ODA 2013; Table 3.6-3). Field surveys conducted in August 2013 documented the presence of some of these noxious weed species, as well as others not identified by WeedMapper (AECOM 2013) (Table 3.6-3).

Table 3.6-3. Occurrence of Potential and Known Noxious Weed Species

Common Name	Scientific Name	Weed Classification	Observation Source
Scotch broom	*Cytisus scoparius*	B	ODA WeedMapper/ 2013 Field Survey
Japanese knotweed	*Polygonum cuspidatum*	B	ODA WeedMapper/ 2013 Field Survey
Giant knotweed	*Polygonum sachalinense*	B	ODA WeedMapper/ 2013 Field Survey
Tansy ragwort	*Senecio jacobea*	B	ODA WeedMapper/ 2013 Field Survey
Himalayan blackberry	*Rubus armeniacus*	B	2013 Field Survey
Canada thistle	*Cirsium arvense*	B	2013 Field Survey
Bull thistle	*Cirsium vulgare*	B	2013 Field Survey
Field bindweed	*Convolvulus arvense*	B	2013 Field Survey
Meadow knapweed	*Centaurea pratensis*	B	2013 Field Survey

3.6.2 Environmental Consequences–Proposed Action

Potential impacts on vegetation would occur from the removal of existing structures and installation of new structures, access road construction and reconstruction/improvement, use of temporary travel routes, danger tree removal, staging areas and tensioning areas, and ongoing operation and maintenance activities. Direct impacts on vegetation would include the removal of or disturbance to vegetation, including crushing vegetation, damage to plant roots from compaction of soils by heavy equipment, and soil disturbance. Indirect impacts could include the introduction and spread of noxious weed species and disturbance to plant communities from erosion and sedimentation.

Structure Removal and Replacement

Structure removal and replacement would impact approximately 68.3 acres in total, on managed ROW vegetation in the immediate vicinity of each structure. To minimize disturbance where approximately 20 structures are located in riparian communities, the disturbance area would be reduced to 50 feet by 50 feet per structure (0.06 acre), if possible. Signage, fences, or flagging would be installed where needed to restrict vehicles and equipment to designated routes outside of sensitive communities.

Potential impacts associated with structure replacement would include clearing and crushing of vegetation, damage to plant roots from compaction of soils by heavy equipment, and soil disturbance. The extent of direct impacts at any particular site would depend on the quality of existing vegetation and soils, as well as site topography. Most structures and associated components would be replaced in their existing locations, which have been previously disturbed and are therefore typically in a lower quality condition. However, 62 replacement structures would be moved from the location of existing structures by more than 5 feet, and 3 new structures would be constructed in areas not previously disturbed. As these structures are still located within the managed ROW vegetation community, the impacts would likely occur in areas with low quality vegetation. Because structure removal and replacement would occur within the managed ROW, and mitigation measures to minimize impacts on riparian communities would be implemented, impacts on vegetation from the Proposed Action are expected to be **low**.

During structure removal and replacement, construction vehicles would drive on access roads and temporary access routes. Because noxious weed species are present in this area, operation of vehicles has the potential to introduce and spread noxious weeds by transporting seeds. Implementation of mitigation measures (See Section 3.6.3, *Mitigation – Proposed Action*), such as washing equipment as it enters or leaves construction sites, would minimize the potential for the introduction and spread of noxious weeds. BPA will also conduct pre- and post-construction noxious weed surveys to identify and manage weed species that may spread from construction. Therefore, the impact of the Proposed Action on the establishment and spread of noxious weeds is expected to be **low**.

Two populations of a rare plant have been located within the project area; however, no plants were located at existing or proposed structure locations (Turnstone 2013b). Therefore, there would likely be **no** impact on rare plants from structure replacement. To minimize disturbance where special-status plants occur near structures, the disturbance area would be reduced to 50 feet by 50 feet per structure (0.06 acre), if possible. Signage, fences, or flagging would be installed where needed to restrict vehicles and equipment to designated routes outside of known populations. Implementation of these measures to avoid known populations would reduce direct construction-related impacts of structure removal and replacement on special-status plants. Impacts from these activities are expected to be **low**.

Access Roads

New road construction, approximately 1.13 miles (2.8 acres), would require the removal of existing herbaceous vegetation within the managed ROW (2.5 acres), agricultural lands (0.2 acre), and mixed coniferous forest communities (<0.1 acre). Because the removal of vegetation associated with new roads is small in comparison to the existing amount of access roads, impacts on vegetation are expected to be **low.**

Temporary impacts on vegetation from road reconstruction/improvement and temporary access routes, approximately 108 miles (248.4 acres), would affect existing low-quality vegetation that has grown up in or along the edges of existing road beds. Impacts on vegetation would include limbing or mowing to maintain a 20-foot wide travel way for equipment. Access roads would temporarily impact vegetation in the managed ROW (80.2 acres), agricultural lands (22.28 acres), mixed coniferous forest (74.3 acres), Oregon white oak (1.0 acre), and wetland/riparian (12.8 acres) vegetation communities. Because the removal of vegetation associated with these activities would occur on previously disturbed constructed roads and the road width would not increase, impacts on vegetation are expected to be **low**.

The majority of vegetation temporarily affected by the reconstruction of access roads would be associated with previously disturbed habitat within the existing ROW and along existing access roads. New access roads that are acquired (46.47 miles) and require improvement may result in temporary impacts on adjacent vegetation communities. Although vegetation in these areas may be of higher quality and less disturbed, the level of impact would be reduced, due to the limited extent of the road width. Implementation of the mitigation measures described in Section 3.6.3, *Mitigation – Proposed Action*, would reduce construction-related impacts on vegetation resulting from access road improvements.

The use of temporary travel routes across fields would crush existing vegetation, damage roots, and compact soils. In most cases, these routes would cross farm fields that would be restored to their existing condition following construction. Impacts on vegetation from temporary travel routes would be **low**.

Two rare plant populations (both of Nelson's checker-mallow) have been located within the ROW. Temporary travels routes between structures may cross existing populations, potentially damaging individual plants. To minimize disturbance to these populations, the population edge would be flagged in the field prior to construction, and temporary travel routes would be moved to avoid travelling through the population. Signage, fences, or flagging would be installed where needed to restrict vehicles and equipment to designated routes outside of known populations. If complete avoidance of the population is not possible by restricting travel routes, temporary transplanting would occur. Temporary transplanting would involve the removal of all plants from the travel way and stockpiling them in a designated area. Plants would be removed in blocks of earth to protect the roots and stored in appropriately sized containers. After equipment completes construction activities and exits the area, the plants would be replaced to the original location. Supplemental watering by hand may be necessary during stockpiling and to facilitate reestablishment after transplanting. Implementation of these measures to avoid or minimize potential impacts on known populations would reduce direct impacts from access roads on special-status plants. Impacts from these activities are expected to be **low**.

Similar to the removal and replacement of structures, construction and reconstruction of access roads have the potential to introduce and spread noxious weed species. The implementation of mitigation designed to minimize the establishment and spread of noxious weeds (see Section 3.6.3, *Mitigation – Proposed Action*) would result in a **low** impact.

Staging and Tensioning Areas

In general, staging and tensioning areas would be located in flat areas that have been previously disturbed or developed. Keeler Substation would serve as one staging area for the project; up to two additional temporary staging areas may be utilized during project construction. Staging and tensioning areas would not be located in known locations of special-status species or sensitive plant communities such as wetlands or riparian areas. Impacts on vegetation from staging and tensioning areas are likely to occur from crushing or soil compaction as a result of equipment operations. Implementation of mitigation measures, including revegetation of temporarily disturbed areas, would reduce the amount of overall disturbance, and washing vehicles would minimize the establishment and spread of noxious weeds (see Section 3.6.3, *Mitigation – Proposed Action*). Impacts on vegetation from staging and tensioning areas are expected to be **low**.

Danger Tree Removal

Danger tree removal would constitute a direct impact on vegetation through the removal of trees and tall shrubs. An estimated 2,666 trees, averaging between 50 and 100 feet from the centerline of the transmission line ROW, would need to be removed as part of the Proposed Action. Trees proposed for removal range in diameter from under 8 inches to more than 20 inches dbh. Appendix A includes a list of potential danger trees, primarily Douglas-fir and red alder, to be removed as part of the Proposed Action. The amount of tree removal is higher than typical because of the presence of a root pathogen in the forest stands of the Tillamook State Forest. In some instances, diseased trees that may not currently be classified as danger trees are being removed in conjunction with designated danger trees to minimize future damage to the line as diseased trees eventually die and could fall on the line. Additionally, trees within 50 feet of a diseased tree are removed to reduce the spread of the root pathogen, and thus increase forest health, and safety of transmission facilities. Trees removed outside the ROW would be allowed to regrow but would not be allowed to become danger trees in the future. Trees removed within the ROW would not be allowed to regrow, per BPA's vegetation management policies. Because of the magnitude of tree removal, implementation of the Proposed Action would have a **low to moderate** impact on vegetation adjacent to the ROW.

Removing groups of danger trees outside the ROW could open up adjacent forested areas to increased light, making these areas more vulnerable to invasion by weed species, many of which require higher light levels to grow. Native understory plants that grow in shaded areas would not thrive in these forest openings. If danger trees removed comprise the outer trees in a larger group, the inner trees could become more exposed to wind and susceptible to falling over. Existing understory vegetation (typically saplings of the trees removed, shrubs, and herbaceous species) would, however, be expected to grow quickly in any forest openings created by danger tree removal. As a result, potential impacts on vegetation would be **low to moderate**.

Operation and Maintenance

Operation and maintenance activities would be similar to existing activities. Vegetation maintenance would be conducted under BPA's Transmission System Vegetation Management Program Final EIS and Record of Decision, which evaluates a variety of methods to keep plants from interfering with transmission lines and control noxious weeds (BPA 2000). BPA uses a variety of vegetation maintenance methods, including manual, mechanical, chemical, and biological actions, to keep plants from interfering with the transmission lines and access roads. Typical operation and maintenance activities include periodic trimming, cutting, or clearing of vegetation to allow access to the transmission line and to prevent vegetation from growing too close to conductors. Most vegetation management activities (e.g., trimming, limbing, or brushing) are non-ground-disturbing and would not affect root systems or herbaceous vegetation. In general, operation and maintenance activities would have a **low** impact on vegetation because they would be confined to small, localized areas dispersed along the length of the transmission line corridor.

Steel Structure Replacement

BPA is considering using steel pole structures instead of wood at some locations (see Section 2.1, *Proposed Action*). The use of steel poles would have similar effects on vegetation as the use of wood poles. Compared to wood structures, a higher level of compaction may be necessary around the base of a steel pole for stability. However, the disturbance footprint for a steel pole would be similar to that of the wood poles. Additional vegetation removal, including danger trees, for installation of steel poles is not required.

3.6.3 Mitigation–Proposed Action

The following mitigation measures would be implemented to reduce or eliminate impacts on vegetation from the Proposed Action:

- Locate staging areas in previously disturbed or graveled areas to minimize soil and vegetation disturbance, where practicable.
- Wash equipment and vehicles before entering construction areas.
- Restrict construction activities to the area needed to work effectively to limit the disturbance of native plant communities and to prevent the expansion of noxious weed species.
- Minimize chip, sawdust, or brush accumulation in the ROW, and haul these materials out, if possible.

- Limit the disturbance area to 50 feet by 50 feet when work is required in riparian zones where practicable.
- Use appropriate seed mixes, application rates, methods, and timing to revegetate disturbed areas following the completion of construction activities.
- If special-status plant species are identified during follow-up surveys, develop appropriate avoidance measures to the extent possible. If avoidance is not possible, temporary transplanting may occur.
- Temporary transplanting of rare plants would involve the removal of all plants from the travel way and stockpiling them in a designated area. Plants would be removed in blocks of earth to protect the roots and stored in appropriately sized containers. After construction activities are complete and equipment has been removed from the area, the plants would be replaced to the original location. Supplemental watering by hand may be necessary during stockpiling and to facilitate reestablishment after transplanting.
- Identify noxious weed populations for construction crews so these populations can be avoided when possible. Cooperate with private, county, state, and federal landowners to reduce the introduction and spread of noxious weeds, including locating vehicle wash or blow stations as appropriate to avoid the spread of noxious weeds.
- Stockpile topsoil excavated during structure and temporary spur road construction and use on-site for contouring and restoration, where possible.
- Use weed-free straw, hydromulch, or similar ground cover for erosion control during construction and restoration activities in areas that cannot be revegetated immediately.
- Apply herbicides according to the BPA Transmission System Vegetation Management Program EIS and Record of Decision (DOE/EIS-0285; BPA 2000) and label recommendations to ensure protection of surface water, ecological integrity, and public health and safety.
- Retain existing low-growing vegetation where possible to prevent sediment movement off site, and minimize the use of clearing/grubbing to preserve the roots of low-lying vegetation.
- Avoid snag and large tree removal to the extent possible.
- Leave erosion and sediment control devices in place until all disturbed sites are revegetated and erosion potential has returned to pre-project conditions.
- Limit ground-disturbing activities to designated work areas (see Section 3.2.3, *Mitigation–Proposed Action [Land Use, Recreation, and Transportation]*).
- Promote native vegetation in the ROW by leaving low-growing species undisturbed within the 100-foot-wide ROW, where it would not interfere with the safe operation of the transmission line.
- Restore compacted cropland soils as close as possible to pre-construction conditions using tillage and stockpiling topsoil separately during excavation. Where select backfill is used around tower poles, cover in native topsoil to the extent possible (see Section 3.3.3, *Mitigation–Proposed Action [Geology and Soils]*).
- Design temporary and permanent access roads to control runoff and prevent erosion by using low grades, drain dips, water bars, etc., or a combination of these methods (see Section 3.3.3, *Mitigation–Proposed Action [Geology and Soils]*).

- Minimize the project ground disturbance footprint; particularly in sensitive areas (see Section 3.7.3, *Mitigation–Proposed Action [Waterways, Water Quality, and Floodplains*).
- Consult with the appropriate federal or state land management agency (e.g., ODF) concerning any special-status species (see Section 3.5.3, *Mitigation–Proposed Action [Wildlife]*).
- Initiate discussions with local fire districts and work with the districts and other appropriate entities to develop fire and emergency response plans (see Section 3.13.3, *Mitigation–Proposed Action [Noise, Public Health, and Safety]*).

3.6.4 Unavoidable Impacts after Mitigation–Proposed Action

The Proposed Action could result in the loss of mature native plants, habitat complexity, and species diversity. Replacement of structures would primarily occur within the managed ROW community on previously disturbed ground. Where new structures are proposed, or structures are moved up or down line, new unavoidable impacts on vegetation could result from construction-related activities. Similarly, construction of the new access roads would result in the unavoidable loss of vegetation within the road width. Potential impacts would be reduced through implementation of the mitigation measures identified in Section 3.6.3, *Mitigation–Proposed Action*. Due to the prolific nature of noxious weeds and the difficulty of controlling them, their unintentional spread into some areas that are not currently infested may occur.

3.6.5 Cumulative Impacts–Proposed Action

The principal ongoing and future activities that can be reasonably assumed to cumulatively affect vegetation are agriculture, residential and commercial development, and timber harvest practices. Agricultural activities continually disturb vegetation during the planting and harvest cycle. Timber harvest is planned in the Tillamook State Forest. Forest management plans do limit timber production; however, vegetation disturbance would follow long-term cycles from clearing to regeneration. Other reasonably foreseeable future projects in the vicinity of the Proposed Action that could affect vegetation are listed and described in Appendix B.

Cumulative impacts on vegetation in conjunction with the Proposed Action could contribute to a loss of forested vegetation adjacent to the transmission line. ODF timber harvests adjacent to the ROW would remove vegetation within specific project footprints. However, vegetation would be replaced over the long term as shrubs and trees re-colonize the harvest unit. Similarly, expansion of the Intel campus in Hillsboro could result in the removal of vegetation. Improvement of the access roads associated with the Boyer-Tillamook transmission line and relocating the Tillamook PUD underbuild could also impact vegetation during construction activities. Since the Proposed Action is within existing ROW, large-scale vegetation clearing is not anticipated, but long-term impacts on vegetation would result from areas of danger tree removal. Trees removed outside the ROW would be allowed to regenerate, which would replace forested vegetation over time (trees could be removed if they become danger trees in the future). However, trees removed within the ROW would not be allowed to regenerate. Therefore, cumulative impacts on vegetation are expected to be **low to moderate**.

3.6.6 Environmental Consequences–No Action Alternative

Under the No Action Alternative, the existing transmission line would not be rebuilt and impacts related to the construction of the project would not occur. Operation and maintenance, including vegetation management, would be similar to existing conditions, as described in Section 2.1.7, *Operation and Maintenance*. Maintenance activities would likely increase as existing structures deteriorate, and more structure repair and replacement could be required. Maintenance of access roads would be needed, and the road work improvement proposed under the Proposed Action would likely need to take place as an operations and maintenance activity. Danger trees would be removed as part of routine line maintenance as they would still pose a threat to infrastructure. The maintenance activities would result in **low to moderate** impacts on vegetation, similar to the impacts described above for the Proposed Action.

3.7 Waterways, Water Quality, and Floodplains

3.7.1 Affected Environment

The *Waterways, Water Quality, and Floodplains* section assess the potential impacts of the Proposed Action on surface water, groundwater, and floodplains intersected by the 100-foot wide Keeler to Tillamook transmission line ROW and off-ROW access roads, plus surface waters, groundwater, and floodplains within 100 feet of existing or proposed infrastructure or access roads.

Waterways and Water Quality

The Proposed Action passes through the Dairy Creek, Gales Creek, Rock Creek-Tualatin River, Trask River, and Wilson River watersheds. Based on the USGS National Hydrography Dataset (NHD) (USGS 2010), 398 waterways intersect the area of assessment (see Figure 3.7-1, *Waterways, Water Quality, and Floodplains*). Table 3.7-1 identifies the waterways by watershed and subwatershed based on the USGS data.

Table 3.7-1. Streams in the Project Area by Watershed and Subwatershed

Watershed	Subwatershed	Number of Streams in Area of Assessment [a]
Dairy Creek	Lower West Fork Dairy Creek	48
	Lower McKay Creek	40
	Lower Dairy Creek	45
	Dairy Creek Watershed Subtotal	*133*
Gales Creek	Upper Gales Creek	6
	Middle Gales Creek	7
	Gales Creek Watershed Subtotal	*13*
Rock Creek - Tualatin River	Lower Rock Creek-Tualatin River	1
	Upper Rock Creek-Tualatin River	0
	Rock Creek-Tualatin River Watershed Total	*1*
Trask River	Lower Trask River	10
	Trask River Watershed Subtotal	*10*
Wilson River	Lower Devil's Lake Fork Wilson River	16
	South Fork Wilson River	31
	North Fork Wilson River	0
	Upper Wilson River-Cedar Creek	33
	Middle Wilson River	71
	Little North Fork Wilson River	1
	Lower Wilson River	89
	Wilson River Watershed Subtotal	*241*
	Total	**398**

[a] The water resources area of assessment consists of the Proposed Action, plus surface waters, groundwater, or floodplains within 100 feet of existing or proposed infrastructure or access roads.

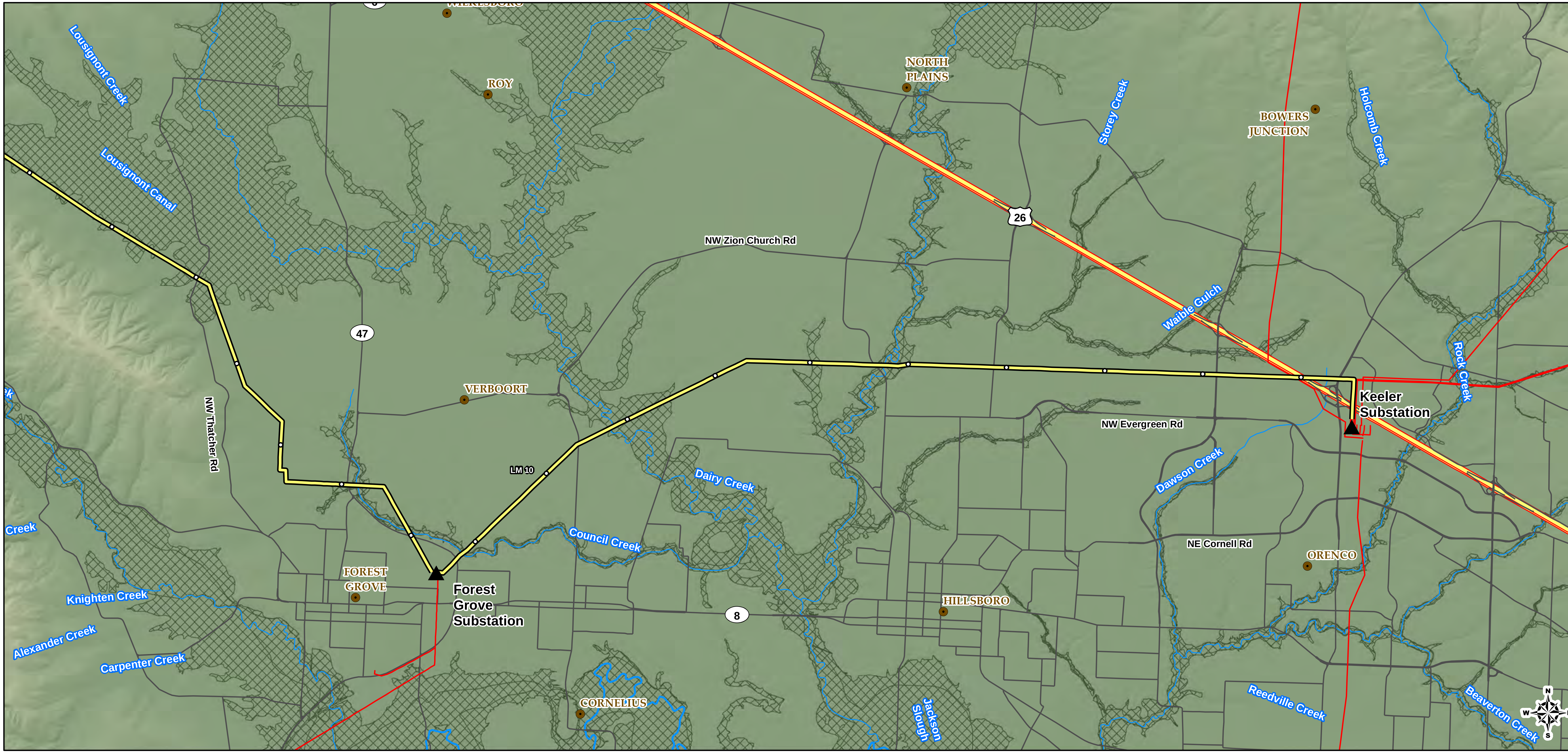
Waterways (including ditches) were also identified in the field as part of the wetlands surveys conducted for this project (Turnstone 2013a). A total of 318 waterways (including ditches) were delineated (Turnstone 2013a). As this lower number suggests, many of the 398 streams identified in the USGS NHD map layer were not present. ***Riparian*** vegetation is an important factor in maintaining cool temperatures in water bodies in the Pacific Northwest. Natural riparian vegetation, especially large trees, is limited in the lowlands west of the Coast Range and in the Willamette Valley. Most of the rivers and streams in the central portion of the project area in the Coast Range ecoregion are well shaded where they cross the Tillamook State Forest. Some smaller streams on private forest lands are lacking riparian vegetation where recent harvest activities have occurred.

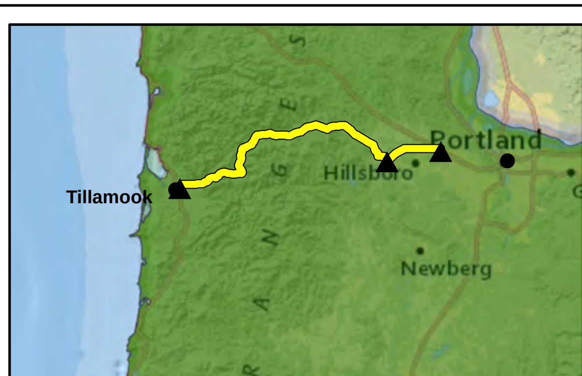
Every 2 years, the Oregon Department of Environmental Quality (ODEQ) is required to assess water quality and report to the U.S. Environmental Protection Agency (EPA) on the condition of Oregon's waters. ODEQ prepares an integrated report that meets the requirements of the federal CWA for Section 305(b) and Section 303(d). CWA Section 305(b) requires a report on the overall condition of Oregon's waters. CWA Section 303(d) requires states to develop lists of impaired waters. These are waters that are too polluted or otherwise too degraded to meet water quality standards set by the state. CWA section 303(d) requires states to establish priority rankings for impaired waters and develop ***Total Maximum Daily Loads*** (TMDLs). A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards. Oregon categorizes water bodies in the state as Category 1–5. Category 4 and Category 5 waters are those that do not meet water quality standards for one or more pollutants. Category 4A waters are those that need a TMDL to attain applicable water quality standards. Category 5 waters comprise the Section 303(d) list and are those for which a TMDL still needs to be developed. Table 3.7-2 lists Category 4 and Category 5 waters in the water resources area of assessment.

Table 3.7-2. Surface Waters with Impaired or Limited Water Quality Parameters

Surface Water Name	Assessment Category	Pollutant [a]	Beneficial Use [b]
Wilson River (RM 0 to 3.5)	4A	fecal coliform	shellfish growing
Wilson River (RM 2.2 to 4.8)	5/303(d)	dissolved oxygen	salmon/steelhead spawning
Wilson River (RM 5.8 to 27.2)	5/303(d)	dissolved oxygen	salmon/steelhead spawning
Hoquarten Slough (RM 0 to 2.6)	5/303(d)	dissolved oxygen	—
Hoquarten Slough (RM 0 to 3.1)	4A	fecal coliform	shellfish growing
Hoquarten Slough (RM 0 to 3.6)	5/303(d)	dissolved oxygen	aquatic life
Dougherty Slough (RM 0 to 3.2)	5/303(d)	dissolved oxygen	—
Dougherty Slough (0 to 4.9)	5/303(d)	dissolved oxygen	aquatic life
Dougherty Slough (0 to 4.9)	4A	fecal coliform	shellfish growing
Gales Creek (RM 0 to 11)	4A	E. coli	water contact recreation
Gales Creek (RM 11 to 20.6 and 9.6)	4A	E. coli	water contact recreation.
Gales Creek (RM 0 to 23)	5/303(d)	dissolved oxygen	salmon/steelhead spawning
Little North Fork Wilson River (RM 0.6 to 11.2)	5/303(d)	Biocriteria [c]	aquatic life
Dairy Creek (RM 0 to 10.1)	5/303(d)	dissolved oxygen	spawning

RM = river mile.
[a] Pollutant - A pollutant or condition that may impair water quality and that has an Oregon water quality standard.
[b] Beneficial Use - Beneficial use protected by the water quality standard.
[c] Changes in resident biological communities of freshwater macroinvertebrates (insects, crustaceans, snails, clams, worms, mites, etc.) are considered a form of pollution.
Source: ODEQ 2010c.





This product was made for informational and display purposes only and was created with best available data at time of production. It does not represent any legal information or boundaries. Sources: BPA Regional Geodatabase 2013; ODEQ 2010, USGS National Hydrography Dataset 2010, OregonExplorer 2013 Print Date: October 23, 2013

Legend

- BPA Substation
- Line Mile (LM)
- Keeler - Tillamook No. 1 Transmission Lines
- BPA Transmission Line
- Cities or Towns

Water Resources

- Waterway
- 100 Year Floodplain

Keeler to Tillamook 115-kV Transmission Line Rebuild Project

Figure 3.7-1a

Waterways, Water Quality, and Floodplains

1 inch = 1 miles

0 0.5 1 2 Miles

BONNEVILLE POWER ADMINISTRATION

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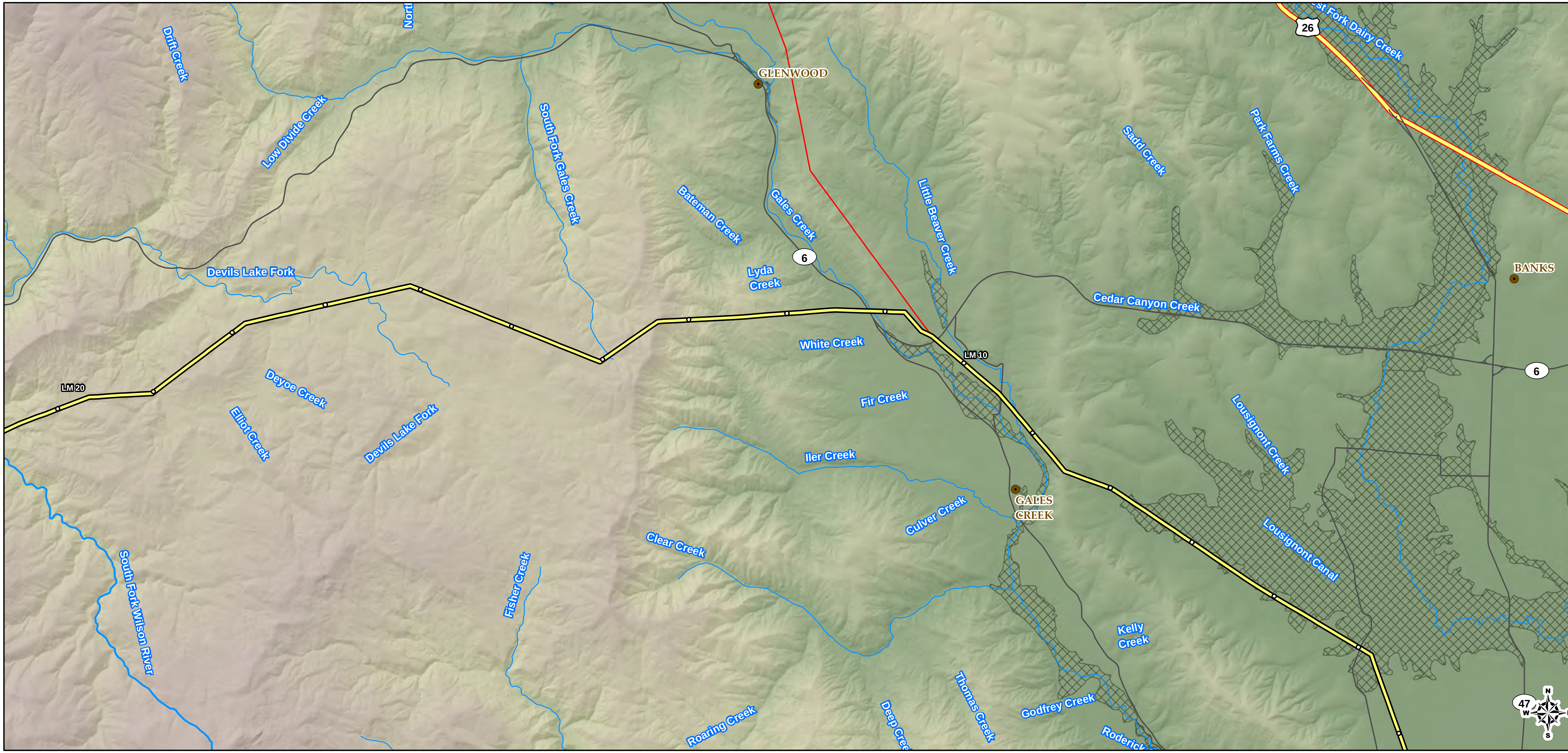

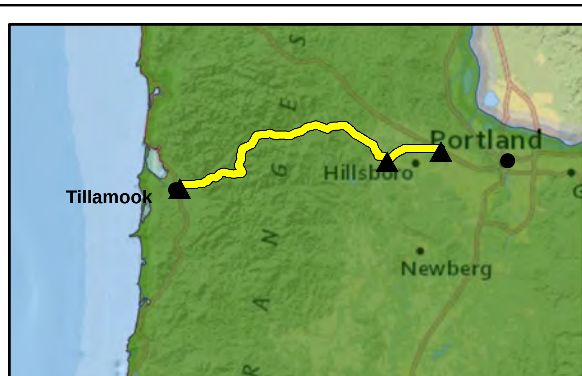

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Legend

- BPA Substation
- Line Mile (LM)
- Keeler - Tillamook No. 1 Transmission Lines
- BPA Transmission Line
- Cities or Towns

Water Resources

- Waterway
- 100 Year Floodplain

Keeler to Tillamook 115-kV Transmission Line Rebuild Project

Figure 3.7-1b

Waterways, Water Quality, and Floodplains

1 inch = 1 miles

0 0.5 1 2 Miles

BONNEVILLE POWER ADMINISTRATION

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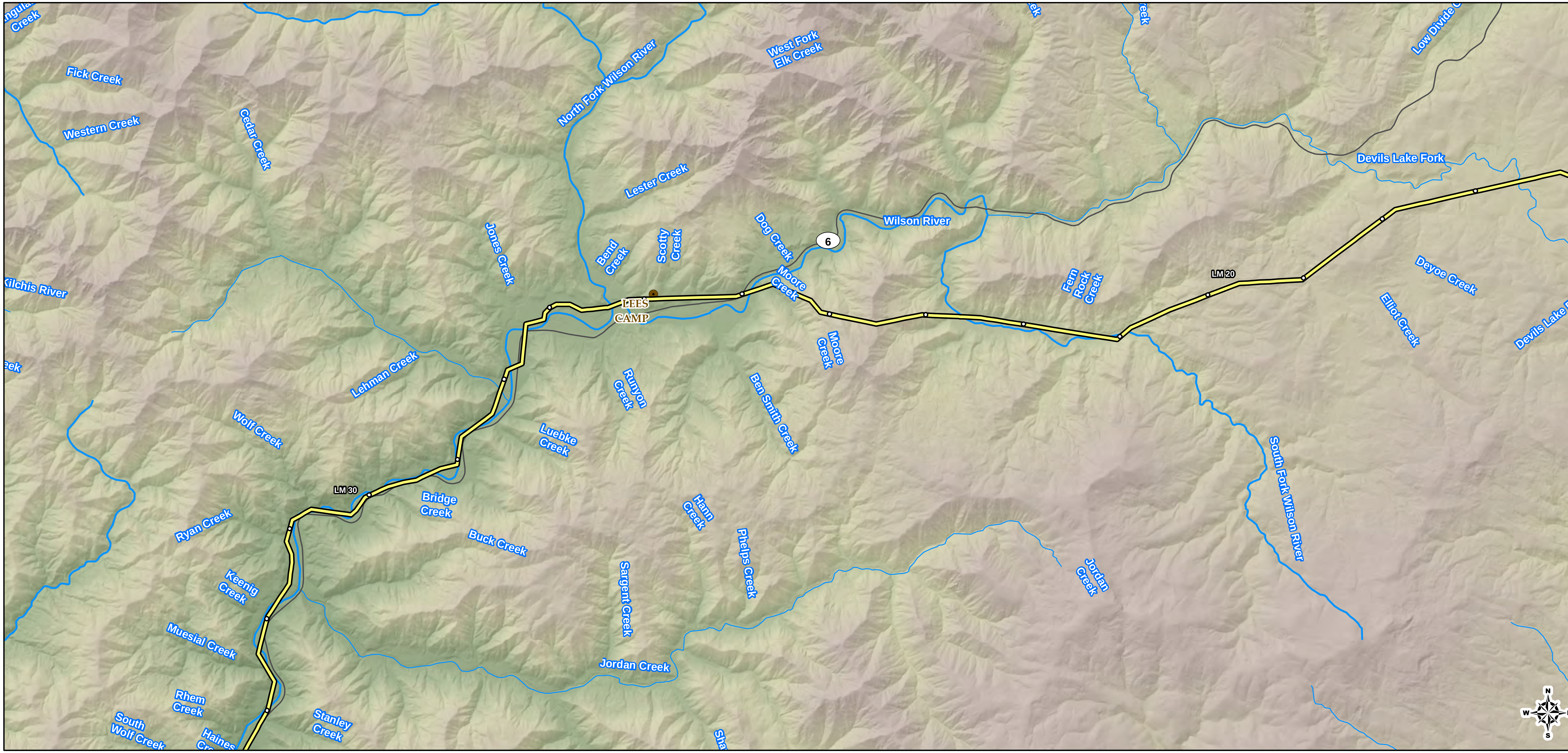

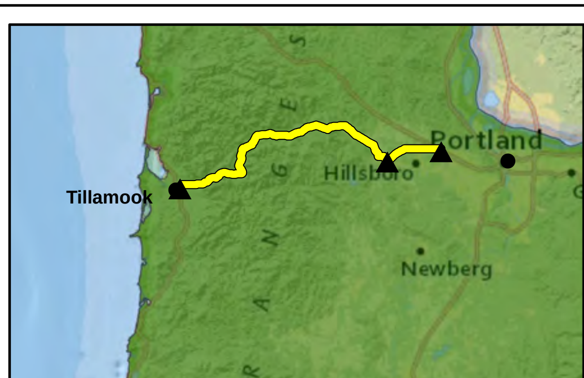

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Legend

- BPA Substation
- Line Mile (LM)
- Keeler - Tillamook No. 1 Transmission Lines
- BPA Transmission Line
- Cities or Towns

Water Resources

- Waterway
- 100 Year Floodplain

Keeler to Tillamook 115-kV Transmission Line Rebuild Project

Figure 3.7-1c

Waterways, Water Quality, and Floodplains

1 inch = 1 miles

0 0.5 1 2 Miles

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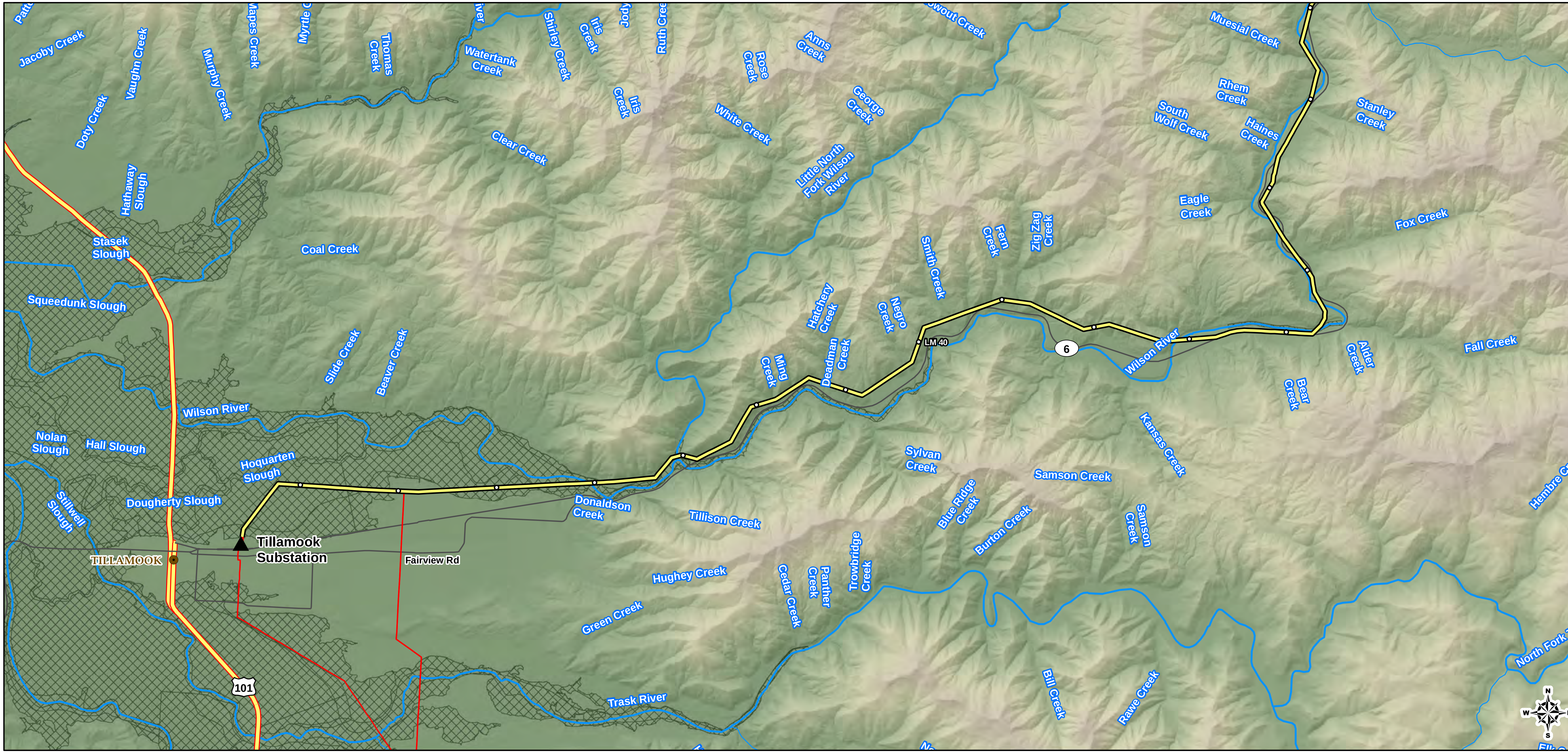

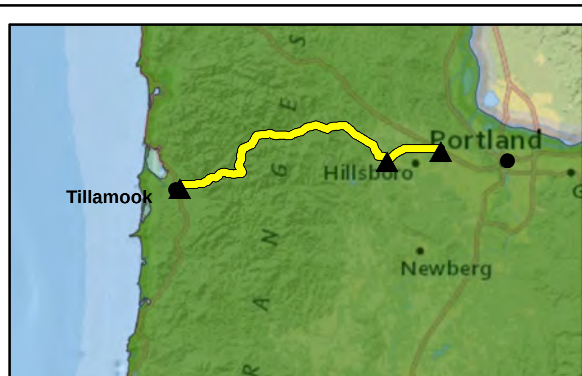

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Legend

- ▲ BPA Substation
- ○ Line Mile (LM)
- Keeler - Tillamook No. 1 Transmission Lines
- BPA Transmission Line
- ● Cities or Towns

Water Resources

- Waterway
- 100 Year Floodplain

Keeler to Tillamook 115-kV Transmission Line Rebuild Project

Figure 3.7-1d

Waterways, Water Quality, and Floodplains

1 inch = 1 miles

0 0.5 1 2 Miles

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Floodplains

The Federal Emergency Management Agency (FEMA) identifies areas with a 1 percent chance of being flooded in a given year as ***100-year floodplains***. FEMA floodplain mapping is not available for a large portion of the project area. The ROW crosses approximately 95 acres of FEMA-mapped floodplains. Waterways with 100-year floodplains that are intersected by the ROW include Dougherty Slough, Hoquarten Slough, Wilson River, Little North Fork Wilson River, Gales Creek, Lousignont Canal, Council Creek, Dairy Creek, and McKay Creek (see Figure 3.7-1, *Waterways, Water Quality, and Floodplains*).

Groundwater

Groundwater in the area of assessment generally occurs in regional ***aquifer*** systems found in unconsolidated deposits (primarily sands and gravels) and ***Miocene basaltic rock***. These aquifers provide freshwater for most public-supply, domestic, commercial, and industrial purposes. They are also important sources of water for agricultural purposes, primarily irrigation. On the western side of the Willamette River Valley, wells deeper than 100 feet usually penetrate consolidated pre-Miocene sedimentary rocks that yield saltwater (Whitehead 1994). EPA designates ***sole source aquifers*** (SSAs) in areas where there are few or no alternative sources to the groundwater resource and where, if contamination were to occur, using an alternative source would be extremely expensive. Sole source or principal source aquifers are those that supply at least 50 percent of the drinking water consumed in the area overlying the aquifer. There are no designated SSAs in the vicinity of the project area (EPA 2008).

The western end of the project corridor in the vicinity of the Tillamook Substation overlays groundwater drinking water source areas (DWSAs) for the City of Tillamook and surrounding areas. Near LM 27 of the Forest Grove-Tillamook No. 1 transmission line, the project corridor overlays the ODF Jones Creek DWSA. In western Washington County, the project corridor overlays the Gales Creek Shell & Grocery DWSA and the Colemen's Shady Restaurant DWSA between LM 11 and LM 12, of the Forest Grove-Tillamook No. 1 transmission line (see Figure 3.7-2).

3.7.2 Environmental Consequences–Proposed Action

Waterways and Water Quality

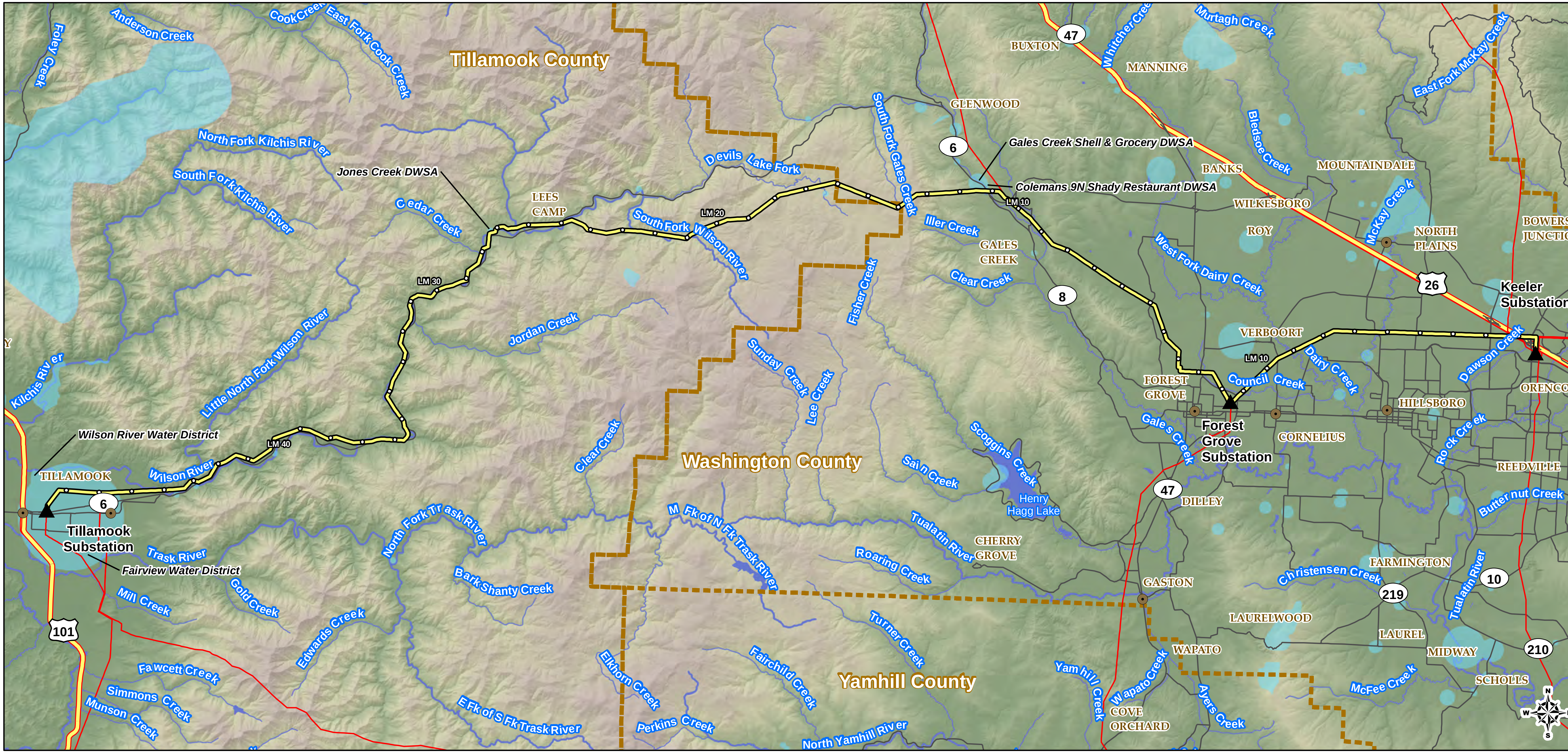
In total, temporary and permanent disturbance areas for 85 structures are located within 100 feet of delineated streams (not including ditches). Appendix D (see Table D-1, *Proposed Structures within 100 feet of Streams*) lists structure activities and disturbance areas that would occur within 100 feet of streams. Ground disturbance associated with the removal and installation of new structures, including clearing of vegetation, grading, and compaction from heavy equipment, could indirectly cause erosion and sedimentation that could reach streams and increase turbidity, degrading water quality. Each structure would have a small area of exposed bare soils for a few weeks that could, if not managed, erode and become a source of sediment to nearby streams. For those structures in cultivated fields, the amount of exposed soil would fall within the range of current conditions as cultivated fields are often laid bare for plowing and planting. The risk of erosion would be highest where unconsolidated sediments are susceptible to water and wind erosion, on steep slopes with erodible soils, and after rain events. Nine structures within 100 feet of streams on the Forest Grove-Tillamook No. transmission 1 line are located in areas with severe to very severe erosion potential (see Section 3.3, *Geology and Soils*).

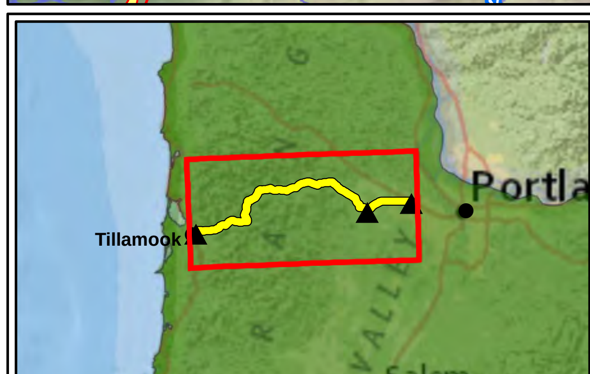
Implementation of the erosion and sediment control mitigation measures in Section 3.7.3, *Mitigation – Proposed Action*, would minimize water quality impacts associated with structure removal and replacement. Indirect water quality impacts related to structure removal and installation are expected to be localized and temporary and are not expected to affect stream function or habitat, or result in water quality parameters being exceeded. Therefore, indirect impacts associated with the removal and installation of new structures would be short-term and **low**.

The Proposed Action would include five new access roads (totaling 0.1 mile) and 52 reconstructed/improved access roads (totaling 1.44 miles) within 100 feet of streams delineated in the area of assessment. Appendix D (see Table D-2, *Proposed Access Roads within 100 feet of Streams)* lists access road work within 100 feet of streams. One new access road crosses a stream, and reconstructed/improved access roads involve 20 stream crossings, potentially requiring in-water work (i.e., culvert work, bridge crossings) (Appendix D, Table D-2, *Proposed Access Roads within 100 feet of Streams*). Ground disturbance associated with access road construction and reconstruction could indirectly cause erosion and sedimentation that could reach streams and increase turbidity both during and after construction. Construction BMPs, including erosion and sediment control measures, would be implemented during construction to prevent adverse impacts on water quality in streams. New access roads would increase impervious surfaces in specific areas, which could adversely affect stream hydrology and water quality over the long term. Access roads would be constructed with drainage ditches, culverts, or water bars, as necessary, to prevent potential surface erosion or other road failure to minimize these effects. Additionally, new and improved access roads would be composed of a compacted gravel surface to minimize erosion.

In addition to the access road work described above, the Proposed Action would involve installing or replacing three bridges and installing, improving, or replacing 20 culverts. Bridge and culvert work could have a direct short-term impact on stream function by interfering with or disrupting stream flows during construction, and an indirect short-term impact on water quality by increasing turbidity. All bridge and culvert work in streams would likely occur in the dry season to avoid or minimize impacts on stream function and water quality during construction. Bridge and culvert work in streams would be conducted when there is no flow or, if that is not possible, flow would be diverted around the work area. Culvert work in ***perennial*** streams would likely require that flows be diverted around the work area. Bridges and culverts could have a direct, long-term impact on stream function and habitat associated with the permanent removal of stream bank vegetation, alteration of channel characteristics (e.g., channel width/depth, streambed substrate, etc.), and alteration of hydrologic conditions (e.g., water surface levels, flow velocities). Bridges and culverts could have indirect long-term impacts on water quality from the removal of stream bank vegetation, which can increase stream temperature, and from increased flow velocities, which can increase turbidity, especially downstream of perched culverts. The implementation of mitigation measures listed in Section 3.7.3, *Mitigation – Proposed Action*, would minimize direct and indirect short-term and long-term impacts on water resources and water quality from access road and bridge/culvert work.

Direct impacts on specific waterways and water quality from access road and bridge/culvert work would include both short- and long-term impacts (as described above) and are expected to range from **low to moderate** depending on site-specific characteristics (e.g., stream type [ephemeral, intermittent, perennial], and channel characteristics). Indirect impacts on specific waterways and water quality from access road construction and bridge/culvert work would also include both short- and long-term impacts (as described above) and are also expected to range from **low to moderate*,*** depending on site-specific conditions (e.g., stream bank vegetation)





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Print Date: October 23, 2013

Legend

- ▲ BPA Substation
- ° Line Mile (LM)
- Keeler - Tillamook No. 1 Transmission Lines
- BPA Transmission Line
- Cities or Towns
- County Boundary

Water Resources

- Waterway
- Groundwater Drinking Water Source Area (DWSA)

Keeler to Tillamook 115-kV Transmission Line Rebuild Project

Figure 3.7-2

Groundwater Drinking Water Source Areas

1 inch = 3 miles
0 1.5 3 6 Miles

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BPA estimates that approximately 2,666 danger trees would be removed as part of the Proposed Action. These trees are distributed along the ROW and identified by structure location in Appendix A. If required, danger tree removal within a riparian buffer could directly reduce structural diversity (the combination of plant species diversity and height classes, in addition to other structural components of riparian habitat, such as downed wood), increase erosion and sediment, reduce bank stabilization, and reduce stream shading, indirectly impacting water quality (e.g., temperature, sedimentation, turbidity) and habitat functions (described in detail Section 3.4, *Fish*, and Section 3.5, *Wildlife*) over the long term. The general location of danger tree removal in relation to the transmission line and nearest structures is provided in Appendix A. These danger tree removal areas were compared to the location of riparian buffers in the project area using geographic information system (GIS) to determine if danger tree removal could occur within riparian buffers. The results of the analysis are included in Appendix D (see Table D-3, *Potential Danger Tree Removal within Riparian Buffers*), which lists the number of potential danger trees to be removed in riparian buffers by stream and nearest structure. Based on this evaluation, a total of 1,329 danger trees could potentially be removed within the riparian buffers of 70 different streams. To reduce the potential indirect impacts on water quality and habitat function from danger tree removal, vegetation would be cut above the ground and the roots left in place to maintain bank stability and minimize erosion and sediment effects from increased soil exposure where adequate ground cover is not adequate.

Indirect impacts on the water quality of specific streams, including sedimentation, and reduced shading, potentially impacting water temperature, from danger tree removal are expected to be **low to moderate** depending on site-specific conditions of riparian habitat adjacent to danger tree removal and the number and condition of trees to be removed in a particular area. For example, if danger trees targeted for removal at a particular site do not provide shade or moderate stream temperature, their removal would have little impact on stream function or water quality regardless of the number removed in that area. If danger trees targeted for removal do provide shade and moderate stream temperature, the impact would range from low to moderate depending on the number and density of trees removed near a particular stream. The potential reduction in stream shading and habitat functions from tree removal would be permanent but small relative to the typical percent cover along streams in the corridor within the central Coast Range portion of the project area. Furthermore, the Proposed Action involves rebuilding an existing transmission line in an area already maintained with low vegetation for safety purposes, and, as result, very little or no change would occur to stream shade or temperature from current conditions. However, riparian structural diversity and shading effects of riparian trees would still be reduced over the long term. Overall, indirect, long-term impacts on water resources and water quality from the removal of danger trees are expected to be **low to moderate**.

The accidental release of fuels, oils, or chemicals during construction, including uncured concrete (if any) used for bridge abutments, could result in hazardous materials entering surface water, floodplains, or groundwater. However, the risk of accidental spills would be minimized by implementation of the mitigation measures specified in Section 3.7.3, *Mitigation – Proposed Action*, which would require SPRP to be implemented and that spill prevention and response equipment be present at all construction sites. There would likely be **no** effect on the impaired water bodies, including 303(d) waters, listed in Table 3.7-2 from hazardous materials.

Floodplains

The Proposed Action has the potential to directly affect floodplains and impair floodplain functions from construction disturbance associated with structure removal and replacement, and access road work. Table

3.7-3 shows the number of structures and miles of access road work in floodplains and within 100 feet of floodplains.

Table 3.7-3. Structures and Access Road Work within 100 feet of 100-Year Floodplain

Floodplain	Structures		Access Road Work	
	In Floodplain (number)	Within 100 feet of Floodplain	In Floodplain	Within 100 feet of Floodplain
Wilson River (includes Dougherty and Hoquarten Sloughs)	24	5	Reconstruct 0.58 mile of access road	Reconstruct 0.18 mile of access road
Little North Fork Wilson River	None	2	None	None
Gales Creek	None	1	Improve 0.12 mile of access road	Improve 0.05 mile of access road
Lousignont Canal	19	2	Improve 0.5 mile of access road	None
Council Creek	5	4	None	None
Dairy Creek	5	1	Improve 0.12 mile of access road	Improve 0.02 mile of access road
McKay Creek	2	1	None	Improve 0.01 miles of access road
TOTALS	**55**	**16**	**1.32 miles**	**0.26 mile**

Fifty-five structures are located within FEMA-mapped floodplains, and an additional 16 are located outside of the floodplain but within 100 feet of the floodplain (Table 3.7-3). Of the 55 structures within the floodplain, one existing structure (structure 8/9 of the Keeler-Forest Grove No. 1 transmission line) in the Dairy Creek floodplain would not be replaced or have its hardware replaced. Eleven existing lattice steel and one wood structure in the Wilson River floodplain on the Forest Grove-Tillamook No. 1 transmission line and one existing wood structure (structure 2/3 of the Forest Grove-Tillamook No. 1 transmission line) in the Council Creek floodplain would have only their hardware replaced. In total, 40 structures in floodplains would be removed and replaced in the same location, and one structure in the Lousignont Canal floodplain would be moved greater than 10 feet from its existing location. One structure, 11/4 (on the Keeler-Forest Grove No. 1 transmission line), a three-pole structure in the Council Creek floodplain, would be moved from its existing location but remain within the mapped floodplain. An additional two structures (35/5 and 35/7 on the Forest Grove-Tillamook No. 1 transmission line) would be moved to avoid the Wilson River floodplain; these structures are in an area not captured by FEMA floodplain mapping. Table 3.7-4 shows temporary and permanent disturbance areas from structure work in floodplains and within 100 feet of floodplains. Structure replacement in floodplains would not result in net fill within the floodplains.

Removal and installation of structures in floodplains would disturb vegetation and soils and could result in soil compaction from heavy equipment, which could lead to erosion. These disturbances could directly affect some floodplain functions, including flood storage capacity, direction of flows, and habitat functions. Ground disturbance associated with structure removal and replacement within 100 feet of floodplains could cause erosion and sedimentation in floodplains, indirectly affecting floodplain functions. To minimize impacts on floodplains, the disturbance area for work associated with the removal and installation of structures in floodplains and within 100 feet of floodplains would be reduced to 50 feet by 50 feet per structure (approximately 0.06 acre).

Table 3.7-4. Structure Impacts within Floodplains and within 100 feet of Floodplains

Floodplain	In Floodplain		Within 100 feet of Floodplain	
	Temporary Impacts (acres)	Permanent Impacts (acres)	Temporary Impacts (acres)	Permanent Impacts (acres)
Wilson River (includes Dougherty and Hoquarten Sloughs)	2.95	0	0.82	<0.01
Little North Fork Wilson River	0	0	0.26	0
Gales Creek	0	0	0.20	0
Lousignont Canal	2.31	<0.01	0.34	0
Council Creek	0.78	0	0.53	0
Dairy Creek	0.45	0	0.01	0
McKay Creek	0.45	0	0.12	0
TOTALS	**6.94**	**<0.01**	**2.28**	**<0.01**

The implementation of additional mitigation measures in Section 3.7.3, *Mitigation – Proposed Action*, (including installing erosion and sediment control measures, working in the dry season as much as possible, and revegetation of work sites) would minimize sediment deposition in floodplains so that it would not affect flood storage capacity or flood flows. Impacts on floodplains from the removal and installation of structures are expected to be temporary and **low.**

A combined total of approximately 1.32 miles of access road reconstruction and improvements would occur within the floodplains of Wilson River, Gales Creek, Lousignont Canal, and Dairy Creek (Table 3.7-3). An additional 0.26 mile of access road reconstruction and improvements would occur within 100 feet of 100-year floodplains (Table 3.7-3). Access road work (including grading or rocking of road surfaces, replacing culverts, and removing vegetation) could result in short-term soil erosion and compaction. Since access road work within floodplains and within 100 feet of floodplains would be limited to existing access roads, and would result in minimal ground disturbance, these short-term impacts on floodplains associated with access road reconstruction are expected to be short-term and **low.** Access road reconstruction/improvement in floodplains would involve the placement of surfacing aggregate and would result in a small permanent amount of net fill within the floodplains. This would be a long-term impact. The amount of net new fill in floodplains required for access road reconstruction would not be sufficient to result in a decrease in flood storage capacity, and would thus be a long-term, **low** impact. Implementation of the mitigation measures in Section 3.7.3, *Mitigation – Proposed Action*, would further reduce impacts on floodplains associated with access road reconstruction.

Approximately 78 danger trees would be removed within floodplains. Danger tree removal within floodplains would have **no impact** on 100-year flood elevations or interfere with flood discharges, and would have negligible effects on most floodplain functions (e.g., flood storage). Danger tree removal could affect floodplain habitat functions by reducing habitat for birds and other wildlife using these areas. However, overall impacts on floodplains from danger tree removal under the Proposed Action would be **low** given the small area that would be affected relative to the overall size of floodplains and the limited number of danger trees removed in floodplain areas.

Groundwater

Impervious surfaces intercept rain and other precipitation, preventing water from soaking into the ground. Groundwater feeds water bodies (rivers, streams, lakes, ponds) and wetlands during periods of low precipitation and low flow. Since impervious surfaces prevent rainfall infiltration, groundwater sources are not recharged, and water bodies and wetlands are not replenished during low flow periods. Replacement of existing structures is not expected to reduce surface water to groundwater infiltration rates to a degree that it would affect groundwater recharge, because the new structures would result in a small net gain in impervious surfaces. **No** impacts on groundwater are expected to result from structure removal and installation.

Impervious surfaces from new and improved/reconstructed access roads could reduce surface to groundwater infiltration rates in localized areas but would not reduce infiltration rates to a degree that it would affect groundwater recharge. There would be **no impact** on groundwater.

Staging Areas and Tensioning Sites

The Keeler Substation would serve as one staging area for the project; up to two additional temporary staging areas may be utilized during project construction. BPA would conduct the necessary site-specific environmental review on any other additional temporary staging areas. Staging and tensioning areas would likely be located on previously disturbed areas and no new disturbance would occur. BPA would require the construction contractor to locate all staging areas outside stream channels in level, open, and already developed or disturbed sites, and at least 100 feet from streams to prevent water quality impacts from potential leaks and spills. The Proposed Action is expected to have **no** impacts on water resources and water quality from staging areas.

Ground disturbance associated with the use of tensioning sites could cause construction-related runoff and erosion that could impact streams and water quality. However, tensioning sites would be located outside of streams, and disturbance associated with tensioning sites would be temporary and localized, mainly occurring nearby or in conjunction with the removal of existing structures and the installation of new structures. Implementation of the mitigation measures in Section 3.7.3, *Mitigation – Proposed Action*, would further reduce impacts; as result, impacts on water resources and water quality from tensioning sites are expected to be **low**.

Operation and Maintenance

Operation and maintenance activities would be similar to current conditions. Maintenance activities would require access by vehicles during line inspections a few times each year. Occasionally, equipment such as insulators may need replacement. Current vegetation management activities would continue, including the removal or pruning of danger trees and control of noxious weeds in the ROW.

Water quality could be directly affected by increased turbidity from erosion and sedimentation associated with danger tree removal as part of maintenance activities. However, this type of disturbance would be infrequent, and impacts would be temporary and localized. Emergency line repair following accidental downing of wires could require unplanned travel across streams or riparian areas. The resulting disruption could have short-term adverse effects on water quality from localized increases in sediment and a loss of riparian trees and function (shade, organic input). This type of occurrence, however, is expected to be rare and would likely happen less often after completion of the Proposed Action. Herbicides used to control noxious weeds and other vegetation could enter surface or groundwater resources and impair water quality. Vegetation maintenance would be guided by the program identified in BPA's Transmission System Vegetation Management Program Final Environmental Impact Statement and Record of Decision (BPA 2000) to reduce these potential impacts. Impacts on water resources and water quality from operation and maintenance of the Proposed Action would likely be short-term and **low**.

Access road and culvert maintenance activities, and vegetation removal in floodplains could result in soil erosion and compaction, and sedimentation in floodplains. These activities within floodplains would be infrequent and limited in scope. Impacts on floodplain functions would be short-term and ***low.***

3.7.3 Mitigation–Proposed Action

The following mitigation measures would be implemented to reduce or eliminate impacts on waterways, water resources, and floodplains from the Proposed Action:

- Avoid siting new structures and access roads within 100 feet of surface waters during the design process, where possible.
- Locate tensioning sites at least 100 feet away from surface waters, where possible.
- Design and construct access roads to minimize drainage from the road surface directly into surface waters, size new and replacement culverts large enough to accommodate predicted flows, and size and space ***cross drains*** and water bars properly to accommodate flows and direct sediment laden waters into vegetated areas.
- Obtain required permits associated with working in or near floodplains and waterways, and work with regulatory agencies to develop appropriate mitigation.
- Review required BMPs, water quality mitigation measures, and other permit requirements with construction contractors and inspectors during a pre-construction meeting covering environmental requirements.
- Conduct construction activities during the dry season (between June 1 and November 1), as much as possible, to minimize erosion, sedimentation, and soil compaction.
- Minimize disturbance to streams and stream buffers by reducing the disturbance area for work associated with structures to 50 feet by 50 feet per structure (approximately 0.06 acre) where possible; install signage, fences, and flagging where needed to restrict vehicles and equipment to designated routes outside of streams.
- Prepare and implement SPRP.
- Delineate construction limits within 100 feet of streams, other water bodies, wetlands, and floodplains, as specified in the SWPPP, with a sediment fence, straw wattles, or a similarly approved method to eliminate sediment discharge into waterways; minimize the size of construction disturbance areas; and minimize the removal of vegetation, to the greatest extent possible.
- Restrict refueling and servicing operations to locations where any spilled material cannot enter natural or human-made drainage conveyances (e.g., ditches, catch basins, ponds, wetlands, streams, and pipes) and use pumps, funnels, absorbent pads, and drip pans when fueling or servicing vehicles.

- Store, fuel, and maintain vehicles and equipment in designated vehicle staging areas located a minimum of 100 feet away from any stream or water body.
- Power wash all vehicles and equipment at an approved cleaning facility prior to entering construction work areas to remove any residual sediment, petroleum, or other contaminants; inspect equipment and tanks on a weekly basis for drips or leaks and promptly make necessary repairs.
- Check all equipment used for instream work for leaks, and, prior to entering waterways, completely clean off any external petroleum products, hydraulic fluid, coolants, and other pollutants.
- Prohibit sidecasting of road grading materials along roads within 100 feet of perennial streams.
- Reseed disturbed areas after construction activities are complete, at the appropriate time period for germination, with a native seed mix, a seed mix recommended by ODFW, or as agreed upon with landowners for use on their property.
- Revegetate disturbed areas in stream buffers following specific revegetation guidelines in permits; native species will be used for revegetation in wetlands that are not in agricultural areas, and pastures will be reseeded with an appropriate seed mix.
- Inspect and maintain access roads, culverts, and other facilities after construction to ensure proper function and nominal erosion levels.
- Limit ground-disturbing activities to designated work areas, including structure sites, access roads, pulling/tensioning sites, and staging areas (see Section 3.2.3, *Mitigation—Proposed Action [Land Use, Recreation, and Transportation]*).
- Leave erosion and sediment control devices in place until all disturbed sites are revegetated and erosion potential has returned to pre-project conditions (see Section 3.6.3, *Mitigation—Proposed Action [Vegetation]*).
- Install sediment barriers and other suitable erosion and runoff control devices (see Section 3.3.3, *Mitigation—Proposed Action [Geology and Soils]*).
- Provide spill prevention kits at designated locations on the project site.

3.7.4 Unavoidable Impacts after Mitigation–Proposed Action

Implementation of the Proposed Action would generally result in unavoidable impacts on waterways and water quality, where in-water work is needed (i.e., culvert replacement or installation). The removal of danger trees within riparian buffers may reduce stream shading and affect stream temperature in some locations.

The Proposed Action would also result in approximately 23.06 acres of temporary disturbance in floodplains and 11.24 acres of temporary disturbance within 100 feet of floodplains from road reconstruction/improvement and use of temporary travel routes. The removal and replacement of structures within floodplains would result in unavoidable short-term disturbances during construction. Implementation of the mitigation measures in Section 3.7.3, *Mitigation – Proposed Action*, would reduce impacts on floodplains. However, activities associated with structure removal and installation, and access road reconstruction would likely cause soil erosion and compaction. These impacts are not expected to measurably alter floodplain functions.

Operation and maintenance activities under the Proposed Action would be temporary and infrequent, but could have unavoidable impacts on waterways, water quality, and floodplains during the use and maintenance of access roads, culvert maintenance, and danger tree removal. New and improved access roads would decrease groundwater infiltration rates.

3.7.5 Cumulative Impacts–Proposed Action

Other reasonably foreseeable future projects in the vicinity of the Proposed Action that could affect waterways, water quality, floodplains, and groundwater are listed and described in Appendix B.

Past and ongoing ODF and private forest management and timber harvest activities in the Coast Range portion of the project area, including an extensive network of forest roads, have impacted streams, water quality, and groundwater. Future timber harvest activities and associated road construction and maintenance are expected to continue to contribute to stream and water quality impacts, and forest roads could contribute to localized decreases in groundwater infiltration rates. Past and ongoing development and agricultural land uses in the Willamette Valley portion of the project area have impacted streams and other surface waters, water quality, floodplains, and groundwater throughout the area. Agricultural land uses are ongoing and are expected to continue to contribute moderately to these impacts. Current and future planned development by Intel in Hillsboro and the City of Forest Grove near the Forest Grove Substation could also result in impacts on water resources and floodplains in that area. Streams, floodplains, water quality, and groundwater have been impacted in the lowlands west of the Coast Range by past and ongoing activities, including within the floodplain of the Wilson River, and Dougherty and Hoquarten sloughs. Rural development, including highways and local roads, scattered rural residences, and dairy farm operations are the primary sources of these impacts. BPA's planned improvement of the access roads associated with the Boyer-Tillamook transmission line, which exits out of the Tillamook Substation, would likely have similar impacts as the Proposed Action on streams, floodplains, water quality, and groundwater.

The Proposed Action would temporarily disturb streams and water quality during construction and could permanently impact streams and water quality through the removal of riparian vegetation. Overall, the Proposed Project’s short- and long-term impacts to streams, water quality, and floodplains would be relatively small and highly localized, and would have no measurable impact on overall resource function in the project area. The Proposed Action would have no impact on groundwater recharge or DWSA’s. Therefore, the Proposed Action’s contribution to the past, ongoing, and future impacts on these resources in the project area are considered to be **low.**

3.7.6 Environmental Consequences–No Action Alternative

Under the No Action Alternative, the existing transmission lines would not be rebuilt. No construction activities or construction-related impacts on surface waters, water quality, floodplains, or groundwater would occur. Under the No Action Alternative, structures 35/5 and 35/7 (on the Forest Grove-Tillamook No. 1 transmission line) would remain within the Wilson River floodplain. Operation and maintenance activities, including danger tree removal and road maintenance/improvement, would be similar to those associated with the Proposed Action. However, as the existing structures deteriorate, the frequency of maintenance activities would likely increase, as would the potential for unplanned emergency maintenance activities. Overall impacts on streams, water quality and floodplains, including erosion and sedimentation and reductions in stream shading, would be **low**. There would be **no impact** on groundwater recharge or DWSAs.

3.8 Wetlands

3.8.1 Affected Environment

Wetlands are areas inundated or saturated by surface water or groundwater long enough during the growing season to support vegetation or aquatic life, typically adapted for life in saturated or seasonally saturated soil conditions. To be considered a wetland, certain hydrologic, vegetation, and soil conditions must be met: (1) the area must be inundated or saturated with water for a portion of the growing season in most years; (2) soils in the area must have certain characteristics of ***hydric soils***; and (3) plants in the area are dominated by those that have special adaptations enabling them to grow in saturated soils. These criteria are typically determined in the field using field indicators for wetland hydrology, hydric soils, and ***hydrophytic*** vegetation.

Wetland buffers are naturally vegetated upland areas adjacent to wetlands (or surface waters) that can serve several purposes, including but not limited to: (1) protecting wetlands from encroachment by incompatible land uses; (2) protecting wetlands from the impacts of adjacent land uses, such as trapping pollutants and sediment before they enter wetlands; and (3) providing habitat for wetland associated wildlife. Many federal, state, and local agencies (counties and cities) specify wetland buffer widths for wetlands in their jurisdictions.

Wetland Delineation, Classification, and Assessment

Wetland Investigation and Delineation

A wetland investigation was conducted to determine the presence of wetlands and other non-wetland waters of the U.S. (i.e., streams and ponds) in the project area (Turnstone 2013a). The wetland investigation involved a preliminary review of existing information, including precipitation data, soil surveys, and national and local wetland inventories. Wetlands were identified using the *U.S. Army Corps of Engineers Wetland Delineation Manual* (Corps 1987), the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region, Version 2* (Corps 2010), and the Oregon Department of State Land's (ODSL) draft guidance document *Delineations for Large Linear Projects* (ODSL 2011). Wetland buffer widths were determined for each wetland identified based on the requirements of the applicable jurisdiction, including: ODF, Clean Water Services, and Tillamook County. Clean Water Services regulates wetlands in Washington County. The area of assessment used for investigating, delineating, and assessing wetlands consisted of the Proposed Action plus a 10- to 15- foot buffer around the off-ROW access roads.

Wetland Classification

Identified wetlands were classified in accordance with the *Cowardin Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979) and the *Guidebook for Hydrogeomorphic (HGM)-based Assessment of Oregon Wetland and Riparian Sites: Statewide Classification and Profiles* (Adamus 2001). Wetland studies often classify wetlands using both of these classification systems as each is useful for understanding general wetland characteristics (e.g., predominant vegetation type) and function.

Cowardin Classification System

The Cowardin classification system classifies wetland habitats based on hydrophytic plants, hydric soils, and frequency of flooding. The classification hierarchy consists of Systems, Subsystems, Classes, Subclasses, Dominance Types, and various modifiers to describe more specific attributes of related hydrology, soils, and vegetation. Only ***palustrine*** wetlands (Turnstone 2013a) were found in the project area. Palustrine wetlands are inland wetlands that lack flowing water, contain ocean-derived salts in concentrations less than 0.05 percent, and are non-tidal. Palustrine forested wetlands (PFO) are dominated by trees, palustrine scrub-shrub wetlands (PSS) are dominated by shrubs, and palustrine emergent wetlands (PEM) are dominated by herbaceous vegetation, including mosses or lichens.

Oregon HGM Classification System

The Oregon HGM-based classification system classifies wetland and riparian areas in Oregon based on their HGM characteristics: their dominant water sources and setting in the landscape (Adamus 2001). The basic premise of HGM classification is that sites belonging to the same class are more likely to be similar in function to each other than to sites belonging to another class. This simplifies communication of knowledge about these systems, including allowing scientists and resource managers to assess the function and condition of just a few wetlands in a watershed and extrapolating that data to entire populations of sites. The Oregon HGM-based classification system includes 14 HGM subclasses, seven of which were identified during the wetland delineation: riverine flow-through (RFT); riverine impounding (RI); depressional, closed non-permanently flooded (DCNF); depressional outflow (DOF); slope, headwater (HS); slope, valley (VS); and flats (Turnstone 2013a).

Wetland Assessment (Functions and Values)

Wetland functions and values were assessed in accordance with ODSL guidance for linear projects (ODSL 2013). The ODSL guidance specifies that, for linear projects, the predominant wetland condition be assessed using the Oregon Rapid Wetland Assessment Protocol (ORWAP). The ORWAP is a standardized protocol for rapidly assessing functions and values of wetlands and is applicable to wetlands of any type throughout Oregon. The ORWAP utilizes an Excel spreadsheet that generates scores to reflect a wetland's relative effectiveness at performing wetland functions (e.g., Water Storage and Delay, Anadromous Fish Habitat), grouped functions (e.g., Hydrologic Functions, Water Quality Functions), and relative values of each function or grouped function. Not all wetlands perform the same functions, nor do they perform all functions equally well. For example, depressional wetlands typically provide greater water storage and delay than slope wetlands due to their position within depressions in the landscape. Slope wetlands are located on, or near the base of, a slope and water typically sheet flows off the surface our discharges through a channel at the base of the slope, but is not contained. Detailed definitions for each ORWAP function, grouped function, and other scored attributes are available in the ORWAP guidance document (Adamus et al. 2010).

Based on the guidance and discussions with ODSL mitigation specialists, the project corridor was divided into four sections by ecoregion: Coastal Lowlands, east slope of the Coast Range, west slope of the Coast Range, and the Willamette Valley. No "special areas of concern" defined by ODSL (ODSL 2013) were encountered in the project corridor during the wetland delineation that would have required separate functional assessments.

Identified Wetlands

A field investigation was conducted between December 19, 2012 and May 31, 2013. The investigation identified 118 wetlands (totaling 44.6 acres). Complete summary information, including: wetland size, Cowardin and HGM classifications, wetland buffer widths, local jurisdiction, and nearest structure, is provided in the Keeler-Tillamook Transmission Line Rebuild Project Wetland Delineation Report (Turnstone 2013a). For a discussion of non-wetland waters, refer to Section 3.7, *Waterways, Water Quality, and Floodplains*. All of the identified wetlands are palustrine wetlands (see Table 3.8-1). In total, 101 of the 118 wetlands identified extend beyond the 100-foot transmission line ROW (Turnstone 2013a).

Table 3.8-1. Summary of Wetland Classifications

Cowardin Classification		Oregon HGM Classification	
Type	**Number of Wetlands**	**Type**	**Number of Wetlands**
Palustrine Emergent (PEM)	93	Slope (VS, HS)	49
Palustrine Scrub-Shrub (PSS)	23	Flats	28
Palustrine Forested (PFO)	2	Riverine (RI, RFT)	27
		Depressional (DCNF, DOF)	14
VS = valley slope; HS = headwater slope; RI = riverine impounding; RFT = riverine flow-through; DCNF = depressional, closed non-permanently flooded; DOF = depressional outflow.			

Table 3.8-2 presents the ORWAP Grouped Function scores for the representative wetlands assessed in each project section, which provides a coarse representation of overall wetland condition in the project corridor based on the predominant wetland class.

The Coastal Lowlands section of the project corridor includes riverine, slope, flat, and depressional wetlands. Flats (wetlands that receive most of their water from direct precipitation, which seeps vertically into the ground) are the predominant HGM class in this portion of the project area. As reflected in the ORWAP Group Function scores for the representative wetlands assessed, wetlands along the project corridor in the Coastal Lowlands provide low to moderate levels of most functions. Ecological condition is relatively low and stressors are high. This reflects the high degree of landscape alteration and human activity in this area.

The east and west slopes of the Coast Range both include riverine and slope wetlands. Riverine wetlands are those where the dominant water sources is channel flow or overbank flow from a channel (floodplains); water flows in one direction in channels and is bidirectional in floodplains. Slope wetlands are those where the dominant water source is groundwater discharge and water flows horizontally in one direction. In both areas, slope wetlands are the predominant wetland class. The representative wetlands assessed in these two areas scored similarly on the ORWAP for all functions, grouped functions, and other attributes (see Table 3.8-2). The slope wetlands in the Coast Range sections of the project corridor provide little to no support for hydrologic functions (water storage and delay) as indicated by a score of zero (see Table 3.8-2), and also scored very low for carbon sequestration. This is typical of slope wetlands due to their position in the landscape. Water storage and delay, and carbon sequestration both depend on a wetland’s ability to retain water or particulates. Depressional wetlands are generally better at providing these functions. Although the Stressors score is moderate in the Coast Range wetlands, Ecological Condition still scored relatively high.

Table 3.8-2. ORWAP Grouped Function Scores [a]

Project Section	Coastal Lowlands		Coast Range (east slope)		Coast Range (west slope)		Willamette Valley	
Group Function [b]	**Functions**	**Values**	**Functions**	**Values**	**Functions**	**Values**	**Functions**	**Values**
Hydrologic Function	1.67	6.94	0.00	3.08	0.00	3.08	4.44	4.51
Water Quality	5.21	6.64	5.03	5.92	5.03	6.19	4.14	6.10
Carbon Sequestration	3.52	—	2.80	—	2.80	—	2.38	—
Fish Support	1.33	10.00	6.18	10.00	6.18	10.00	1.06	4.15
Aquatic Support	5.56	10.00	5.84	7.37	5.84	7.37	7.38	8.00
Terrestrial Support	4.02	6.67	7.87	6.00	7.87	6.00	5.60	7.00
Public Use & Recognition	—	3.96	—	0.83	—	0.83	—	1.46
Provisioning Services	—	0.00	—	4.00	—	4.00	—	4.00
Other Attributes								
Ecological Condition [c]	—	3.02	—	7.41	—	7.41	—	4.64
Stressors [d]	—	7.55	—	5.69	—	5.69	—	5.77
Sensitivity [e]	—	7.20	—	5.42	—	5.42	—	6.10

[a] Scores are based on a relative scale of 0 to 10, with 0 being the lowest and 10 being the highest. The dashed boxes are where the ORWAP does not generate a score for that group function or value.

[b] Definitions are provided in the ORWAP guidance document (Adamus et al. 2010).

[c] Operationally, the integrity or health of the wetland as defined primarily by its vegetation composition. More broadly, the structure, composition, and function of an ecosystem as compared to reference ecosystems operating within the bounds of natural or historic disturbance regimes.

[d] The degree to which the wetland is or has recently been altered by, or exposed to risk from human and natural factors.

[e] The lack of intrinsic resistance and resilience of the wetland to human and natural stressors (higher score = more sensitive).

Source: Turnstone 2013a.

The Willamette Valley section of the project corridor includes riverine, slope, flats, and depressional wetlands. Like the Coastal Lowlands, flats are the predominant HGM class in the Willamette Valley. The ORWAP grouped function scores for the representative Willamette Valley wetlands are highly variable, ranging from very low (Fish Support) to moderately high (Aquatic Support). Wetland stressors in the Willamette Valley section of the project corridor are similar to those in the Coastal Lowlands (a high degree of alteration and intensive, ongoing agricultural activity) and Ecological Condition is moderately low.

3.8.2 Environmental Consequences–Proposed Action

The Proposed Action could result in direct and indirect impacts on wetlands and wetland buffers as a result of project activities including structure and hardware replacement, road construction and reconstruction, danger tree removal, and the use of temporary travel routes. Direct wetland impacts would include disturbances to hydrology, soils, and vegetation from project activities within wetland boundaries and from the installation of drainage features such as culverts for stream crossings. Indirect impacts are those resulting from project activities occurring outside of wetland boundaries, but within wetland buffers. The Proposed Action has the potential to impact various functions provided by wetlands. The functions most likely affected by project activities include: hydrologic functions (i.e., water storage and delay); water quality; and fish, aquatic, and terrestrial support functions. Impacts may be temporary (short-term), such as disturbance to vegetation that is restored after work is completed or regenerates in a short period of time, or permanent (long-term), such as a new road fill within a wetland area that results in a permanent loss of wetland function. Mitigation could reduce such a loss of wetland function to a temporary loss. Wetland and wetland buffer impacts associated with structures, access roads, and temporary travel routes are summarized in Tables 3.8-3, *Structure Impacts on Wetlands and Wetland Buffers*, and 3.8-4, *Access Road and Temporary Travel Route Impacts on Wetlands and Wetland Buffers*, and described below.

Table 3.8-3. Structure Impacts on Wetlands and Wetland Buffers

Wetland ID	Structure ID	Segment	Wetland Impacts (acres)		Wetland Buffer Impacts (acres)	
			Permanent	Temporary	Permanent	Temporary
11413A_1	1/4	FGT		0.02		0.02
	1/5	FGT				< 0.01
11413A_3	1/8	KFG				0.01
11413A_4	1/10	KFG	< 0.01	0.02	< 0.01	0.02
11413A_5	2/6	KFG		< 0.01		0.04
11513A_1	3/4	KFG	< 0.01	0.04		
11513A_4	3/8	KFG		0.01		0.04
11613A_3	5/8	KFG				0.02
11613A_5	6/1	KFG		0.04		
	6/2	KFG		0.01		0.03
11713A_1	8/7	KFG		0.02		0.03
	8/8	KFG		0.04		
11813A_1	11/4	KFG				0.04
11813A_3	11/6	KFG				0.01
12113A_1	1/6	FGT				< 0.01
12113A_2	1/5	FGT		0.04		< 0.01
12113A_3	1/7	FGT		0.02		0.03
121912A_1	28/2	FGT		0.01		
121912A_4	28/4	FGT		0.01		
12213A_1	2/2	FGT		0.02		0.03
	2/3	FGT		0.04		0.01
	2/4	FGT		0.04		
12213A_2	2/5	FGT				0.01
12213A_3	2/10	FGT				0.03
	2/7	FGT				0.01
	2/8	FGT		0.04		0.01
	2/9	FGT		0.03		0.02
12213A_4	3/2	FGT		< 0.01		0.04
12313A_2	3/4	FGT				0.02

Wetland ID	Structure ID	Segment	Wetland Impacts (acres)		Wetland Buffer Impacts (acres)	
			Permanent	Temporary	Permanent	Temporary
12313A_4	3/7	FGT		0.04		< 0.01
12313A_5	3/7	FGT				0.02
12413A_1	5/2	FGT		0.03		0.02
12413A_2	6/2	FGT		0.04		< 0.01
12513A_2	7/7	FGT		0.03		0.01
12513A_3	7/6	FGT		< 0.01		0.04
12513A_4	7/5	FGT		0.01		0.04
12813A_2	9/5	FGT		0.04		< 0.01
13113A_1	10/1	FGT		0.04		
13113A_2	10/2	FGT				0.04
13113A_3	10/3	FGT		0.04		
13113A_4	10/4	FGT		0.04		
13113A_5	10/5	FGT				0.04
13113A_7	10/6	FGT		0.04		< 0.01
22813A_1	33/6	FGT				0.03
31913A_1	45/4	FGT		0.04		
31913A_2	46/8	FGT		0.01		
	47/1	FGT		0.04		
32013A_2	47/2	FGT		0.03		
32013A_6	47/5	FGT		0.04		
3513A_3	35/7	FGT		0.01		
42913A_1	44/3	FGT		0.02		
	44/4	FGT		0.04		
	44/5	FGT		0.02		
		Totals (acres)	< 0.01	**1.09**	< 0.01	**0.73**

Notes: FGT=Forest Grove to Tillamook, KFG=Keeler to Forest Grove.
Blank cells indicate no impact.

Table 3.8-4. Access Road and Temporary Travel Route Impacts on Wetlands and Wetland Buffers

Wetland ID	Wetland Impacts (acres)			Wetland Buffer Impacts (acres)		
	New Road	Improve/Recon-structed Road	Temporary Travel Route	New Road	Improve/Recon-structed Road	Temporary Travel Route
11013A_3		0.03				
11013A_4		< 0.01				
11013A_5			< 0.01			
11013A_7		0.01			0.06	
11413A_3				< 0.01		0.01
11413A_4						0.04
11413A_5						< 0.01
11513A_1			0.03			0.10
11513A_2			0.06			0.05
11513A_3			0.17			0.06
11513A_4			0.52			0.07
11613A_3			0.07		0.06	0.01
11613A_2					0.08	
11613A_3						0.03
11613A_4			< 0.01			0.08
11613A_5						0.09
11713A_1		0.01	0.59		0.03	0.01
11813A_1						0.14
11813A_3						0.01
12113A_2			< 0.01			0.06
12113A_3			0.01			0.03
12113A_4			0.04			0.02
121912A_1		< 0.01				
121912A_2		< 0.01				

Wetland ID	Wetland Impacts (acres)			Wetland Buffer Impacts (acres)		
	New Road	Improve/Recon-structed Road	Temporary Travel Route	New Road	Improve/Recon-structed Road	Temporary Travel Route
121912A_3		< 0.01				
12213A_1			0.20			0.11
12213A_2			0.01			0.05
12213A_3		0.01	< 0.01		0.05	0.05
12213A_4		< 0.01	0.01		0.11	0.06
12313A_2			0.06			0.07
12313A_3			0.01			0.10
12313A_4			0.02			0.05
12313A_5			0.03			0.04
12413A_1			0.04			0.04
12413A_2			0.19			0.05
12513A_1			0.07			0.06
12513A_2		0.02			0.05	
12513A_3		0.08			0.04	
12513A_4		0.29			0.11	
12513A_5		0.05			0.05	
12513A_6		0.10			0.05	
12813A_2			< 0.01			0.02
12813A_2						0.02
13113A_1			0.13			0.05
13113A_2			0.07			0.03
13113A_3			0.05			0.05
13113A_4			0.13			0.05
13113A_5			0.02			0.05
13113A_6			0.04			0.05

Wetland ID	Wetland Impacts (acres)			Wetland Buffer Impacts (acres)		
	New Road	Improve/Recon-structed Road	Temporary Travel Route	New Road	Improve/Recon-structed Road	Temporary Travel Route
13113A_7			0.03			0.07
1813A_1			0.04	0.04		0.10
1813A_2						0.01
21113A_4						0.02
21913A_1			< 0.01			
21913A_2						0.06
21913A_3					0.03	0.06
22513A_1						0.05
22613A_1			0.03			
22713A_1					0.01	
22813A_1						
2513A_1					0.03	
2813A_2		< 0.01				
31913A_1			0.21			
31913A_2			0.59			
32013A_2			0.02			
32013A_6		0.04	0.01			
42913A_1			0.57			
52813A_1		< 0.01				
52813A_2		< 0.01				
52813A_3		< 0.01				
52813A_4		< 0.01				
Total	**0.00**	**0.65**	**4.07**	**0.04**	**0.77**	**2.17**

Note: New Roads are considered permanent impacts, Improved/Reconstructed Road and Temporary Travel Routes are considered temporary impacts.

Construction

Structure Removal and Replacement

Overall, structure work in wetlands would temporarily disturb a combined total of 1.09 acres of wetland habitat and permanently disturb less than 0.01 acre of wetland habitat. Disturbance areas in or near sensitive habitats, such as wetlands, would be reduced to 50 feet by 50 feet per structure (approximately 0.06 acre) where possible, so the wetland disturbance areas shown in Table 3.8-3 may overestimate temporary structure disturbance in some wetlands.

Construction activities associated with structure removal and installation would result in direct, short-term impacts on wetlands from the disturbance of vegetation, excavation to remove existing structures, soil compaction from heavy equipment, and potential erosion of exposed soils. Vegetation in the impacted wetlands is dominated by herbaceous species; however, some shrubs or small trees may also occur and may need to be removed to allow equipment access to structures. Herbaceous vegetation may need to be temporarily cut or mowed. Once work at each structure site is complete, herbaceous vegetation in impacted wetlands is expected to regenerate naturally and relatively quickly (within one season) and would help to stabilize exposed soils. Shrubs and trees are also expected to regenerate naturally over time, but would be subject to routine vegetation maintenance. Because these minor, temporary disturbances to vegetation and soils in wetlands would be limited to small areas, loss of wetland function would be temporary, and recovery from impacts would likely occur naturally without the need for restoration, wetland impacts associated with structure removal and installation would be **low**.

Structure removal and replacement in wetland buffers would temporarily disturb approximately 0.73 acre of wetland buffer and would permanently disturb less than 0.01 acre of wetland buffer (Table 3.8-3). These buffer disturbance areas are all located within the existing maintained transmission line ROW in areas that have been previously disturbed. Vegetation is one of the most important elements of wetland buffers, and removal or disturbance of vegetation in wetland buffers can directly displace or degrade habitat for wetland-associated species (especially birds) and indirectly impact adjacent wetlands, especially water quality.

The removal or temporary disturbance of buffer vegetation and disturbance to soils could indirectly affect wetlands by allowing sediments or other contaminants to enter. Mitigation measures listed in Section 3.8.3, *Mitigation – Proposed Action*, including minimizing disturbance areas associated with structures to 50 feet by 50 feet per structure within wetland buffers (approximately 0.06 acre) where possible; installing signage, fences, and flagging where needed to restrict vehicles and equipment to areas outside of wetlands; and installing erosion and sediment control BMPs. These measures would minimize potential indirect impacts on wetlands from structure work in buffer areas.

Once work is complete, disturbed vegetation is expected to regenerate naturally and relatively quickly and would help to stabilize exposed soils. Potential indirect impacts on wetlands associated with structure work in adjacent buffers would be temporary; impacts are considered to be ***low.***

Access Roads

No new access roads would be constructed within wetlands. Construction of new access roads would occur within two wetland buffers (Table 3.8-4) and would permanently impact a combined total of approximately

0.04 acre of wetland buffer (Table 3.8-4). Construction of new access roads would include the permanent removal of vegetation, grading, and installation of road sub-base and surface aggregate, drainage structures, and ditches. New access road construction would have **no** direct impact on wetlands because no new roads would be constructed in wetlands. However, vegetation removal, soil disturbance, the addition of road fill and surface aggregate, and the use of equipment and vehicles in wetland buffers could indirectly affect adjacent wetlands both during and after construction by allowing sediments or other contaminants to enter. The mitigation measures listed in Section 3.8-3, *Mitigation – Proposed Action*, would minimize potential short- and long-term indirect impacts on wetlands. Given the small disturbance areas within wetland buffers, the potential long-term indirect impacts on wetland function are expected to be minimal. However, because the new roads would be a continuous source of potential erosion and sediment, this is considered to be a **long-term**, **moderate** impact.

Road reconstruction/improvement would occur within 20 wetlands and 14 wetland buffers (Table 3.8-4). Road reconstruction/improvement would temporarily disturb a combined total of 0.65 acre of wetland habitat, and a combined total of 0.77 acre of wetland buffer (Table 3.8-4). Road reconstruction would be limited to the existing road width and would not result in new ground disturbance. Erosion and sediment runoff could potentially impact wetland function. With implementation of the mitigation measures in Section 3.8.3, *Mitigation – Proposed Action,* impacts on overall wetland function and condition are not expected. Direct and indirect impacts on wetlands from road reconstruction in wetlands and wetland buffers would be **low** both during and after construction because impacts would occur within the existing disturbed road bed.

Temporary travel routes would cross 38 wetlands and 43 wetland buffers (Table 3.8-4). These wetlands and wetland buffers are in agricultural areas and are disturbed, lower quality wetlands and wetland buffer areas (Table 3.8-4). Temporary improvements, such as drainage features and surface improvements to facilitate travel during construction, where necessary, would directly disturb wetlands and buffers. Use of travel routes would temporarily disturb a combined total of approximately 4.07 acres of wetlands and 2.17 acres of wetland buffer. Travel route disturbances in wetlands could permanently alter wetland ***microtopography*** and would likely impair water quality functions due to the temporary fill for surface improvements, temporary damage to vegetation, and soil compaction. Because temporary improvements would be removed following construction and these travel routes are located within the maintained transmission line ROW in already disturbed areas, including disturbance from ongoing agricultural activities, temporary losses in water quality function in wetlands are expected to be temporary and **low**. Permanent alterations in wetland microtopography are not expected to impact overall wetland hydrology.

Danger Trees

If required, danger tree removal within a wetland or wetland buffer could directly reduce structural diversity and some habitat functions. The danger tree removal areas were compared to the location of wetlands and wetland buffers in the area of wetland assessment to determine if danger tree removal could occur within wetlands or wetland buffers. Wetland Cowardin class, which indicates the dominant vegetation community type was also considered. Table 3.8-5 presents the results of this evaluation.

Table 3.8-5. Potential Danger Tree Removal within Wetlands or Wetland Buffers

Wetland ID	Cowardin Class	Segment	Tower Number	Number of Trees	Species	Potential Location
11413A_2	PEM	KFG	1/6	68	Cottonwood, Hawthorn, Alder, Ash, Willow	WB
11513A_4	PEM	KFG	3/8	6	Willow, Ash	WB
11513A_4	PEM	KFG	4/1	23	Oak, Willow, Birch	WB
22513A_1	PSS	KFG	4/1	23	Oak, Willow, Birch	W, WB
11613A_6	PEM	KFG	6/8	23	Cedar, Noble Fir, Willow, Ash	WB
12513A_6	PEM	FGT	7/3	3	Oak	WB
12513A_5	PEM	FGT	7/3	3	Oak	WB
2813A_1	PSS	FGT	7/2	200	1" dbh Willows	W
21313A_1	PFO	FGT	19/4	7	10-28" dbh Douglas-fir	W
22613A_1 or 22613A_2	PEM	FGT	31/9	4	Alder	W

Notes: dbh=diameter at breast height, W=wetland, WB=wetland buffer; KFG = Keeler to Forest Grove transmission line No. 1; FGT = Forest Grove to Tillamook.

Based on this evaluation, danger tree removal could potentially occur within four wetlands and seven wetland buffers (Table 3.8-5). One of these (near structure 19/4 on the Forest Grove to Tillamook line) is a forested wetland. Danger tree removal in wetlands and wetland buffers would directly impact some wetland functions (e.g., carbon sequestration, terrestrial support) and indirectly impact water quality, fish support, aquatic support, overall ecological integrity, stressors, and sensitivity over the long term. These impacts would be ***moderate,*** long-term impacts.

Staging Areas and Tensioning Sites

BPA would require the construction contractor to locate all staging and tensioning areas at least 100 feet from wetlands and wetland buffers (to the extent feasible) in level, open, and already developed or disturbed sites, to prevent water quality impacts from potential leaks and spills, and disturbance to wildlife. Keeler Substation would serve as one staging area for the Rebuild Project and no wetlands would be impacted in this area; up to two additional temporary staging areas may be utilized during project construction. Considering the mitigation measures, staging areas would likely have **no** direct or indirect impacts on wetlands.

BPA would require that tensioning sites be located at least 100 feet from wetlands, to the extent possible. Ground disturbance associated with the use of tensioning sites could cause construction-related runoff and erosion that could indirectly impact wetlands if located within 100 feet. However, tensioning sites would be located outside of wetlands to the extent feasible, and disturbance associated with tensioning sites would be temporary and localized, mainly occurring nearby or in conjunction with the removal of existing structures and the installation of new structures. Implementation of the mitigation measures in Section 3.8.3, *Mitigation – Proposed Action*, would further reduce impacts, and, as result, impacts on wetlands from tensioning sites are expected to be temporary and **low**.

Operations and Maintenance

Operation and maintenance activities would be similar to current conditions. Maintenance activities would require access by vehicles during line inspections a few times each year. Occasionally, equipment such as insulators may need replacement. Current vegetation management activities would continue, including the removal or pruning of danger trees and control of noxious weeds in the ROW.

Trimming or removal of tall vegetation from wetlands or adjacent uplands, and road maintenance activities in or near wetlands could impact wetlands or wetland buffers. Most of the identified wetlands are vegetated with herbaceous or shrub species, or are farmed wetlands, and vegetation maintenance activities would have **no** or **low** impacts on wetlands. Vegetation maintenance would be conducted under BPA's Transmission System Vegetation Management Program Final EIS and Record of Decision, which uses a variety of methods to keep plants from interfering with transmission lines and control noxious weeds (BPA 2000). Road maintenance activities would occur near or within wetlands. Maintenance of structures in or directly adjacent to wetlands would rarely be needed, but when needed, would result in disturbance of wetland and wetland buffer vegetation and soils. Due to the localized impact on wetlands that would generally be temporary, operation and maintenance would have a **low to moderate** impact on wetlands, depending on the type of work, quality of wetland, and extent of impacts.

3.8.3 Mitigation–Proposed Action

The following mitigation measures would be implemented to reduce or eliminate wetland impacts from the Proposed Action:

- Avoid siting new structures and access roads within 100 feet of wetlands during the final design process, where possible.
- Locate tensioning sites at least 100 feet away from wetlands and other water bodies, where possible.
- Design and construct access roads to minimize drainage from the road surface directly into wetlands, size new and replacement culverts large enough to accommodate predicted flows, and size and space cross drains and water bars properly to accommodate flows and direct sediment laden waters into vegetated areas.
- Obtain required permits associated with working in or near wetlands and work with regulatory agencies to develop appropriate mitigation for wetland impacts according to federal, state, and local permit requirements.
- Conduct peak construction activities during the dry season (between June 1 and November 1), as much as possible, to minimize erosion, sedimentation, and soil compaction.
- Minimize disturbance to wetlands and wetland buffers by reducing the disturbance area for work associated with structures to 50 feet by 50 feet per structure (approximately 0.06 acre) where possible; install signage, fences, and flagging where needed to restrict vehicles and equipment to designated routes outside of wetlands.
- Delineate construction limits within 100 feet of wetlands and other water bodies, as specified in the SWPPP (see Section 3.7.3, *Mitigation–Proposed Action [Waterways, Water Quality, and Floodplains]*).

- Inspect erosion and sediment controls (see Section 3.7.3, *Mitigation–Proposed Action [Waterways, Water Quality, and Floodplains]*).
- Avoid depositing excavated material into wetlands during structure construction, remove all excavated material from the wetland, except as allowed by permit, and stabilize the removed fill in an upland area.
- Check all equipment used for instream work for leaks prior to entering waterways (see Section 3.7.3, *Mitigation–Proposed Action [Waterways, Water Quality, and Floodplains]*).
- Prohibit discharge of vehicle wash water into any wetland without pretreatment to meet state water quality standards.
- Reseed disturbed areas after construction activities are complete (see Section 3.7.3, *Mitigation–Proposed Action [Waterways, Water Quality, and Floodplains]*).
- Revegetate disturbed areas in wetlands and wetland buffers following specific revegetation guidelines in permits; native species will be used for revegetation in wetlands that are not in agricultural areas, and pastures will be reseeded with an appropriate seed mix.
- Identify wetlands and other sensitive areas prior to initiating construction.

3.8.4 Unavoidable Impacts after Mitigation–Proposed Action

Even with the implementation of the mitigation measures identified in Section 3.8.3, unavoidable impacts on wetlands would occur from the Proposed Action. Temporary disturbances in wetlands from project activities such as structure removal and installation, access road work, and temporary travel routes could result in minor, temporary losses of wetland function until vegetation regenerates and soils stabilize. Permanent disturbances of wetlands from new structures and access roads could have moderate, long-term impacts on wetlands functions. Danger tree removal in wetlands and wetland buffers would also have a long-term adverse impact on wetland functions.

Operation and maintenance activities under the Proposed Action would be temporary and infrequent, but could have minor temporary impacts on wetlands during the maintenance of structures, use and maintenance of access roads, culvert maintenance, and danger tree removal. New access roads in wetland buffers would be a long-term source of erosion and sediment that could impact wetlands.

3.8.5 Cumulative Impacts–Proposed Action

Other reasonably foreseeable future projects in the vicinity of the project area that could affect wetlands are listed and described in Appendix B.

Wetlands in the Coast Range portion of the project area have been impacted by past and ongoing ODF and private forest management and timber harvest activities, including an extensive network of forest roads. Future timber harvest activities and associated road construction and maintenance are expected to continue to contribute to wetland impacts, including the removal of forested vegetation in wetlands or buffers.

Wetlands in the Willamette Valley portion of the project area have been impacted by past and ongoing activities, including conversion of wetlands to developed and agricultural uses. Agricultural land uses may maintain wetlands in altered states from natural conditions, such as the alteration of native species to row crops or pasture grass, subsequently impacting overall wetland function. Current and future planned development by Intel in Hillsboro and the City of Forest Grove near the Forest Grove Substation could also result in impacts on wetlands that could result in fill or removal of vegetation within the wetland or its buffer.

Past and ongoing activities in the westernmost portion of the project area, in the lowlands of the Tillamook Valley and floodplain of the Wilson River, have impacted wetlands through prior conversion of wetland to pasture and agricultural uses, similar to the Willamette Valley. Rural development, including highways and local roads, scattered rural residences, and dairy farm operations are the primary sources of these impacts. BPA's planned improvement of the access roads associated with the Boyer-Tillamook transmission line, which exits out of the Tillamook Substation, would likely have similar impacts as the Proposed Action on wetlands.

The Proposed Action would result in temporary disturbance to approximately 5.81 acres of wetlands associated with structure work, road reconstruction/improvements, and temporary travel routes. Structure replacement and new roads would result in the permanent fill of less than 0.01 acre of wetlands. Temporary disturbance would be mitigated by wetland restoration at the same location as the disturbance. Therefore, the Proposed Action would have a **low** cumulative impact on wetlands.

3.8.6 Environmental Consequences–No Action Alternative

Under the No Action Alternative, the existing transmission line would not be rebuilt. No construction activities or construction-related impacts on wetlands would occur. Operation and maintenance activities, including danger tree removal, would be similar to those associated with the Proposed Action. However, as the existing structures deteriorate, the frequency of maintenance activities would likely increase, as would the potential for unplanned emergency maintenance activities. Increasing the frequency of maintenance activities could increase the frequency of disturbance to soils and vegetation within wetlands and wetland buffers, resulting in periodic, temporary impacts on some wetland functions.

3.9 Visual Resources

Aesthetic or visual resources (the terms “aesthetic resources” and “visual resources” are used interchangeably in this EA) are the various components of the landscape that contribute to the visual character of a place. These components can be natural or human-made and are cumulatively referred to as vistas or ***viewsheds***. Several aesthetic resource assessment methodologies are typically used to assess viewsheds and proposed changes to these viewsheds. While aesthetics and responses to change tend to be driven by subjective viewer preferences, these visual assessment techniques provide a standardized approach to objectively analyze viewsheds and potential changes.

The Federal Highway Administration’s (FHWA) Visual Impact Assessment for Highway Projects (FHWA 1988) was used as guidance to assess the Proposed Action’s potential impacts on viewsheds. The FHWA’s assessment guidelines tend to better address linear projects, as well as aesthetic resources along traffic corridors and in rural to suburban settings (compared to other methodologies that typically focus more on lightly developed areas or largely intact landscapes). The FHWA Visual Impact Assessment guidance focuses on three key concepts:

1. Visual character (the descriptive attributes of a landscape).
2. Visual quality (the sum of a landscape’s ***vividness***, ***intactness***, and ***unity***).
3. Viewer response (concern or awareness of the landscape by typical viewers).

3.9.1 Affected Environment

The area of potential impact for visual resources is the Proposed Action as well as the larger viewsheds from which the Proposed Action can be seen. The Proposed Action crosses lands that are owned and managed by several entities, including the state, local municipalities, private owners, and the federal government (see Section 3.2, *Land Use, Recreation, and Transportation*).

In general, the transmission line ROW is located within three broad landscapes (the viewsheds within each of these landscapes share similar characteristics). Traveling from east to west, these landscapes are:

- *Suburban/Agricultural (Keeler Substation to the eastern edge of the Coast Range)* – This landscape is characterized by a mix of suburban development and farmland that is interspersed with small forested areas, wetlands, and other natural open space areas. It generally includes the transmission line from the Keeler Substation to structure 10/10 of the Forest Grove-Tillamook No. 1 transmission line. Development and other ***cultural modifications*** include communities and associated residential and business development, roads and highways, transportation and utility corridors, farms, and recreation sites and use areas, among others. Given the generally flat topography of this area (a valley bounded by mountains to the east and west), there are many opportunities for panoramic views of and from this landscape. The Coast Range serves as an integral scenic component (often in the middle to background) for many of these views (in particular, views across the flat valley to the west).
- *Coast Range* – This landscape is dominated by forested mountains, rivers, and other natural features (e.g., mixed vegetation, ponds and lakes, rock outcrops and formations). It generally includes the section of the Forest Grove-Tillamook No. 1 transmission line from structure 11/1 to 44/1. Development and other cultural modifications include several transportation and utility corridors, as

well as periodic residences, businesses, and recreation sites and use areas. Due to the mountainous topography and tree height, views tend to be enclosed, with limited opportunities for expansive views of the surrounding landscape.

- *Rural/Agriculture (western edge of the Coast Range to the Tillamook Substation)* – This landscape is similar to the Suburban/Agricultural landscape, but tends to be characterized by a higher degree of agricultural and less suburban development. It generally extends from structure 44/1 on the Forest Grove-Tillamook No. 1 transmission line to the Tillamook Substation. Development and other cultural modifications include farms, roads, utility corridors, and residential/commercial development. The topography of this landscape (generally a flat valley) is also conducive to panoramic views.

The assessment of visual resources associated with the Proposed Action was completed through field visits, a desktop analysis of field-based photography from several key observation points (KOP), and a review of available GIS-based viewshed information.

Field visits to photograph the existing visual environment were conducted on March 11, 2013 and March 18–22, 2013 (in conjunction with the vegetation and fish and wildlife field visits). The photographs were generally taken between 8:00 a.m. and 5:00 p.m. The weather ranged from cloudy to partly cloudy with variable natural lighting, typical in the Pacific Northwest in mid-March. The seasonal nature of the cloud cover, precipitation, and lighting did not influence the assessment of aesthetic conditions, though it is acknowledged in the photographs of the existing transmission line.

Since it is typically not feasible to analyze all of the views from which a project site could be seen by the public, the standard best practice in visual assessments is to select a number of KOPs to represent the visual landscape that may be affected by implementation of a project. Each KOP may then be used to make inferences about potential visual impacts on other similar types of views. Given the length of the existing transmission line, four KOPs were selected that provide representative views of the transmission line ROW within each of the landscape types identified above. KOP locations are identified in Figure 3.9-1, and summarized in Table 3.9-1.

Table 3.9-1. Summary of Key Observation Points

KOP	Description/Orientation/Landscape Type	Primary Viewer Groups
1	Rock Creek Powerline Park on NW Rock Creek Boulevard, unincorporated Washington County, looking west. Suburban/agricultural landscape type.	Recreation users, residents, motorists
2	Jones Creek Day Use Area, Tillamook State Forest, looking south. Coast Range landscape type.	Recreation users, motorists
3	Turnout on SR 6, Tillamook State Forest, eastern end of “The Narrows” neighborhood, looking west. Coast Range landscape type.	Residents, motorists
4	SR 6 at Fairview Road, unincorporated Tillamook County, looking north. Rural/agriculture landscape type.	Residents, motorists

An inventory of key aesthetic elements from each KOP is provided below. For each KOP, the analysis includes a description of the existing visual character and quality. The KOP descriptions include typical distance qualifiers (viewing distances influence viewers' perceptions of visual changes on a landscape). For purposes of this assessment and based on the FHWA's visual resource guidance, these qualifiers are defined as follows:

- **Foreground** – up to ¼ mile from the KOP.
- **Middleground** – between ¼ and 3 miles from the KOP.
- **Background** – more than 3 miles from the KOP.

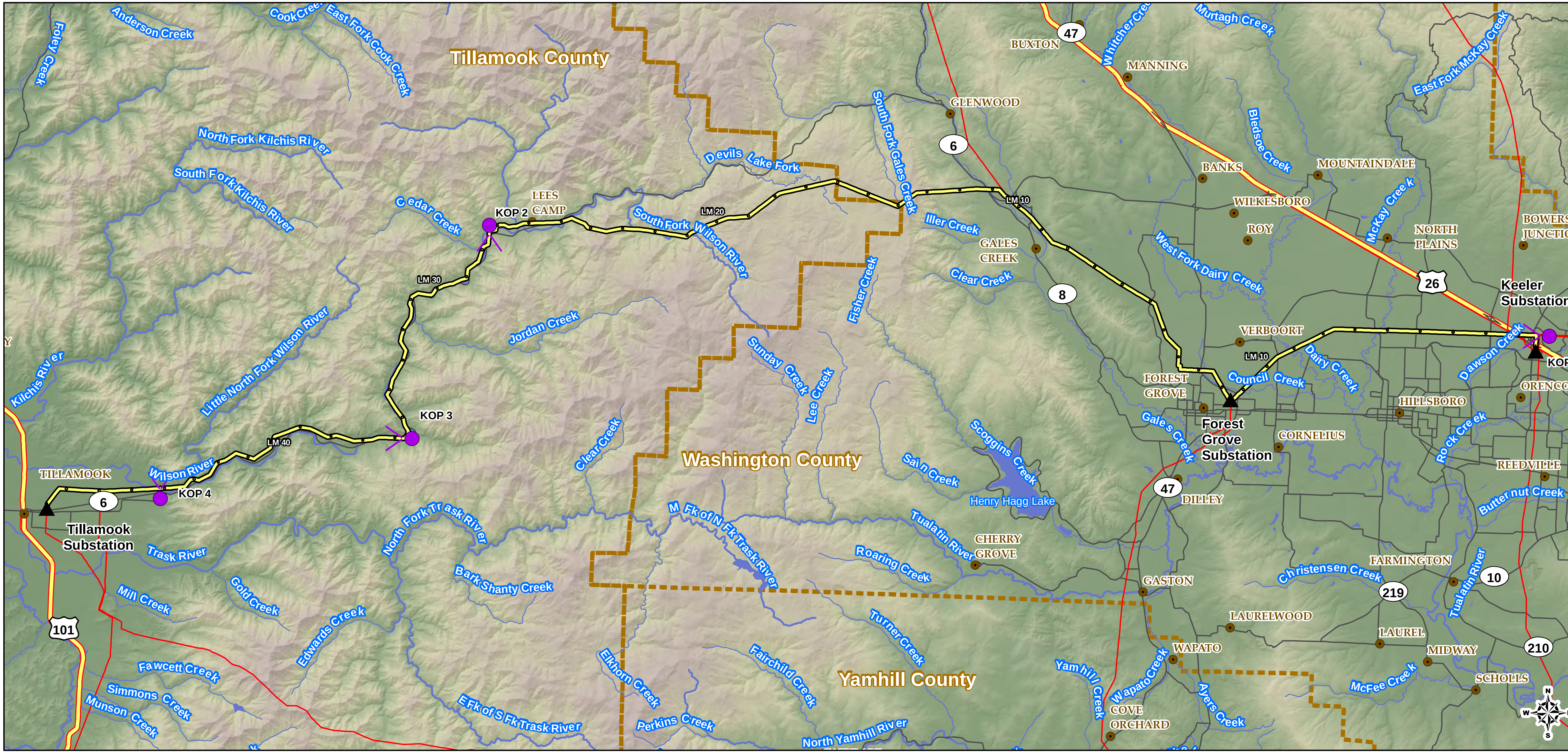
In general, the closer a resource is to the viewer, the more dominant it is and the greater its importance to the viewer. Existing views from each of these KOPs are also depicted in Figures 3.9-2 through 3.9-5. Following the KOP descriptions and photographs, the primary viewer groups are identified and described.

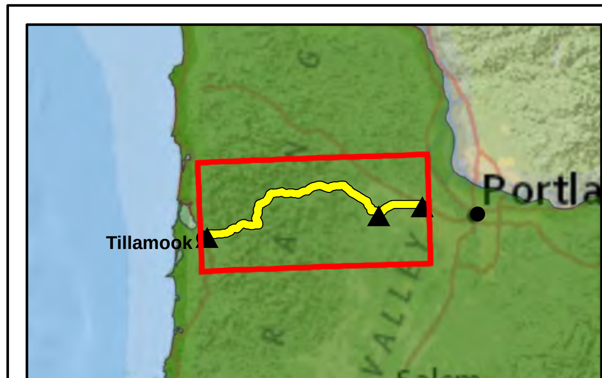
Key Observation Point 1 (KOP 1)

KOP 1 is facing west from the parking area in Rock Creek Powerline Park on NW Rock Creek Boulevard north of US 26. From this location, the existing transmission line is visible in the foreground and extends to the west into the middleground. Since multiple transmission and distribution lines converge at this location, the Keeler-Forest Grove No. 1 transmission line does not stand out. Various shades of green dominate the natural features within the KOP 1 viewshed, while developments and other cultural modifications including transmission lines, buildings, and roads add color diversity and contrast (e.g., grays, white, tan, brown, yellow).

The views from KOP 1 of the transmission line ROW tend to be common to utility corridors in the region. Much of the natural vegetation has also been replaced, and man-made features dominate the viewshed.

Figure 3.9-2. Key Observation Point 1 – facing west (*with views of a utility corridor that includes the existing Keeler-Forest Grove No. 1 transmission line [enters view from the south [left] and then turns to the west]).*





Legend

- ▲ BPA Substation
- • Line Mile (LM)
- Keeler - Tillamook No. 1 Transmission Lines
- BPA Transmission Line
- Cities or Towns
- River
- County Boundary
- Key Observation Point

Keeler to Tillamook 115-kV Transmission Line Rebuild Project

Figure 3.9-1

Key Observation Points

1 inch = 3 miles

0 1.5 3 6 Miles

BONNEVILLE POWER ADMINISTRATION

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Print Date: October 22, 2013

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Key Observation Point 2 (KOP 2)

KOP 2 is located in the parking lot of the Jones Creek Day Use Area (north of SR 6 and the Wilson River) in the Tillamook State Forest. The existing transmission line traverses the parking lot, crosses the Wilson River and SR 6, and then parallels SR 6 as it continues to the south. From the KOP, the existing transmission line is visible in the foreground to middleground as it passes from the parking lot across the Wilson River and SR 6 (Figure 3.9-3). The KOP 2 viewshed is visually diverse, with taller trees and shorter, ground-level vegetation, flowing water, and some developments and other cultural modifications including the transmission line, a road, and a pathway. The cultural modifications, including SR 6, the transmission line corridor, and a trail are visually prominent (e.g., the cleared ROW contrasts with the adjacent forested areas), but do not dominate the view. Colors range from dark to lighter, more vibrant greens, as well as tan, brown, gray, and reflective green-gray from the water. The color and reflectivity in the viewshed likely change based on cloud cover and amount of sunlight. While the position of the KOP within the transmission line ROW provides some more distant viewing opportunities (i.e., into the middle and background), the density and height of the trees, as well as the topography of the area tend to limit more panoramic views from this location.

Figure 3.9-3. Key Observation Point 2 – facing south

The KOP 2 viewshed is typical of views in the SR 6 corridor within the Coast Range/Tillamook State Forest. Views of the transmission line and ROW are limited and only periodically visible as motorists and others travel through the area, but these features are visible given the prominence of the cleared ROW and associated transmission line structures through the forest. The Wilson River, adjacent riparian and forested areas, and limited extent of development and cultural modification present a generally unified or cohesive visual pattern from this location.

Key Observation Point 3 (KOP 3)

The KOP 3 viewshed includes the western foothills of the Coast Range, the SR 6 corridor, and a small residential area ("The Narrows"). The KOP is located on a small turnout on SR 6 above the residential area (Figure 3.9-4). The existing transmission line parallels SR 6 and is directly overhead of some of the homes in this area. From this location on SR 6, the roofs of several homes are visible, though motorists traveling at highway speeds have partially obstructed and brief views of the residential area. The viewshed from this KOP is dominated by the Coast Range mountains, though low structures such as homes and other buildings, roads, utility poles, and signs are also visible in the viewshed. The topography, vegetation, and cultural modifications provide vertical structure and diversity to the viewshed. The color palette of the KOP 3 viewshed is varied and includes green, white, tan, gray, brown, but tends to be subdued. In general, the KOP 3 viewshed is enclosed with limited opportunities for more expansive or panoramic views. This tends to focus viewer attention on those landscape features in the immediate vicinity of the KOP.

Figure 3.9-4. Key Observation Point 3 – facing west

The existing transmission line and SR 6 corridor tend to encroach on the forested mountain setting, in particular in foreground views. The residential homes are partially screened from view and generally do not detract from the natural landscape. Because the man-made features, particularly the houses, are small compared to the mountains and forest of the viewshed, their visual effect on the viewer is minimal.

Key Observation Point 4 (KOP 4)

KOP 4 is located along SR 6 within the Tillamook Valley (Figure 3.9-5). The existing transmission line is visible in the foreground as it crosses agricultural fields toward its western terminus at the Tillamook Substation. The KOP 4 viewshed presents a visually interesting and complex landscape. There is a high degree of contrast between the flat, smooth agricultural fields and the mountains. The transmission line and several trees provide some vertical elements along the flat agricultural fields, but the forested mountains tend to minimize the scale of these features. Colors range from the more vibrant greens of the agricultural fields to the more subdued dark greens, tan, and brown of the forest and other surrounding vegetation. There are several developments and cultural modifications, including the transmission line, farm buildings, and roads. While the mountains limit views in some directions, KOP 4 generally provides panoramic views of the Tillamook Valley.

Figure 3.9-5. Key Observation Point 4 – facing north

The combination of surrounding mountains, agricultural valley, and minimally invasive developments and cultural modifications helps unify the panoramic viewshed at this location.

Viewer Groups and Sensitivity

Viewer sensitivity, or concern for a particular viewshed, is based on the visibility of resources in the landscape, proximity of viewers to the visual resource, elevation of viewers relative to the visual resource, frequency and duration of views, number of viewers, and type and expectations of individuals and viewer groups, among other factors.

Land uses surrounding the project area support a mixture of public and private lands, agricultural and other rural uses, forests, and streets and roadways. These land uses yield the following general viewer groups along the transmission line ROW: motorists, recreationists, and residents. Several major transportation corridors (e.g., SR 6, SR 8, US 26, etc.) and multiple local roadways provide motorists with periodic and intermittent views of the transmission line ROW. Local parks, as well as the Tillamook State Forest, offer viewing opportunities for hikers, sightseers, OHV users, and other recreational visitors. Finally, residences scattered throughout the ROW vicinity have views of the site.

Each of these broad types of viewer groups has a general sensitivity to changes in the visual setting of the project area. These sensitivity levels are summarized below for each viewer group:

- **Motorists** generally have a low sensitivity to visual changes in the environment because their attention is focused on the road and their destination. Given motorist speed, viewing duration, and orientation of the transmission line (occasionally a focal point given the orientation of roadways to the line), motorists' awareness of and sensitivity to the Proposed Action from the established KOPs are likely to be low to moderate.

- **Area residents** tend to have a higher degree of sensitivity to visual changes. They typically take ownership of their views and are more sensitive to change than people just passing through (e.g., motorists). Given the location of the Proposed Action in relation to several residential areas such as those in Forest Grove and The Narrows neighborhood, area residents' awareness of and sensitivity to change from the Proposed Action are estimated to be moderate to high.
- **Recreationists** also tend to have higher levels of sensitivity to visual changes or intrusions in natural settings (e.g., parks, open space areas). Aesthetics, or the scenic interest and beauty of an outdoor recreation area, is typically one of several components that influence the quality of a visitor's overall recreation experience. Given the presence of several local parks, as well as the Tillamook State Forest (an outdoor recreation resource of regional importance), recreationists' awareness of and sensitivity to change from the Proposed Action are likely to be moderate to high.

3.9.2 Environmental Consequences–Proposed Action

The level of impact from a proposed project is typically a function of the change in viewsheds and overall viewer response to viewshed changes. Typically, a new transmission line (or other type of developments and cultural modifications) would impact the viewsheds from these KOPs. However, the Proposed Action is a replacement of an existing transmission line and was specifically designed to minimize potential changes to viewsheds along the transmission line ROW. Because the Proposed Action is designed to limit any potential impacts on the existing viewsheds, potential changes and impacts are described, but visual impact scores (a typical component of the FHWA Visual Impact Assessment process) are not included in this analysis. Mitigation measures have been proposed that would reduce or eliminate potential impacts on visual resources (see Section 3.9.3, *Mitigation – Proposed Action*).

Since most of the Proposed Action involves replacing existing wood-pole structures with new, but similar wood-pole structures in generally the same locations, the long-term impacts on visual resources through most of the ROW viewsheds would be **low**. The height of new poles would increase from a current maximum height of 75 feet to 112 feet, depending on terrain, length of spans, and other factors. This increased height would make the structures more visible on the landscape from specific locations and at specific viewing distances (the change in height would be more pronounced in the foreground, but less perceptible in the background), but would not substantially alter the overall scenic quality of the transmission line ROW viewsheds. Initially, the new conductors may be more reflective than the existing conductors, but would weather and dull over time. The new conductors may be more perceptible for several years after replacement and thus constitute a **low** to **moderate** impact; however, as they dull over time, their impact would diminish and be considered **low**.

In the short term, construction activities would create disruptions and distractions to the existing ROW viewsheds. Depending on the time and location of the construction activities, viewers would clearly see construction crews replacing structures, clearing vegetation, improving/upgrading and constructing new access roads, using and storing equipment at staging areas, and using heavy equipment to string and tension conductors on new structures. These activities would temporarily affect visual resources, in particular for those viewers with a higher degree of sensitivity to change (area residents and recreationists). The degree of visibility of construction activities and associated impacts on visual resources from each of the established KOPs (which serve as representative views within each of the three landscapes traversed by the Proposed Action) would include:

- ***KOP 1 –*** Construction activities would be clearly visible given the lack of topography and other landscape elements such as trees or buildings that may screen the transmission line ROW. These activities would be most visible in the foreground and become less perceptible as the transmission line continues through the middleground to the west of this location. The larger lattice-steel towers and other transmission lines would continue to dominate the viewshed from KOP 1 during construction and operation of the reconstructed transmission line. Overall, construction activities would be visible from KOP 1 and similar sites, such as most of the project area near and along US 26 in Hillsboro. Associated impacts on visual resources would be **low**.
- ***KOP 2 –*** The topography of the Coast Range mountains, as well as the forest cover, would help screen construction activities from the Proposed Action in the vicinity of KOP 2. However, the location of KOP 2 at a recreation site provides direct views of the transmission line ROW, including a view that extends into the middleground. This direct line of sight into the ROW clearing acts to focus views and would make construction activities more pronounced. For motorists on SR 6, views of construction activities would be brief and not within their direct line-of sight, except where the line crosses the highway at KOP 2, but recreationists would have lengthier and more direct views of these activities. Overall, construction activities would be partially to clearly visible at this location and similar sites, such as most of the project area along SR 6 near the Wilson River in the Coast Range. Associated impacts on visual resources would be **low** to **moderate** depending on the type of viewer.
- ***KOP 3 –*** Most construction activities would be clearly visible and a focal point of motorists on SR 6 from this location and the rest of the area in The Narrows neighborhood. Additionally, area residents would be sensitive to construction activities given the proximity of the line to area homes. Danger tree removal would be visible in this area as most of the vegetation within the ROW would be removed. While these activities would be temporary, they nonetheless would result in disturbances to ROW viewsheds at KOP 3. The disturbances and associated impacts would be **moderate** given the focal nature of the construction activities for motorists and the proximity to area residents' homes.
- ***KOP 4 –*** Construction activities from the Proposed Action would be clearly visible from this location and similar sites, including most of the area in the Tillamook Valley from KOP 4 to the terminus of the transmission line at the Tillamook Substation. These activities would be most visible in the foreground and become less perceptible in the middle- to background. Trees, homes, and other farm buildings would partially screen some construction activities along portions of the transmission line ROW. For motorists, these visual distractions would not likely detract from the overall visual quality of the area, given the duration of views and obstructions; however, area residents would be more sensitive to construction activities, in particular on those portions of the Proposed Action that are near homes in this area. The view from KOP 4 would continue to be framed and dominated by the middle-to-background views of the mountains both during construction and operation. As such, while construction activities would be clearly visible from KOP 4 and similar sites, impacts on visual resources would be **low** to **moderate** from this location.

Overall, construction-related impacts on visual resources such as the presence of work crews, additional traffic, and construction equipment are anticipated to be **low** to **moderate**. These impacts would be temporary and not result in long-term adverse impacts on the ROW viewsheds. Operation and maintenance activities would be similar to those already being implemented along the transmission line, including periodic and temporary visual disturbances from the presence of work crews and equipment, and would not result in any new impacts on visual resources.

The Proposed Action includes the removal of approximately 2,666 danger trees (see Section 2.1.6, *Vegetation Management*). The majority of these trees are in groups of less than 10 trees, and their removal would not substantially change viewsheds in the project area. Larger contiguous areas of tree removal, as well as removal of those trees that may currently provide some level of vegetative screening, would change existing views for some viewers. For example, if a large group of danger trees that currently screens views of the transmission line from SR 6 is removed, then motorists would have increased opportunities to view the line in this location. On the other hand, if a large group of danger trees is removed in the middle of a forested area that is not within a major travel corridor, their removal would only influence the viewing experience for some recreationists (e.g., OHV users, hikers, hunters). In general, danger tree removal would potentially result in **low** to **moderate** impacts by increasing the visibility of the Proposed Action for some viewers.

Environmental Consequences–Steel Pole Replacement

Steel pole replacement (as described in Section 2.1.8, *Steel Pole Replacement*) would result in similar impacts as described above for the Proposed Action since the only difference is the pole material. Steel poles are mostly being considered along the Forest Grove to Tillamook section of the project, in the Coast Range mountains. Steel poles provide numerous benefits, as outlined in Section 2.1.8. Steel poles are expected to be used in The Narrows neighborhood between towers 36/2 and 36/18, and would be visible from KOP 3. The dark color would be similar to the existing wood poles at most viewing distances, and the difference in pole color would be perceptible in the foreground, but would be less and less discernible as viewing distance increased (see Section 3.9.3, *Mitigation – Proposed Action*). In the long term, the more durable steel poles would require less frequent routine maintenance compared to wood poles, thus minimizing temporary visual disturbances created by these activities.

3.9.3 Mitigation–Proposed Action

The following mitigation measures would be implemented to reduce or eliminate impacts on visual resources from the Proposed Action:

- Perform construction work during daylight hours to avoid noise and the use of nighttime illumination of work areas, to the extent possible.
- Utilize non-specular (non-reflective) finish on transmission lines, insulators, and other hardware to reduce reflection.
- Avoid storing construction equipment and supplies on residential streets or access roads directly adjacent to residential property, to the greatest extent possible.
- Implement construction site maintenance and clean-up and keep construction areas free of debris.
- Incorporate BMPs for the control of erosion and dust associated with the construction of access roads to minimize visual impacts on nearby residential viewers.

- Leave plants less than 4 feet in height undisturbed within the 100-foot-wide ROW (where they would not interfere with the safe operation of the transmission line) to reduce the effect of the cleared ROW on visual resources.
- Reseed disturbed, non-farmed areas once construction is complete using a predominantly native seed mix or a seed mix agreed upon with landowners. Periodically inspect reseeded sites to verify adequate growth. If necessary, implement contingency measures to ensure adequate growth and vegetation cover.
- Locate construction staging areas away from sensitive viewers as much as possible.
- Require contractors to maintain clean construction sites.
- Use similar color palette for steel poles as wood poles, and treat poles to reduce reflectivity (steel pole replacement).

3.9.4 Unavoidable Impacts after Mitigation–Proposed Action

During construction of the Proposed Action, motorists, residents, and recreational users would be exposed to the sight of construction activities. The visual impact would be short-term, site-specific, and would not persist beyond the construction phase of the Proposed Action, but the impact would be unavoidable. Additionally, implementation of the mitigation measures in Section 3.9.3, *Mitigation – Proposed Action* would minimize these visual disturbances. Post-construction, long-term unavoidable impacts on visual resources are anticipated to be minimal since the Proposed Action is replacing an existing transmission line. However, the use of taller poles or poles made of different materials may increase the visibility of the Proposed Action from certain locations.

3.9.5 Cumulative Impacts–Proposed Action

Reasonably foreseeable future projects in the vicinity of the Proposed Action that could affect visual resources are listed and described in Appendix B, and include the following: expansion of the Intel campus, timber harvest on ODF lands, improvement of the access roads associated with BPA's Boyer-Tillamook transmission line, commercial development in Hillsboro and Forest Grove, as well as relocating the Tillamook PUD transmission line.

Several of these projects would introduce new or modified developments to the visual landscape. However, most of these projects are located in areas that are already characterized by a relatively high degree of cultural modifications, including areas with existing buildings and other structures, roads, and utility corridors, and would not substantially degrade existing visual resources. For any projects with overlapping construction schedules, temporary construction activities would create visual distractions for motorists, residents, and recreational users, which would have **low** to **moderate** effects on visual resources. Since these cumulative effects would primarily be concentrated during potential overlaps in construction timeframes, they are not anticipated to result in long-term adverse effects on visual resources.

3.9.6 Environmental Consequences–No Action Alternative

Under the No Action Alternative, replacement of the existing transmission line structures would not occur. Since the existing transmission line would not be rebuilt, there would be no construction-related disturbances or other long-term impacts on visual resources along the transmission line ROW. Continued operation and maintenance of the existing transmission line would result in visual impacts for motorists, residents, and recreational users. Although routine maintenance activities are expected to be more frequent as the line deteriorates under the No Action Alternative, overall visual impacts are expected to be **low**.

3.10 Air Quality and Climate Change

3.10.1 Affected Environment

Air Quality

The ODEQ and the EPA regulate air quality in Oregon. Under the Clean Air Act (42 U.S.C. 7401 *et seq*.), EPA has established the National Ambient Air Quality Standards (NAAQS) for six criteria air pollutants: carbon monoxide (CO), ozone, particulate matter, lead, sulfur dioxide, and nitrogen dioxide (Appendix E). ODEQ has adopted the standards set by EPA. For each of the six criteria pollutants, NAAQS is defined as a maximum concentration above which adverse effects on human health may occur. An area that fails to meet the standards established by EPA for any criteria pollutant is designated a "***nonattainment area***." If a nonattainment area meets the EPA-promulgated standards for the criteria pollutant in question, then the area is designated a "maintenance area" after a maintenance plan has been established to keep the area within the standards approved by the EPA.

No part of the air basin that includes Washington or Tillamook Counties is within a designated nonattainment area for monitored pollutants (ODEQ 2010a). Portions of the air basin near the Keeler and Forest Grove substations are within designated maintenance areas for CO and ozone (ODEQ 2010b).

Given the nature of the proposed Rebuild Project and history of air quality in the area, three criteria pollutants are described in this section: CO, ozone, and particulate matter. The remaining criteria pollutants are not described further.

Carbon Monoxide

CO is an air pollutant generally associated with transportation sources, but also comes from wood-burning activities. The highest ambient CO concentrations often occur near congested roadways and intersections during periods of low temperatures, light winds, and stable atmospheric conditions. Primary sources of CO from vehicle emissions are from traffic on highways, including US 26, US 101, and SR 6, as well as other local roads. Traffic density, and therefore vehicle emissions, is greater on the east end of the project near the greater Portland metropolitan area, than the west end near Tillamook. The closest CO monitoring station to the project is located in downtown Portland, approximately 11 miles east of the Keeler Substation.

The Portland metropolitan area was classified as a nonattainment area for CO prior to 1996 (ODEQ 2004). Subsequent to 1996, air quality monitoring has shown that no CO exceedances have occurred. The current Portland Area Carbon Monoxide Maintenance Plan describes how the area will maintain CO emissions through 2017 below the NAAQS threshold (ODEQ 2004).

Ozone

Ozone, sometimes referred to as ground-level smog, is not a directly emitted pollutant. Rather, ozone is a product of photochemical reactions in the atmosphere between volatile organic compounds (VOCs), nitrous oxides, and sunlight. Ozone tends to form from concentrated motor vehicle traffic (VOCs and nitrous oxides [NO_X] are components of vehicle emissions) during warm, sunny weather. Small amounts of ozone might be produced by the existing transmission line as a result of ***corona*** (the breakdown of air at the surface of conductors). ODEQ does not directly monitor ozone in project air basin. The closest ozone monitoring station is located at 11300 SE 23rd Avenue in Portland (ODEQ 2007). Ozone concentrations along the project area are likely to be less than the 8-hour average standard of 0.075 parts per million (ppm), because the area is generally less developed and traffic levels are relatively low compared to locations near the ozone monitoring station in downtown Portland.

Prior to 1998, the Portland metropolitan area exceeded NAAQS for ozone, resulting in a nonattainment designation (ODEQ 2007). Adoption of the Ozone Maintenance Plan for the Portland-Vancouver Air Quality Maintenance Area (AQMA) in 1998 implemented strategies for reducing ozone, which have so far proved successful (ODEQ 2007). No exceedances of ozone standards have been reported since 1998 (ODEQ 2007).

Particulate Matter

Particulate matter is generated by industrial emissions, residential wood combustion, motor vehicle tailpipes, and dust from roadways and unpaved surfaces. Two forms of particulate matter are regulated by EPA: particulate matter less than 10 microns in size (PM_{10}) and particulate matter less than 2.5 microns in size ($PM_{2.5}$). $PM_{2.5}$ has a greater health effect than PM_{10} at locations far from the emitting source, because it remains suspended in the atmosphere longer and travels farther. ODEQ monitors PM emissions at several sites in the Portland area, with the closest site at Hillsboro Hare Field. ODEQ does not monitor air quality on the west end of the project area. There have been no exceedances of NAAQS for particulate matter within the project air basin.

Air quality, especially particulate matter, can have an effect on visibility and regional haze. Section 160 of the Clean Air Act (42 U.S.C. 7470(2) *et seq*.), require that air quality be preserved, protected, and enhanced in specific areas of national or regional natural, recreational, scenic, or historic value. These areas are designated as Class 1 areas, and there are 12 mandatory Class 1 areas in Oregon where the protection of visibility is required (40 Code of Federal Regulations [CFR] Part 81). There are no Class 1 areas near the Proposed Action. The closest Class 1 area is the Mount Hood Wilderness, approximately 60 miles east of the project.

Climate Change

Greenhouse gases (GHGs) are chemical compounds found in the Earth's atmosphere that absorb and trap infrared radiation as heat. Global atmospheric GHG concentrations are a product of continuous emission (release) and removal (storage) of GHGs over time. In the natural environment, this release and storage process is largely cyclical. For example, through the process of photosynthesis, plants capture atmospheric carbon as they grow and store it in the form of sugars. When plants decay or are burned, the stored carbon is released back into the atmosphere, where it is available to be taken up again by new plants (ESA 2008). A large amount of GHGs is stored deep underground in the form of ***fossil fuels***, and soils store carbon in the form of decomposing plant material and serve as the largest carbon reservoir on land.

Human activities such as deforestation, soil disturbance, and burning of fossil fuels disrupt the natural cycle by increasing the GHG emission rate over the storage rate, which results in a net increase of GHGs in the atmosphere. When forests are permanently converted to cropland, for instance, or when new buildings or roads displace vegetation, the GHG storage capacity of the disturbed area is diminished. Carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4) emissions increase when soils are disturbed, and burning fossil fuels releases GHGs that have been stored underground for thousands of years and cannot be readily replaced (Kessavalou et al. 1998). The resulting buildup of heat in the atmosphere is due to increased GHG levels, which causes warming of the planet through a greenhouse-like effect (EIA 2009a). Increasing levels of GHGs could increase the Earth's temperature by up to 7.2 degrees Fahrenheit by the end of the 21st century (EPA 2010b).

The principal GHGs emitted into the atmosphere through human activities are CO_2, CH_4, N_2O, and fluorinated gases such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6) (EPA 2010b). CO_2 is the major GHG emitted, and the burning of fossil fuels accounts for 81 percent of all U.S. GHG emissions (EPA 2010b; Houghton 2010; EIA 2009b). CO_2 enters the atmosphere as a result of such activities as changing land use; burning of fossil fuels including coal, natural gas, oil, and wood products; and from the manufacture of cement. CO_2 levels have increased to 379 ppm within the last 100 years, a 36 percent increase, as a result of human activities (IPCC 2007). A report describing these specific GHGs in more detail is in Appendix F.

3.10.2 Environmental Consequences–Proposed Action

Air Quality

Air quality would be primarily affected during construction from the operation of vehicles and construction equipment. Construction is expected to take about 9 months (April 2014 through December 2014). Construction activities are considered short-term, temporary impacts and would likely increase particulate matter, CO, nitrous oxides, and VOC levels on a temporary basis within the project air basin.

Particulate matter, including $PM_{2.5}$, PM_{10}, and dust, would be the pollutant of most concern generated by construction activities. Dust could be created during site preparation, including access road work, on-site travel on unpaved surfaces, and soil-disturbing operations. However, construction activities would only increase dust and particulate levels on a temporary basis in a localized area. Implementation of the mitigation measures described in Section 3.10.3, *Mitigation – Proposed Action*, would minimize these impacts.

In addition to increased particulates, the operation of heavy equipment and vehicles during construction of the Proposed Action could result in increases in CO, NO_X, and VOC levels. However, these emissions would also be short term and localized to the project area. On average, a single crew would use two pieces of heavy equipment (i.e., a boom crane and drill rig), plus several support vehicles (i.e., line truck and delivery truck) to operate at a single structure location. During construction, up to six crews are expected to work on the project on a given day. Construction activities during hot summer months would have a greater potential to increase ozone in the project area as a result of vehicle emissions. Implementation of the mitigation measures described in Section 3.10.3, *Mitigation – Proposed Action*, would reduce potential ozone formation by limiting vehicle idling.

Air quality could also be affected as a result of the operation and maintenance of facilities associated with the Proposed Action. During operation, the transmission line emits limited amounts of ozone as a result of the corona effect. However, ozone would be released in very small quantities. In addition, although there would be occasional vehicle emissions during maintenance activities, the number of vehicle trips is anticipated to be low (approximately 18 vehicle trips per year) and would also be similar to existing conditions. For these reasons, impacts on air quality from construction, operation, and maintenance activities would be short-term and **low**.

Climate Change

GHG emissions resulting from the Proposed Action were calculated using the methodology described in the GHG technical report (see Appendix F, *Greenhouse Gas Supplemental Information*). Calculations were done for two types of activities that produce GHG emissions: rebuilding the transmission line (approximately 9 months), and ongoing annual operations and maintenance for the estimated 50-year-long operational life of the lines. The Proposed Action would likely result in fewer operation and maintenance trips, compared to existing conditions, but for purposes of this analysis, operation and maintenance trips were assumed to be similar to existing conditions.

The Proposed Action would result in an estimated total of 4,869 metric tons of ***carbon dioxide equivalent*** (CO_2e) emissions during construction and an estimated 101 total metric tons of CO_2e emissions for ongoing operations and maintenance activities over the 50-year lifespan of the line (see Table 3.10-1). Detailed information related to these calculations is presented in Appendix F.

Table 3.10-1. Net Carbon Footprint over 50-Year Life of the Proposed Action

Type of Activity	Total CO_2e emissions in Metric Tons
Construction	4,869
Operation and Maintenance (over the entire project life)	101

To provide context for this level of emissions, the EPA's mandatory reporting threshold primarily for large sources of GHGs is 25,000 metric tons of CO_2e emitted annually (74 FR 56260). This threshold is approximately the amount of CO_2e generated by 4,400 passenger vehicles per year. Comparatively, the emissions during construction of the Proposed Action would be equivalent to the emissions generated by about 643 passenger vehicles during the construction period, or 19 percent of the annual reporting threshold. Operation and maintenance activities would result in fewer emissions, with CO_2 emissions, about equal to that of 18 passenger vehicles per year, or 0.4 percent of the annual reporting threshold. Therefore, contributions of the Proposed Action to climate change would be **low**.

Environmental Consequences–Steel Pole Replacement

Effects on air quality and climate change associated with BPA's steel pole replacement would be the same as described above for the Proposed Action. The use of steel poles, as described in Section 2.1.8, *Steel Pole Replacement*, would likely not change the results of the analysis, but in the long term, the more durable steel poles would require less frequent routine maintenance (compared to wood poles) and extend the anticipated lifecycle of the transmission line.

3.10.3 Mitigation–Proposed Action

The following mitigation measures would be implemented to reduce or eliminate air quality and climate change impacts from the Proposed Action:

- Encourage construction vehicles to travel at low speeds on access roads and construction sites to minimize dust.
- Encourage construction crews to shut down idling construction equipment, if feasible.

- Locate staging areas as close to construction sites as practicable to minimize driving distances between staging areas and construction sites.
- Recycle or salvage non-hazardous construction and demolition debris, if possible.
- Use local rock sources for road construction, if possible.
- Prepare a Fugitive Dust Control Plan.
- Use appropriate seed mixes, application rates, methods, and timing to revegetate disturbed areas and thus help manage dust that may result from exposed soils (see Section 3.6.3, *Mitigation–Proposed Action [Vegetation]*).
- Limit the time soils are left exposed.
- Use water trucks or other dust control measures to control dust during construction where soil is exposed.
- Encourage contractor to maintain all vehicle engines in good operating condition to minimize exhaust emissions.

3.10.4 Unavoidable Impacts after Mitigation–Proposed Action

As noted above, short-term, temporary increases in some criteria pollutants would occur during construction of the Proposed Action and these impacts would be unavoidable. Levels of ozone similar to existing levels would result from the corona effect throughout operation.

3.10.5 Cumulative Impacts–Proposed Action

Vehicular traffic, agricultural activities, residential wood burning, and other commercial and industrial facilities all contribute to ambient air pollutant emissions. These sources of pollutants will continue to occur over the life of the Proposed Action. Other reasonably foreseeable future projects are identified in Appendix B.

These reasonably foreseeable future projects would contribute to air pollutants through temporary increases in vehicle and equipment emissions and the generation of dust during any construction activity. Ongoing and reasonably foreseeable future activities are not, however, expected to violate NAAQS. Continued implementation of the maintenance plans for ozone and CO for the Portland metropolitan area would maintain these air pollutants below NAAQS thresholds (ODEQ 2007, 2004).

The Proposed Action would generate relatively low GHG emissions. All levels of GHG emissions are important in that they contribute to global GHG concentrations and climate change. However, given the small amount of contribution, the Proposed Action’s cumulative impact on air quality and climate change would be **low**.

3.10.6 Environmental Consequences–No Action Alternative

Under the No Action Alternative, the transmission line would not be rebuilt, so there would be no impacts on air quality from construction activities. Air quality impacts from danger tree removal, road maintenance, and vehicle emissions may occur in the long term as the aging transmission line would require increased maintenance over time. Although routine maintenance activities are expected to be more frequent in the future under the No Action Alternative, overall air quality impacts are expected to be **low**.

3.11 Socioeconomics, Environmental Justice, and Public Services

3.11.1 Affected Environment

This section addresses socioeconomic conditions, including population, economic characteristics, income and revenues, and ***environmental justice populations***, and describes public services, including electrical and natural gas services, solid waste disposal facilities, fire protection and emergency services, police protection services, and public schools.

The transmission line ROW passes through Tillamook and Washington counties, and the cities of Tillamook, Hillsboro, and Forest Grove. Outside of the cities, rural areas comprise most of Tillamook and Washington counties, including large tracts of farm and forestland with scattered rural residences (as described in more detail in Section 3.2, *Land Use, Recreation, and Transportation*).

Tillamook County encompasses 1,125 square miles on the north-central Oregon coast. The Pacific Ocean forms its western boundary, Lincoln County shares its southern border, Yamhill and Washington counties constitute its eastern boundary, and Clatsop County lies to the north. Tillamook County includes seven incorporated cities and more than 30 unincorporated communities. The county includes 75 miles of coastline, four bays, nine rivers, and agriculture and forestland. More than half of the county's residents reside in unincorporated communities throughout the county (Tillamook County 2012a). The City of Tillamook is the county seat and is the primary business center in the county. The city consists mainly of residential, commercial, office, and industrial uses. The ROW also spans the South Fork Forest Camp, located in the Tillamook State Forest. The South Fork Forest Camp houses an Oregon Department of Corrections (ODOC) minimum security correction center and ODF facilities.

Washington County encompasses 726 square miles and is bound by Columbia County on the north, Yamhill County on the south, Multnomah and Clackamas counties on the east, and Clatsop and Tillamook counties on the west. Washington County includes 16 incorporated cities and over 60 unincorporated communities. Most of the county is in the Tualatin Valley, and the northern and western portions of the county are forested. The City of Hillsboro is the county seat and the largest city within the county. Both the cities of Hillsboro and Forest Grove are densely populated urban areas that consist of residential, commercial, office, and industrial uses.

Population

In 2010, the population of Tillamook County was estimated at 25,250, less than one percent of the state's population (3,831,074 people) (U.S. Census Bureau 2010). The county had a 2010 population density of approximately 23 persons per square mile, which is almost half the population density of the state average (40 persons per square mile). The total population remained relatively constant in Tillamook County between 2000 and 2010, increasing by just 988 people (4.1 percent). While precise statistics are unavailable, part-time residents and summer visitors nearly double the county's population in the summer months (Tillamook County 2012a). The City of Tillamook, which includes a portion of the ROW and the Tillamook Substation, had a population of 4,935 in 2010 (U.S. Census Bureau 2010). The City of Tillamook is the largest city within the county, accounting for 19.5 percent of the county's 2010 population.

In 2010, the population of Washington County was estimated at 529,710, with the majority concentrated in urban areas (U.S. Census Bureau 2010). Washington County had a population density of approximately 732 persons per square mile in 2010. From 2000 to 2010, the total population in Washington County increased by 18.9 percent. The City of Forest Grove, which includes a portion of the ROW and the Forest Grove Substation, and the City of Hillsboro, which also includes a small portion of the ROW and Keeler Substation, had a population of 21,083 and 91,611, respectively, in 2010 (U.S. Census Bureau 2010). Combined, these cities accounted for 21.3 percent of the county's 2010 population.

Economic Characteristics

Tillamook County's 2011 civilian work force consisted of 12,963 people. Of these, 11,809 were employed, resulting in an unemployment rate of 9.1 percent (Oregon Employment Department 2011). In 2012, Tillamook County had a seasonally unadjusted unemployment rate of 8.5 percent (Oregon Employment Department 2013). The main industries in Tillamook County are agriculture, forest products, tourism, and recreation. The leading nonfarm employment sectors in 2011 were government (1,900 jobs); trade, transportation, and utilities (1,250 jobs); leisure and hospitality (1,250 jobs); manufacturing (1,120 jobs); and education and health services (940 jobs) (Oregon Employment Department 2011). Professional and business services, educational and health services, and manufacturing industries are expected to be the fastest growing nonfarm-related industries between 2010 and 2020 at rates of 38 percent, 27 percent, and 26 percent, respectively (Oregon Employment Department 2013). Per-capita income and median household income in Tillamook County were $22,706 and $41,400, respectively, in 2011 (U.S. Census Bureau 2011). The 2011 per-capita income and median household incomes in the City of Tillamook were $18,590 and $31,418, respectively (U.S. Census Bureau 2011).

Travel/tourism is one of the leading economic industries in Tillamook County. In 2012, spending by visitors generated $197.7 million from sales in lodging, food services, recreation, transportation, retail businesses, and arts and entertainment (Oregon Tourism Commission 2013). Industry earning associated with travel and tourism totaled $59.4 million. The travel industry generated approximately 2,050 jobs in Tillamook County in 2012.

In 2011, the civilian labor force in Washington County included 294,403 people. Of these, 271,803 were employed, resulting in an unemployment rate of 7.7 percent (Oregon Employment Department 2013). In 2012, Washington County had a seasonally unadjusted unemployment rate of 7.1 percent (Oregon Employment Department 2013). The main industries in Washington County are agriculture, forest products, manufacturing, and food processing. The leading nonfarm employment sectors in 2011 were trade, transportation, and utilities (48,300 jobs); manufacturing (43,100 jobs); professional and business services (36,400 jobs); education and health services (30,400 jobs); and government (22,900 jobs) (Oregon Employment Department 2011). Large electronics companies, including SolarWorld, TriQuint Semiconductor, Epson America, FEI Company, and Maximum Integrated Products, are dominant industries in the county. The Intel Corporation, located within the City of Hillsboro, is one of the largest employers in the state with approximately 16,250 employees. Construction, educational and health services, and professional and business services are expected to be the fastest growing nonfarm-related industries between 2010 and 2020 at rates of 34 percent, 32 percent, and 28 percent, respectively (Oregon Employment Department 2013). In Washington County, 2011 per-capita and median household incomes were $31,165 and $63,814, respectively (U.S. Census Bureau 2011). In 2011, the City of Forest Grove and the City of Hillsboro had per-capita incomes of $21,118 and $27,034, respectively, and the median household incomes of the City of Forest Grove and the City of Hillsboro were $49,034 and $64,197, respectively (U.S. Census Bureau 2011).

Agriculture

A portion of the ROW crosses agricultural land in both Tillamook and Washington counties. In 2007, there were approximately 37,780 acres of agricultural land in Tillamook County, representing a little more than 5 percent of the land base in the county (USDA 2007b). A total of 302 farms in Tillamook County with an average size of 125 acres generated approximately $110 million in agricultural sales in 2007. Milk and milk products were the leading agricultural commodity in 2007 with a value of $97.6 million, followed by cattle and calves ($7.5 million) and aquaculture ($4.4 million) (USDA 2007b).

There are about 127,984 acres of agricultural lands in Washington County, representing approximately 27.6 percent of the land base in the county (USDA 2007a). A total of 1,761 farms in Washington County with an average size of 73 acres generated approximately $311 million in agricultural sales in 2007, with crops accounting for 95 percent of sales by value. In 2007, nursery, greenhouse, flower farming, and sod had the highest crop value ($199.3 million), followed by fruit and tree nuts ($52.6 million) and Christmas trees ($25.0 million) (USDA 2007a).

Forestry and Timber Resources

A majority of forestlands in the area are part of the Tillamook State Forest, managed by ODF. Approximately 18.3 miles of the existing Forest Grove-Tillamook No. 1 transmission line are within the Tillamook State Forest, and the existing transmission lines and associated access roads cross approximately 0.4 mile of BLM lands. The remaining acreage of forested land crossed by the existing ROW is privately owned. (See Section 3.2, *Land Use, Recreation, and Transportation*, and Section 3.6, *Vegetation*, for additional information.)

In 2011, 3.6 billion board feet of timber was harvested from Oregon timberlands, and total sales were approximately $5.5 billion (ODF 2011a, 2011b). Approximately 75 percent of the total timber harvested in the state was from private lands. In Tillamook County, 179 million board feet of timber was harvested in 2011, and total sales were approximately $9.9 million (ODF 2011b). In Washington County, 150 million board feet of timber was harvested in 2010 (ODF 2011b). Approximately 61 percent and 65 percent of timber in Tillamook and Washington counties, respectively, was harvested from private lands. Douglas-fir was the predominant species harvested on all lands, followed by pine and western hemlock.

Property Taxes and Values

State and local property taxes help support the activities of local taxing districts, such as schools and local government services. In both Tillamook and Washington counties, property taxes were the largest sources of revenue in the 2011–2012 fiscal year. Property taxes generated nearly $11 million in revenue in Tillamook County and $164 million in Washington County in the 2011–2012 fiscal year (Tillamook County 2012b, Washington County 2012b).

All federal, state, and local government real property is exempt from property taxation. When BPA acquires an easement across private property, the landowner continues to pay property taxes, but often at a lesser value, based on any limitation of use created by the easement.

If BPA acquires new easements or new access roads on private land, landowners are offered fair market value for the land as established through the appraisal process. The appraisal accounts for all factors affecting property value, including the impact the transmission line easement or access road would have on the remaining portion of the property. Each property is appraised individually using neighborhood-specific data to determine fair market value. Where existing easements accommodate new transmission facilities or existing access roads are used to access the project corridor, and no new acquisition is made, no additional compensation is paid.

Environmental Justice Populations

All projects involving a federal action (funding, permit, or land) must comply with Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, signed by President Clinton on February 11, 1994. This Executive Order directs federal agencies to take the appropriate and necessary steps to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of federal programs, policies, and activities on the health or environment of ***minority populations*** and ***low-income populations*** (collectively, the environmental justice ***populations***) to the greatest extent practicable and permitted by law.

Minority Populations

Guidelines provided by the Council on Environmental Quality and EPA indicate that a minority community may be defined where either: (1) the ***minority population*** comprises more than 50 percent of the total population, or (2) the minority population of the affected area is meaningfully greater than the minority population in the general population of an appropriate benchmark region used for comparison (CEQ 1997; EPA 1998).

The estimated 2010 Tillamook County population (25,250) was characterized by the following racial and ethnic composition: 91.5 percent white, 9.0 percent Hispanic or Latino origin, 0.3 percent Black or African American, 0.9 percent Asian, 1.2 percent American Indian and Pacific Islander, and 2.4 percent of two or more races (U.S. Census Bureau 2010). In Tillamook County, no minority populations recognized by the U.S. Census Bureau are proportionally larger than in the state as a whole. The racial and ethnic composition of the City of Tillamook consisted of a slightly higher percentage of the population characterized as white (97.0 percent) and Hispanic or Latino origin (17.2 percent) than the county (U.S. Census Bureau 2010). The percentage of people who are of Hispanic or Latino origin in the City of Tillamook is slightly larger (5.5 percent) than the state average.

The estimated 2010 Washington County population (529,710) was characterized by the following racial and ethnic composition: 91.5 percent white, 15.7 percent Hispanic or Latino origin, 1.8 percent Black or African American, 8.6 percent Asian, 1.2 percent American Indian and Pacific Islander, and 4.3 percent of two or more races (U.S. Census Bureau 2010). The Asian and multiple-race populations are larger than those in Oregon as a whole, 4.9 percent and 0.5 percent higher, respectively. The cities of Forest Grove and Hillsboro generally consist of similar racial and ethnic compositions compared to the state as a whole. The 2010 Census data show that Washington County and the cities of Forest Grove and Hillsboro had a higher percentage of people who are of Hispanic or Latino origin (15.7 percent, 23.1 percent, and 22.6 percent, respectively) than the state average (11.7 percent) (U.S. Census Bureau 2010).

Low-Income Populations

Low income is defined based on the U.S. Department of Health and Human Services poverty guidelines; for 2011, this was $22,350 for a family of four (U.S. Department of Health and Human Services 2011). Median household incomes in Tillamook and Washington counties exceed this level ($41,400 and $63,814, respectively).

In addition, guidelines provided by the CEQ and EPA indicate that a low-income community may be defined where either: (1) the low-income population comprises more than 50 percent of the population below the poverty level in the affected area, or (2) the low-income population of the affected area is meaningfully greater than the minority population in the general population of an appropriate benchmark region used for comparison (CEQ 1997; EPA 1998).

The share of the population below the poverty level in Tillamook County and the City of Tillamook in 2011 was 17.6 percent and 21.4 percent, respectively, compared to 14.8 percent statewide. The percentages of the population below the poverty levels are slightly larger (2.8 percent and 6.6 percent, respectively) than those in Oregon as a whole (U.S. Census Bureau 2011).

Washington County's population below the poverty level in 2011 was 10.4 percent, which was less than the percent statewide (14.8 percent). In addition, the population below poverty levels in the City of Hillsboro (11.8 percent) was less than the percent statewide. However, the percentage of population below the poverty level in the City of Forest Grove (21.0 percent) was greater than the percent statewide. This percentage of the population is slightly larger (6.2 percent) than those in Oregon as a whole (U.S. Census Bureau 2011).

Public Services

The following discussion provides an overview of the public services in the area that could be utilized or affected by the Rebuild Project, including electrical and natural gas services, solid waste disposal facilities, fire protection and emergency services, police protection services, and public schools.

The primary electrical service providers in the area are Tillamook PUD, which serves all of Tillamook County and portions of Clatsop and Yamhill counties; Forest Grove Light & Power, which serves the City of Forest Grove; and Portland General Electric, which serves Washington County. Northwest Natural Gas is the primary natural gas provider in the area. Ferrellgas provides natural gas and propane to customers throughout the state. Public water is provided by municipal systems and water divisions.

Washington County provides solid waste disposal through franchise agreements with three disposal sites in the county: the Hillsboro Landfill, the Lakeside Reclamation Landfill, and the Nature's Needs Compost Facility. Three solid waste transfer station facilities are managed through franchise agreements with Tillamook County: the Manzanita Transfer Station, the Pacific City Transfer Station, and the Tillamook Transfer Station. All waste collected at the Manzanita and Pacific City transfer stations is transferred to the Tillamook Transfer Station before being transported to its final destination at the Coffin Butte Landfill outside of Corvallis, Oregon.

Fire protection and emergency services are provided by local fire departments, county fire districts, and the state. Fire protection in the cities of Tillamook, Forest Grove, and Hillsboro are provided by the Tillamook Fire Department, Forest Grove Fire Department, and Hillsboro Fire Department, respectively. The Tillamook

Fire District and Washington County Fire District 2 provide fire protection and emergency services within unincorporated areas of those counties. The ODF Fire Division protects private and public forestland from fire, including wildland-urban interface areas (i.e., forestlands with residences and other structures within the reach of wildfires), through a coordinated system of fire prevention, suppression, and fuels management. Fire and Aviation Management is a cooperative effort between the BLM and U.S. Forest Service in close collaboration with the Pacific Northwest Wildfire Coordinating Group, an interagency group with representation from five federal wildland fire agencies; two state forestry agencies, including the ODF; and two state fire marshal associations to provide wildland fire management and prevention. In addition, through an agreement between the ODF and the Oregon State Police (OSP), the Wildland Arson Division patrols high-risk fire areas within the wildland-urban interface in an effort to prevent arson-related fires and responds to calls from ODF for assistance outside their immediate areas.

Police protection is provided by the local police departments, county sheriff's departments, and the state. Police protection in the cities of Tillamook, Forest Grove, and Hillsboro is provided by the City of Tillamook Police Department, the City of Forest Grove Police Department, and the City of Hillsboro Police Department, respectively. The Tillamook County Sheriff's Department serves the unincorporated portions of the county, provides support services to city police departments, and provides forest deputies to ODF to enforce rules and laws applicable to forest activities. The Washington County Sheriff's Department provides law enforcement services to unincorporated areas of Washington County and support services to city police departments. The OSP provides patrol services to rural areas throughout the state and assists local city police and sheriff's departments. The OSP's specialized programs and services include transportation safety, major crime investigations, forensic services, drug investigations, fish and wildlife enforcement, state emergency response coordination, medical examiner services, and special weapons and tactics, and serves as the point of contact to the U.S. Department of Homeland Security.

Tillamook County is served by three school districts, and Washington County is served by 16 school districts, all providing kindergarten through 12th grade education. Students within the Tillamook County portion of the project area are located within the Tillamook School District boundaries. Portions of the project area within Washington County are located within the Forest Grove School District and Hillsboro School District boundaries. The Forest Grove School District covers approximately 225 square miles and encompasses the communities of Cornelius, Dilley, Forest Grove, and Gales Creek. The Hillsboro School District is the fourth largest public school district in the state. The Hillsboro School District encompasses the cities of Hillsboro; North Plains; and parts of Cornelius, Aloha, and Sherwood. Students in these school districts are transported to schools by a network of school bus routes that transverse each district's boundaries.

3.11.2 Environmental Consequences–Proposed Action

Population

Because construction activities associated with the Proposed Action would occur within a single year, no permanent changes in population are anticipated in Washington or Tillamook counties. During peak construction, a maximum of 36 construction workers would work along various segments of the transmission line. The origin of the work force is likely to be local, requiring minimal temporary lodging in the local area during construction. Because an increase in population is expected to be minimal, the Proposed Action would have **low to no** effects related to temporary or permanent increases in population.

Employment and Income

No new employment is anticipated from operation of the transmission line or substations. The Proposed Action would have a small, positive impact on the regional economy during construction. Local purchases would likely include fuel for vehicles and equipment, staging area rental, and other incidental materials and supplies. Because construction workers would likely be hired from the local labor force, there likely would not be a large increase in spending. Overall spending from the construction of the Proposed Action would be short-term (9-month construction period) and is likely to have **low** socioeconomic impacts on employment and income. No adverse impacts are expected, although some beneficial impacts on the local economy may result from increased spending in the local community during construction.

The small influx of temporary jobs associated with the Proposed Action would not result in a large enough employment source to substantially alter Tillamook County's seasonally unadjusted 8.5 percent unemployment rate or Washington County's seasonally unadjusted 7.1 percent unemployment rate (Oregon Employment Department 2013).

As the above analysis indicates, estimated local project-related expenditures, employment, and construction-related earnings are likely to be small relative to the total amount of economic activity, employment, and income in the two counties, and are short-term in nature. As a result, the overall impact of construction-related activities on the local and regional economies, while positive, is expected to be temporary and **low**. No new employment would be anticipated for the operation of the transmission lines or substations; therefore, there would be **no** long-term effects on the regional economy of Tillamook or Washington counties.

Agricultural Production

Temporary travel routes within BPA's ROW would cross agricultural fields during construction activities, potentially resulting in a short-term disruption of agricultural production and crop damage. Travel routes in the ROW would be used with the least impact necessary to allow for travel during construction. BPA would coordinate with the local farmers and landowners to minimize potential construction-related disruptions, and temporary travel routes would be restored to pre-project conditions after construction is complete. In addition, BPA has committed to compensating landowners for all revenue losses they would incur as a result of the Proposed Action. Such compensation would ameliorate the impacts of displaced crop production. Because the disruptions would be temporary and landowners would be compensated for revenue losses, the economic impact would be **low**.

Forestlands and Timber Resources

A total of 2,666 danger trees are targeted for removal within 100 feet of the transmission line. The majority of these trees would be Douglas-fir (see Appendix A). Danger tree removal on forestlands (both public and private forestland) would occur within and adjacent to the transmission line ROW, potentially impacting timber resources through a loss of supply. Trees have been previously removed from the ROW (during initial construction of the transmission line), and subsequent maintenance by BPA has prevented most trees from growing back. In general, BPA would compensate individual landowners for any trees removed on a case-by-case basis. Since forest land owners would be compensated for danger tree removal, and danger trees removed from outside the ROW would be allowed to regrow (but would not be allowed to become danger trees), overall economic impacts on forestlands and timber production are expected to be **low**.

Property Taxes and Values

BPA would obtain new easements for approximately 46 miles of access roads to operate and maintain the transmission line (see Section 2.1, *Proposed Action*). However, the underlying land ownership would not change. Property owners would continue to pay property taxes in accordance with valuations. Therefore, the Proposed Action would likely have a **low** effect on the amount of property taxes collected by Washington and Tillamook counties.

Some short-term impacts on property value and salability could occur on an individual basis during construction. However, the Proposed Action involves replacing an existing transmission line with similar structures in many of the same locations. Therefore, property value impacts would likely be **low**.

Environmental Justice Populations

All persons, regardless of race or income, would experience the same impacts associated with construction of the Proposed Action, such as traffic delays and noise. All persons would also experience potential positive economic impacts from short-term construction employment opportunities and economic activity. Thus, there would be **no** high adverse or disproportionate impact on environmental justice populations from the Proposed Action.

Public Services

Construction workers would likely be hired from the local labor force and there would be no long-term increase in the local population that would subsequently increase the demand for public facilities and services (i.e., law enforcement, fire protection, medical services, schools, and utilities). The Proposed Action would be under construction during the dry months of the year, and as such, there could be a slightly higher potential for fire. This would create the potential for increased fire protection services while construction is ongoing during the drier months. BPA's construction crews and contractors will coordinate with the local fire departments to ensure adequate protection during construction. Over the long term, construction of the Proposed Action and BPA's vegetation management program would reduce and minimize fire risk. Therefore, the Proposed Action is expected to have **low** short-term effects on fire protection services and **no** long-term effects on other public facilities or services.

During construction, there would be short-term, low impacts from increased construction traffic, temporary lane closures, or traffic delays on nearby communities. Access to all properties, including public facilities and social service agencies, would be maintained during construction, and local agencies and residents would be notified of upcoming construction activities and potential disruptions to transportation facilities. The Proposed Action would not displace or otherwise hinder the ability of any agency or organization to provide public services to communities near the project corridor. Overall, the Proposed Action is expected to have **low or no** short-term or long-term impact on the provision of public services in the project area.

Environmental Consequences–Steel Pole Replacement

The impacts associated with using steel poles would be similar to those described above for the Proposed Action. The more durable steel poles would require less frequent routine maintenance (compared to wood poles) and extend the anticipated lifecycle of the transmission line. The steel pole replacement would cost BPA about $61,000 additional dollars to implement on top of the overall project budget of $17.7 million.

3.11.3 Mitigation–Proposed Action

Since there would be no impacts on environmental justice populations from the Proposed Action, no mitigation is proposed. The following mitigation measures would be implemented to reduce or eliminate socioeconomic and public services impacts from the Proposed Action:

- Compensate landowners for any damage to crops or property during construction or operation and maintenance activities, as appropriate.
- Plan and conduct construction activities to minimize interference with agricultural activities (see Section 3.2.3, *Mitigation–Proposed Action [Land Use, Recreation, and Transportation]*).
- Use local rock sources for road construction, if possible (see Section 3.10.3, *Mitigation–Proposed Action [Air Quality]*).

3.11.4 Unavoidable Impacts after Mitigation–Proposed Action

Unavoidable impacts on socioeconomic resources would include the loss of economic productivity due to impacts on agricultural production, or timber production due to structure replacement, relocation, and access road construction.

3.11.5 Cumulative Impacts–Proposed Action

The region of influence considered for cumulative impacts on socioeconomics, environmental justice populations, and public services is Tillamook and Washington counties. As described above, the Proposed Action would have a small but positive impact on the regional economy during construction through the local procurement of materials and equipment and hiring of local construction crews. These project-level impacts would be temporary and **low**.

Other reasonably foreseeable future projects in the vicinity of the Proposed Action that could affect socioeconomics, environmental justice populations, and public services are listed and described in Appendix B, and include the following: expansion of the Hillsboro Intel campus, timber harvest on ODF lands, improvement of BPA's Boyer-Tillamook transmission line access roads, commercial development in the City of Hillsboro, future development in the City of Forest Grove, and the relocation of the Tillamook PUD underbuild line. While many of these projects would bring temporary workers to the area, these projects would be constructed at various intervals, thereby reducing the potential overlap of project construction with construction of the Proposed Action. Construction workers associated with the Proposed Action would likely be hired from the local labor force. When considered collectively with other projects in the area, the workers associated with the Proposed Action would not result in a large increase in the number of workers or spending related to work in Tillamook and Washington counties. The small influx of revenue and taxes associated with the temporary increased spending would combine with the spending associated with workers employed on other projects occurring at the same time, which would result in **low** cumulative impacts on employment and income.

ODF is planning several timber sale activities in the Tillamook State Forest in the project vicinity. Some of these activities would likely occur in the same timeframe as construction of the Proposed Action. The ODF timber sales could contribute to cumulative impacts on forestland and timber resources, in conjunction with the danger trees outside of the ROW potentially removed as part of the Proposed Action in the area adjacent to the transmission line. Considering the relatively low number of danger trees expected to be removed and the implementation of the proposed mitigation measures, the cumulative impacts on timber resources would be **low**.

Tillamook PUD operates a 10-mile long, 12-kV underbuild on a section of the Forest Grove-Tillamook No. 1 transmission line. The Tillamook PUD is proposing to relocate equipment from existing towers to the new towers, and the PUD may realign portions of their ROW. These actions could result in temporary power outages to Tillamook PUD customers during construction activities. The Proposed Action could be constructed simultaneously and could potentially cause temporary power outages during the removal of existing structures and installation of new or replacement structures. As described above, the population would essentially be affected equally by power outages without regard to race, ethnicity, or income level. Therefore, the cumulative impacts on environmental justice populations would be **low**.

The Proposed Action is expected to have **low** short-term effects on fire protection services and **no** long-term effects on other public facilities or services, and, therefore, when considered with other past, present and reasonably foreseeable future actions that may impact public services, the cumulative impacts would be **low**.

3.11.6 Environmental Consequences–No Action Alternative

Under the No Action Alternative, BPA would not rebuild the transmission line, and would continue to operate and maintain the existing transmission line in its current state. Socioeconomic impacts associated with the Proposed Action (e.g., temporary employment, purchases or goods and services) would not occur. In addition, there would be the potential for greater cost of electrical service and more frequent disruption of service, because the existing transmission line would likely require more frequent maintenance and upkeep. Maintenance of access roads and danger tree removal would still be needed and would likely result in some **low** impacts on socioeconomics and public facilities, related to temporary construction-related disturbances, and **no** impacts on environmental justice populations would occur during maintenance activities.

3.12 Cultural Resources

3.12.1 Affected Environment

Cultural Resources are those physical remains, objects, places, historic records, and traditional cultural practices or beliefs that connect people to their past. Historic properties, as defined by 36 CFR 800, the implementing regulations of the National Historic Preservation Act (NHPA; 16 U.S.C. 470 *et seq*.), are a subset of cultural resources that includes any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on, the National Register of Historic Places (NRHP) maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria. The NHPA requires that cultural resources be inventoried and evaluated for eligibility for listing on the NRHP and that federal agencies evaluate and consider effects of their actions on such resources. Cultural resources are evaluated for eligibility on the NRHP using four criteria commonly known as Criterion A, B, C, or D, as identified in 36 CFR Part 60.4(a-d). These criteria include an examination of the cultural resource's age, integrity (of location, design, setting, materials, workmanship, feeling, and association), and significance in American culture, among other things. A cultural resource must meet at least one criterion to be eligible for listing on the NRHP.

The ***area of potential effects*** (***APE***; defined in 36 CFR 800.16[d]) for cultural resources includes the existing ROW, the proposed new and reconstructed access roads that extend outside of the ROW, and the staging area at Keeler Substation. The APE is located in two distinct ecoregions within Oregon, the coast and the interior. The earliest inhabitants in areas surrounding the APE were present at least 10,000 years before present (B.P.). This Paleo-Indian period is represented by a few isolated Clovis points, which are fluted projectile points and are distinctive of the Paleo period, scattered across western Oregon. It is possible that sites and artifacts from this period have been inundated beneath the rising sea levels of the past 10,000 years. The fluted points are equivalent in age to well-dated fluted point complexes found in the Southwest and Great Plains (Kolar 2013).

The coast occupation is seen by 10,000 years B.P. and is characterized by groups hunting and gathering, economies with a broad resource base, and a toolkit that became more complex through time (Kolar 2013). The lack of associated shell ***middens***, a dense concentration of shellfish remains, during this period has led some to believe that a "pre-marine" subsistence strategy was being utilized that focused on terrestrial resources (Kolar 2013). From 5,500 to 3,000 B.P., a more marine-oriented subsistence strategy is recognized through the appearance of large shell middens. Larger, more permanent villages are found on coastal headlands and bluffs, as well as on estuaries and rivers during this time period. From 3,000 to 1,500 B.P., more substantial middens are noted with several varieties of shellfish, fish, birds, and mammals. Evidence of rectangular plank houses appears at some village sites. The period from 1,500 to 200 B.P. is characterized by distinctive ethnographic Northwest Coast culture patterns along the Oregon Coast, including large plank house villages, ranked societies, and artistic elaboration (Kolar 2013). The final 200 years of this period demonstrate an influx of non-native artifacts including ceramics and metal.

People were present in the interior by 10,000 B.P. during which well-adapted hunting and gathering groups were located throughout the Willamette Valley. Large leaf-shaped projectile points are diagnostic of this time, and evidence of camas use is also found during this period (Kolar 2013). The period from 6,000 to

2,000 B.P. saw an increase in population and use of a wider range of resources. Artifacts seen during this time include a broad-necked projectile point. Ground stone tools were more common, indicating an increased importance of plant resources. Evidence of the increased use of plant resources is also illustrated by the increase in number of camas roasting ovens found throughout the Valley (Kolar 2013). The years 2,000 to 200 B.P. saw even more development and refinement in the settlement and subsistence patterns as well as an increase in population. Subsistence patterns consisted of a broad range of plants dominated by camas with hunting as an ancillary pursuit (Kolar 2013). Shell ornaments and other artifacts denote increased trade or exchange with the coast and Columbia River region (Kolar 2013).

The region and APE were historically inhabited and used by the Tillamook Tribe along the coast and the Kalapuya Tribe in the Willamette Valley. The Nehalem Tillamook are members of the Salishan language family, which lived around Tillamook Bay as well as along coastal rivers. The Nehalem group consisted of several villages whose people spoke a single dialect and frequented a common territory. The villages were permanent winter villages consisting of large semi-subterranean rectangular cedar plank lodges. Hunting, gathering, and fishing practices of the Tillamook took place near their villages, near estuaries, or the coast line. A seasonal subsistence round, obtaining seasonally available plants and animals, was used to obtain fish and plant resources in the summer and fall, while shellfish were gathered in the fall through spring (Kolar 2013).

The Kalapuya consisted of several autonomous groups who spoke dialects of three closely related Penutian languages. The Kalapuya inhabited the basins of the Willamette River tributaries. These areas offered a variety of riverine, valley, and foothill habitats and resources. The project is located within the territory of the Tualatin band. The Tualatin villages were found on the Tualatin Plains and clustered around Wapato Lake. The resource base was primarily based on seasonal resources when they were available. Camas was a primary staple of their diet as well as wapato, hazelnuts, tarweed, lupine, and various berries (Kolar 2013). Seasonal fishing and hunting of mammals and birds provided for the remainder of the food resources. Kalapuyan camps were small and transitory while winter villages, which were more permanent, were larger and made up of large rectangular semi-subterranean lodges.

The early 1800s brought the beginning of Euro-American explorers, fur traders, and missionaries entering the region. However, disease brought by Europeans who had arrived earlier decimated native populations. A possible malaria epidemic in the early 1830s resulted in an estimated mortality rate as high as 90 percent in coastal villages (Kolar 2013). Sporadic warfare flared throughout Oregon in the 1840s and 1850s, causing the U.S. government to secure treaties with the tribes. In 1851, treaties were negotiated with several Willamette Valley groups. These treaties provided for a reservation around Wapato Lake for the Tualatin people. This treaty was never ratified due to pressure by settlers to move the Indians out of the valley. In 1855, a new treaty was signed with the Kalapuya that ceded their lands and moved them to the Grand Ronde Reservation. The Rogue River and Cow Creek treaties in 1853 established the Coast (Siletz) Reservation in 1855. The tribes removed from southwest Oregon and coastal tribes relocated to the Coast (Siletz) Reservation (Kolar 2013).

Settlement in the Willamette Valley proceeded at a rapid pace as Donation Land Claims (DLC) farms appeared across the valley. The Homestead Act of 1862 (43 U.S.C. 161 *et seq.*) fueled the desire for land, resulting in the settlement of the river valleys and less desirable areas including the Coast Range. The timber industry proved to be a driving industry through the 19th and 20th centuries, establishing large mills throughout the area and employing hundreds of people. The Timber and Stone Act of 1878 (43 U.S.C. 311 *et seq.*) provided opportunities for large tracts of land to be acquired (Kolar 2013). By 1870, Hillsboro and

Forest Grove were connected to Portland by the Oregon Central Railroad, which helped spur development in the area.

BPA was created in 1937 as a part of President Franklin Roosevelt's "New Deal" to transmit and market hydropower from the Columbia River to underserved areas and to support the development of industry in the Pacific Northwest (Kramer 2010b). In 1940, the first PUD was created in Tillamook County. The PUD was one of BPA's earliest customers, and design and construction of the necessary infrastructure began almost immediately after its formation. The transmission lines evaluated in this EA are a part of the PUD's early history.

Archaeological Resources

In compliance with NHPA, BPA has identified and documented cultural resources in the APE and evaluated them for eligibility for listing on the NRHP. BPA conducted a literature review of known sites. This literature review identified 13 archaeological sites and seven archaeological isolates within a 1-mile radius of the APE (Kolar 2013). Archaeological resources consisted of three prehistoric sites, 10 historic sites, four ***prehistoric isolates***, and three ***historic isolates***. Of the 13 sites and seven isolates identified during the background research, one site and three isolates are within the APE.

BPA conducted a pedestrian inventory of the APE to identify previously unrecorded sites and to determine potential impacts the Rebuild Project may have on the resources. All sites and isolates located in the APE are listed in Table 3.12-1. As a result of the field surveys, BPA identified five new isolates and revisited the previously inventoried site (35WN80) to further evaluate the location relative to the ROW. The isolates are not eligible for listing on the NRHP they are not considered significant archeological sites. The revisited site, 35WN80, was previously determined not eligible for listing on the NRHP due to lack of integrity and lack of potential for important information (Anderson and Bialas 2012).

Table 3.12-1. Cultural Resources within the APE

Site/ Isolate	Location	Site/ Isolate Type	Date Recorded	Cultural Materials
35WN80	T1N, R2W, Sec 21	Historic	2012	Sparse historical debris
TVWD#1	T1N, R3W, Sec 28	Prehistoric	1996	Three flakes
TVWD#2	T1N, R3W, Sec 22	Prehistoric	1996	***Debitage*** and fire-cracked rock
03/916-1	T1N, R2W, Sec 21	Prehistoric	2004	Quartzite flake
FGT ISO-1	T1N, R3W, Sec 32	Prehistoric	2013	Obsidian projectile point and quartzite flake
FGT ISO-2	T1N, R4W, Sec 15	Historic	2013	Solarized glass bottle base and porcelain fragment
FGT ISO-3	T1N, R4W, Sec 10	Prehistoric	2013	Chert ***biface*** fragment and three chert flakes
FGT ISO-4	T1N, R4W, Sec 5	Prehistoric	2013	Chert flake
FGT ISO-5	T2N, R4W, Sec 31	Prehistoric	2013	Chert flake and possible fire-cracked rock

Built Resources

BPA has recently received a determination of eligibility (August 2012) for the submission of a Multiple Property Documentation (MPD) form (a thematic group listing of similar resources to the NRHP) for BPA's historic transmission infrastructure (Kramer 2010a, 2010b). BPA's system includes built elements in eight western states, including transmission lines, substations, switchyards, control houses, ***untanking towers***, oil houses, BPA buildings/structures, and microwave facilities. As illustrated in the MPD, the built resources of the BPA transmission system should primarily be considered, and evaluated, for potential significance under NRHP eligibility Criterion A for their association with the design, construction, and operation of the BPA transmission system in the Pacific Northwest during the period 1938 to 1974. Some properties, subject to the specific registration requirements of Section 7 of the MPD, may additionally gain significance under Criterion C for either their architectural design or, in the case of structures, their association with key technologies in the area of electrical transmission (Kramer 2010a).

The existing Keeler-Forest Grove No. 1 and Forest Grove-Tillamook No. 1 transmission lines are part of BPA's transmission infrastructure and were constructed during the period of significance identified in the MPD. BPA has determined that these lines are eligible for listing on the NRHP. BPA is evaluating what effects the Proposed Action or the No Action Alternative may have on these lines.

The Gravelle Brothers Trail is an historic trail within the APE that was located as part of the cultural resource survey. The trail was built in the 1960s and connects to the old Wilson River Wagon Road Trail (Kolar 2013). The Old Trout Cemetery, also called Joe Champion Cemetery or Pioneer Cemetery, near Tillamook Substation is an historic cemetery adjacent to the project, but not within the project impact area. It contains about 300 burials made primarily between 1851 and 1890.

3.12.2 Environmental Consequences–Proposed Action

BPA is required under the NHPA to consider the effects of the Proposed Action on sites eligible for listing on the NRHP. No new sites were identified within the APE of the Proposed Action. The newly identified isolates recorded within the APE have been determined not eligible for listing on the NRHP because they are not considered significant archeological sites. The Keeler-Forest Grove No. 1 and Forest Grove-Tillamook No. 1 transmission lines are eligible for listing on the NRHP. The MPD states that "Normal, in kind repair, and maintenance and upgrades of transmission lines still owned and operated by BPA that are part of functionality do not necessarily affect integrity of the associations" (Kramer 2010a). Based on the eligibility requirements of the MPD, because the lines would be rebuilt, remain within the original construction corridor, and would continue to be operated and maintained by BPA, the proposed undertaking would have **no effect** on historic properties.

Construction activities, including the removal of existing structures, the installation of new structures, and construction or improvement of access roads, have the potential to affect cultural resources, including human remains, not currently known to exist in the APE. Implementation of the mitigation measures described in Section 3.12.3, *Mitigation – Proposed Action*, would ensure that previously undiscovered resources were managed properly as required by NHPA, and would minimize both direct and indirect impacts from the Proposed Action.

Some impacts on cultural resources could occur during the operation and maintenance of the Proposed Action. Impacts would likely be **low to moderate**, depending on the level and amount of disturbance and the eligibility of the resource for listing on the NRHP in the APE.

3.12.3 Mitigation–Proposed Action

The following mitigation measures would be implemented under the Proposed Action to avoid and minimize impacts on cultural resources.

- Minimize construction near isolates and site 35WN80.
- Implement BPA's Inadvertent Discovery Protocol. This procedure provides that should ground-disturbing activities reveal any cultural materials (e.g., structural remains, Euro-American artifacts, or Native American artifacts), all activities in the vicinity of the find would cease. The BPA archaeologist, the Oregon State Historic Preservation Officer (SHPO), and affected tribes would be notified immediately. The Inadvertent Discovery Procedure would also require crews to cease construction immediately within 200 feet of any human remains, suspected human remains, or any items suspected to be related to a human burial (i.e., funerary items, sacred objects, or objects of cultural patrimony) encountered during construction. The area around the discovery will be secured and the Tillamook or Washington County Sheriff, BPA archaeologist, the SHPO, and the affected tribes would be contacted immediately.
- Avoid the Gravelle Brother's Trail segment by marking avoidance areas in the field with flagging tape so construction crews know to avoid the area.

3.12.4 Unavoidable Impacts after Mitigation–Proposed Action

The potential impacts described in Section 3.12.2, *Environmental Consequences – Proposed Action*, would be unavoidable because they are associated with impacts on cultural resources that are currently not known to exist but that may be discovered during construction of the Proposed Action. Implementation of the mitigation measures described in Section 3.12.3, *Mitigation – Proposed Action*, would minimize those construction-related impacts.

3.12.5 Cumulative Impacts–Proposed Action

The region of influence considered for cumulative impacts on cultural resources is the APE. Cultural resources in the APE have likely been cumulatively affected by past and current development activities. Most impacts have likely occurred as a result of inadvertent disturbance or destruction during ground-disturbing activities such as road work, facility construction, etc. Other reasonably foreseeable future projects in the vicinity of the APE have the potential to disturb previously undiscovered cultural resources. Implementation of the mitigation measures described in Section 3.12.3, *Mitigation – Proposed Action*, would minimize potential proposed project impacts and would reduce the potential for construction activities to cumulatively impact cultural resources in the APE. In the event that previously undiscovered historic properties were encountered, potential impacts would be **low to moderate** depending on the level and amount of disturbance and the eligibility of the resource for listing on the NRHP.

3.12.6 Environmental Consequences–No Action Alternative

Under the No Action Alternative, the existing Keeler-Forest Grove No. 1 and Forest Grove-Tillamook No. 1 transmission lines would not be rebuilt, and impacts related to project construction would not occur. Operation and maintenance activities would continue and would be similar to existing practices; however, the frequency and scope of maintenance activities would likely increase as existing structures deteriorate, and more structure repairs and replacements are required. This could in turn result in additional ground disturbance that would have the potential to affect cultural resources. Impacts associated with continued routine maintenance of the existing line as well as emergency additional repairs could range from **low to**

moderate, depending on the level and amount of disturbance, the location of the disturbance, and the eligibility of other resources for listing on the NRHP.

3.13 Noise, Public Health, and Safety

3.13.1 Affected Environment

Noise

Noise is commonly defined as unwanted sound that disrupts normal human activities or diminishes the quality of the human environment. Audible noise is usually measured in ***decibels*** (db) on the ***A-weighted scale*** (dBA). This scale models sound as it corresponds to human perception. Exceedence levels refer to the A-weighted noise level that is exceeded for a specified percentage of the time. An L_{10} exceedence level refers to the noise level that is exceeded only 10 percent of the time, whereas L_{50} exceedence level refers to the noise level that is exceeded 50 percent of the time. Table 3.13-1 shows typical noise levels for common sources expressed in dBA. Noise exposure depends on how much time an individual spends in different locations.

Table 3.13-1. Common Noise Levels

Sound Level (dBA)	Noise Source or Effect
110	Rock-and-roll band
80	Truck at 50 feet
70	Gas lawnmower at 100 feet
60	Normal conversation indoors
50	Moderate rainfall on foliage
40	Refrigerator
25	Bedroom at night

Source: Adapted from BPA 1986, 1996.

Noise-Sensitive Receivers

This assessment considered noise-sensitive land uses that could be affected by the Proposed Action. Noise-sensitive land uses near the project area include residences, schools, churches, and municipal parks concentrated in urban and suburban areas in and around Hillsboro, Cornelius, Forest Grove, and Tillamook. In rural portions of the project area, noise-sensitive land uses include scattered rural residences and churches, and recreational areas and wildlife habitat in the Tillamook State Forest.

Ambient Noise Environment

Within the project area, ***ambient noise*** levels vary across the landscape with land use and intensity of development, and with the proximity of the transmission line corridor to highways and other noise-generating activities. Ambient noise levels in rural farming areas are generally very low. The predominant sources of noise are typically agricultural equipment and vehicular traffic. Ambient noise levels on remote forestlands, exclusive of timber harvest activities, are also generally very low. The predominant sources of noise on remote forestlands are typically natural (e.g., wind, water, etc.) and some vehicular traffic. Ambient daytime noise levels in low-density rural areas such as those in the transmission line corridor range from 35 to 45 dBA (EPA 1978, FTA 2006).

Ambient noise levels in urban environments vary with land use type (i.e., residential, commercial, industrial, mixed-use, etc.); density (i.e., low, medium, high); and proximity to major roadways (EPA 1978, Cavanaugh and Tocci 1998, Caltrans 2009; FTA 2006). Noise levels adjacent to major roadways vary with traffic volume, vehicle mix (e.g., percentage of truck traffic), and vehicle speed. Ambient noise levels in quiet urban areas can be as low as 50 dBA, while urban areas adjacent to freeway traffic can have ambient noise levels as high 88 dBA (Caltrans 2009; Cavanaugh and Tocci 1998).

Audible noise from high-voltage transmission lines occurs as a result of ***corona***. Corona-generated noise can be characterized as a hissing, crackling sound that is accompanied by a 120 Hertz hum under certain conditions. Corona noise from transmission lines generally occurs during foul or wet weather. Generally, audible noise from 115-kV lines is so low as to be not noticeable (due to the low amount of corona activity generated at this voltage level) and is usually well below other ambient noise levels in the area. BPA designed these 115-kV transmission lines to meet applicable state and federal noise regulations (see Chapter 4). Historically, public complaints/inquiries of transmission line audible noise at this voltage level are extremely rare.

EPA has established a guideline of 55 dBA for the average day-night noise level (Ldn) in outdoor areas (EPA 1974, 1978). In computing this value, a 10 dBA correction (penalty) is added to night-time noise between the hours of 10:00 p.m. and 7:00 a.m. BPA has established a design criterion for corona-generated audible noise from transmission lines of 50 dBA for L_{50} (foul weather) at the edge of the ROW (BPA 2006). Likewise, BPA's design criterion for substation noise is 50 dBA at a substation property line.

Public Health and Safety

Electric Fields

All electric devices produce ***electromagnetic fields*** (EMF). ***Current***, the flow of electric charge in a wire, produces the magnetic field. Voltage, the force that drives the current, is the source of the electric field. The strength of EMF depends on the design of an electrical line and distance from it. EMF is found around any electrical wiring, including household wiring, electrical appliances, and equipment.

Electric fields are measured in volts per meter (V/m) or kilovolts per meter (kV/m). Throughout a home, the average electric field strength from wiring and appliances is typically less than 0.01 kV/m. Electric field levels in public buildings such as shops, offices, and malls are comparable with residential levels. Outdoor electric fields in publicly accessible places can vary widely from less than 0.01 kV/m to 12.0 kV/m; the higher fields are present only in limited areas along high-voltage transmission line ROWs. Electric field strength is reduced by intervening objects such as walls and vegetation.

The International Committee on Electromagnetic Safety (ICES) has established a public exposure guideline of 5.0 kV/m for electric fields, except on power line ROWs where the limit is 10.0 kV/m (ICES 2002). However, there are no national guidelines or standards for electric fields from transmission lines (EPA 2013). The NESC does specify a 5-milliampere criterion for maximum permissible induced shock current from large vehicles traveling under any BPA transmission line. BPA designs transmission line projects to meet the NESC exposure criterion within and outside the transmission corridor ROW. BPA designs new transmission lines to meet its electric-field guidelines of 9.0 kV/m maximum on the ROW, 5.0 kV/m maximum at the edge of the ROW, 5.0 kV/m for road crossings, and 2.5 to 3.5 kV/m in parking lots.

Magnetic Fields

Magnetic fields are measured in units of gauss (G) or milligauss (mG). The strength of an average magnetic field in most homes (away from electrical appliances and home wiring) is typically less than 2 mG. Very close to appliances that carry a high current, fields of tens or hundreds of mG are present. Unlike electric fields, magnetic fields from outside power lines are not reduced in strength by trees or building material. Therefore, transmission lines and distribution lines can be a major source of magnetic field exposure throughout a home located close to the line. There are no national guidelines or standards for magnetic fields in the United States, and the State of Oregon does not have a limit for magnetic fields from transmission lines.

Radio and Television Interference

Radio and television interference from high voltage power lines can be produced from two general sources: conductor corona activity (see audible noise section) and ***spark-discharge activity*** on connecting hardware. Conductor corona activity is primarily a function of the operating line voltage, while spark-discharge activity on connecting hardware is usually associated with the aging condition of hardware (e.g., over time, hardware connections can become loose and corroded causing small spark-gaps). Historically, public complaints of radio and television interference from BPA transmission lines operating at this voltage are rare.

Hazardous Materials

In general, hazardous materials are media containing organic or inorganic constituents considered toxic to humans or the environment. Hazardous materials that could be used during construction, operation, and maintenance of the Rebuild Project include, but are not limited to, fuels, lubricants, solvents, and herbicides used to manage vegetation, including noxious weeds, within the transmission line corridor. The project corridor includes forest, agricultural, and developed land uses. Hazardous waste sites, such as leaking underground storage tanks (LUST), or contaminated soils, could be present within the ROW as a result of past or ongoing land use activities and could be encountered during construction of the Rebuild Project, especially in areas where ground disturbance would occur. Abandoned waste (e.g., suspect drug lab materials, containers with contents that cannot be visually identified, etc.) could be encountered during construction or maintenance of the Rebuild Project, especially in more remote areas away from population centers. Farms are a potential source of unknown contamination as they commonly have old or inactive underground storage tanks. Additionally, ongoing agricultural activities in the area may involve the use of pesticides or herbicides that could pose a health and safety risk to construction and maintenance workers.

A records search of ODEQ's Facility Profiler revealed the presence of two sites along the transmission line ROW with known, potential, or cleaned-up hazardous materials contamination: South Fork Forest Camp (Site ID: 1179) and Lyda Camp-ODF (Site ID: 1730) (ODEQ 2013a). A brief description of each hazardous waste site is presented below.

The South Fork Forest Camp is a 25-acre site in the Tillamook State Forest that houses an ODOC minimum security correction center and ODF facilities. The transmission line roughly spans the north edge of the property between existing structures 22/7 and 23/5 on the Forest Grove-Tillamook No. 1 transmission line. Hydrocarbon contamination of soils occurred on the property from past ODOC vehicle maintenance practices, an ODOC emergency generator leak, and an ODF building fire in 1995 that caused stored oil to be released (ODEQ 2013b). Contaminated soil was removed from the site by an ODF contractor and since the contamination affected only shallow soils and was localized, and the contamination did not threaten human health or the environment, ODEQ required no further action by ODOC. The ODEQ report indicates that the site may require further investigation as past investigations have suggested there may be contamination on portions of the site operated by ODF (ODEQ 2013b). Contaminated soils from LUST were discovered on the site in 1995, 2001, and 2002 during decommissioning of the tanks. All cleanup actions from these LUST incidences have been completed (ODEQ 2013c, d, and e).

Lyda Camp, also located in the Tillamook State Forest roughly 300–500 feet south of structures 21/6 and 21/7 of the Forest Grove-Tillamook No. transmission 1 line, is a clearing on the side of a gravel road situated close to and above the South Fork Wilson River. In May 1995, a large number of crushed and buried 55-gallon drums were discovered during excavation of the site by ODF for a new motorcycle staging area. Sampling of soils from the pit and liquids draining from the excavated drums both indicated the presence of herbicides. The drums were removed from the site in January 1996; however, no soil was removed or additional pit samples taken before ODF backfilled the excavation. The Site Summary Report indicated that further characterization of residual soil contamination and evaluation of groundwater between the former pit and the South Fork Wilson River should be conducted (ODEQ 2013f).

3.13.2 Environmental Consequences–Proposed Action

Construction Noise

Construction activities associated with material and equipment staging, site preparation, danger tree removal, construction of access roads and transmission line structures including tensioning, and construction-related traffic would temporarily increase noise levels above ambient conditions as construction progresses along the ROW. Construction noise could result in short-term, intermittent, and transitory increases in noise levels that may affect nearby sensitive receptors. Table 3.13-2 summarizes noise levels produced by typical construction equipment that would likely be used for the Proposed Action.

Table 3.13-2. Noise Levels Produced by Typical Construction Equipment

Type of Equipment	Lmax [a] (dBA) at 50 Feet
Road grader	85
Bulldozers	85
Heavy trucks	88
Backhoe	80
Pneumatic tools	85
Crane	85
Combined equipment	92

[a] Lmax refers to the highest noise occurring during a specific period of time.
Source: FHWA 2006; FTA 2006.

Use of conventional construction equipment is estimated to produce a maximum sound level of 92 dBA at 50 feet from the site (this assumes that several pieces of the noisiest equipment are operating at the same time). Construction equipment is typically considered to be stationary noise sources when calculating noise levels. For point sources, levels attenuate (or drop off) at a rate of 6 dBA for each doubling of the distance. Table 3.13-3 shows estimated construction sound levels at different distances between the noise source (the construction site) and noise receptors based on this attenuation rate.

Table 3.13-3. Construction Noise

Distance between Source and Receiver (feet)	Calculated Sound Level (dBA Leq)[a]
50	92
100	86
200	80
300	76
400	74
500	72
600	70
800	68
1,600	62
3,200	56
6,400	50
12,800	44

Source: FHWA 2006; FTA 2006.

[a] Leq refers to the average noise level occurring over a 1-hour period. This calculation does not include effects, if any, of ground surfaces, or local shielding from topography, walls, or other barriers that may reduce sound levels further.

Helicopters may be used to install conductors and to remove structures. A loaded cargo helicopter flying 250 feet away produces about 95 dBA, which is the same amount of noise produced by a diesel locomotive 100 feet away. Noise associated with helicopter use would be temporary and intermittent. It would generally take less than 10 minutes to string the conductor at each structure, and BPA estimates that helicopters would not be in any given line mile for more than 3 hours.

Noise from truck traffic and increased worker trips would temporarily contribute to existing traffic noise on local roads and highways. Traffic noise related to the Proposed Action is expected to result in a **low** impact on average traffic noise levels because construction activities would not take place at any single location for a long period of time.

The ROW is located near population centers in incorporated areas and near scattered rural residences in rural areas. Noise-sensitive receptors, including residences, within approximately 1,600 feet of construction could be exposed to daytime noise levels greater than 60 dBA, as shown in Table 3.13-3; however, construction activities would be limited to the hours of 7:00 a.m. to 5:00 p.m. Monday through Friday, and 8:00 a.m. to 5:00 p.m. Saturday (see Section 3.13., *Mitigation – Proposed Action)*, and construction noise is exempt from applicable noise regulations (see Section 4.10.1). Construction noise levels would noticeably exceed ambient noise levels during a portion of the time in areas where noise-sensitive receptors, including residences, are present. While construction activities at any single location would be short-term and temporary, this would be considered a **moderate** impact.

Operation and Maintenance Noise

Periodic noise impacts would occur during maintenance activities from equipment used to maintain or repair infrastructure (e.g., structures, access roads). These events would typically occur less than 5 days per year and last less than 2 hours. Given the short-term nature of this noise, operation and maintenance activities would have a **low** impact.

BPA also conducts routine inspection patrols of the federal transmission line system in the Pacific Northwest via helicopter, including BPA's Keeler to Tillamook transmission lines. BPA would continue to use helicopters to fly along the rebuilt lines and other BPA lines to identify repair needs. These patrols typically occur two or three times per year. Any noise experienced by receptors on the ground during these flyovers would be infrequent and brief (only the few seconds it would take for the helicopter to pass over), and thus would have a **low** impact.

During stormy or very humid weather, audible corona noise from a transmission line operating at 230 kV or greater can contribute to ambient noise, along with wind and rain hitting vegetation. BPA design criteria ensure a maximum level of 50 dBA for corona-generated noise associated with all new transmission lines (115 kV, as well as 230 kV and higher) at the edge of the ROW. Since the lines would continue to operate at 115 kV (well below 230 kV), corona-generated noise would stay below this 50 dBA maximum level and would likely not contribute to the ambient noise levels of the surrounding areas. Therefore, there would be **no** impact from corona activity on noise levels from the Proposed Action.

For this project, no changes to the operating line voltage of the Keeler-Forest Grove No. 1 and Forest Grove–Tillamook No. 1 115-kV lines are expected. Thus, the audible noise environment is not expected to change as a result of the Proposed Action. BPA has calculated audible noise levels (for wet conditions), as summarized in Table 3.13-4. The data indicate that the Proposed Action would slightly reduce the audible noise near the ROW. The rebuilt lines would continue to be compliant with applicable noise regulations (see Section 4.10.1).

Table 3.13-4. Representative ROW Audible Noise, Proposed Action (dBA, wet conditions) [a]

ROW Section Description		Eastern ROW Edge (dBA)	Maximum on ROW (dBA)	Western ROW Edge (dBA)
150 ft ROW with 2 Lines: Keeler-Forest Grove No. 1 115-kV Keeler-Forest Grove No. 2 115-kV	Existing Conditions	17.8	20.8	17.8
	With Proposed Action	17.5	20.6	17.6
100 ft ROW with 1 Line: Forest Grove-Tillamook No. 1 115-kV	Existing Conditions	23.6	26.2	24.0
	With Proposed Action	18.5	21	18.8

[a] Values developed from BPA modeling programs.

Public Health and Safety

Public Health and Safety during Construction

Potential public health and safety impacts would be associated with the use of construction and heavy equipment; potential exposure to hazardous materials used during construction, such as fuels, lubricants, solvents, and herbicides; construction traffic entering and traveling across the transmission line corridor; potential aircraft hazards; and worker proximity to high-voltage transmission lines. Two documented hazardous waste sites (South Fork Forest Camp and Lyda Camp) are located near the transmission line. While ground disturbance associated with structure removal and replacement at the South Fork Forest Camp is not expected to occur in the exact location of past and existing soil contamination on the property, ODEQ's site report indicates that potential unknown contamination may be present in some areas, creating a moderate risk of encountering contaminated soils in this area. No ground disturbance associated with construction activities is expected to occur in the vicinity of Lyda Camp, so the risk of encountering contaminated soils or groundwater at that site is low. Implementation of the mitigation measures described in Section 3.13.3, *Mitigation – Proposed Action*, would reduce these potential public health and safety impacts during construction to **low**.

Public Health and Safety during Operation

The primary parameters that impact the EMF levels produced by a power line are line voltage, current loading, line configuration, and line routing. The Rebuild Project would not appreciably change any of these parameters. In a few isolated cases, pole heights would need to be increased slightly to raise the conductor-to-ground clearances. In these areas, ground-level EMF would decrease slightly within the ROW. No changes are expected beyond the ROW. Therefore, no changes to EMF in the vicinity of the line are expected.

BPA has calculated EMF levels for the Proposed Action – see Tables 3.13-5 and 3.13-6, respectively. The data indicate that the Proposed Action would result in minor changes to the electric field and minor decreases to the magnetic field on the ROW. Overall, EMF emissions from the Proposed Action are expected to conform to BPA and NESC criteria; therefore, EMF emission impacts from the Proposed Action would be **low**.

Table 3.13-5. Representative ROW Electric Fields [a]

ROW Section Description		Northern ROW Edge (kV/m)	Maximum on ROW (kV/m)	Southern ROW Edge (kV/m)
150 ft ROW with 2 Lines: Keeler-Forest Grove No. 1 115-kV Keeler-Forest Grove No. 2 115-kV	Existing Conditions	0.5	1.6	0.5
	With Proposed Action	0.5	1.6	0.5
100 ft ROW with 1 Line: Forest Grove-Tillamook No. 1 115-kV	Existing Conditions	0.3	1.0	0.2
	With Proposed Action	0.2	1.1	0.2

[a] Values developed from BPA modeling programs.

kV/m = kilovolts per meter.

Table 3.13-6. Representative ROW Magnetic Fields [a]

ROW Section Description		Northern ROW Edge (mG)		Maximum on ROW (mG)		Southern ROW Edge (mG)	
		Annual Average	Annual Peak	Annual Average	Annual Peak	Annual Average	Annual Peak
150 ft. ROW with 2 Lines: Keeler-Forest Grove No. 1 115-kV Keeler-Forest Grove No. 2 115-kV	Existing Conditions	11.1	22.9	22.0	82.7	11.1	22.3
	With Proposed Action	11.1	22.9	22.0	82.7	11.1	22.3
100 ft. ROW with 1 Line: Forest Grove-Tillamook No. 1 115-kV	Existing Conditions	1.9	3.9	4.7	20.1	1.8	3.8
	With Proposed Action	1.7	3.6	4.3	18.5	1.7	3.5

[a] Calculation of annual average and annual peak magnetic fields are based on historical 2011–2012 annual line loading statistical data obtained from BPA's Supervisory Control and Data Acquisition system.

kV = kilovolts, mG = milligauss.

Radio and Television Interference

No changes to the operating line voltages of the Keeler-Forest Grove No. 1 and Forest Grove-Tillamook 115-kV No. 1 transmission lines are expected. Additionally, the Rebuild Project would result in new, properly installed connecting hardware that would reduce any risk associated with aging hardware spark-discharge activity. As a result, the Proposed Action is expected to either not change or slightly decrease radio and television interference along the affected line sections. In addition, based on past performance, interference complaints are not expected. In any case, any legitimate radio or television interference complaint received by BPA would be investigated. If BPA facilities are determined to be the cause of the interference, BPA would take corrective action to eliminate the interference.

Environmental Consequences–Steel Pole Replacement

BPA is considering whether to use steel pole structures instead of wood at some locations (see Section 2.1, *Proposed Action*). Noise impacts and public health and safety impacts would be similar to those described for the Proposed Action. In the long term, the more durable steel poles would require less frequent routine maintenance (compared to wood poles) and thus noise associated with maintenance activities.

3.13.3 Mitigation–Proposed Action

The following mitigation measures would be implemented to reduce or eliminate noise impacts from the Proposed Action:

- Provide a schedule of construction activities to all landowners who could be affected by construction.

- Locate equipment as far away as is practical from noise-sensitive uses.
- Ensure that all equipment has standard sound-control devices.
- Conduct noise-generating construction activities only during normal daytime hours (i.e., between the hours of 7:00 a.m. to 5:00 p.m. Monday to Friday, and 8:00 a.m. to 5:00 p.m. Saturday), to the extent possible.
- Shut down idling construction equipment, if feasible (see Section 3.10.3, *Mitigation–Proposed Action [Air Quality]*).

The following mitigation measures would minimize potential public health and safety risks:

- Prepare and implement SPRP to avoid and contain accidental spills, including notification assessment, security, clean-up, and reporting requirements. Implement BMPs to ensure that all harmful materials are stored, contained, and disposed of properly.
- Provide spill prevention kits at designated locations on the project site and where hazardous materials are stored.
- Inspect equipment daily for potential leaks.
- Initiate discussions with local fire districts prior to construction and work with the districts and other appropriate emergency response entities to develop appropriate fire and emergency response plans.
- Construct and operate the rebuilt transmission line according to the NESC guidelines.
- Restore reception quality if radio or television interference occurs as a result of rebuilding the transmission line so that reception is as good as or better than before the interference.
- Install barriers, gates, and postings at appropriate access points (see Section 3.2.3, *Mitigation–Proposed Action [Land Use, Recreation, and Transportation]*).
- Apply herbicides according to the BPA Transmission System Vegetation Management Program EIS and Record of Decision (DOE/EIS-0285; BPA 2000) and label recommendations (see Section 3.6.3, *Mitigation–Proposed Action [Vegetation]*).
- Cease project construction near stream courses under high flow conditions (see Section 3.7.3, *Mitigation–Proposed Action [Water Resources, Water Quality, and Floodplains]*).
- Hold crew safety meetings at the start of each workday to review hazards associated with the job, work procedures, special precautions, and other potential safety issues.
- Secure the site at the end of each workday, as much as possible, to protect equipment and the general public.
- Comply with all fire safety laws, rules, and regulations of the State of Oregon and prepare a fire prevention and suppression plan to meet BPA, local authority, and land manager requirements.
- Notify the BPA Contracting Officer's Technical Representative immediately if a hazardous material is discovered that could pose an immediate threat to human health or the environment, and stop work in that area until the site is properly cleaned up.

- Ground fences and other metal structures on and near the transmission line corridor during construction to limit the potential for shocks.

3.13.4 Unavoidable Impacts after Mitigation–Proposed Action

Potential unavoidable noise impacts would include short-term increases in sound levels experienced by area residents up to 0.5 mile from construction activities during construction of the Proposed Action. Some corona noise may also be heard along the line, especially in wet or foggy weather.

Potential unavoidable public health and safety risks include increased risk of electrical shocks, accidental release of fuels or oils, accidental injury to construction workers, and possible collisions between construction vehicles and vehicles driven by the public while construction is ongoing.

3.13.5 Cumulative Impacts–Proposed Action

Cumulative noise impacts typically occur when sensitive receptors are exposed to multiple noise sources at approximately the same time, such as cumulative noise from residential uses, industrial and commercial activities, agricultural and forestry activities, highway traffic, and construction traffic and activities. Construction noise from the Proposed Action would temporarily contribute to noise levels in the area. However, noise levels would return to existing levels after construction.

Other reasonably foreseeable future projects in the vicinity of the project area that could affect noise, public health, and safety are listed and described in Appendix B. Construction activities associated with these projects would occur within the same general timeframe as the Proposed Action. Construction-related noise impacts in rural areas are expected to be **low** to **moderate** because forestry activities associated with timber sales within the Tillamook State Forest would likely occur while BPA is reconstructing the line in 2014. Scattered rural residents in the vicinity of both activities could experience increases in ambient noise levels temporarily. The Proposed Action has the greatest potential to contribute to construction noise-related cumulative impacts in the vicinity of the Intel expansion in Hillsboro near the Keeler Substation, for which construction would be ongoing at the same time as the Proposed Action. However, because sensitive lands uses (residences) in this area are on the opposite side of US 26 from the Intel campus, the potential for the Proposed Action to contribute to construction noise-related cumulative impacts is expected to be **low**.

The Proposed Action would not increase the overall level of EMF exposure along the corridor. The transmission lines with new structures would have similar EMF levels to those of the existing lines, and there are no known plans to construct additional transmission lines in the area, so the potential for the Proposed Action to contribute to cumulative levels of EMF is expected to be **low**.

3.13.6 Environmental Consequences–No Action Alternative

Under the No Action Alternative, noise associated with construction activities would not occur. Noise associated with maintenance would continue as in the past, and could occur more often than under the Proposed Action because of the deteriorated condition of the existing lines and the likely need for more frequent maintenance activities. Potential construction-related public health and safety risks would also not occur under the No Action Alternative. EMF exposure would remain similar to current conditions. Continued operation and maintenance of the existing transmission line would have **low** impacts on noise, public health, and safety.

Chapter 4
Consultation, Review, and Permit Requirements

This chapter addresses statutes, implementing regulations, and executive orders applicable to the Proposed Action. This EA is being sent to tribes, federal agencies, state agencies, and state and local governments as part of the consultation process for the Proposed Action. Where applicable, resources have been combined where laws or policies are common (e.g., Fish and Wildlife).

4.1 National Environmental Policy Act

This EA was prepared pursuant to regulations implementing NEPA (42 U.S.C. 4321 et seq.), which requires federal agencies to assess the impacts that their actions may have on the environment. NEPA requires the preparation of an EIS for major federal actions significantly affecting the quality of the human environment. BPA prepared this Draft EA to determine if the Rebuild Project would create any significant environmental impacts that would warrant preparing an EIS, or if a FONSI is justified. It is the Department of Energy's policy to follow the letter and spirit of NEPA; comply fully with the CEQ Regulations; and apply the NEPA review process early in the planning stages for its proposals (10 CFR Part 1021).

4.2 Land Use, Recreation, and Transportation

4.2.1 Land Use

BPA, as a federal agency, is generally not required to comply with the requirements associated with obtaining state and local land-use approvals or permits, because Congress has not waived federal sovereign immunity over these areas. As a federal agency, BPA only obtains those state and local permits for which Congress has clearly and unambiguously waived sovereign immunity. However, BPA would, to the maximum extent practical, strive to meet or exceed the substantive standards and policies of the following environmental regulations:

- Washington County Comprehensive Plan (2012a).
- Washington County Rural/Natural Resources Plan (2006).
- Tillamook County Comprehensive Plan (1982).
- Hillsboro Comprehensive Plan (1977, amended through September 2012).
- Forest Grove Comprehensive Plan (1980, 1985 currently being updated).
- City of Tillamook Comprehensive Plan (2012).

The Rebuild Project would use an existing corridor and would be consistent with these land use plans to the extent practicable. See Section 3.2, *Land Use, Recreation, and Transportation*, of this EA for further discussion.

Washington County Comprehensive Plan

Approximately 25.47 miles of the transmission lines are within Washington County. Most of the transmission line is outside the county's UGB. About 5.1 miles of transmission line are within the UGB. The Comprehensive Framework Plan for the Urban Area provides guidance related to areas within the UGB, but does not include specific strategies related to transmission lines (Washington County 2012a).

Tillamook County Comprehensive Plan

About 32.41 miles of the Forest Grove-Tillamook No. 1 transmission line are within Tillamook County. The Land Use element of the Tillamook County Comprehensive Plan prioritizes developed uses (in particular, moderate to very high density development) within existing UGBs, as well as the conservation of rural areas, but does not provide specific guidance for land use strategies associated with transmission lines (Tillamook County 1982).

City of Hillsboro Comprehensive Plan

Approximately 2.05 miles of the Keeler-Forest Grove No. 1 transmission line are within the Hillsboro UGB. The Hillsboro Comprehensive Plan addresses the siting of distribution lines within the UGB, but does not address transmission lines (Hillsboro 1977, amended through September 2012). The Comprehensive Plan calls for utilities to be sited underground, where appropriate, and for aesthetics to be addressed when utilities are provided aboveground. This guidance is generally not applicable to BPA transmission lines.

City of Forest Grove Comprehensive Plan

Approximately 4.02 miles of the Forest Grove-Tillamook No. 1 transmission line are within the Forest Grove UGB. The Forest Grove Comprehensive Plan addresses the siting of distribution lines within the UGB, but does not address transmission lines (Forest Grove 1980, 1985 currently being updated). The Comprehensive Plan calls for utilities to be sited underground, where appropriate, and for aesthetics to be addressed when utilities are provided aboveground. This guidance is generally not applicable to transmission lines.

City of Tillamook Comprehensive Plan

While the Forest Grove-Tillamook No. 1 transmission line terminates in Tillamook at the Tillamook Substation, none of the existing transmission line is within Tillamook's UGB.

4.2.2 Recreation

No designated wilderness or other areas of national environmental concern are found on or around the ROW. Recreation on Tillamook State Forest lands is subject to guidelines in the Northwest Oregon State Forests Management Plan (ODF 2010a) (see Section 4.5.2, *State*).

4.2.3 Transportation

According to Oregon Revised Statute (ORS) Chapter 818 (Vehicle Limits), oversize or overweight vehicles need transportation permits to travel on highways and local public roads in the state. BPA would consult with ODOT, Tillamook County Public Works Department, and Washington County Public Works Department to coordinate the routing and scheduling of construction traffic.

4.3 Fish and Wildlife

4.3.1 Endangered Species Act (ESA)

The ESA (16 U.S.C. 1531 *et seq.*) establishes a national program for the conservation of threatened and ***endangered species*** of fish, wildlife, and plants, and the preservation of the ecosystems on which they depend. The ESA is administered by the USFWS for terrestrial species and some freshwater fish species, and by NMFS for anadromous fish and marine species.

Section 7(a)(2) of the ESA requires federal agencies to ensure that the actions they authorize, fund, and carry out do not jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat. Section 7(c) of the ESA and other federal regulations require that federal agencies prepare a biological assessment addressing the potential effects of their actions on listed or proposed endangered species and critical habitats.

BPA used the following resources to determine which endangered and threatened species and critical habitat occur near the Proposed Action, as addressed in Section 3.4 (*Fish)*, Section 3.5 (*Wildlife)*, and Section 3.6 (*Vegetation)* of this EA:

- USFWS lists of fish, wildlife, and plant species in Washington and Tillamook counties that are protected under the ESA (USFWS 2013a, 2013b).
- NMFS list of fish species protected under the ESA (NMFS 2012).
- Oregon Natural Heritage database records of known special-status species locations (ORBIC 2010).

Pursuant to requirements of Section 7(c) of ESA, BPA is preparing a biological assessment to be submitted to the USFWS that will address effects of the Proposed Action on marbled murrelet, northern spotted owl, and Nelson's checker-mallow (all federally listed as threatened), and a separate biological assessment to NMFS that will address the effects of the Propose Action on OC coho salmon and UWR steelhead (both federally listed as threatened). BPA has initiated informal consultation with USFWS regarding potential effects, survey protocol requirements, and the contents of the biological assessment, and BPA will submit a draft biological assessment to the USFWS and NMFS in 2013.

Additionally, there is potential habitat for two federally listed plant species: Nelson's checker-mallow and Kincaid's lupine. Both are listed as threatened under the ESA. Potential impacts on these species are addressed in Section 3.6, *Vegetation*. Vegetation surveys conducted in 2013 included the entire length of the existing ROW and roads. Populations of Nelson's checker-mallow were observed within the transmission line ROW. Impacts on known populations of Nelson's checker-mallow would be reduced by implementation of the mitigation measures identified in Section 3.6.3.

4.3.2 Magnuson-Stevens Fishery Conservation and Management Act of 1976 (MSA)

NMFS is responsible for ensuring compliance with the Magnuson-Stevens Fishery Conservation and Management of 1976 (16 U.S.C. 1801 *et seq.*). The Act establishes new requirements for evaluating and consulting on adverse effects on EFH The facilities associated with Proposed Action are located within

Essential Fish Habitat for Pacific salmonids (coho and Chinook salmon). This EA addresses EFH in Section 3.4. Compliance with this law is consolidated with BPA's ESA Section 7 consultation with NMFS. The biological assessment will contain any conservation measures intended to appropriately avoid and minimize impacts on EFH of federally managed fish species.

4.3.3 Fish and Wildlife Conservation Act and Fish and Wildlife Coordination Act

The Fish and Wildlife Conservation Act of 1980 (16 U.S.C. 2901 *et seq*.) encourages federal agencies to conserve and promote the conservation of non-game fish and wildlife and their habitats. The Fish and Wildlife Coordination Act of 1934 (16 U.S.C. 661 *et seq*.) requires federal agencies with projects affecting water resources to consult with the USFWS and the state agency responsible for fish and wildlife resources.

BPA coordinated with the ODFW and the USFWS in developing mitigation measures for the protection of fish and wildlife and preparing the biological assessment. Mitigation measures identified in the biological assessment are incorporated by reference into this EA. BPA has also been consulting with ODF to consider ways to protect waters of the state including protection measures for riparian areas and wetlands on forest lands.

The analysis in Section 3.4 (*Fish)* and Section 3.5 (*Wildlife)* of this EA indicates that the alternatives would have low to moderate impacts on fish and wildlife, with implementation of appropriate mitigation. The USFWS, NMFS, and ODFW will be sent copies of this Draft EA, and mitigation measures designed to avoid and minimize impacts on fish and wildlife and their habitat are identified in Section 3.4 (*Fish*), Section 3.5 (*Wildlife*), Section 3.7 (*Waterways, Water Quality, and Floodplains*), and Section 3.8 (*Wetlands*).

4.3.4 Migratory Bird Treaty Act (MBTA) and Federal Memorandum of Understanding

The MBTA implements various treaties and conventions between the United States and other countries, including Canada, Japan, Mexico, and the former Soviet Union, for the protection of migratory birds (16 U.S.C. 703–712). Under the MBTA, the taking, killing, or possessing migratory birds, or their eggs or nests, is unlawful. The act classifies most species of birds as migratory, except for upland and ***nonnative*** birds such as pheasant, chukar, gray partridge, house sparrow, European starling, and rock dove.

BPA, through the U.S. Department of Energy and the USFWS have a memorandum of understanding (MOU) to address migratory bird conservation in accordance with Executive Order 13186 (Responsibilities to Federal Agencies to Protect Migratory Birds), which directs each federal agency that is taking actions possibly negatively affecting migratory bird populations to work with the USFWS to develop an agreement to conserve those birds (U.S. Department of Energy and USFWS 2006). The MOU addresses how both agencies can work cooperatively to address migratory bird conservation and includes specific measures to consider during project planning and implementation. BPA follows this MOU to minimize potential impacts on migratory birds. The Proposed Action may affect migratory birds through the loss of habitat and potential for collisions with the transmission line. BPA would implement feasible measures, including the design of transmission lines to minimize the potential for avian collisions. The existing alignment of the transmission lines would be retained. Larger conductors would be used that could make the transmission line more visible to birds, decreasing the potential for collisions. The transmission line is designed with conductors spaced far enough apart to prevent electrocution of raptors. Because no areas along the corridor are known to be particularly problematic for avian collisions, moving structures was not considered. BPA would mark the rebuilt transmission line with bird flight diverters over any major water body that may be a potential flyway for migratory bird species (waterfowl) where appropriate. Potential impacts and mitigation measures are described in Section 3.5 (*Wildlife*) of this EA. Construction, operation, and maintenance of the Rebuild Project would result in low to moderate impacts on migratory birds, as a result of loss of habitat or incidental mortality, as described in Section 3.5, *Wildlife*, of this EA.

4.3.5 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act prohibits the taking or possessing of and commerce in bald and golden eagles, with limited exceptions (16 U.S.C. 668–668d). The Act covers only intentional acts, or acts in “wanton disregard” of the safety of bald or golden eagles. The Oregon Biodiversity Information Center (previously known as the Oregon Natural Heritage Information Center) database includes records of three known bald eagle nests within 2 miles of the transmission line ROW (ORBIC 2012). Golden eagles are not expected to occur near the Proposed Action because they are rare west of the Cascade Mountain Range, no golden eagles have been documented within 2 miles of the transmission line ROW (ORBIC 2012), and the area lacks suitable habitat.

As described in Section 3.5, Wildlife, there have been no known collisions of eagles with the existing transmission line or its conductor, and bird diverters would be used in longer spans over rivers and floodplains to help prevent collisions. This mitigation would avoid and minimize impacts on eagles and other birds. Additional mitigation measures to avoid and minimize impacts on birds, including eagles, are identified in Section 3.5.3.

4.4 Vegetation

4.4.1 State

Oregon Forest Practices Act

The Oregon Forest Practices Act (FPA) and Forest Practices Rules and Regulations are the state's principal means of regulating activities on non-federal forestlands. The FPA rules and regulations are administered by ODF. Because the FPA does not apply to federal agencies on non-federal land, BPA would not obtain an FPA permit from the state. BPA would follow the FPA, where possible. Project specifications include substantial compliance with the BMPs described in the FPA. In addition, as required under the FPA, BPA has been consulting with ODF to consider ways to protect waters of the state including protection measures for riparian areas and wetlands.

Northwest Oregon State Forests Management Plan

Approximately 18.3 miles of the Forest Grove-Tillamook No. 1 transmission line are within the Tillamook State Forest. ODF manages the State Forest according to the management prescriptions detailed in the Northwest Oregon State Forests Management Plan, which also references the Tillamook State Forest Recreation Action Plan (ODF 2010a; 2000). The Northwest Oregon State Forests Management Plan identifies transmission lines as an appropriate use of State Forest lands and assigns a focused stewardship management category to lands impacted by transmission lines. This management category does not preclude the overarching integrated resource management goal of the plan, but does acknowledge that uses within this category may "affect harvesting systems, the size and location of harvest units, or road locations." The Tillamook State Forest Recreation Action Plan does not provide management guidelines or policies specific to utility corridors or transmission lines.

4.5 Wetlands, Floodplains, Waterways, and Water Quality

Wetlands and other water resources are regulated on multiple levels at the federal, state, and local level. As part of the NEPA review, U.S. Department of Energy NEPA regulations require that impacts on floodplains and wetlands be assessed and alternatives for protection of these resources be evaluated in accordance with Compliance with Floodplain/Wetlands Environmental Review Requirements (10 CFR 1022.12) and Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands). Evaluation of impacts of the Proposed Action on floodplains and wetlands are described briefly below and in more detail in Section 3.7, *Waterways, Water Quality, and Floodplains,* and Section 3.8, *Wetlands*. The EA serves as notice of floodplain and wetlands actions as required under 10 CFR 1022.12(b).

Efforts were made during the Rebuild Project design phase to avoid or minimize impacts on floodplains and wetlands. Wetlands were identified near structure locations (existing and proposed) and along access roads. For those wetlands that would be unavoidably impacted, BPA would secure the appropriate permits prior to any wetland impacts.

4.5.1 Federal

Clean Water Act (CWA)

Wetland and waterway management, regulation, and protection are addressed in several sections of the CWA, including Sections 401, 402, and 404. The various sections applicable to the Proposed Action are described below.

- **Section 401**. A federal permit to conduct an activity that causes discharges into navigable waters is issued only after the affected state certifies that existing water quality standards would not be violated if the permit were issued. ODEQ would review the permit application for the Rebuild Project for compliance with Oregon's water quality standards including Oregon's current turbidity standard (OAR 340-41-0036), which requires that turbidity not increase more than 10 percent from background levels as measured at an upstream control point.
- **Section 402**. This section authorizes discharges including stormwater into waters of the U.S. under the National Pollutant Discharge Elimination System (NPDES) program. The EPA, Region 10, has a general permit for federal facilities for discharges from construction activities. BPA is working with EPA to determine if it needs to obtain coverage under this general permit, and is preparing an SWPPP to address stabilization practices, structural practices, stormwater management, and other controls (see Section 3.7, *Waterways, Water Quality, and Floodplains*).
- **Section 404**. Authorization from the Corps is required in accordance with the provisions of Section 404 of the CWA when dredged or fill material is discharged into waters of the United States,

including wetlands. Impacts on wetlands are described in Section 3.8, *Wetlands*. BPA will apply for a permit under Section 404 for unavoidable wetland impacts.

Coastal Zone Management Act (CZMA)

As a federal agency, BPA would follow the guidelines of the CZMA (16 U.S.C. 1451-1464) to ensure that Rebuild Project activities are, to the maximum extent practicable, consistent with the enforceable policies of the state management programs. Because a portion of the Rebuild Project is within Oregon's coastal zone, which includes Tillamook County, BPA is subject to the coordination and consistency requirements of CZMA.

The State of Oregon has an approved Coastal Zone Management Program, Oregon Coastal Management Program (OCMP), which is implemented by the Oregon Department of Land Conservation and Development (DLCD). The CZMA requires that "each federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved state management programs" (16 U.S.C. 1456c(1)(A)). OCMP policies include the statewide planning goals, county and city comprehensive plans, and state natural resource laws.

BPA is designing and planning to implement the Rebuild Project in such a way that it would be consistent to the maximum extent practicable with the OCMP. BPA has notified Tillamook County about the Proposed Action. BPA will work with Tillamook County planning staff and ODSL and submit a consistency statement to DLCD, in conjunction with any necessary wetland permits.

4.5.2 State

Oregon's Removal Fill Law

Oregon's Removal Fill Law (ORS 196.795-990), administered by the ODSL, requires a permit for the removal of material or placement of fill in waters of the state, which include waterways and wetlands. Some activities, such as culvert replacement, are exempt from this requirement. BPA is coordinating with ODSL to determine which activities are subject to the Removal Fill Law and will meet the requirements, as part of the CZMA consistency determination. BPA submitted a wetland delineation report for this project to ODSL for review in July 2013.

4.5.3 Local

Division 635 of the OARs establishes protective measures in riparian management areas on private forestland to provide resource protection during operations adjacent to and within streams, lakes, wetlands, and riparian management areas so that goals for fish, wildlife, and water quality are met (ORS 527.765). OAR 629-635-000 through 629-660-0060, known as the "water protection rules" include vegetation retention objectives for streams (OAR 629-640-000), significant wetlands (OAR 629-645-000), and lakes (OAR 629-650-000) that will maintain water quality and habitat components and functions necessary for the protection of fish and wildlife. OAR 629-635-0200 classifies streams and wetlands based on a variety of factors, including beneficial uses, size, fish use, and significance. OAR 629-635-310 specifies riparian management area widths for the streams. Division 655 of the Water Protection Rules establishes protective measures for "other wetlands," seeps, and springs.

The Tillamook County Land Use Ordinance, Section 4.080, Requirements for the Protection of Water Quality and Streambank Stabilization, establishes riparian buffer widths for streams in the county. Section 3.092 of the Tillamook County Code establishes a freshwater wetlands overlay zone to protect significant areas of freshwater wetlands, marshes, and swamps from filling, drainage, or other alteration that would destroy or reduce their biological value. The Freshwater Wetlands Overlay Zone specifies permitted uses and development standards within wetlands specified as significant in Goal 5 of the Comprehensive Plan and wetlands shown on the Statewide Wetland Inventory.

Requirements for protecting streams, wetlands, and other water quality sensitive areas in Washington County are based on the CWA and ESA and administered by Clean Water Services.

4.6 Visual Resources

BPA, as a federal agency, is not required to comply with state and local visual resource guidance or regulations because Congress has not waived sovereign immunity in these areas. As a federal agency, BPA only complies with those state and local permits for which Congress has clearly and unambiguously waived sovereign immunity. However, BPA will, to the maximum extent practical, strive to meet or exceed the substantive standards and policies of the state and local environmental regulations, including the following:

- Washington County Comprehensive Plan, Rural/Natural Resources Plan (2006).
- Tillamook County Comprehensive Plan (1982).
- Hillsboro Comprehensive Plan (1977, amended through September 2012).
- Forest Grove Comprehensive Plan (1980, 1985, currently being updated).
- City of Tillamook Comprehensive Plan (2012).

Other than the Tillamook County Comprehensive Plan, these plans all include general aesthetic/scenic resource guidance. The Washington County Comprehensive Plan calls for the protection and enhancement of outstanding scenic views, routes, and other features. The Proposed Action does not cross or otherwise influence any of the scenic routes, views, or other scenic features identified in the Washington County Comprehensive Plan.

The three community comprehensive plans (Hillsboro, Forest Grove, and Tillamook) all include policies and other guidelines associated with protecting and preserving scenic resources and visually attractive environments, including:

- Promoting and encouraging development that is characteristic of the natural features of the landscape (Hillsboro Comprehensive Plan).
- Promoting visually attractive environments in harmony with the natural landscape (Forest Grove Comprehensive Plan).
- Preserving scenic views and sites (e.g., encourage minimum development, provide vegetative screening) within and outside the Tillamook UBG (Tillamook Comprehensive Plan).

The existing transmission line is generally consistent with these broad scenic resource policies and guidelines. As such and because the Proposed Action is a rebuild of the existing transmission line, there are no anticipated conflicts from the Proposed Action with the established county and community comprehensive plans.

In addition to the county and local plans, the Northwest Oregon State Forests Management Plan also provides guidance related to visual resources and management on state lands in the Tillamook State Forest (ODF 2010a). The Northwest Oregon State Forests Management Plan primarily addresses visual resources as they relate to forest management practices. The plan assigns viewer sensitivity levels (low, moderate, high) to areas within the Tillamook State Forest. It assigns a high sensitivity rating to areas along major highways (e.g., SR 6), at public vistas and viewpoints, and adjacent to campgrounds. This high sensitivity rating does not preclude certain types of activities (e.g., timber harvest), but does require the use of methods that reduce the potential visual resource impacts from these activities. The transmission line ROW is sited within high viewer sensitivity areas in Tillamook State Forest, in particular where it parallels SR 6, though it is not specifically addressed by the management objectives of the Northwest Oregon State Forests Management Plan.

4.7 Air Quality

4.7.1 Clean Air Act

The Clean Air Act (42 U.S.C. 7401 *et seq.*), requires the EPA and individual states to carry out a range of regulatory programs intended to ensure attainment of the NAAQS. In Oregon, the EPA has delegated authority to the ODEQ. Because the Rebuild Project would occur in an area that is currently in attainment for meeting the NAAQS and because no stationary sources of air emissions would occur, construction activities associated with the Rebuild Project are exempt from state regulation.

4.7.2 Climate Change

Gases that absorb infrared radiation and prevent heat loss to space are called GHGs. Models predict that atmospheric concentrations of all GHGs will increase over the next century, but the extent and rate of change are difficult to predict, especially on a global scale. As a response to concerns over the predicted increase of global GHG levels, various federal and state mandates address the need to reduce GHG emissions, including the following.

- The Clean Air Act is a federal law that establishes regulations to control emissions from large generation sources such as power plants; limited regulation of GHG emissions occurs through New Source Review.
- The EPA has issued the *Final Mandatory Reporting of Greenhouse Gases Rule* (40 CFR Part 98) that requires reporting of GHG emissions from large sources. Under the rule, suppliers of fossil fuels or industrial GHGs, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHGs are required to submit annual reports to the EPA (EPA 2010a).
- Executive Orders 13423 and 13514 require federal agencies to measure, manage, and reduce GHG emissions by agency-defined target amounts and dates.

- In Oregon, House Bill 3543, from 2007 (ORS 468A.205), directs state and local governments, businesses, nonprofit organizations, and individual residents to reduce GHG emissions by 2010. By 2020, the state is directed to achieve GHG levels that are 10 percent below 1990 levels. By 2050, the state is directed to achieve GHG levels that are at least 75 percent below 1990 levels (Oregon Global Warming Commission 2010).

GHG emissions were estimated for Rebuild Project activities that produce GHG emissions: transportation-related direct emissions resulting from construction activities, ongoing operations and maintenance activities for the estimated 50-year operational life of the transmission line, and permanent vegetation removal for new roads and structures. GHG emissions would be below EPA's mandatory reporting threshold. The impact of the Proposed Action on GHG concentrations would be low, as described in Section 3.10, *Air Quality*.

4.8 Socioeconomics, Environmental Justice, and Public Services

4.8.1 Executive Order on Environmental Justice

In February 1994, Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations, was released to federal agencies. This order states that federal agencies shall identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. The Proposed Action would not cause disproportionately high and adverse impacts on minority and low-income populations. Section 3.11, *Socioeconomics, Environmental Justice, and Public Services*, contains a discussion on environmental justice.

4.9 Cultural Resources

Laws and regulations govern the management of cultural resources. A cultural resource is an object, structure, building, site, or district that provides irreplaceable evidence of natural or human history of national, state, or local significance, such as National Landmarks, archeological sites, and properties listed (or eligible for listing) on the NRHP. Cultural resource related laws and regulations include:

- Antiquities Act of 1906 (16 U.S.C. 431–433).
- Historic Sites Act of 1935 (16 U.S.C. 461–467).
- Section 106 of the NHPA (16 U.S.C. 470 *et seq*.), as amended.
- Archaeological Data Preservation Act of 1974 (16 U.S.C. 469 a–c).
- Archaeological Resources Protection Act of 1979 (16 U.S.C. 470 aa-mm.), as amended.
- Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 *et seq*.).
- Executive Order 13007, Indian Sacred Sites.

- American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996, 1996a).
- ORS 97.740–97.760, 358.905–358.955, and 390.235: state regulations for archaeological and historic sites.
- ORS 390.235: permit information and conditions for excavation or removal of archaeological or historic materials.
- ORS 97.740–97.760: prohibits disturbance of Indian burials.

Section 106 of the NHPA requires federal agencies to consider the effects of their actions on historic properties. The NHPA provides a process, known as the Section 106 process that enables agencies to assess impacts on historic properties along with participation from interested and affected parties such as tribes, and then avoid, minimize, or mitigate for these impacts. Historic properties may be prehistoric or historic sites, including objects and structures that are included in or eligible for inclusion on the NRHP. Historic properties also include artifacts or remains within historic sites and properties of traditional and cultural importance to tribes.

To this end, BPA has provided information about the Proposed Action and requested input on the level and type of proposed identification and evaluation efforts of the prehistoric resources from the Oregon SHPO, BLM archaeologist, ODSL archaeologist, the Confederated Tribes of the Grand Ronde, and the Confederated Tribes of the Siletz Indians.

The cultural resource report for this project was submitted to the SHPO, BLM, ODSL, and tribes in July 2013. BPA evaluated historic transmission line facilities, as described in Section 3.12, *Cultural Resources*, for eligibility in the NRHP. BPA made a determination of no adverse effect on historic properties from the Rebuild Project.

4.10 Noise, Public Health, and Safety

4.10.1 Noise

Noise in the project area is regulated by the federal, state, county, and local jurisdictions, including Washington County, and the cities of Tillamook, Forest Grove, and Hillsboro, in compliance with Chapter 467 (Noise Control) of the ORS. Tillamook County has no noise ordinance, and unincorporated areas within Tillamook County would be subject to state regulations.

Federal

The Federal Noise Control Act of 1972 (42 U.S.C. 4901 *et seq.*) requires that federal entities, such as BPA, comply with state and local noise requirements. Environmental noise is regulated by the state of Oregon, which established limits on levels and duration of noise. Temporary construction is exempt from state and local regulation. The analysis in Section 3.13, *Noise, Public Health, and Safety*, indicates that the alternatives would have low to moderate noise impacts, with implementation of appropriate mitigation (see Section 3.13.3).

State

State noise regulations are included in Chapter 340, Division 35 of the Oregon Administrative Rules (OAR) and include ambient noise limits for vehicles operating within 1,000 feet of "noise-sensitive properties" and "quiet areas" and for permanent stationary industrial facilities. Noise-sensitive properties are those normally used for sleeping or normally used as schools, churches, hospitals, or public libraries (OAR 340-35-015). Quiet areas are those where the qualities of serenity, tranquility, and quiet are of extraordinary significance and serve an important public need, such as a wilderness area, national park, state park, game reserve, wildlife breeding area, or amphitheater. Noise from vehicles may not exceed 60 dBA during daytime hours (7:00 a.m. to 10:00 p.m.) or 55 dBA during nighttime hours (10:00 p.m. to 7:00 a.m.) (OAR 340-035-030). Construction noise is exempt from state regulations. Noise levels from industrial sources (permanent stationary sources) may not exceed 55 dBA (L50) during the day or 50 dBA (L50) during the night (OAR 340-35-035(a)(b) and may not exceed 50 dBA (L50) during the day or 45 dBA (L50) during the night near quiet areas (OAR 340-035-035).

County and Local

Chapter 8.24 (Noise Control) of the Washington County Code (WCC) prohibits noise that "unreasonably annoys, disturbs, injures or endangers the comfort, repose, health, peace or safety of any person of normal sensitivity in a noise-sensitive unit" (WCC 8.24.030). "Noise-sensitive unit" means any building, or portion thereof, vehicle, boat, or other structure used as a church, daycare center, hospital, nursing care center, school, or place used for overnight accommodations of persons, including, but not limited to, individual homes, individual apartments, trailers, and nursing homes (WCC 8.24.015). WCC 8.24 does not specify allowable noise levels at either the noise source or receptor, but determination of violations would consider the volume, intensity, nature and origin of the noise source, background noise, noise levels within the noise-sensitive unit, and other parameters. Construction activities are prohibited between 7:00 p.m. and 7:00 a.m. and on legal holidays [WCC 8.24.040 (F)] except by variance.

Tillamook City Ordinance (TCO) 1253 addresses noise within their incorporated limits. TCO 1253 Section 8 prohibits noise that disturbs, injures, or endangers the health, safety, or welfare of others, but does not establish specific allowable noise levels. The ordinance defines noise as sound that can be heard at or beyond the property boundary of the noise source, that disturbs the peace, and that can be heard within a noise-sensitive unit (church, daycare center, hospital, nursing care center, school, individual homes, apartments, trailers, nursing homes, or other places used for overnight accommodation [TCO 1253 Section 5, Definitions]). Construction noise is prohibited between the hours of 6:00 p.m. and 7:00 a.m. without a permit.

Section 5.250 (Noise Regulations) of the Forest Grove Municipal Code (FGMC) regulates noise within the city limits of Forest Grove. Noise-sensitive areas or uses include areas zoned as residential or institutional.

Construction noise is exempt from these regulations Monday through Friday during daytime hours and on Saturday between 8:00 a.m. and 7:00 p.m.

Chapter 6.24.030 (Noise Limits) of the City of Hillsboro Municipal Code (HMC) prohibits noise levels exceeding 60 dBA between 6:00 a.m. and 9:00 p.m. and 50 dBA between 9:00 p.m. and 6:00 a.m. or that is plainly audible between 9:00 p.m. and 6:00 a.m. within a noise-sensitive building or on a public ROW within 100 feet from the noise source (HMC 6.24.030). Construction activities are prohibited adjacent to residential or business districts between 9:00 p.m. and 6:00 a.m. except under certain conditions [HMC 6.24.040(E)]. Construction noise is exempt from this regulation between 6:00 a.m. and 9:00 p.m. [HMC 624.050(F)].

4.10.2 Public Health

The use, storage, and disposal of hazardous materials are regulated by numerous local, state, and federal laws. Various provisions of the Spill Prevention Control and Countermeasures Rule (40 CFR Part 112), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. 9601 et seq.), and the Resource Conservation and Recovery Act (RCRA) (42 U.S.C. 9601 et seq.) may apply to the project, depending upon the exact quantities and types of hazardous materials stored on-site. Other laws, such as the Toxic Substances Control Act (TSCA) (15 U.S.C. 2601 *et seq*.), the Federal Insecticide, Fungicide and Rodenticide Act (7 U.S.C. 136 (a-y)), and the Uniform Fire Code, may also apply to the project.

The Spill Prevention Control and Countermeasures Rule

The Spill Prevention Control and Countermeasures Rule is intended to prevent discharges of oil and oil-related materials from reaching navigable waters and adjoining shorelines. It applies to facilities with total above-ground oil storage capacity (not actual gallons on site) of greater than 1,320 gallons and facilities with below-ground storage capacity of 42,000 gallons. No on-site storage of oil or oil-related materials is proposed as part of the Rebuild Project.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

CERCLA provides funding for hazardous materials training in emergency planning, preparedness, mitigation implementation, response, and recovery. Eligible individuals include public officials, emergency service responders, medical personnel, and other tribal response and planning personnel.

Resource Conservation and Recovery Act (RCRA)

RCRA, as amended, is designed to provide a program for managing and controlling hazardous waste by imposing requirements on generators and transporters of this waste, and on owners and operators of treatment, storage, and disposal facilities. Each facility owner or operator is required to have a permit issued by EPA or the state. Typical construction and maintenance activities can generate small amounts of the following hazardous wastes: solvents, pesticides, paint products, motor and lubricating oils, and cleaners. Small amounts of hazardous wastes may be generated by the project. These materials would be disposed of according to state law and RCRA.

If a hazardous material, toxic substance, or petroleum product is discovered, and may pose an immediate threat to human health or the environment, BPA requires that contractors notify the Contracting Officer’s Technical Representative (COTR) immediately. Other conditions such as large dump sites, drums of unknown substances, suspicious odors, and stained soil must also be reported immediately to the COTR. The COTR would coordinate with the appropriate BPA personnel. In addition, the contractor would not be allowed to disturb such conditions until the COTR has given the notice to proceed.

Toxic Substances Control Act (TSCA)

The TSCA is intended to protect human health and the environment from toxic chemicals. Section 6 of the act regulates the use, storage, and disposal of polychlorinated biphenyls (PCBs). BPA adopted guidelines to ensure that PCBs are not introduced into the environment. Equipment used for the Rebuild Project would not contain PCBs. Any equipment removed that may have PCBs would be handled according to the disposal provisions of this act.

Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide and Rodenticide Act registers and regulates pesticides. BPA uses herbicides (a kind of pesticide) during vegetation management. Herbicides are used on the transmission line ROW, along access roads, and in substation yards to control vegetation, including noxious weeds. When BPA uses herbicides, the date, dose, and chemicals used are recorded and reported to state government officials. Herbicide containers are disposed of according to RCRA standards.

Uniform Fire Code

The development of a Hazardous Materials Management Plan may also be required by local fire districts in accordance with the Uniform Fire Code. BPA would develop and implement such a plan, if required.

4.11 Other Federal Laws and Regulations

4.11.1 Federal Communications Commission

Federal Communications Commission (FCC) regulations require that transmission lines be operated so that radio and television reception would not be seriously degraded or repeatedly interrupted. The FCC regulations require that impacts on reception be mitigated. The Proposed Action would likely cause no interference with radio, television, or other reception (see Section 3.13, *Noise, Environmental Justice and Public Health, and Safety*). BPA would comply with FCC requirements and investigate any complaints about electromagnetic interference, if any interference occurs.

4.11.2 Farmland Protection Policy Act (FPPA)

The FPPA (7 U.S.C. 4201 *et seq.*) directs federal agencies to identify and quantify adverse impacts of federal programs on farmlands. The purpose of this act is to minimize the number of federal programs that contribute to the unnecessary and irreversible conversion of agricultural land to non-agricultural uses. As described in Section 3.2, *Land Use, Recreation, and Transportation*, the Proposed Action would covert less than 0.5 acre of agricultural land to access roads. Other potential impacts on agricultural lands are described in Section 3.2, *Land Use, Recreation, and Transportation*.

4.11.3 Permits for Right-of-Way on Public Lands

The Rebuild Project would cross lands administered by BLM where BPA has existing rights to operate and maintain its transmission line. Because BPA has existing rights, it is not required to apply for a ROW permit from BLM.

Chapter 5
Persons, Tribes, and Agencies Consulted

The project mailing list includes tribes; local, state, and federal agencies; utilities; public officials; and potentially interested or affected landowners. These agencies, organizations, and people will have an opportunity to review and comment on the EA. Specific entities (other than private persons) receiving the Notice of Availability for this EA are listed below by category.

Federal Agencies

National Oceanic and Atmospheric Administration, National Marine Fisheries Service

U.S. Army Corps of Engineers

U.S. Department of the Interior, Bureau of Land Management

U.S. Department of the Interior, Fish and Wildlife Service

U.S. Environmental Protection Agency

State Agencies and Elected Officials

State of Oregon, Department of Fish & Wildlife

State of Oregon, Department of Forestry & Forest Programs

State of Oregon, Department of Transportation

State of Oregon, House of Representatives District 29, Honorable Katie Eyre Brewer

State of Oregon, House of Representatives District 30, Honorable Shawn Lindsay

State of Oregon, House of Representatives District 32, Honorable Deborah Boone

State of Oregon, State Senate District 15, Honorable Bruce Starr

State of Oregon, State Senate District 16, Honorable Betsy Johnson

US House of Representatives, District 1, Honorable Suzanne Bonamici

US House of Representative, District 5, Honorable Kurt Schrader

US Senate, Honorable Jeff Merkley

US Senate, Honorable Ron Wyden

Counties and Cities

Tillamook County

Washington County

City of Forest Grove

City of Forest Grove, Department of Light and Power

City of Tillamook

City of Hillsboro

City of Tualatin

Tribes

Confederated Tribes of Grand Ronde Community

Confederated Tribes of Siletz Indians

Utilities

Tillamook People's Utility District

Portland General Electric Company

Other

Port of Portland, Department of Aviation

Chapter 6
Glossary and Acronyms

6.1 Glossary

100-year floodplain – areas that have a 1 percent chance of being flooded in a given year, as designated by FEMA.

Access road – roads and spurs that provide access to the transmission line corridor and structure sites during construction and operation and maintenance.

Ambient noise – background noise generated by existing noise sources in the surrounding area.

Angle structures – structures that support the transmission line at points where it changes direction at an angle of 15 degrees or more.

Aquifer – underground bed or layer of permeable rock, sediment, or soil that contains groundwater.

Area of Potential Effects (APE) –the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.

Average daily traffic – the average number of vehicles that pass a specific point going both directions over a 24-hour period.

A-weighted decibel – logarithmic measurement of sound based on the decibel but weighted to approximate the human perception of sound. Commonly used for measuring environmental and industrial noise levels.

Best management practices (BMPs) – typically state-of-the-art technology designed to prevent or reduce impacts. They represent physical, institutional, or strategic approaches to environmental problems and are practices determined by the discipline to be the most effective at achieving a specific goal.

Biface - an artifact that has flake scars on both faces of the artifact.

Blading – mechanical alteration of the ground surface to achieve a level surface. Typically used for access road improvements and accomplished with bulldozers or road graders.

Candidate species – plants and animals native to the U.S. for which the USFWS or NMFS has derived from sufficient information on biological vulnerability and threats to justify proposing to add them to the threatened and endangered species list.

Capable habitat – in the context of marbled murrelet management, capable habitat is characterized by trees 0 to 60 years old and could develop into recruitment habitat.

Capacity – the ability to store an electrical charge.

Carbon dioxide equivalent (CO_2e)– a measurement used to compare the global warming potential of a typical GHG, based on concentrations of carbon dioxide.

Centerline – the center line of the transmission corridor, which divides the corridor into halves of equal width.

Circuit – the pathway for an electrical current.

Cofferdam – a temporary barrier used to exclude water from an area that is normally submerged by a river, lake, or other water body, to allow for construction activities.

Colluvium – loose deposit of unconsolidated sediments accumulated through the action of gravity at the base of a cliff or slope.

Compaction – the compression of soils by heavy equipment, which degrades soil structure and increases the risk of sheet erosion.

Conductor – the wire cable strung along a transmission line through which electricity flows.

Corona – an electrical field around the surface of a conductor, insulator, or hardware caused by ionization of the surrounding air.

Counterpoise – a weight that counterbalances the weight of the transmission lines, typically underground wires that extend horizontally from each structure and that connect with ground wire to provide lightning protection.

Critical habitat – as defined by the ESA, a specific geographic area(s) that is essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery.

Cross drain – a culvert or structure crossing a roadway used to divert water.

Crustal fault - a fracture or zone of fractures located in the earth’s crust.

Cultural modification – in visual resource assessments, the term “cultural modifications” is used to describe human influences on the landscape. These influences may include built structures (e.g., buildings, roads, utility lines, water towers), modifications to landforms (e.g., berms, erosion control measures), and activities (e.g., grazing, agriculture, forestry operations).

Cultural resources – historic, archaeological, or paleontological resources that are protected under federal statutes, regulations, and executive orders.

Culvert – a device used to carry or divert water from a drainage area to prevent erosion.

Cumulative impacts – impacts on the environment that result from the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions.

Current – the flow of an electrical charge through the transmission line conductor.

Dampers – devices attached to insulators to minimize vibration of the conductors in windy conditions.

Danger trees – trees located off the transmission line corridor that are a current or future hazard to the transmission line.

Dead-end structure – a structure that can independently carry the weight and tension of conductors and is typically used on a straight alignment, at angles greater than 15 degrees, or over river crossings.

Debitage – all waste material produced during lithic reduction and the production of chipped stone tools.

Decibel – a logarithmic ratio of sound relative to a reference level.

Direct impacts—impacts that would occur as a direct result of project construction within the work area and would have an immediate impact on the environmental resource being evaluated.

Distinct Population Segment (DPS) –a vertebrate population or group of populations that is discrete from other populations of the species and significant in relation to the entire species. The federal ESA provides for listing species, subspecies, or distinct population segments of vertebrate species.

Drain dip - mounds of crushed rock that create a high point directing water from the road to a nearby drain system (i.e., along the side of or off of a road, not diagonally across the road like a water bar).

Ecoregion – large unit of land or water containing a geographically distinct assemblage of species, natural communities, and environmental conditions including climate, soil, and geology.

Electromagnetic field (EMF) – the physical field around the electric wire or conductor that is produced when electric transmission is occurring.

Endangered species – a plant or animal species in danger of extinction within the foreseeable future throughout all or a significant portion of its range.

Environmental justice populations – low-income and minority populations protected under Executive Order 12898 from disproportionate adverse effects of federal projects.

Erosion – the movement of soil and surface sediments caused by wind and water.

Erosion potential – the likelihood that an area is susceptible to erosion. Erosion potential is assessed using slope and soil properties such as cohesion, drainage, and organic content.

Essential Fish Habitat – defined in the Magnuson-Stevens Act as "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." NMFS further clarified the definition of EFH as waters—aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate—sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary—the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and spawning, breeding, feeding, or growth to maturity—stages representing a species' full life cycle.

Floodplain – the flat land that is adjacent to a surface water that is periodically flooded.

Forb – a broadleaf non-woody plant that is not a grass, sedge, or rush.

Fossil fuels – fuels derived from hydrocarbon deposits in the Earth's crust; typically combusted for energy (e.g., natural gas, oil, and coal).

Freshet – a sudden rise or overflow of a stream resulting from a heavy rain or melting snow.

Global warming potential – a relative measure of how much heat a GHG traps in the atmosphere that compares the amount of heat trapped by a certain mass of the gas in question to the amount of heat trapped by a similar mass of carbon dioxide.

Greenhouse gas (GHG) – chemical compounds that absorb and trap infrared radiation as heat (e.g., carbon dioxide, nitrous oxide, methane, and fluorinated gases).

Ground wire – wires placed above the conductors to route lightning-strike electricity to the ground.

Groundwater – water that is stored beneath the Earth's surface in soil pores or rock formations.

Guy wire and guy anchor– a guy wire is a tensioned cable that attaches to a guy anchor, in order to hold a structure to the ground to provide extra stability.

Historic isolate – an archaeological site with less than nine artifacts.

Hydric soils – soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.

Hydrophytic vegetation – plants that have special adaptations enabling them to grow in water-saturated soils.

Indirect impacts—impacts that would occur after project construction or adjacent to the work area.

Insulator – a component made of non-conductive materials that connects the conductor to the suspension structure and prevents the transmission of electrical current from the conductor to the ground.

Intactness – the integrity of the overall landscape (including both natural and human-developed elements) and the extent to which the landscape is free from cultural modifications that encroach on the landscape.

Kilovolt – one thousand volts of electrical power.

Landslide – the movement of surface soil and other matter down a steep slope.

Lattice-steel structure – a square or triangular transmission tower constructed of steel poles.

Liquefaction – a process whereby waterlogged soil becomes soft and liquid as a result of ground shaking.

Loam - soil material that contains particles of clay, silt, and sand. A silty loam would have a higher percentage of silt material. A sandy loam would have a higher percentage of sandy material.

Low-income population – a group of low-income residents who live in geographic proximity that could be disproportionately affected by a federal action.

Microtopography - the surface features, or topography, of a very small area.

Midden– a mound of domestic refuse containing shells and animal bones marking the site of a prehistoric settlement.

Minority population – a group of minority persons who live in geographic proximity that could be disproportionately affected by a federal action.

Miocene basaltic rock – is volcanic rock that contains groundwater formed from rapid cooling of lava flows 20 to 5 million years ago.

Mitigation – measures that would reduce the impacts of the Proposed Action on a resource by reducing the impact, avoiding it completely, or compensating for the impact.

Nonattainment area – an air basin that is not in compliance with applicable air quality standards for a specific pollutant.

Nonnative – a species that has been introduced and has acclimated to an area outside of its normal distribution range.

Noxious weeds – nonnative plants that have been identified by state law as damaging to natural or human resources.

Outage – the loss of electric power to an area caused by a natural or human disturbance to the electrical system.

Palustrine wetlands – are inland wetlands that lack flowing water, contain ocean-derived salts in concentrations less than 0.05 percent, and are non-tidal.

Pelagic –of, relating to, or living or occurring in the open sea rather than waters adjacent to land or inland waters.

Perennial – refers to streams or waterways with continuous, year-round water flow.

Pole line easements – the legal right for BPA to cross or otherwise use a landowner's parcel for a transmission line, as well as access to the line for construction and maintenance. A pole line easement does not include a ROW corridor underneath the transmission line, as would typically be included in a typical BPA ROW easement.

Prehistoric isolate - A prehistoric artifact occurrence that does not qualify for a site designation (i.e., ≤ 9 artifacts) is referred to as an isolate find.

Proposed species – any species of fish, wildlife, or plant that is proposed in the Federal Register to be listed under the ESA**.**

Pulling and tensioning – the process of installing and tightening new conductors.

Recruitment habitat – in the context of marbled murrelet management, recruitment habitat is characterized by trees 60 years or older and with no nesting structure and could develop into suitable nesting habitat.

Riffles – Fast, turbulent, shallow flow over submerged or partially submerged gravel and cobble substrates. Low gradient; usually 0.5-2.0 percent slope, rarely up to 6 percent.

Right-of-way (ROW) – the corridor of land in which transmission structures and conductors are established, operated, and maintained.

Riparian –vegetation or habitat situated on the banks of rivers and streams.

Salmonid – member of the family of soft-finned fish that includes salmon and trout. Most are anadromous: they spawn in fresh water, but spend the majority of their life in the marine environment.

Sensitive vulnerable (SV) species – are facing one or more threats to their populations and/or habitats. Vulnerable species are not currently imperiled with extirpation from a specific geographic area or the state but could become so with continued or increased threats to populations and/or habitats.

Sheet erosion – the removal of a uniform, thin layer of soil by raindrops or water runoff on bare soil.

Smolt – a young salmon (or trout) after the parr stage, when it becomes silvery and migrates to the sea for the first time and has completed, or is in the process of completing, the morphological and physiological changes necessary for survival in saltwater.

Sock line – the line or rope connected to a steel wire that is used to pull the conductors through the structures during installation.

Sole Source Aquifer (SSA) – defined by the EPA as an underground water source that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer.

Spark-discharge activity—electric sparks between electrical separations (gaps) in the metal parts of a transmission line. Spark discharges can create noise and possible electromagnetic interference. Spark-discharge activity with transmission lines is often associated aging connecting hardware.

Special-status species – plant or wildlife species that have been identified for protection and/or management under federal or state law.

Spur road – a short length of new road extending from an existing road network.

Staging area – the area cleared and used to store and assemble materials and equipment for the Rebuild Project.

State critical (SC) species- critical sensitive species are imperiled with extirpation from a specific geographic area of the state because of small population sizes, habitat loss or degradation, and/or immediate threats. Critical species may decline to point of qualifying for threatened or endangered status if conservation actions are not taken.

Stormwater runoff – precipitation water that runs off non-permeable surfaces into a drainage, sewer, or stormwater system.

Structure – a type of support used to hold up transmission or substation equipment.

Subduction – The process of one of earth's plates descending beneath another.

Substation – the fenced site that contains the terminal switching and transformation equipment that transforms voltage.

Surface water – open water bodies such as rivers, lakes, and streams.

Tectonic – the process and dynamics of lithospheric plate movement.

Threatened species – a plant or animal species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Total Maximum Daily Load (TMDL) – the maximum amount of a pollutant that can be introduced to a water body while still being compliant with water quality standards.

Travel route – travel routes are either routes through farm fields (temporary travel route) or existing non-public roads in good condition that may require surface improvements, such as blading, grading, and aggregate surfacing (permanent travel route).

Tributary – a stream or river that flows into a main stem (or parent) river or a lake. A tributary does not flow directly into a sea or ocean.

Turbidity – the amount of particulate matter, such as suspended sediment, per unit volume of water.

Unconsolidated sediments – sediments such as soil, sand, or organic matter that are not bound together and are susceptible to wind and water erosion.

Underbuild – a lower voltage distribution line underneath a higher voltage transmission line, located on a single structure.

Unincorporated – an area that is not part of or governed by a municipality.

Unity – the overall harmony or compatibility of landscape elements (i.e., the degree to which visual resources form a coherent, harmonious landscape).

Untanking towers – narrow, vertical volumes relate to transformer maintenance functions in connection with substations built during the first period of significance.

Upland – land above the floodplain that supports precipitation-dependent vegetation.

Viewshed – an area visible from a defined location.

Vividness – the memorable impression of the combination of contrasting, striking, and/or distinctive visual elements of a landscape.

Water bar – a channel across the road surface that diverts surface water that would otherwise flow down the whole length of the road, used to prevent erosion on sloping roads, cleared paths through woodland, or other access ways by reducing flow length.

Watershed – a geographic area that is drained by a river and its tributaries. Separated from other watersheds by an elevated boundary such as a mountain.

Wetland – land that is permanently or periodically saturated with water. May be connected to a surface water or groundwater source. Indicators of wetlands include plant species adapted to such conditions, characteristic soil colors and chemical properties, and physical evidence of flooding or waterlogged soils.

6.2 Acronyms and Abbreviations

μg/m^3	micrograms per cubic meter
ADT	average daily traffic
APE	area of potential effects
APLIC	Avian Power Line Interaction Committee
AQMA	Air Quality Maintenance Area
B.P.	Before Present
BLM	U.S. Bureau of Land Management
BMP	best management practice
BPA	Bonneville Power Administration
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFC	chlorofluorocarbons
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
Corps	U.S. Army Corps of Engineers
COTR	Contracting Officer's Technical Representative
CWA	Clean Water Act
CWS	Clean Water Services
CZMA	Coastal Zone Management Act
dB	decibel
dBA	A-weighted decibel
dbh	diameter at breast height
DCNF	closed non-permanently flooded (wetland type)
DLC	Donation Land Claim
DLCD	Department of Land Conservation and Development
DOE	Department of Energy
DOF	depressional outflow (wetland type)
DOGAMI	Oregon Department of Geology and Mineral Industries
DPS	Distinct Population Segment
DWSA	drinking water source area
EA	environmental assessment
EFH	essential fish habitat
EIS	environmental impact statement
EMF	Electromagnetic fields
EPA	U.S. Environmental Protection Agency

ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FGMC	Forest Grove Municipal Code
FGT	Forest Grove to Tillamook No. 1 transmission line
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
FPA	Forest Practices Act
FPPA	Farmland Protection Policy Act
FR	Federal Register
G	gauss
GAP	Gap Analysis Program
GHG	greenhouse gas
GIS	geographical information system
GWP	global warming potential
HFCs	hydrofluorocarbons
HGM	Hydrogeomorphic
HMC	City of Hillsboro Municipal Code
HS	headwater (wetland type)
HUC	Hydrologic Unit Code
ICES	International Committee on Electromagnetic Safety
IPCC	Intergovernmental Panel on Climate Change
KFG	Keeler to Forest Grove No. 1 transmission line
KOP	Key Observation Point
kV	kilovolt
kV/m	kilovolts per meter
L_{50}	noise level that is exceeded 50 percent of the time
Ldn	average day-night noise level
LM	Line Mile
LT	Listed Threatened
LUA	Land Use Application
LUST	leaking underground storage tank
MBTA	Migratory Bird Treaty Act
mG	milligauss
MOU	Memorandum of Understanding
MPD	Multiple Property Documentation
mpg	miles per gallon
MSA	Magnuson-Stevens Fishery Conservation Management Act
N_2O	nitrous oxide

NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESC	National Electrical Safety Code
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act
NLCD	National Land Cover Database
NMFS	National Marine Fisheries Service
NO_X	generic term for mono-nitrogen oxides NO and NO_2
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
OAR	Oregon Administrative Rules
OC	Oregon coast
OCMP	Oregon Coastal Management Program
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
ODOC	Oregon Department of Corrections
ODOT	Oregon Department of Transportation
ODSL	Oregon Department of State Lands
OHV	off-highway vehicle
OHWM	ordinary high water mark
ORBIC	Oregon Biodiversity Information Center
ORNHIC	Oregon Natural Heritage Information Center
ORS	Oregon Revised Statutes
ORWAP	Oregon Rapid Wetland Assessment Protocol
OSP	Oregon State Police
PCBs	polychlorinated biphenyls
PEM	palustrine emergent
PFCs	perfluorocarbons
PFMC	Pacific Fishery Management Council
PFO	palustrine forested
PL	Public Law
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
ppb	parts per billion
ppm	parts per million
PSG	Pacific Seabird Group
PSS	palustrine scrub-shrub

PUD	People's Utility District
RCRA	Resource Conservation and Recovery Act
RFT	riverine flow-through (wetland type)
RI	riverine impounding (wetland type)
RM	river mile
ROW	right-of-way
SC	Sensitive Critical
SF_6	sulfur hexafluoride
SHPO	State Historic Preservation Office
SLIDO	Statewide Landslide Information Database for Oregon
SPRP	Spill Prevention and Response Procedures
SR 6	State Route 6
SSA	sole source aquifer
SV	Sensitive Vulnerable
SWPPP	Stormwater Pollution Prevention Plan
TCO	Tillamook City Ordinance
TMDL	Total Maximum Daily Load
TSCA	Toxic Substances Control Act
U.S.C.	United States Code
UGB	urban growth boundary
USDA	U.S. Department of Agriculture
US 26	U.S. Highway 26
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UWR	Upper Willamette River
V/m	volts per meter
VOC	volatile organic compound
VS	slope, valley (wetland type)
WCC	Washington County Code

Chapter 7
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7.2 Personal Communications

Canaday, H. 2013. Personal communication from Harley Canaday, BPA forester, to Dan Roscoe, AECOM Deputy Project Manager, regarding the danger tree surveys and root rot infections. April 29, 2013.

Marsey, E. 2013. Personal communication from Eric Marsey, ODF Forest pathologist, to Dan Roscoe, AECOM Deputy Project Manager, regarding laminated root rot infections adjacent to the transmission line ROW. May 7, 2013.

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Appendix A
Danger Tree Data

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Keeler-Tillamook 115 kV Transmission Line Rebuild

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
Forest Grove - Tillamook (FGT)	2	-8"	Oak	Left	50-65'	-60' 1/5	-30' 1/5
FGT	2	8"	"	"	"	"	"
FGT	2	10"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	1	-8"	Oak	Left	0-50'		-45' 1/9
FGT	2	8"	"	"	"		"
FGT	4	8"	Wild Cherry	Left	50-65'		+10' 1/9
FGT	1	10"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	2	8"	Oak	Right	50-60'	+65' 7/3	+125' 7/3
FGT	2	10"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	2	16"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	1	24"	Oak	Right	50-65'		-275' 7/4
FGT	1	-8"	Oak	Right	50-60'		-215' 7/4
FGT	1	28"	Douglas-fir	Left	50-85'		-110' 7/4
FGT	1	18"	Cottonwood	Left	50-75'		+215' 7/6
FGT	1	12"	Maple	Left	0-50'		-230' 8/6
FGT	1	20"	"	"	"		"
FGT	1	10"	Maple	Left	50-60'		-200' 8/6
FGT	1	18"	"	"	"		"
FGT	1	20"	"	"	"		"
FGT	1	22"	"	"	"		"
FGT	2	14"	Maple	Left	0-50'		-140' 8/8
FGT	1	10"	Maple	Right	50-55'		-25' 8/8
FGT	2	12"	"	"	"		"
FGT	1	10"	Oak	Left	50-60'		+265' 8/9
FGT	1	20"	"	"	"		"
FGT	1	-8"	Maple	Left	50-75'	+285' 8/9	+305' 8/9
FGT	1	8"	"	"	"	"	"
FGT	1	10"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	1	18"	Oak	Right	50-55'	+305' 8/9	+320' 8/9
FGT	1	20"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	1	14"	Oak	Left	0-50'		+415' 8/9
FGT	1	24"	Douglas-fir	"	"		"
FGT	1	16"	Douglas-fir	Left	0-50'		-520' 9/1
FGT	1	16"	Douglas-fir	Left	0-50'		-385' 9/1
FGT	1	18"	Douglas-fir	Right	0-50'		-240' 9/1
FGT	1	8"	Douglas-fir	Left	0-50'		-240' 9/1
FGT	1	22"	Grand fir	Left	50-60'		-240' 9/1
FGT	1	20"	Douglas-fir	Right	50-55'		-200' 9/1
FGT	1	14"	Douglas-fir	Left	0-50'		-160' 9/1
FGT	1	16"	Douglas-fir	Left	0-50'		-50' 9/1
FGT	1	18"	"	"	"		"
FGT	1	14"	Douglas-fir	Left	50-55'		-15' 9/1
FGT	1	16"	Douglas-fir	Right	0-50'		+90' 9/1
FGT	1	-8"	Douglas-fir	Left	0-50'	+125' 9/1	+165' 9/1
FGT	1	14"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	4	-8"	Maple	"	"	"	"

FGT: Forest Grove-Tillamook No. 1 Transmission Line
KFG: Keeler-Forest Grove No. 1 Transmission Line

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	1	-8"	Douglas-fir	Right	0-50'		+165' 9/1
FGT	1	18"	"	"	"		"
FGT	1	20"	Douglas-fir	Right	50-55'		+230' 9/1
FGT	1	12"	Douglas-fir	Right	0-50'	+250' 9/1	+290' 9/1
FGT	1	18"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	1	24"	"	"	"	"	"
FGT	1	22"	Douglas-fir	Left	0-50'		-275' 9/2
FGT	1	18"	Douglas-fir	Right	0-50'		-180' 9/2
FGT	1	20"	"	"	"		"
FGT	1	26"	Oak	Right	0-50'		-85' 9/2
FGT	2	8"	Maple	Right	50-55'		-115' 9/2
FGT	1	10"	"	"	"		"
FGT	1	12"	"	"	"		"
FGT	1	22"	Douglas-fir	Left	0-50'	+195' 9/2	+210' 9/2
FGT	1	24"	"	"	"	"	"
FGT	2	-8"	Maple	Left	0-50'		+260' 9/2
FGT	1	22"	Douglas-fir	Left	0-50'	-130' 9/3	-95' 9/3
FGT	1	24"	"	"	"	"	"
FGT	1	8"	Douglas-fir	Left	0-50'		+200' 9/3
FGT	1	20"	"	"	"		"
FGT	1	22"	"	"	"		"
FGT	1	28"	Grand fir	Right	50-60'		-130' 9/4
FGT	41	-8"	Maple	Right	50-60'		-125' 10/10
FGT	6	8"	"	"	"		"
FGT	2	10"	"	"	"		"
FGT	1	12"	"	"	"		"
FGT	1	-8"	Douglas-fir	Left	0-50'		+30' 12/1
FGT	1	10"	"	"	"		"
FGT	3	-8"	Douglas-fir	Left	0-50'	+100' 12/5	+150' 12/5
FGT	1	8"	"	"	"	"	"
FGT	2	12"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	4	-8"	Douglas-fir	Left	0-50'	-400 14/4	-315' 14/4
FGT	3	8"	"	"	"	"	"
FGT	2	8"	Douglas-fir	Right	50-70'	-260' 15/1	-190' 15/1
FGT	1	10"	"	"	"	"	"
FGT	2	12"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	2	-8"	Douglas-fir	Right	50-100'	-260' 15/4	-180' 15/4
FGT	1	10"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	2	14"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	1	24"	"	"	"	"	"
FGT	1	-8"	Douglas-fir	Left	0-50		+325' 15/5
FGT	1	22"	Douglas-fir	Left	50-75'		+135' 16/3
FGT	1	14"	Douglas-fir	Left	50-90'	+175' 16/3	+260' 16/3
FGT	1	16"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"

FGT: Forest Grove-Tillamook No. 1 Transmission Line
KFG: Keeler-Forest Grove No. 1 Transmission Line

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	3	20"	"	"	"	"	"
FGT	2	22"	"	"	"	"	"
FGT	1	12"	Douglas-fir	Right	50-90'	+50' 16/4	+80' 16/4
FGT	1	14"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	2	18"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	1	12"	Douglas-fir	Right	50-100'	+240' 16/4	+325' 16/4
FGT	1	18"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	2	8"	Douglas-fir	Right	50-80'	-345' 16/5	-265' 16/5
FGT	1	14"	"	"	"	"	"
FGT	2	16"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	1	16"	Hemlock	"	"	"	"
FGT	2	20"	"	"	"	"	"
FGT	1	20"	Douglas-fir	Right	50-60'		+90' 16/5
FGT	1	8"	Douglas-fir	Left	50-90'	+25' 16/5	+110' 16/5
FGT	1	12"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	2	18"	"	"	"	"	"
FGT	3	20"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	1	24"	"	"	"	"	"
FGT	1	28"	"	"	"	"	"
FGT	1	18"	Hemlock	"	"	"	"
FGT	2	16"	Douglas-fir	Left	50-80'	+150' 16/5	+190' 16/5
FGT	1	18"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	1	18"	Douglas-fir	Right	50-70'	+60' 17/1	+140' 17/1
FGT	1	20"	"	"	"	"	"
FGT	200	1"	Willow	C/L	0-50'	+100' 17/1	-430' 17/2
FGT	1	10"	Douglas-fir	Left	50-85'	+160' 17/1	-15' 17/2
FGT	3	12"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	2	14"	"	"	"	"	"
FGT	5	16"	"	"	"	"	"
FGT	2	18"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	1	26"	"	"	"	"	"
FGT	1	28"	"	"	"	"	"
FGT	1	32"	"	"	"	"	"
FGT	1	8"	Hemlock	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	7	-8"	Willow	"	"	"	"
FGT	7	8"	"	"	"	"	"
FGT	7	10"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	4	14"	"	"	"	"	"

FGT: Forest Grove-Tillamook No. 1 Transmission Line
KFG: Keeler-Forest Grove No. 1 Transmission Line

Keeler-Tillamook 115 kV Transmission Line Rebuild

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	1	16"	"	"	"	"	"
FGT	2	20"	"	"	"	"	"
FGT	1	26"	"	"	"	"	"
FGT	1	8"	Willow	Right	50-75'		+260 17/2
FGT	1	10"	"	"	"		"
FGT	1	16"	Douglas-fir	Right	50-85'	-255' 17/2	-230' 17/2
FGT	1	18"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	2	12"	Douglas-fir	Right	50-75'	-115' 17/2	-90' 17/2
FGT	1	14"	"	"	"	"	"
FGT	1	28"	"	"	"	"	"
FGT	1	30"	Douglas-fir	Right	50-75'		+10' 17/2
FGT	1	8"	Douglas-fir	Right	50-70'	+220' 17/2	+275' 17/2
FGT	1	10"	"	"	"	"	"
FGT	2	14"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	2	8"	Douglas-fir	Left	50-65'		+350' 17/2
FGT	2	8"	Douglas-fir	Left	50-60'	-185' 17/3	-165' 17/3
FGT	2	10"	"	"	"	"	"
FGT	1	24"	"	"	"	"	"
FGT	1	10"	Grand fir	Right	"	-235' 17/3	-220' 17/3
FGT	1	16"	Douglas-fir	"	"	"	"
FGT	1	12"	Douglas-fir	Left	50-70'		-125' 17/4
FGT	1	14"	Cedar	Left	50-70'		-185' 17/4
FGT	1	18"	Douglas-fir	Right	50-70'		-195' 17/4
FGT	1	16"	Douglas-fir	Right	50-75'		-160' 17/4
FGT	1	10"	Douglas-fir	Right	50-65'	-70' 17/4	-45' 17/4
FGT	2	12"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	1	-8"	Douglas-fir	Right	50-60'		-145' 17/4
FGT	1	16"	Douglas-fir	Left	50-60'		+15' 17/4
FGT	1	-8"	Douglas-fir	Left	50-60'		+155 17/4
FGT	2	8"	"	"	"		"
FGT	1	10"	"	"	"		"
FGT	1	16"	Cedar	Left	50-60'	-170' 17/5	-125' 17/5
FGT	1	18"	"	"	"	"	"
FGT	3	-8"	Douglas-fir	Left	0-50	-100 17/4	-45' 17/4
FGT	1	8"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	28"	Douglas-fir	Left	50-60'		+235 17/4
FGT	1	10"	Cedar	Left	50-60'		+305' 17/4
FGT	1	10"	Douglas-fir	Left	0-50'		+235' 17/7
FGT	1	14"	Douglas-fir	Right	50-85'		-340' 17/8
FGT	1	20"	"	"	"		"
FGT	1	24"	Douglas-fir	Right	50-60'		-290' 17/8
FGT	1	14"	Douglas-fir	Left	0-50'	+475' 17/8	+545' 17/8
FGT	1	16"	"	"	"	"	"
FGT	1	24"	"	"	"	"	"
FGT	2	26"	"	"	"	"	"
FGT	1	28"	"	"	"	"	"
FGT	1	24"	Douglas-fir	Left	50-60'		-345' 17/9
FGT	1	26"	Douglas-fir	Right	50-60'		-190' 17/10
FGT	1	16"	Douglas-fir	Right	50-60'		-135' 17/10

FGT: Forest Grove-Tillamook No. 1 Transmission Line
KFG: Keeler-Forest Grove No. 1 Transmission Line

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	1	8"	Douglas-fir	Right	50-60'	-80' 17/10	-60' 17/10
FGT	1	12"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	1	-8"	Douglas-fir	Right	50-100'	+265' 18/1	+305' 18/1
FGT	1	8"	"	"	"	"	"
FGT	1	8"	"	"	"	"	"
FGT	1	10"	"	"	"	"	"
FGT	2	12"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	5	20"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	2	24"	"	"	"	"	"
FGT	1	-8"	Noble fir	Right	0-50'	+40' 18/2	+50' 18/2
FGT	1	32"	Douglas-fir	"	"	"	"
FGT	1	12"	Douglas-fir	Right	0-50'		+120' 18/2
FGT	1	-8"	Douglas-fir	Right	0-50'		+240' 18/2
FGT	1	28"	"	"	"		"
FGT	1	-8"	Noble fir	"	"		"
FGT	3	-8"	Douglas-fir	Right	50-65'	-10' 18/3	+150' 18/3
FGT	1	8"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	24"	"	"	"	"	"
FGT	1	26"	"	"	"	"	"
FGT	1	28"	"	"	"	"	"
FGT	1	10"	Noble fir	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	8"	Douglas-fir	Right	0-50'		+150' 18/3
FGT	1	14"	"	"	"		"
FGT	1	22"	Douglas-fir	Right	50-60'		+295' 18/3
FGT	1	24"	"	"	"		"
FGT	1	8"	Douglas-fir	Right	0-50'	+70' 18/4	110' 18/4
FGT	1	24"	"	"	"	"	"
FGT	1	24"	Douglas-fir	Right	50-65'		-30' 18/5
FGT	1	26"	Douglas-fir	Left	50-60'		+60' 18/5
FGT	1	22"	Douglas-fir	Right	0-50'		+70' 18/5
FGT	1	-8"	Douglas-fir	Right	0-50'		-130' 18/6
FGT	1	10"	"	"	"		"
FGT	1	-8"	Douglas-fir	Left	50-60'	-75' 18/6	-20' 18/6
FGT	1	10"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	1	12"	Douglas-fir	Right	50-80'	-35' 18/6	-25' 18/6
FGT	1	18"	"	"	"	"	"
FGT	1	12"	Douglas-fir	Right	0-50'	+185' 18/6	+375' 18/6
FGT	1	22"	"	"	"	"	"
FGT	2	26"	"	"	"	"	"
FGT	1	-8"	Douglas-fir	Left	0-50'		-85' 18/7
FGT	1	16"	Douglas-fir	Left	50-55'	-50' 18/8	+90' 18/8

FGT: Forest Grove-Tillamook No. 1 Transmission Line
KFG: Keeler-Forest Grove No. 1 Transmission Line

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	1	28"	"	"	"	"	"
FGT	1	14"	Douglas-fir	Right	50-60'		-300' 19/1
FGT	1	16"	"	"	"		"
FGT	1	18"	"	"	"		"
FGT	1	20"	"	"	"		"
FGT	1	-8"	Douglas-fir	Right	50-70'	-120' 19/1	-85' 19/1
FGT	1	10"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	2	16"	"	"	"	"	"
FGT	1	18"	"		"	"	"
FGT	1	14"	Douglas-fir	Left	50-60'		+120' 19/1
FGT	1	16"	Douglas-fir	Right	50-60'		+130' 19/1
FGT	1	8"	Douglas-fir	Left	0-50'		+140' 19/1
FGT	1	22"	Douglas-fir	Left	50-60'		+20' 19/2
FGT	1	28"	Douglas-fir	Left	50-55'		+150' 19/2
FGT	1	20"	Noble fir	"	"		"
FGT	1	12"	Douglas-fir	Left	50-60'		+35' 19/3
FGT	1	10"	Douglas-fir	Right	50-60'	-350' 19/4	-300' 19/4
FGT	1	12"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	10"	Douglas-fir	Right	0-50'	+235' 19/4	+315' 19/4
FGT	1	16"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	2	22"	"	"	"	"	"
FGT	1	24"	"	"	"	"	"
FGT	1	28"	"	"	"	"	"
FGT	1	-8"	Douglas-fir	Right	50-65'	-250' 19/7	-150' 19/7
FGT	1	18"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	1	14"	Douglas-fir	Right	50-60'		-20' 19/7
FGT	1	20"	Douglas-fir	Right	50-60'		+135' 19/7
FGT	1	14"	Douglas-fir	Right	50-60'		+300' 19/7
FGT	1	22"	"	"	"		"
FGT	1	-8"	Douglas-fir	Right	50-60'	+200' 19/8	+235' 19/8
FGT	1	10"	"	"	"	"	"
FGT	1	24"	Douglas-fir	Right	50-60'		-40' 19/9
FGT	1	10"	Douglas-fir	Right	50-60'		+75' 19/9
FGT	2	10"	Douglas-fir	Right	50-75'	+115' 19/9	+180' 19/9
FGT	1	14"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	1	12"	Douglas-fir	Right	50-90'	-295' 20/1	-180' 20/1
FGT	2	18"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	1	26"	"	"	"	"	"
FGT	1	16"	Douglas-fir	Right	50-70'		-30' 20/1
FGT	1	14"	Douglas-fir	Right	50-65'		+130' 20/1
FGT	1	16"	Douglas-fir	Left	0-50'		+155' 21/1
FGT	1	18"	"	"	"		"
FGT	1	8"	Douglas-fir	Left	50-85'	-225' 21/2	-160' 21/2
FGT	1	18"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	2	24"	"	"	"	"	"
FGT	1	22"	Douglas-fir	Right	50-60'		-150' 21/2

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	1	10"	Noble fir	Left	50-65'		+00 21/3
FGT	1	20"	Douglas-fir	Right	50-60'		+135' 21/3
FGT	1	16"	Douglas-fir	Right	50-80'	-250' 21/7	-215' 21/7
FGT	1	20"	"	"	"	"	"
FGT	2	10"	Douglas-fir	Right	0-50'	-110' 21/7	-75' 21/7
FGT	1	12"	"	"	"	"	"
FGT	2	24"	Douglas-fir	Right	50-60'		+50' 21/7
FGT	1	-8"	Douglas-fir	Right	0-50'		-500' 22/1
FGT	1	18"	Douglas-fir	Right	50-60'		-500' 22/1
FGT	1	20"	Douglas-fir	Right	50-60'		-320' 22/1
FGT	1	20"	Douglas-fir	Right	50-60'		-240' 22/1
FGT	1	30"	Douglas-fir	Right	50-60'		+265' 22/1
FGT	2	-8"	Douglas-fir	Left	0-50'		+305' 22/1
FGT	2	12"	Douglas-fir	Left	50-60'	+375' 22/1	+415' 22/1
FGT	1	14"	"	"	"	"	"
FGT	1	32"	Douglas-fir	Right	50-60'		+360' 22/2
FGT	2	-8"	Noble	Right	0-50'		-10' 22/3
FGT	1	8"	"	"	"		"
FGT	1	24"	Douglas-fir	Right	50-60'		-140' 22/4
FGT	1	30"	Douglas-fir	Right	50-60'		-55' 22/4
FGT	1	24"	Douglas-fir	Right	0-50'		-365' 22/7
FGT	1	8"	Cottonwood	Left	50-55'		+135' 22/9
FGT	1	10"	"	"	"		"
FGT	3	-8"	Noble	C/L	0-50'		-135' 23/1
FGT	1	14"	Douglas-fir	Left	0-50'		-65' 23/1
FGT	5	-8"	Hardwood	C/L	0-50'		-225' 23/4
FGT	1	8"	Douglas-fir	Left	0-50'	+475' 23/4	+575' 23/4
FGT	1	20"	"	"	"	"	"
FGT	1	24"	"	"	"	"	"
FGT	1	26"	"	"	"	"	"
FGT	8	-8"	Alder	"	"	"	"
FGT	1	8"	Douglas-fir	Left	0-50'		-125' 23/6
FGT	1	20"	Douglas-fir	Left	50-60'		-125' 23/6
FGT	1	14"	Douglas-fir	Left	50-55'		-70' 23/6
FGT	3	-8"	Douglas-fir	Right	50-80'	+40' 23/6	-90' 23/7
FGT	6	8"	"	"	"	"	"
FGT	7	10"	"	"	"	"	"
FGT	2	12"	"	"	"	"	"
FGT	7	14"	"	"	"	"	"
FGT	7	16"	"	"	"	"	"
FGT	3	18"	"	"	"	"	"
FGT	4	20"	"	"	"	"	"
FGT	2	22"	"	"	"	"	"
FGT	3	24"	"	"	"	"	"
FGT	1	26"	"	"	"	"	"
FGT	1	32"	"	"	"	"	"
FGT	11	-8"	Alder	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	26"	Douglas-fir	Left	50-65'		+215' 23/6
FGT	1	14"	Douglas-fir	Left	50-65'	+25' 23/7	+45' 23/7
FGT	1	16"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	1	18"	Douglas-fir	Right	50-65'		+25' 23/7
FGT	2	16"	Douglas-fir	Right	50-65'		+75' 23/7

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	1	8"	Douglas-fir	Right	50-70'		+110' 23/7
FGT	1	10"	"	"	"		"
FGT	4	-8"	Douglas-fir	Right	50-70"	+140' 23/7	-65' 23/8
FGT	2	10"	"	"	"	"	"
FGT	3	12"	"	"	"	"	"
FGT	4	14"	"	"	"	"	"
FGT	6	16"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	1	12"	Douglas-fir	Left	50-65'		-135' 23/8
FGT	1	14"	"	"	"		"
FGT	1	20"	"	"	"		"
FGT	1	18"	Douglas-fir	Left	50-65'		+75' 23/8
FGT	1	14"	Douglas-fir	Right	50-65'	+40' 23/8	+75' 23/8
FGT	2	18"	"	"	"	"	"
FGT	1	20"	Douglas-fir	Right	50-60'		+260' 23/8
FGT	1	20"	Douglas-fir	Right	50-65'		-85' 23/9
FGT	2	12"	Alder	Right	50-65'	-35' 23/9	+30' 23/9
FGT	1	14"	"	"	"	"	"
FGT	1	34"	Douglas-fir	Right	50-65'		+125' 23/10
FGT	5	10"	Douglas-fir	Left	50-65'	-370' 24/1	-155' 24/1
FGT	1	14"	"	"	"	"	"
FGT	1	-8"	Douglas-fir	Right	50-65'	+00 24/1	+90' 24/1
FGT	1	10"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	2	14"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	1	32"	"	"	"	"	"
FGT	5	-8"	Alder	Right	50-60'	+140' 24/1	+175' 24/1
FGT	1	8"	Noble fir	"	"	"	"
FGT	1	10"	"	"	"	"	"
FGT	1	30"	Douglas-fir	"	"	"	"
FGT	1	32"	"	"	"	"	"
FGT	1	22"	Douglas-fir	Left	50-60'		-170' 24/3
FGT	1	12"	Douglas-fir	Right	50-65'	-100' 24/3	-5' 24/3
FGT	1	14"	"	"	"	"	"
FGT	2	18"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	1	30"	Douglas-fir	Right	50-65'		+50' 24/3
FGT	1	26"	Douglas-fir	Right	50-75'		+145' 24/3
FGT	1	18"	Alder	Right	50-65'		-315' 24/5
FGT	1	-8"	Alder	Right	50-65'		-290' 24/5
FGT	1	14"	"	"	"		"
FGT	1	18"	Douglas-fir	Right	50-80'	-110' 24/5	-85' 24/5
FGT	1	20"	Douglas-fir	"	"	"	"
FGT	1	16"	Douglas-fir	Right	50-75'		+40' 24/5
FGT	1	20"	"	"	"		"
FGT	1	20"	Douglas-fir	Right	50-70'		-65' 24/6
FGT	1	26"	Douglas-fir	Right	50-70'		+105' 25/1
FGT	1	16"	Alder	Left	50-70'		+95' 25/1
FGT	1	20"	Douglas-fir	Right	50-90'		-10' 25/1
FGT	2	8"	Alder	Right	50-70'	-100' 25/2	00' 25/2
FGT	1	12"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	1	18"	Douglas-fir	"	"	"	"
FGT	2	22"	"	"	"	"	"
FGT	1	32"	"	"	"	"	"
FGT	1	26"	Douglas-fir	Right	50-60'	+140' 25/2	+290' 25/2
FGT	2	28"	"	"	"	"	"
FGT	2	30"	"	"	"	"	"
FGT	1	36"	"	"	"	"	"
FGT	1	34"	Douglas-fir	Right	50-60'		-175' 25/3
FGT	1	8"	Alder	Right	50-70'	-105' 25/3	-80' 25/3
FGT	2	10"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	1	22"	Maple	Left	50-75'		-35' 25/3
FGT	5	-8"	Alder	Right	50-70'	-60' 25/3	-25' 25/3
FGT	2	8"	"	"	"	"	"
FGT	1	10"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	1	8"	Alder	Right	50-70'	+15' 25/3	+40 25/3
FGT	2	12"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	1	18"	Maple	"	"	"	"
FGT	1	10"	Alder	Left	50-75'	+375' 25/4	+405' 25/4
FGT	2	14"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	2	10"	Alder	Left	50-65'	+420' 25/4	+440' 25/4
FGT	1	12"	"	"	"	"	"
FGT	3	-8"	Noble	Right	0-50'	+75' 25/6	-250' 25/7
FGT	4	8"	"	"	"	"	"
FGT	12	10"	"	"	"	"	"
FGT	2	12"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	2	-8"	Alder	"	"	"	"
FGT	2	-8"	Douglas-fir	"	"	"	"
FGT	1	8"	"	"	"	"	"
FGT	1	10"	Douglas-fir	Left	0-50'	+30' 25/7	+100' 25/7
FGT	1	12"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	2	10"	Douglas-fir	Right	0-50'	+205' 25/7	+260' 25/7
FGT	1	24"	Douglas-fir	Right	50-55'		-165' 25/8
FGT	1	18"	Douglas-fir	Left	50-70'		+15' 25/9
FGT	1	28"	Douglas-fir	Right	0-50'		-95' 27/2
FGT	1	-8"	Douglas-fir	Right	0-50'	+25' 27/2	+60' 27/3
FGT	3	12"	"	"	"	"	"
FGT	2	16"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	3	24"	"	"	"	"	"
FGT	2	26"	"	"	"	"	"
FGT	1	28"	"	"	"	"	"
FGT	1	30"	"	"	"	"	"
FGT	1	-8"	Alder	"	"	"	"
FGT	1	10"	Douglas-fir	Right	0-50'		-75' 27/4
FGT	1	24"	"	"	"		"

FGT: Forest Grove-Tillamook No. 1 Transmission Line
KFG: Keeler-Forest Grove No. 1 Transmission Line

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	1	-8"	Douglas-fir	Right	0-50'	+30' 27/4	+50' 27/4
FGT	1	20"	"	"	"	"	"
FGT	1	20"	Douglas-fir	Right	50-55'		+95' 27/4
FGT	1	26"	Douglas-fir	Right	50-70'		-85' 27/9
FGT	2	24"	Douglas-fir	Right	50-70'		-50' 27/10
FGT	1	16"	Douglas-fir	Right	50-60'		-65' 28/3
FGT	1	14"	Douglas-fir	Left	0-50'		+175' 28/6
FGT	1	22"	"	"	"		"
FGT	1	24"	"	"	"		"
FGT	1	10"	Douglas-fir	Right	0-50'		-90' 28/6
FGT	1	24"	"	"	"		"
FGT	1	8"	Douglas-fir	Right	0-50'	-100' 28/10	-75' 28/10
FGT	1	16"	"	"	"	"	"
FGT	1	10"	Maple	Right	0-50'		+245' 28/10
FGT	2	18"	Douglas-fir	Right	0-50'		+85' 28/11
FGT	1	28"	"	"	"		"
FGT	1	20"	Douglas-fir	Right	0-50'		-185' 28/12
FGT	1	22"	Douglas-fir	Right	0-50'	-145' 28/12	-115' 28/12
FGT	1	26"	"	"	"	"	"
FGT	1	30"	Douglas-fir	Right	0-50'		+60' 28/12
FGT	1	30"	Douglas-fir	Right	0-50'		-125' 29/2
FGT	1	20"	Douglas-fir	Right	0-65'		-205' 30/1
FGT	1	18"	Douglas-fir	Left	0-55'	-65' 30/6	+60' 30/6
FGT	2	22"	"	"	"	"	"
FGT	1	24"	"	"	"	"	"
FGT	1	26"	"	"	"	"	"
FGT	6	-8"	Maple	Left	0-45		-150' 30/8
FGT	2	8"	"	"	"		"
FGT	1	10"	"	"	"		"
FGT	1	14"	"	"	"		"
FGT	1	16"	"	"	"		"
FGT	15	-8"	Maple	Right	0-50'		+130' 30/8
FGT	10	-8"	Maple	Left	0-40'		+170' 30/8
FGT	2	8"	"	"	"		"
FGT	2	26"	Douglas-fir	Right	0-40'		-15' 30/9
FGT	1	32"	Cedar	Left	0-40'		+40' 30/9
FGT	1	32"	Cedar	Right	0-55'		+115' 30/9
FGT	1	34"	Cedar	Right	0-60'		+130' 30/9
FGT	1	28"	Douglas-fir	Left	0-30'		+215' 30/9
FGT	1	24"	Cedar	Left	0-35'		-130' 30/10
FGT	0	1"	Alder	C/L	0-50'	-100' 30/11	+150' 30/13
FGT	0	1"	Douglas-fir	"	"	"	"
FGT	1	18"	Douglas-fir	Left	50-80'		-75' 30/11
FGT	1	22"	"	"	"		"
FGT	20	-8"	Alder	Left	50-55'	-120 30/12	+15' 30/12
FGT	1	8"	"	"	"	"	"
FGT	1	10"	"	"	"	"	"
FGT	1	18"	Maple	Right	50-65'		-45' 30/12
FGT	1	20"	Douglas-fir	Right	0-50'		+60' 30/12
FGT	2	-8"	Alder	Left	50-55'	+35' 30/12	+60' 30/12
FGT	2	8"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"

Keeler-Tillamook 115 kV Transmission Line Rebuild

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	2	8"	Douglas-fir	Left	0-50'		+50' 30/12
FGT	2	12"	Douglas-fir	Right	0-50'	+150' 13/12	+170' 13/12
FGT	1	16"	"	"	"	"	"
FGT	1	12"	Douglas-fir	Right	50-55'		+175' 30/12
FGT	12	-8"	Alder	Left	0-50'	-85' 30/13	-25' 30/13
FGT	3	8"	"	"	"	"	"
FGT	1	-8"	Vine Maple	"	"	"	"
FGT	1	-8"	Douglas-fir	"	"	"	"
FGT	1	18"	Douglas-fir	Right	0-50'		-65' 30/13
FGT	1	16"	Douglas-fir	Right	0-50'		-30' 30/13
FGT	1	8"	Alder	Right	0-50'		+00' 30/13
FGT	1	22"	Douglas-fir	Right	0-50'		+50' 30/13
FGT	2	16"	Maple	Right	50-65'	+100' 30/13	+140' 30/13
FGT	1	18"	"	"	"	"	"
FGT	1	28"	"	"	"	"	"
FGT	6	-8"	Maple	Left	0-60'	-260' 30/14	-200' 30/14
FGT	2	12"	"	"	"	"	"
FGT	1	30"	"	"	"	"	"
FGT	1	12"	Douglas-fir	Right	0-30'		-150' 30/14
FGT	1	14"	Alder	Left	0-60'	-10' 30/14	+60' 30/14
FGT	1	16"	Pine	"	"	"	"
FGT	1	8"	Douglas-fir	Right	0-50'	-260' 31/1	-180' 31/1
FGT	1	24"	"	"	"	"	"
FGT	1	26"	"	"	"	"	"
FGT	1	10"	Douglas-fir	Left	0-50'	-150' 31/1	-100' 31/1
FGT	1	14"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	2	26"	"	"	"	"	"
FGT	1	-8"	Douglas-fir	Left	0-50'	+65' 31/1	+100' 31/1
FGT	1	8"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	1	-8"	Alder	Left	0-65'	+00 31/2	105' 31/3
FGT	1	8"	"	"	"	"	"
FGT	3	10"	"	"	"	"	"
FGT	3	12"	"	"	"	"	"
FGT	5	14"	"	"	"	"	"
FGT	1	8"	Maple	"	"	"	"
FGT	2	10"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	16"	Douglas-fir	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	1	22"	Douglas-fir	Right	0-55'		-130' 31/3
FGT	1	16"	Douglas-fir	Left	0-65'		-100' 31/3
FGT	1	16"	Maple	"	"		"
FGT	1	12"	Alder	Left	0-50'	+95' 31/3	+120 31/3
FGT	1	8"	Maple	"	"	"	"
FGT	1	10"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	4	16"	"	"	"	"	"
FGT	1	-8"	Alder	Left	0-40'		-80' 31/4
FGT	1	12"	"	"	"		"

FGT: Forest Grove-Tillamook No. 1 Transmission Line
KFG: Keeler-Forest Grove No. 1 Transmission Line

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	1	14"	"	"	"		"
FGT	1	16"	"	"	"		"
FGT	1	10"	Douglas-fir	"	"		"
FGT	1	12"	Alder	Right	0-65'		-35' 31/4
FGT	1	14"	"	"	"		"
FGT	1	-8"	Alder	Right	0-40'	+00 31/5	+60' 31/5
FGT	2	10"	Douglas-fir	"	"	"	"
FGT	2	-8"	Maple	"	"	"	"
FGT	1	10"	Douglas-fir	Left	0-35'		+100' 31/5
FGT	1	14"	Alder	Left	0-30'		-195' 31/6
FGT	1	14"	Alder	Left	0-45'		-100' 31/6
FGT	1	12"	Douglas-fir	Left	0-40'		-50' 31/6
FGT	3	-8"	Alder	Left	0-35'	+115' 31/6	-130' 31/7
FGT	4	8"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	1	8"	Douglas-fir	Right	0-35'		-110' 31/7
FGT	1	20"	"	"	"		"
FGT	4	-8"	Alder	Right	0-60'	+115' 31/8	+150' 31/8
FGT	2	8"	"	"	"	"	"
FGT	1	10"	"	"	"	"	"
FGT	1	12"	Cascara	"	"	"	"
FGT	65	-8"	Alder	Right	0-50'	+190' 31/8	-160' 31/9
FGT	8	8"	"	"	"	"	"
FGT	1	18"	Douglas-fir	"	"	"	"
FGT	7	-8"	Maple	"	"	"	"
FGT	1	16"	Hemlock	"	"	"	"
FGT	1	10"	Alder	Right	0-50'		-145' 31/9
FGT	1	10"	Alder	Right	0-50'		-55' 31/9
FGT	1	-8"	Alder	Right	0-40'		+90' 31/9
FGT	1	8"	"	"	"		"
FGT	2	-8"	Alder	Right	0-25'		-130' 31/10
FGT	8	-8"	Alder	Right	0-45'	+55' 31/10	-235' 31/11
FGT	3	8"	"	"	"	"	"
FGT	2	10"	"	"	"	"	"
FGT	1	16"	Alder	Right	0-50'		-105' 31/11
FGT	50	-8"	Holly	C/L	0-50'		-60' 31/12
FGT	1	8"	Alder	Right	0-60'		+45' 31/12
FGT	1	10"	"	"	"		"
FGT	1	12"	"	"	"		"
FGT	1	20"	"	"	"		"
FGT	1	12"	Alder	Right	0-50'		-120' 31/13
FGT	50	-8"	Hardwood	C/L	0-50'	31/13	32/1
FGT	1	16"	Douglas-fir	Left	0-25'	+10' 31/13	+55' 31/13
FGT	2	10"	Cascara	"	"	"	"
FGT	1	-8"	Cascara	Left	0-25'		+120' 31/13
FGT	2	8"	"	"	"		"
FGT	1	-8"	Alder	Right	0-45'		+120' 31/13
FGT	1	8"	"	"	"		"
FGT	2	10"	"	"	"		"
FGT	1	12"	"	"	"		"
FGT	1	14"	Douglas-fir	Left	0-35'		-100' 32/1
FGT	1	20"	"	"	"		"
FGT	1	26"	"	"	"		"
FGT	1	10"	Apple	C/L	0-50'		+40' 32/1

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	2	-8"	Alder	Right	0-20'		+50' 32/1
FGT	1	8"	"	"	"		"
FGT	1	10"	"	"	"		"
FGT	1	8"	Birch	"	"		"
FGT	3	8"	Douglas-fir	Right	0-25'	-260' 32/2	-50' 32/2
FGT	5	10"	"	"	"	"	"
FGT	3	12"	"	"	"	"	"
FGT	2	12"	Douglas-fir	Left	0-35'		-230' 32/2
FGT	1	-8"	Douglas-fir	Left	0-25'		-30' 32/2
FGT	1	10"	"	"	"		"
FGT	1	20"	Maple	Left	0-50'		+00 32/2
FGT	3	-8"	Douglas-fir	Left	0-25'	+105' 32/2	-170' 32/3
FGT	3	8"	"	"	"	"	"
FGT	8	10"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	7	-8"	Douglas-fir	Left	0-50'	-160' 32/3	-105' 32/3
FGT	1	8"	"	"	"	"	"
FGT	1	24"	Douglas-fir	Right	0-50'		-135' 32/3
FGT	1	26"	Douglas-fir	Right	0-50'		+155' 32/3
FGT	1	12"	Alder	Right	0-50'		+90' 32/11
FGT	1	32"	Cedar	Right	0-50'		+175' 32/11
FGT	1	8"	Douglas-fir	Right	0-50'	+165' 33/4	-40' 33/5
FGT	2	10"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	1	26"	"	"	"	"	"
FGT	1	38"	Maple	Right	0-50'		+145' 34/2
FGT	1	-8"	Douglas-fir	Right	0-50'	+25' 34/6	+160' 34/6
FGT	1	12"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	2	22"	"		"	"	"
FGT	2	24"	"	"	"	"	"
FGT	1	-8"	Alder	Right	0-50'	-90' 34/7	+170' 34/7
FGT	2	8"	"	"	"	"	"
FGT	3	10"	"	"	"	"	"
FGT	2	14"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	12"	Douglas-fir	"	"	"	"
FGT	3	14"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	4	-8"	Alder	Left	0-50'		+00' 34/7
FGT	1	10"	Douglas-fir	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	2	20"	"	"	"	"	"
FGT	1	30"	"	"	"	"	"
FGT	1	28"	Douglas-fir	Left	0-50'		-30' 34/8
FGT	1	10"	Maple	"	"		"
FGT	1	-8"	Cascara	Left	0-50'	-85' 34/9	-20' 34/9
FGT	1	10"	Cedar	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	1	8"	Douglas-fir	"	"	"	"
FGT	1	14"	"	"	"	"	"

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	2	-8"	Douglas-fir	Left	0-50'	+40' 34/9	-20' 34/10
FGT	2	8"	"	"	"	"	"
FGT	3	10"	"	"	"	"	"
FGT	4	12"	"	"	"	"	"
FGT	2	14"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	2	8"	Cedar	"	"	"	"
FGT	1	10"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	1	14"	Alder	Right	0-50'	+125' 34/9	+00' 34/10
FGT	2	16"	"	"	"	"	"
FGT	1	12"	Cedar	"	"	"	"
FGT	1	-8"	Douglas-fir	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	1	14"	Douglas-fir	Left	0-50'	+75' 34/10	+140' 34/10
FGT	1	20"	"	"	"	"	"
FGT	1	30"	"	"	"	"	"
FGT	1	18'	Alder	Right	0-65'	-350' 35/1	-310' 35/1
FGT	1	20"	"	"	"	"	"
FGT	2	8"	Maple	Left	0-65'	-310' 35/1	-300' 35/1
FGT	3	10"	"	"	"	"	"
FGT	2	12"	"	"	"	"	"
FGT	2	14"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	1	12"	Alder	Left	0-65'	-225' 35/1	-200' 35/1
FGT	1	18"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	1	18"	Maple	"	"	"	"
FGT	1	24"	"	"	"	"	"
FGT	1	8"	Alder	Left	0-55'	-150' 35/1	+00' 35/1
FGT	1	10"	"	"	"	"	"
FGT	3	12"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	2	16"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	1	12"	Maple	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	4	-8"	Douglas-fir	Left	0-55'	+00' 35/1	+00' 35/2
FGT	8	-8"	Alder	"	"	"	"
FGT	2	8"	"	"	"	"	"
FGT	1	-8"	Maple	"	"	"	"
FGT	1	16"	Alder	Left	0-50'		-25' 35/14
FGT	1	8"	Maple	Left	0-50'		-10' 35/14
FGT	1	12"	Alder	Left	0-50'	+20' 35/14	+20' 35/15
FGT	1	14"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	20	-8"	Alder	Right	0-50'	+40' 35/14	+75' 35/14
FGT	1	14"	Douglas-fir	Right	0-50'		+240' 36/1
FGT	1	8"	Alder	Right	0-25'	+50' 36/2	+84 36/2
FGT	1	10"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	1	12"	"	"	"	"	"
FGT	1	10"	Alder	Right	0-25"	+123' 36/2	+157' 36/2
FGT	1	8"	"	"	"	"	"
FGT	1	6"	"	"	"	"	"
FGT	1	10"	"	"	"	"	"
FGT	1	8"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	10"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	1	14"	Alder	Right	0-40'	+173' 36/2	+223' 36/2
FGT	1	12"	"	"	"	"	"
FGT	1	10"	"	"	"	"	"
FGT	1	10"	"	"	"	"	"
FGT	1	6"	Maple	"	"	"	"
FGT	1	14"	Alder	"	"	"	"
FGT	1	8"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	1	12"	Alder	Right	0-45'	-149' 36/3	-73' 36/3
FGT	1	8"	"	"	"	"	"
FGT	1	8"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	1	32"	"	"	"	"	"
FGT	1	12"	Alder	Right	0-40'		-15' 36/3
FGT	1	8"	"	"	"		"
FGT	1	6"	Alder	Right	0-40'		+5' 36/3
FGT	1	4"	"	"	"		"
FGT	1	10"	Alder	Right	0-45'		+27' 36/3
FGT	1	18"	"	"	"		"
FGT	1	8"	Alder	Right	0-45'		+45' 36/3
FGT	1	14"	Alder	Right	0-40'	+55' 36/3	+71' 36/3
FGT	1	10"	"	"	"	"	"
FGT	1	8"	"	"	"	"	"
FGT	1	-8"	"	"	"	"	"
FGT	1	10"	Alder	Right	0-50'	+80' 36/3	+105' 36/3
FGT	1	12"	"	"	"	"	"
FGT	1	8"	"	"	"	"	"
FGT	1	-8"	"	"	"	"	"
FGT	1	10"	Alder	Right	0-50'	+110' 36/3	113' 36/3
FGT	1	10"	"	"	"	"	"
FGT	1	10"	Alder	Right	0-50'		+121' 36/3
FGT	1	14"	Alder	Right	0-50'		+145' 36/3
FGT	1	8"	Alder	Right	0-50'		+176' 36/3
FGT	5	-8"	Alder	Right	0-50'		+196' 36/3
FGT	1	14"	Alder	Right	0-50'	+215' 36/3	+220' 36/3
FGT	1	12"	Alder	Right	"	"	"
FGT	2	-8"	Maple	Right	"	"	"
FGT	1	10"	Alder	Right	0-50'	+240' 36/3	+260' 36/3
FGT	1	14"	"	"	"	"	"
FGT	1	-8"	Maple	"	"	"	"
FGT	1	10"	"	"	"	"	"
FGT	1	8"	Alder	Right	0-50"		-30' 36/4
FGT	1	10"	Alder	Right	0-50"		-24' 36/4
FGT	1	14"	Alder	Right	0-50"		-12' 36/4
FGT	10	-8"	Hardwoods	C/L	0-15'	+75' 36/5	+185' 36/7

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	3	-8"	Holly	Right	0-25'		-77' 36/8
FGT	5	-8"-10"	"	"	"		"
FGT	2	-8"	Holly	Right	0-25'		-61' 36/8
FGT	1	8"	"	"	"		"
FGT	2	8"	Holly	Right	0-25'		-45' 36/8
FGT	2	10"	"	"	"		"
FGT	3	-8"	Holly	Right	0-25'		-26' 36/8
FGT	1	10"	"	"	"		"
FGT	12	-8"	Maple	Right	0-25'		+10' 38/6
FGT	2	-8"	Maple	Left	0-15'		+10' 36/8
FGT	2	-8"-10"	Holly	Right	0-25'		+40' 36/8
FGT	3	-8"-8"	Holly	Right	0-15'		+55' 36/8
FGT	1	10"	Holly	Right	0-25'		+75' 36/8
FGT	3	8"	Holly	Right	0-25'		+95' 36/8
FGT	3	8"	"	"	"		"
FGT	1	12"	Holly	Right	0-25'		+110' 36/8
FGT	2	8"-10"	"	"	"		"
FGT	2	8"-10"	Holly	Right	0-25'		+130' 36/8
FGT	1	10"	"	"	"		"
FGT	3	8"	Holly	Right	0-25'		+145' 36/8
FGT	1	10"	Holly	Right	0-25'		+166' 36/8
FGT	2	8"-10"	Holly	Right	0-25'		+184' 36/8
FGT	3	8"	Holly	Right	0-25'		+201' 36/8
FGT	3	8"	"	"	"		"
FGT	4	-8"-12"	Holly	Right	0-25'		+220' 36/8
FGT	4	8"	"	"	"		"
FGT	1	12"	Holly	Right	0-25'		+238' 36/8
FGT	4	-8"-8"	"	"	"		"
FGT	4	-8"	Holly	Right	0-25'		-3' 36/9
FGT	2	8"	"	"	"		"
FGT	3	-8"	Holly	Right	0-25'		+20' 36/9
FGT	5	-8"	"	"	"		"
FGT	2	8"-10"	Holly	Right	0-25'		+35' 36/9
FGT	1	10"	"	"	"		"
FGT	3	-8"	Holly	Right	0-25'		+40' 36/9
FGT	15	-8"	Hazelnt	"	"		"
FGT	1	12"	Holly	Right	0-25'		+55' 36/9
FGT	5	-8"	Holly	Right	0-25'		
FGT	1	12"	"	"	"		
FGT	2	-8"-10"	Holly	Right	0-25'		+108' 36/9
FGT	1	12"	Hemlock	Right	0-25'		+122' 36/9
FGT	1	16"	Holly	Right	0-25'		+142' 36/9
FGT	2	-8"	Maple	Right	0-35'		+161' 36/9
FGT	1	-8"	"	"	"		"
FGT	2	8"-12"	Holly	"	"		"
FGT	1	12"	Holly	Right	0-25'		-25' 36/10
FGT	1	12"	Holly	Right	0-20'		+17' 36/10
FGT	1	14"	Holly	Right	0-10'		+34' 36/10
FGT	3	-8"	Holly	Right	0-15'		+89' 36/10
FGT	4	-8"	Holly	Right	0-15'		+107' 36/10
FGT	4	-8"	Holly	Right	0-15'		+124' 36/10
FGT	2	8"-12"	Holly	Right	0-15'		+146' 36/10
FGT	15	-8"	Lilac	Right	0-10'		+171' 36/10

FGT: Forest Grove-Tillamook No. 1 Transmission Line
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Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	1	10"	Holly	Right	0-15'		+216' 36/10
FGT	1	12"	Holly	Right	0-15'		+233' 36/10
FGT	1	12"	Holly	Right	0-15'		+252' 36/10
FGT	2	8"-10"	Holly	Right	0-15'		+272' 36/10
FGT	6	-8"	Lilac	Right	0-15'		-25' 36/11
FGT	2	8"	Holly	Right	0-15'		-15' 36/11
FGT	1	10"	Holly	Right	0-25'		+45' 36/11
FGT	2	8"-10"	Holly	Right	0-25'		+64' 36/11
FGT	4	-8"	Lilac	Left	0-5'		+26' 36/11
FGT	1	-8"	Maple	Right	0-25'		+87' 36/11
FGT	5	-8"	Lilac	Left	0-5'		+90' 36/11
FGT	6	-8"	Vine Maple	Left	0-5'		+100' 36/11
FGT	1	22"	Sycamore	Right	0-30'		+112' 36/11
FGT	10	-8"	Maple	Left	0-15'		+115' 36/11
FGT	1	-8"	Maple	Left	0-15'		+130' 36/11
FGT	10	-8"	Hardwood	Left	0-20'		-50' 36/12
FGT	10	-8"	Elderberry	Right	0-10'		+25' 36/12
FGT	10	-8"	Hazelnt	Right	0-10'		+85' 36/12
FGT	1	10"	Holly	Right	0-10'		+123' 36/12
FGT	5	-8"	Holly	Right	0-10'		+138' 36/12
FGT	4	-8"-10"	"	"	"		"
FGT	20	-8"	Cascara	Right	0-25'	+125' 36/12	+170' 36/12
FGT	2	-8"-8"	Holly	"	"	"	"
FGT	1	8"	Hazelnt	"	"	"	"
FGT	4	8"	Holly	Right	0-25'	+180' 36/12	+210' 36/12
FGT	5	-8"-8"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	-8"	"	"	"	"	"
FGT	1	10"	Holly	Right	0-25'	+235' 36/12	+245' 36/12
FGT	1	8"	Pear	"	"	"	"
FGT	1	12"	Douglas-fir	"	"	"	"
FGT	2	-8"-8"	Holly	"	"	"	"
FGT	1	-8"	Spruce	"	"	"	"
FGT	1	-8"	Pear	Right	0-30'	+270' 36/12	+278' 36/12
FGT	2	-8"	Spruce	"	"	"	"
FGT	3	-8"-12"	Holly	"	"	"	"
FGT	36	-8"	Vine Maple	Right	0-10'		+300' 36/12
FGT	24	-8"	Vine Maple	Right	0-20'		+325' 36/12
FGT	1	-8"	Sitka Spruce	Right	0-30'	-56' 36/13	+00 36/13
FGT	1	-8"	"	"	"	"	"
FGT	1	10"	"	"	"	"	"
FGT	1	8"	"	"	"	"	"
FGT	1	-8"	"	"	"	"	"
FGT	1	8"	"	"	"	"	"
FGT	1	10"	"	"	"	"	"
FGT	15	-8"	Vine Maple	"	"	"	"
FGT	5	-8"	Alder	"	"	"	"
FGT	5	8"	Maple	Right	0-25'		-33' 36/13
FGT	17	-8"	Maple	Right	0-35'		+83' 36/13
FGT	6	-8"	Maple	Right	0-35'		+100' 36/13
FGT	0	1"	Hardwood	C/L	0-10'	+105' 36/13	-215' 36/13
FGT	7	-8"	Vine Maple	Right	0-30'		+160' 36/13

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Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	5	-8"	Maple	Right	0-30'		+177' 36/13
FGT	41	-8"	Hardwood	C/L	0-10'	+275' 36/13	+320' 36/13
FGT	1	-8"	Cedar	Right	0-25'	-170' 36/12	-130' 36/14
FGT	1	8"	Pear	"	"	"	"
FGT	1	-8"	Maple	"	"	"	"
FGT	1	8"	Pear	"	"	"	"
FGT	2	8"	Holly	"	"	"	"
FGT	1	8"	"	"	"	"	"
FGT	1	8"	"	"	"	"	"
FGT	0	1"	Hardwoods	C/L	0-10'	-130' 36/14	+00 36/14
FGT	1	-8"	Cascara	Right	0-20'	-104' 36/14	-88' 36/14
FGT	4	-8"	"	"	"	"	"
FGT	1	8"	"	"	"	"	"
FGT	1	8"	"	"	"	"	"
FGT	1	-8"	Cascara	Right	0-25'	-85' 36/14	-60' 36/14
FGT	1	8"	"	"	"	"	"
FGT	3	-8"	"	"	"	"	"
FGT	4	-8"	Cherry	Right	0-25'	-45' 36/14	-30' 36/14
FGT	6	8"	Holly	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	1	-8"	Maple	"	"	"	"
FGT	4	-8"	Hazelnt	Right	0-15'		+00 36/14
FGT	5	8"	Holly	Right	0-15'		+15' 36/14
FGT	1	14"	Cascara	Right	0-25'		+164' 36/14
FGT	1	8"	Douglas-fir	Right	0-25'		+220' 36/14
FGT	1	8"	Cascara	Right	0-10'		+250' 36/14
FGT	1	8"	Holly	Right	0-25'		-35' 36/14
FGT	8	-8"-8"	Alder	Right	0-25'		-25' 36/14
FGT	11	-8"	Cascara	Right	0-40'	+10' 36/15	+25' 36/15
FGT	1	8"	Douglas-fir	"	"	"	"
FGT	9	-8"	Hazelnt	Right	0-40'	+45' 36/15	+70' 36/15
FGT	1	-8"	"	"	"	"	"
FGT	1	-8"	Cascara	Right	0-20'		+138' 36/15
FGT	6	-8"	Cascara	Right	0-25'		+160' 36/15
FGT	2	8"	Holly	Right	0-10'		+180' 36/15
FGT	1	-8"	Maple	Right	0-10'		+205' 36/15
FGT	5	-8"	Elderberry	"	"		"
FGT	3	8"	Cascara	Right	0-30'		+345' 36/15
FGT	6	-8"	Cascara	Right	0-40'	+00 36/16	+10' 36/16
FGT	1	12"	Sitka Spruce	Right	50-60'		+345' 37/1
FGT	1	20"	"	"	"		"
FGT	1	32"	"	"	"		"
FGT	1	8"	Alder	"	"		"
FGT	1	14"	Hemlock	Right	50-55'		+00 37/2
FGT	1	24"	Hemlock	Right	50-60'		-130' 37/3
FGT	1	26"	"	"	"		"
FGT	1	12"	Hemlock	Left	50-55'	-45' 37/3	+00 37/3
FGT	1	16"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	1	14"	Alder	Left	50-60'		+550' 37/3
FGT	1	22"	"	"	"		"
FGT	1	22"	Douglas-fir	Right	0-50'		+215' 37/4
FGT	1	10"	Hemlock	Left	0-50'	+360' 37/4	-240' 37/5
FGT	1	8"	Douglas-fir	"	"	"	"

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	1	18"	"	"	"	"	"
FGT	1	20"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	2	24"	"	"	"	"	"
FGT	1	32"	"	"	"	"	"
FGT	1	26"	Douglas-fir	Right	0-50'		-250' 37/5
FGT	2	22"	Douglas-fir	Right	0-50'	-190' 37/5	-170' 37/5
FGT	1	16"	Douglas-fir	Right	0-50'		-105' 37/5
FGT	1	20"	"	"	"		"
FGT	1	14"	Douglas-fir	Left	0-50'		-50' 37/5
FGT	1	10"	Douglas-fir	Left	0-50'		+05' 37/5
FGT	1	26"	"	"	"		"
FGT	1	22"	Douglas-fir	Left	0-50'		+55' 37/5
FGT	1	20"	Douglas-fir	Left	0-50'	-50' 37/6	+50' 37/6
FGT	3	22"	"	"	"	"	"
FGT	1	24"	"	"	"	"	"
FGT	1	22"	Douglas-fir	Right	0-50'		+220' 37/6
FGT	1	16"	Douglas-fir	Left	0-50'	-60' 37/7	+100' 37/7
FGT	1	18"	"	"	"	"	"
FGT	1	26"	"	"	"	"	"
FGT	4	-8"	Alder	Left	0-50'	-105' 38/2	-55' 38/2
FGT	1	8"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	4	-8"	Douglas-fir	"	"	"	"
FGT	1	8"	"	"	"	"	"
FGT	1	10"	"	"	"	"	"
FGT	1	30"	Spruce	Left	0-50'		+50' 38/2
FGT	1	12"	Douglas-fir	Right	0-50'		-75' 38/3
FGT	1	24"	Douglas-fir	Right	0-50'		+110' 38/3
FGT	1	22"	Hemlock	Right	50-60'		-25' 38/7
FGT	1	20"	Douglas-fir	Left	0-50'		-85' 39/1
FGT	1	22"	Hemlock	Right	50-55'		+70' 39/1
FGT	1	24"	Douglas-fir	Left	50-55'		+120' 39/1
FGT	1	26"	Hemlock	Right	50-60'		+215' 39/1
FGT	1	12"	Hemlock	Left	50-55'		-55' 40/2
FGT	3	12"	Hemlock	Right	50-55'	-55' 40/2	+00 40/2
FGT	1	-8"	Hemlock	Right	0-50'		-300' 40/3
FGT	1	8"	"	"	"		"
FGT	1	12"	"	"	"		"
FGT	1	14"	"	"	"		"
FGT	1	12"	Douglas-fir	Left	0-50'		-25' 40/3
FGT	1	14"	"	"	"		"
FGT	1	24"	Hemlock	Right	0-50'	-400' 40/4	-325' 40/4
FGT	1	26"	"	"	"	"	"
FGT	1	-8"	Hemlock	Right	50-55'		-240' 40/4
FGT	1	16"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	1	22"	Hemlock	Left	50-55'		-205' 40/4
FGT	1	18"	Hemlock	Right	0-50'	-135' 40/4	-115' 40/4
FGT	1	24"	"	"	"	"	"
FGT	1	18"	Hemlock	Right	0-50'		-25' 40/4
FGT	1	20"	"	"	"		"
FGT	1	18"	Hemlock	Right	0-50'		+100' 40/4
FGT	1	20"	Alder	Right	50-60'		+130' 40/4

FGT: Forest Grove-Tillamook No. 1 Transmission Line
KFG: Keeler-Forest Grove No. 1 Transmission Line

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	1	8"	Hemlock	Right	50-60'		+400' 40/4
FGT	2	10"	"	"	"		"
FGT	1	12"	"	"	"		"
FGT	1	14"	"	"	"		"
FGT	1	16"	Alder	Right	0-50'		-190' 40/5
FGT	1	12"	Alder	Right	0-50'		-110' 40/5
FGT	2	8"	Alder	Left	0-50'		-110' 40/5
FGT	1	18"	"	"	"		"
FGT	1	10"	Hemlock	Right	0-50'		+120' 40/6
FGT	1	12"	"	"	"		"
FGT	1	18"	Hemlock	Left	50-60'		+170' 40/6
FGT	1	30"	"	"	"		"
FGT	1	50"	Sitka Spruce	Left	50-60'		-100' 40/8
FGT	1	12"	Hemlock	Right	50-55'		+55' 40/8
FGT	1	8"	Alder	Right	50-60'	-80' 41/2	+00 41/2
FGT	2	14	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	1	12"	Hemlock	Left	0-50'	-15' 41/2	+40' 41/2
FGT	1	14"	"	"	"	"	"
FGT	1	16"	"	"	"	"	"
FGT	1	18"	"	"	"	"	"
FGT	1	22"	"	"	"	"	"
FGT	1	10"	Spruce	Right	0-50'		-10' 41/3
FGT	1	14"	"	"	"		"
FGT	1	-8"	Spruce	"	"		"
FGT	1	16"	Alder	Left	0-50'	+10' 41/3	+195' 41/3
FGT	1	10"	Cascara	"	"	"	"
FGT	1	-8"	Hemlock	"	"	"	"
FGT	1	8"	"	"	"	"	"
FGT	1	12"	"	"	"	"	"
FGT	1	14"	"	"	"	"	"
FGT	2	20"	"	"	"	"	"
FGT	4	22"	"	"	"	"	"
FGT	1	24"	"	"	"	"	"
FGT	1	18"	Douglas-fir	Right	0-50'		+90' 41/3
FGT	1	14"	Hemlock	Left	50-60'		+110' 41/3
FGT	1	12"	Hemlock	Right	0-50'		-60' 41/5
FGT	1	22"	Hemlock	Left	0-50'		-50' 41/5
FGT	1	-8"	Alder	Right	0-55'	+40' 41/5	+55' 41/5
FGT	1	8"	"	"	"	"	"
FGT	1	10"	"	"	"	"	"
FGT	1	26"	Maple	"	"	"	"
FGT	1	16"	Alder	Left	0-50'		+630' 41/5
FGT	1	12"	Spruce	Left	0-50'	-430' 41/6	-390' 41/6
FGT	1	14"	Alder	"	"	"	"
FGT	1	12"	Hemlock	"	"	"	"
FGT	1	30"	Sitka Spruce	Right	50-65'		-310' 41/6
FGT	1	20"	Alder	Left	50-60'		+80' 42/9
FGT	1	32"	Sitka Spruce	Left	50-70'		+200' 42/10
FGT	1	8"	Alder	Right	50-65'		-15' 43/2
FGT	2	10"	"	"	"		"
FGT	1	12"	"	"	"		"
FGT	1	14"	Hemlock	Left	50-70'		+320' 43/4

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
FGT	1	24"	"	"	"		"
FGT	2	26"	Sitka Spruce	Right	50-60'	+105' 43/9	+160' 43/9
FGT	1	30"	"	"	"	"	"
FGT	1	26"	Alder	Right	50-60'		-230' 44/6
Keeler-Forest Grove (KFG)	21	-8"	Cottonwood	Right	50-90'	-140'	+165'
KFG	4	8"	Cottonwood	Right	50-90'	-140'	+165'
KFG	6	10"	Cottonwood	Right	50-90'	-140'	+165'
KFG	3	14"	Cottonwood	Right	50-90'	-140'	+165'
KFG	6	-8"	Cottonwood	Right	50-90'	-140'	+165'
KFG	2	8"	Cottonwood	Right	50-90'	-140'	+165'
KFG	2	10"	Cottonwood	Right	50-90'	-140'	+165'
KFG	2	12"	Cottonwood	Right	50-90'	-140'	+165'
KFG	1	-8"	Hawthorn	Right	50-90'	-140'	+165'
KFG	1	8"	Hawthorn	Right	50-90'	-140'	+165'
KFG	1	12"	Hawthorn	Right	50-90'	-140'	+165'
KFG	1	16"	Hawthorn	Right	50-90'	-140'	+165'
KFG	2	-8"	Alder	Right	50-90'	-140'	+165'
KFG	10	-8"	Ash	Right	50-90'	-140'	+165'
KFG	4	-8"	Willow	Right	50-90'	-140'	+165'
KFG	1	8"	Willow	Right	50-90'	-140'	+165'
KFG	1	12"	Willow	Right	50-90'	-140'	+165'
KFG	1	16"	Douglas-fir	Right	50-65'	+240'	
KFG	1	16"	Douglas-fir	Right	50-65'	+320'	
KFG	1	32"	Oak	Right	50-65'	-260'	
KFG	9	-8"	Wild Cherry	Right	50-65'	+120'	-50'
KFG	1	8"	Wild Cherry	Right	50-65'	+120'	-50'
KFG	2	10"	Wild Cherry	Right	50-65'	+120'	-50'
KFG	1	10"	Willow	Right	50-65'	+120'	-50'
KFG	2	12"	Willow	Right	50-65'	+120'	-50'
KFG	1	36"	Willow	Right	50-65'	+120'	-50'
KFG	1	20"	Douglas-fir	Right	50-65'	+120'	-50'
KFG	1	24"	Douglas-fir	Right	50-65'	+120'	-50'
KFG	1	12"	Oak	Right	50-65'	+120'	-50'
KFG	1	14"	Oak	Right	50-65'	+120'	-50'
KFG	2	18"	Oak	Right	50-65'	+120'	-50'
KFG	2	20"	Oak	Right	50-65'	+120'	-50'
KFG	1	24"	Oak	Right	50-65'	+120'	-50'
KFG	1	12"	Willow	Right	50-60'	-365'	-335'
KFG	1	14"	Willow	Right	50-60'	-365'	-335'
KFG	2	-8"	Ash	Right	50-60'	-365'	-335'
KFG	2	8"	Ash	Right	50-60'	-365'	-335'
KFG	1	10"	Oak	Right	50-60'	-520'	-420'
KFG	1	12"	Oak	Right	50-60'	-520'	-420'
KFG	1	18"	Oak	Right	50-60'	-520'	-420'
KFG	1	-8"	Willow	Right	50-60'	-370'	-300'
KFG	3	8"	Willow	Right	50-60'	-370'	-300'
KFG	4	10"	Willow	Right	50-60'	-370'	-300'
KFG	1	12"	Willow	Right	50-60'	-370'	-300'
KFG	1	14"	Willow	Right	50-60'	-370'	-300'
KFG	2	16"	Willow	Right	50-60'	-370'	-300'
KFG	1	18"	Willow	Right	50-60'	-370'	-300'
KFG	6	-8"	Willow	Right	50-60'	-30'	
KFG	1	-8"	Birch	Right	50-60'	-30'	

FGT: Forest Grove-Tillamook No. 1 Transmission Line
KFG: Keeler-Forest Grove No. 1 Transmission Line

Segment	Number of Trees	dbh	Species	Direction from Centerline (Ahead on Line)	Distance from Centerline	Distance from Tower + / -	Distance to Tower + / -
KFG	2	10"	Cottonwood	Right	50-60'	+80'	+190'
KFG	1	22"	Pine	Right	50-60'	+80'	+190'
KFG	1	24"	Pine	Right	50-60'	+80'	+190'
KFG	1	46"	Maple	Right	50-60'	+80'	+190'
KFG	2	-8"	Cottonwood	Right	50-105'	+380'	
KFG	5	14"	Cottonwood	Right	50-105'	+380'	
KFG	1	16"	Cottonwood	Right	50-105'	+380'	
KFG	60	-8"	Cottonwood	Right	50-105'	+385'	+530'
KFG	15	8"	Cottonwood	Right	50-105'	+385'	+530'
KFG	12	10"	Cottonwood	Right	50-105'	+385'	+530'
KFG	5	12"	Cottonwood	Right	50-105'	+385'	+530'
KFG	3	14"	Cottonwood	Right	50-105'	+385'	+530'
KFG	3	16"	Cottonwood	Right	50-105'	+385'	+530'
KFG	1	18"	Cottonwood	Right	50-105'	+385'	+530'
KFG	1	20"	Cottonwood	Right	50-105'	+385'	+530'
KFG	1	24"	Cottonwood	Right	50-105'	+385'	+530'
KFG	1	16"	Maple	Right	50-60'	+50'	
KFG	1	20"	Ash	Right	50-60'	+75'	
KFG	3	-8"	Ash	Right	50-60'	+100'	
KFG	1	12"	Ash	Right	50-60'	+100'	
KFG	2	-8"	Oak	Right	50-60'	-5'	+310'
KFG	2	8"	Oak	Right	50-60'	-5'	+310'
KFG	2	10"	Oak	Right	50-60'	-5'	+310'
KFG	1	12"	Oak	Right	50-60'	-5'	+310'
KFG	2	14"	Oak	Right	50-60'	-5'	+310'
KFG	1	16"	Oak	Right	50-60'	-5'	+310'
KFG	1	22"	Oak	Right	50-60'	-5'	+310'
KFG	1	14"	Douglas-fir	Right	50-60'	-5'	+310'
KFG	1	24"	Douglas-fir	Right	50-60'	-5'	+310'
KFG	5	-8"	Wild Cherry	Right	50-60'	-5'	+310'
KFG	2	8"	Wild Cherry	Right	50-60'	-5'	+310'
KFG	3	10"	Wild Cherry	Right	50-60'	-5'	+310'
KFG	1	12"	Wild Cherry	Right	50-60'	-5'	+310'
KFG	1	16"	Wild Cherry	Right	50-60'	-5'	+310'
KFG	1	18"	Cedar	Right	50-85'	-340'	-300'
KFG	1	22"	Cedar	Right	50-85'	-340'	-300'
KFG	1	26"	Cedar	Right	50-85'	-340'	-300'
KFG	1	30"	Cedar	Right	50-85'	-340'	-300'
KFG	1	32"	Cedar	Right	50-85'	-340'	-300'
KFG	6	-8"	Ash	Right	50-85'	-340'	-300'
KFG	12	-8"	Willow	Right	50-85'	-340'	-300'
KFG	1	10"	Ash	Right	0-50'	-275'	
KFG	3	8"	Noble	Right	0-50'	-120"	-100'
KFG	1	36"	Douglas-fir	Right	50-65'	-15'	
KFG	1	24"	Douglas-fir	Right	0-50'	-10'	
KFG	1	28"	Walnut	Right	50-65'	-35'	

Appendix B
Cumulative Impacts

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APPENDIX B

Cumulative Impacts

Cumulative impacts are the effect on the environment that results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR 1508.7). Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time. The Proposed Action, in combination with past, present, and reasonably foreseeable future actions, would result in **low to moderate** cumulative impacts on all assessed resources.

The following list of projects in the Rebuild Project vicinity is used in the cumulative effects assessments presented in Chapter 3 of the EA. This list is based on review of the following sources:

- BPA list of current and proposed transmission line projects.
- Oregon Department of Forestry (ODF) Timber Sales (ODF 2013).
- Oregon Department of Transportation (ODOT) Region 1 and Region 2 project tracking website (ODOT 2013).
- Review of county planning documents and other publically available planning information sources.

Past and Present Actions

Intel is planning a major expansion of its facilities at its Ronler Acres campus in Hillsboro, adjacent to the Proposed Action ROW. Phase I of the project, construction of a new research facility, is currently underway and is due to open in 2013. Phase II of the expansion is anticipated to begin in 2013 and open in 2015. The project will require additional transmission capacity near the transmission line.

ODOT is currently building a new intersection at Wilson River Highway (SR 6) and Wilson River Loop Road, just east of Tillamook. This project involves a short reroute of the Wilson River Loop Road to create a safer intersection to the east. Construction activities are expected to be completed in October 2013.

Future Actions

ODF is planning several timber sale activities in the Tillamook State Forest in the project vicinity. Some of these activities would likely occur in the same timeframe as construction of the Proposed Action.

BPA is proposing to improve the access roads associated with the Boyer-Tillamook transmission line, which exits out of the Tillamook Substation, starting in fall 2013 with construction lasting until November 2014.

The Keeler-Forest Grove portion of the Proposed Action crosses a long-term planning area that the City of Hillsboro has identified for commercial development.

The City of Forest Grove has some long-term planning goals near the Forest Grove Substation.

Tillamook PUD operates a 10-mile long, 12-kV underbuild on a section of the Forest Grove transmission line. They will be moving their equipment from the existing towers to the new towers. The project may also include some re-alignments.

ODOT is currently planning a major upgrade to the US 26-Brookwood Parkway/Helvetia Road interchange. In response to increased growth and traffic in the area, ODOT has proposed to construct new ramps and widen existing roads to improve traffic flows during peak commute times. Project construction is expected to begin in 2013 and run through 2015.

References

ODF (Oregon Department of Forestry). 2013. ODF Advertised Timber Sale Notices. http://www.odf.state.or.us/divisions/management/asset_management/SaleNotices.asp. Last accessed April 8, 2013.

ODOT (Oregon Department of Transportation). 2013. ODOT Project Tracking Map. https://gis.odot.state.or.us/opt/. Last accessed April 8, 2013.

Appendix C

Supplemental Wildlife Information

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Table C-1. Special-Status Wildlife Species near the Proposed Action

Common Name (Scientific Name)	Federal Status	Oregon Status	Potential Occurrence, Associated Habitat, Habitat Present in or near the Project Area, Known Observations	Potential Effects
Fender's blue butterfly (*Icaricia icarioides fenderi*)	Endangered 1/25/2000 (65 FR 3875)	None	Low. Native prairie habitat. Little or no potential habitat. Habitat converted to agriculture, disturbed by development. No documented occurrences in or near the project area. No host plants observed during 2013 rare plant survey.	See Section 3.5.2.
Marbled murrelet (*Brachyramphus marmoratus*)	Threatened 10/1/1992 (57 FR 45328)	LT	Present. Old-growth forest. Suitable habitat is present. Critical habitat present. Detected during the 2012 and 2013 marbled murrelet surveys.	See Section 3.5.2.
Northern spotted owl (*Strix occidentalis caurina*)	Threatened 6/26/1990 (55 FR 26114)	LT	Moderate to Low. Old-growth forest. The project area is within or near the home range of three historic spotted owl sites. Critical habitat present. No detections during the 2012 and 2013 surveys.	See Section 3.5.2.
Oregon silverspot butterfly (*Speyeria zerene hippolyta*)	Threatened 7/2/1980 (45 FR 44935)	None	Low. Native prairie habitat. Little or no potential habitat. Habitat converted to agriculture, disturbed by development. No documented occurrences in or near the project area.	See Section 3.5.2. .
Streaked horned lark (*Eremophila alperstris strigata*)	Threatened 10/3/2013 (78 FR 61452)	SC	Low. Native prairie habitat, agricultural land, airports. Suitable habitat is degraded but present in the area. No documented occurrences in or near the project area.	See Section 3.5.2.
Red tree vole (*Arborimus longicaudus*) North Oregon Coast DPS	Candidate 10/13/2011 (76 FR 63720)	SV	Low. Mature conifer forest with suitable cover to provide canopy connectivity. Because of their exclusive diet of conifer needles, red tree voles are restricted to conifer forests. Marginal habitat present and lacks required structural complexity. No documented occurrences in or near the project area.	No effect determination; see biological assessment (BPA 2013c).
Fisher (*Martes pennanti*) West Coast DPS	Candidate 4/8/2004 (69 FR 18770)	SC	Low. Fishers select forests with high canopy closure, large trees, and a high percentage of conifers. Marginal habitat. One record by an unknown trapper in 1980 near the Little North Fork Wilson River.	No effect determination; see biological assessment (BPA 2013c).
Bald eagle (*Haliaeetus leucocephalus*)	Protection under Bald and Golden Eagle Protection Act	LT	Present. Mature forest near water, shorelines. Foraging, nesting, roosting habitat present in the area. Known nest sites documented.	See Section 3.5.2.
Migratory birds	Protection under the MBTA	NA	Present. Variety of habitats, waterways, riparian, wetlands, forests, snags. Variety of waterfowl, raptors, songbirds documented.	See Section 3.5.2.

Table C-1. Special-Status Wildlife Species near the Proposed Action

Common Name (Scientific Name)	Federal Status	Oregon Status	Potential Occurrence, Associated Habitat, Habitat Present in or near the Project Area, Known Observations	Potential Effects
Pacific pond turtle (*Actinemys marmorata*)	Species of Concern	SC	Low. Ponds and low energy streams. Marginal habitat present in and near the project area. Four documented sites within 2 miles of the ROW in 1991, 1993, 2000, 2001, no other documented occurrences closer to the project area.	No effect determination; see biological assessment (BPA 2013c).
Townsend's big-eared bat (*Corynorhinus townsendii*)	Species of Concern	SC	Low. This species uses caves, mines, hollow trees, and built structures for roosting. Marginal habitat present. Adult male observed in 1954 in the area.	Low effect.
Northern red-legged frog (*Rana aurora*)	Species of Concern	SV	Low. Associated with wetlands, ephemeral ponds. Marginal habitat present. Two species documented in the area.	Low effect.
Sources: USFWS 2013a, 2013b; ORBIC 2012; Turnstone 2013b and 2013c. DPS = Distinct Population Segment; FR = Federal Register; LT = listed threatened; MBTA = Migratory Bird Treaty Act; NA = not applicable; SC = ODFW sensitive critical; SV = ODFW sensitive vulnerable.				

Appendix D
Wetlands and Waters Summary Information

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Table D-1. Proposed Structures within 100 feet of Streams

Waterway ID	Segment	Structure	Proposed Activities	Temporary Impacts (acres)	Permanent Impacts (acres)	Structure Distance to Stream (feet)
012113A_W1	Forest Grove-Tillamook (FGT)	1/5	Replace hardware	0.0448		53
012113A_W4	FGT	1/6	Replace structure and hardware	0.0252		57
012113A_W4	FGT	1/7	Replace structure and hardware	0.0448		57
011413A_W2	Keeler-Forest Grove (KFG)	1/10	Install new poles and hardware	0.0440	0.0008	14
012213A_W1	FGT	2/3	Replace hardware	0.0448		12
012313A_W2	FGT	3/4	Replace structure and hardware	0.0058		110
012313A_W2	FGT	3/5	Replace structure and hardware	0.0104		110
012413A_W4	FGT	5/5	Replace structure and hardware	0.0448		61
012413A_W5	FGT	5/10	Replace structure and hardware	0.0448		29
012513A_W4	FGT	7/8	Replace structure and hardware	0.0448		13
012513A_W2	FGT	8/2	Replace structure and hardware	0.0448		23
053113A_D1	KFG	8/7	Replace structure and hardware	0.0229		95
012813A_W6	FGT	9/6	Replace structure and hardware	0.0248		36
011813A_W6	KFG	11/4	Replace structure and hardware	0.0448		17
011013A_W1	FGT	11/7	Replace structure and hardware	0.0448		32
020513A_W6	FGT	16/1	Replace structure and hardware	0.0253		92
020613A_W1	FGT	17/1	Replace structure and hardware	0.0393		84
020813A_W4	FGT	17/6	Replace structure and hardware	0.0379		83
021313A_W1	FGT	19/4	Replace structure and hardware	0.0198		101
010813A_W3	FGT	20/4	Replace structure and hardware	0.0261		98
010713A_W4	FGT	21/5	Replace structure and hardware	0.0448		36

Table D-1. Proposed Structures within 100 feet of Streams

Waterway ID	Segment	Structure	Proposed Activities	Temporary Impacts (acres)	Permanent Impacts (acres)	Structure Distance to Stream (feet)
010713A_W6	FGT	21/6	Replace structure and hardware	0.0448		23
010913A_W1	FGT	22/2	Replace structure and hardware	0.0439		74
010913A_W12_B	FGT	22/9	Replace structure and hardware	0.0448		28
010913A_W15	FGT	23/1	Replace structure and hardware	0.0302		49
010913A_W15	FGT	23/2	Replace hardware	0.0448		49
010913A_W16	FGT	23/4	Replace structure and hardware	0.0448		66
021513A_W3	FGT	25/9	Replace structure and hardware	0.0040		116
121912A_W2	FGT	27/16	Replace structure and hardware	0.0448		24
010713A_W1	FGT	27/9	Replace structure and hardware	0.0448		39
021913A_W6	FGT	28/14	Replace structure and hardware	0.0448		73
021913A_W5	FGT	28/9	Replace structure and hardware	0.0129		106
021913A_W6	FGT	29/1	Replace structure and hardware	0.0365		73
022013A_W3	FGT	29/10	Replace structure and hardware	0.0448		24
021913A_W8	FGT	29/5	Replace structure and hardware	0.0448		28
021913A_W8	FGT	29/6	Replace structure and hardware	0.0448		28
022013A_W3	FGT	29/8	Replace structure and hardware	0.0448		24
022013A_W3	FGT	29/9	Replace structure and hardware	0.0290		24
022013A_W8	FGT	30/1	Install new poles and hardware	0.0446	0.0002	55
022113A_W4	FGT	30/11	Replace hardware	0.0329		89
022613A_W2	FGT	30/13	Replace structure and hardware	0.0448		43
022613A_W3	FGT	30/15	Replace structure and hardware	0.0059		111
022013A_W3	FGT	30/2	Replace structure and hardware	0.0166		24

Table D-1. Proposed Structures within 100 feet of Streams

Waterway ID	Segment	Structure	Proposed Activities	Temporary Impacts (acres)	Permanent Impacts (acres)	Structure Distance to Stream (feet)
022013A_W9	FGT	30/5	Replace structure and hardware	0.0370		86
022013A_W9	FGT	30/6	Replace structure and hardware	0.0448		0
022013A_W9	FGT	30/7	Replace structure and hardware	0.0211		61
022613A_W4	FGT	31/2	Replace structure and hardware	0.0448		34
022613A_W6	FGT	31/3	Replace structure and hardware	0.0448		73
022613A_W6	FGT	31/4	Replace structure and hardware	0.0001		73
022613A_W9	FGT	31/6	Replace structure and hardware	0.0448		52
022713A_W9	FGT	32/13	Install new poles and hardware	0.0281	0.0002	99
022713A_W2	FGT	32/4	Replace structure and hardware	0.0003		119
022713A_W3	FGT	32/5	Replace structure and hardware	0.0023		116
022813A_W1	FGT	33/1	Replace structure and hardware	0.0448		50
022813A_W2	FGT	33/6	Replace structure and hardware	0.0320		32
022813A_W3	FGT	33/7	Replace structure and hardware	0.0420		30
030113A_W7	FGT	34/13	Replace structure and hardware	0.0240		10
030113A_W12	FGT	34/15	Replace structure and hardware	0.0415		85
022813A_W7	FGT	34/2	Replace structure and hardware	0.0448		21
030513A_W2	FGT	35/4	Install new poles and hardware	0.0317	0.0002	27
030513A_W3	FGT	35/6	Replace structure and hardware	0.0448		39
030513A_W5	FGT	35/7	Move, replace structure and hardware	0.0448		17
030613A_W1	FGT	35/8	Replace structure and hardware	0.0448		46
030613A_W1	FGT	35/9	Replace structure and hardware	0.0448		46
030713A_W9	FGT	36/13	Replace structure and hardware	0.0448		40

Table D-1. Proposed Structures within 100 feet of Streams

Waterway ID	Segment	Structure	Proposed Activities	Temporary Impacts (acres)	Permanent Impacts (acres)	Structure Distance to Stream (feet)
030713A_W10_A	FGT	36/14	Replace structure and hardware	0.0358		30
030713A_W13	FGT	36/18	Replace structure and hardware	0.0064		81
030613A_W5	FGT	36/2	Replace structure and hardware	0.0063		110
030713A_W4	FGT	36/4	Replace structure and hardware	0.0167		104
030713A_W13	FGT	37/1	Replace structure and hardware	0.0408		81
030813A_W9	FGT	38/5	Replace structure and hardware	0.0081		114
031213A_W2	FGT	39/2	Replace structure and hardware	0.0362		85
031313A_W9	FGT	41/1	Replace structure and hardware	0.0177		100
031413A_W3	FGT	41/4	Replace structure and hardware	0.0096		114
031813A_W5	FGT	43/12	Replace structure and hardware	0.0343		73
031813A_W5	FGT	43/13	Replace structure and hardware	0.0448		73
031813A_W2	FGT	43/8	Replace structure and hardware	0.0448		68
031813A_W4	FGT	43/9	Replace structure and hardware	0.0038		116
031913A_W2	FGT	45/4	Replace structure and hardware	0.0448		23
032013A_W4	FGT	47/4	Replace hardware	0.0448		50
022713A_W7	FGT	32/10	Replace structure and hardware	0.0020		123
031413A_W8	FGT	42/1	Replace structure and hardware	0.0005		124
010913A_W3	FGT	22/3	Replace structure and hardware	0.0007		126
030613A_W4	FGT	35/12	Replace structure and hardware	0.0003		127
TOTAL				2.6768	0.0014	

KFG = Keeler-Forest Grove No. 1 transmission line; FGT = Forest Grove-Tillamook No. 1 transmission line.

Table D-2. Proposed Access Roads within 100 feet of Streams

Segment[1]	Road Number[2]	Proposed Activities	Waterway ID[3]	Fish Use	Road Segment Closest Distance to Stream (ft)	Stream Crossing[4] (y/n)
Keeler-Forest Grove (KFG)	008-060	Improve	053113A_D1	No	8	y
KFG	008-070	Improve	053113A_D1	No	1	y
KFG	008-072	Improve	053113A_D1	No	0	y
Forest Grove-Tillamook (FGT)	009-052	Improve	012813A_W6	Yes	6	n
FGT	009-052	Improve	053013A_D1	No	6	n
FGT	009-053	Improve	012813A_W6	Yes	28	y
FGT	012-013	Improve	053013A_W1	No	0	y
FGT	023-010	New construct	010913A_W15	Yes	52	n
FGT	033-070	New construct	022813A_W2	Yes	45	n
FGT	033-070	New construct	022813A_W3	Unknown	0	y
FGT	033-080	New construct	022813A_W7	Unknown	57	n
FGT	035-030	New construct	030513A_W2	No	74	n
FGT	036-140	New construct	030713A_W10_A	No	41	n
FGT	036-140	New construct	030713A_W10_B	No	41	n
FGT	012-020	Reconstruct	011013A_W3	No	2	n
FGT	012-020	Reconstruct	020113A_W2	Unknown	0	y
FGT	014-052	Reconstruct	020513A_W1_A	No	69	n
FGT	014-052	Reconstruct	020513A_W1_B	No	69	n
FGT	014-060	Reconstruct	020513A_W1_A	No	18	n
FGT	014-060	Reconstruct	020513A_W1_B	No	36	n
FGT	014-060	Reconstruct	020513A_W1_B	No	18	n
FGT	014-060	Reconstruct	020513A_W2	No	18	n
FGT	014-061	Reconstruct	020513A_W1_A	No	3	n
FGT	014-061	Reconstruct	020513A_W1_B	No	3	n
FGT	014-061	Reconstruct	020513A_W2	No	3	n
FGT	015-010	Reconstruct	020513A_W3	Unknown	2	n
FGT	015-061	Reconstruct	020513A_W5	No	0	y
FGT	017-055	Reconstruct	020813A_W4	Unknown	0	y
FGT	019-020	Reconstruct	021113A_W5	No	0	y
FGT	019-021	Reconstruct	021113A_W5	No	73	y
FGT	019-040	Reconstruct	021313A_W1	No	82	n
FGT	019-041	Reconstruct	021313A_W1	No	82	n
FGT	022-040	Reconstruct	010913A_W4	No	8	n

Table D-2. Proposed Access Roads within 100 feet of Streams

Segment[1]	Road Number[2]	Proposed Activities	Waterway ID[3]	Fish Use	Road Segment Closest Distance to Stream (ft)	Stream Crossing[4] (y/n)
FGT	022-072	Reconstruct	010913A_W12_A	No	31	n
FGT	022-072	Reconstruct	010913A_W12_B	No	31	n
FGT	025-080	Reconstruct	021513A_W3	No	0	y
FGT	025-080	Reconstruct	021513A_W5	No	76	n
FGT	026-010	Reconstruct	021513A_W5	No	28	n
FGT	026-011	Reconstruct	021513A_W5	No	39	n
FGT	027-070	Reconstruct	010713A_W1	Unknown	9	n
FGT	027-090	Reconstruct	010713A_W1	Unknown	25	n
FGT	027-091	Reconstruct	010713A_W1	Unknown	8	n
FGT	027-120	Reconstruct	05242013_D1	No	4	y
FGT	027-121	Reconstruct	05242013_D1	No	0	y
FGT	028-053	Reconstruct	021913A_W2	No	68	n
FGT	028-080	Reconstruct	021913A_W5	Yes	55	n
FGT	029-010	Reconstruct	021913A_W6	Yes	68	n
FGT	031-020	Reconstruct	022613A_W4	Yes	33	n
FGT	031-020	Reconstruct	022613A_W6	Yes	76	n
FGT	031-060	Reconstruct	022613A_W9	Unknown	52	n
FGT	031-100	Reconstruct	022613A_W11	No	66	n
FGT	032-050	Reconstruct	022713A_W3	No	0	y
FGT	032-050	Reconstruct	022713A_W4	No	0	y
FGT	032-070	Reconstruct	022713A_W5	No	0	y
FGT	032-090	Reconstruct	022713A_W7	Yes	77	n
FGT	032-110	Reconstruct	022713A_W9	Yes	97	n
FGT	034-080	Reconstruct	030113A_W4	Unknown	15	n
FGT	034-080	Reconstruct	030113A_W5	Unknown	15	n
FGT	034-121	Reconstruct	030113A_W6	No	21	n
FGT	034-121	Reconstruct	030113A_W7_B	No	0	n
FGT	034-121	Reconstruct	030113A_W7B	No	0	n
FGT	034-121	Reconstruct	030113A_W8_B	No	0	y
FGT	034-121	Reconstruct	030113A_W8B	No	0	y
FGT	035-061	Reconstruct	030513A_W3	Yes	22	n
FGT	035-061	Reconstruct	030513A_W5	No	33	n
FGT	036-130	Reconstruct	030713A_W9	Yes	40	n
FGT	037-010	Reconstruct	030713A_W13	Unknown	78	n

Table D-2. Proposed Access Roads within 100 feet of Streams

Segment[1]	Road Number[2]	Proposed Activities	Waterway ID[3]	Fish Use	Road Segment Closest Distance to Stream (ft)	Stream Crossing[4] (y/n)
FGT	041-040	Reconstruct	031413A_W2	No	0	y
FGT	041-040	Reconstruct	031413A_W3	No	92	n
FGT	043-080	Reconstruct	031813A_W2	Unknown	62	n
FGT	043-080	Reconstruct	052813A_W2	No	62	n
FGT	043-081	Reconstruct	031813A_W2	Unknown	4	n
FGT	043-081	Reconstruct	052813A_W2	No	21	n
FGT	043-081	Reconstruct	052813A_W2	No	4	n
FGT	043-090	Reconstruct	031813A_W4	Unknown	87	n
FGT	043-100	Reconstruct	031813A_W4	Unknown	87	n
FGT	043-111	Reconstruct	031813A_W5	No	100	n
FGT	043-130	Reconstruct	031813A_W5	No	35	n
FGT	043-131	Reconstruct	031813A_W5	No	26	n
FGT	047-022	Reconstruct	052813A_D2	Unknown	0	y
FGT	047-041	Reconstruct	052813A_D1	No	16	n

Notes:

[1] KFG=Keeler-Forest Grove No. 1 transmission line. FGT=Forest Grove-Tillamook No. 1 transmission line.

[2] Road numbers are derived from OTAK road data (OTAK 2013). Roads may be within 100 feet of more than one waterway.

[3] Waterway IDs and fish use are derived from the Turnstone waterways data (Turnstone 2013a).

[4] Stream crossings are derived by overlaying OTAK road data (OTAK 2013) with the Turnstone waterways data (Turnstone 2013a).

Table D-3. Potential Danger Tree Removal within Riparian Buffers

Waterway ID	Riparian Buffer	Segment	No. of Danger Trees
010713A_W1	50	Forest Grove-Tillamook	3
010713A_W3	100	Forest Grove-Tillamook	2
010713A_W6	100	Forest Grove-Tillamook	5
010813A_W4	50	Forest Grove-Tillamook	6
010913A_W1	20	Forest Grove-Tillamook	4
010913A_W12_A	20	Forest Grove-Tillamook	6
010913A_W12_B	20	Forest Grove-Tillamook	9
010913A_W12_C	20	Forest Grove-Tillamook	8
010913A_W15	100	Forest Grove-Tillamook	6
010913A_W16	20	Forest Grove-Tillamook	12
010913A_W17	20	Forest Grove-Tillamook	12
010913A_W3	20	Forest Grove-Tillamook	4
010913A_W8	20	Forest Grove-Tillamook	1
011613A_W8	50	Keeler-Forest Grove	24
011713A_W8	50	Keeler-Forest Grove	2
011813A_W4	50	Keeler-Forest Grove	0
012813A_W2	25	Forest Grove-Tillamook	6
020113A_W2	20	Forest Grove-Tillamook	10
020513A_W2	20	Forest Grove-Tillamook	6
020513A_W3	20	Forest Grove-Tillamook	9
020613A_W1	70	Forest Grove-Tillamook	260
020613A_W3	50	Forest Grove-Tillamook	17
020613A_W5	20	Forest Grove-Tillamook	21
021113A_W1	50	Forest Grove-Tillamook	10
021113A_W3	50	Forest Grove-Tillamook	10
021113A_W4	20	Forest Grove-Tillamook	2
021113A_W5	20	Forest Grove-Tillamook	3
021313A_W2	50	Forest Grove-Tillamook	7
021313A_W4	20	Forest Grove-Tillamook	6
021313A_W5	20	Forest Grove-Tillamook	6
021313A_W6	20	Forest Grove-Tillamook	1
021413A_W6	50	Forest Grove-Tillamook	10
021413A_W7	50	Forest Grove-Tillamook	10
021513A_W1	100	Forest Grove-Tillamook	8
021513A_W3	20	Forest Grove-Tillamook	1
021913A_W1	100	Forest Grove-Tillamook	4
021913A_W2	20	Forest Grove-Tillamook	4
021913A_W6	100	Forest Grove-Tillamook	1

Table D-3. Potential Danger Tree Removal within Riparian Buffers

Waterway ID	Riparian Buffer	Segment	No. of Danger Trees
022013A_W3	100	Forest Grove-Tillamook	1
022013A_W9	100	Forest Grove-Tillamook	32
022113A_W3	100	Forest Grove-Tillamook	27
022113A_W4	100	Forest Grove-Tillamook	3
022613A_W2	100	Forest Grove-Tillamook	71
022613A_W3	100	Forest Grove-Tillamook	14
022613A_W4	100	Forest Grove-Tillamook	3
022613A_W6	100	Forest Grove-Tillamook	35
022613A_W8	20	Forest Grove-Tillamook	9
022613A_W9	50	Forest Grove-Tillamook	19
022713A_W2	100	Forest Grove-Tillamook	1
022813A_W7	50	Forest Grove-Tillamook	1
030113A_W5	50	Forest Grove-Tillamook	25
030613A_W5	100	Forest Grove-Tillamook	28
030713A_W10_A	20	Forest Grove-Tillamook	150
030713A_W10_B	20	Forest Grove-Tillamook	42
030713A_W14	50	Forest Grove-Tillamook	3
030713A_W15	100	Forest Grove-Tillamook	5
030713A_W9	50	Forest Grove-Tillamook	276
030813A_W5	20	Forest Grove-Tillamook	3
030813A_W6	20	Forest Grove-Tillamook	3
030813A_W7	50	Forest Grove-Tillamook	1
031213A_W1	50	Forest Grove-Tillamook	13
031313A_W2	20	Forest Grove-Tillamook	6
031313A_W3	50	Forest Grove-Tillamook	10
031313A_W5	20	Forest Grove-Tillamook	4
031313A_W6	20	Forest Grove-Tillamook	1
031313A_W7	20	Forest Grove-Tillamook	1
031313A_W8	20	Forest Grove-Tillamook	1
031413A_W1	50	Forest Grove-Tillamook	13
031413A_W3	20	Forest Grove-Tillamook	1
031413A_W4	50	Forest Grove-Tillamook	11
		TOTAL	**1,329**

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Appendix E
National Ambient Air Quality Standards (NAAQS)

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Table E-1. Summary of National Ambient Air Quality (NAAQS) Standards

Criteria Pollutant	Average Time	NAAQS	NAAQS Exceedance Level	Oregon Exceedance Level
Carbon monoxide	1-hour	Not to be exceeded more than once/year.	35 ppm	35 ppm
	8-hour	Not to be exceeded more than once/year.	9 ppm	9 ppm
Lead	Calendar Quarter	Quarterly arithmetic mean.	0.15 μg/m^3	0.15 μg/m^3
Nitrogen dioxide	Annual	Annual arithmetic mean.	53 ppb	53 ppb
	1-hour	3-year average of the maximum daily 98th percentile one hour average.	100 ppb	NA
Ozone	8-hour	3-year average of the annual 4th highest daily maximum 8-hour average concentration.	75 ppb	75 ppb
Particulate Matter				
$PM_{2.5}$	24-hour	98th percentile of the 24-hour values determined for each year. 3-year average of the 98th percentile values.	35 μg/m^3	35 μg/m^3
	Annual Average	3-year average of the annual arithmetic mean.	15 μg/m^3	15 μg/m^3
PM_{10}	24-hour	The expected number of days per calendar year with a 24-hour average concentration above 150 μg/m^3 is equal to or less than 1 over a 3-year period.	150 μg/m^3	150 μg/m^3
Sulfur dioxide	1-hour	3-year average of the maximum daily 99th percentile one hour average.	75 ppb	NA

Source: EPA (U.S. Environmental Protection Agency). 2012. National Ambient Air Quality Standards (NAAQS) website. Available at URL = http://www.epa.gov/air/criteria.html. Last updated 12/14/2012; accessed March 2013.

μg/m^3 = micrograms per cubic meter; NA = not applicable; $PM_{2.5}$ = particulate matter less than 2.5 microns in size; PM_{10} = particulate matter less than 10 microns in size; ppm = parts per million; ppb = parts per billion.

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Appendix F
Greenhouse Gas Supplemental Information

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APPENDIX F

Greenhouse Gas Supplemental Information

Greenhouse gases (GHG) are chemical compounds in the Earth's atmosphere that absorb and trap infrared radiation as heat. They are released both naturally and through human activities such as deforestation, soil disturbance, and burning of fossil fuels. These activities disrupt the natural cycle by increasing the GHG emission rate over the storage rate, which results in a net increase of GHGs in the atmosphere. The resulting build-up of heat in the atmosphere due to increased GHG levels causes warming of the planet through a greenhouse-like effect (EIA 2009b). Increasing levels of GHGs could increase the Earth's temperature by up to 7.2 degrees Fahrenheit by the end of the 21st century (EPA 2010a).

The principal GHGs emitted into the atmosphere through human activities are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases (EPA 2010a).

- **Carbon dioxide** is the major GHG emitted (EPA 2010a; Houghton 2010). CO_2 enters the atmosphere as a result of such activities as land use changes, the burning of fossil fuels (e.g., coal, natural gas, oil, and wood products), and the manufacturing of cement. CO_2 emissions resulting from the combustion of coal, oil, and gas constitute 81 percent of all U.S. GHG emissions (EIA 2009a). Before the industrial revolution, CO_2 concentrations in the atmosphere were roughly stable at 280 parts per million (ppm). By 2005, CO_2 levels had increased to 379 ppm, a 36 percent increase, as a result of human activities (IPCC 2007).
- **Methane** is emitted during the processing and transport of fossil fuels, through intensive animal farming, and by the degradation of organic waste. Concentrations of CH_4 in the atmosphere have increased 148 percent above preindustrial levels (EPA 2010a).
- **Nitrous oxide** is emitted during agricultural and industrial activities and during the combustion of fossil fuels and solid waste. Atmospheric levels of N_2O have increased 18 percent since the beginning of industrial activities (EPA 2010a, b).
- **Fluorinated gases**, including hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6), are synthetic compounds emitted through industrial processes. They are replacing ozone-depleting compounds such as chlorofluorocarbons (CFCs) in insulating foams, refrigeration, and air conditioning. Although they are emitted in small quantities, fluorinated gases have the ability to trap more heat than CO_2 and are considered gases with a high ***global warming potential (GWP)***. Atmospheric concentrations of fluorinated gases have been increasing over the last 20 years, and this trend is expected to continue (EPA 2010a).

While models predict that atmospheric concentrations of all GHGs will increase over the next century due to human activity, the extent and rate of change are difficult to predict, especially on a global scale. As a response to concerns over the predicted increase of global GHG levels, various federal and state mandates address the need to reduce GHG emissions, including those described below.

- The U.S. Environmental Protection Agency (EPA) has issued the *Final Mandatory Reporting of Greenhouse Gases Rule,* which requires reporting of GHG emissions from large sources(40 CFR Part 98). Under the rule, suppliers of fossil fuels or industrial GHGs, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHGs are required to submit annual reports to EPA, although no other action is required (EPA 2010b).

- Executive Orders 13423 and 13514 require federal agencies to measure, manage, and reduce GHG emissions by agency-defined target amounts and dates.

Activities that Would Contribute to Greenhouse Gas Emissions

The Proposed Action would involve rebuilding the existing Keeler-Forest Grove No. 1 and Forest Grove-Tillamook No. 1 transmission lines. Under the No Action Alternative, the transmission lines would not be rebuilt and ongoing operation and maintenance of the deteriorating lines would continue. Implementation of the Proposed Action would contribute to an increase in GHG concentrations through the following activities, each described in more detail below:

- **Construction:** Use of gasoline and diesel-powered vehicles, including cars, trucks, construction equipment, and helicopters.
- **Ongoing operation and maintenance:** Use of gasoline and diesel-powered vehicles for routine patrols, maintenance project work (vegetation management and site-specific repairs of roads and transmission line structures and associated hardware), emergency maintenance, and resource review.
- **Ongoing operation and maintenance:** Use of helicopters for aerial inspections of the transmission line corridor.

Methods Used to Calculate Greenhouse Gases

Construction

Construction of the Proposed Action would take approximately 9 months (April 2014 through December 2014), with peak construction activity, including road and structure installation, occurring during a 6-month period. Non-peak construction activities would include installing and removing best management practice (BMP) measures; establishing staging areas; moving equipment and materials into and out of the project rights-of-way (ROWs), access roads, and material yards; and site preparation and restoration work.

The transportation components of GHG emissions were estimated for the Proposed Action based on the approximate number of vehicles that would be used during project construction and the approximate distance those vehicles would travel. GHG emissions were calculated for both the 6-month peak construction period and the 2-month non-peak period based on estimates of vehicle round trips per day.

Overestimating the number of round trips ensures that GHG emission estimates are conservatively high. The number of round trips was deliberately overestimated using the following assumptions.

- The round-trip distance to the project area is the distance from Hillsboro, Oregon, to Tillamook, Oregon and back (about 120 miles round trip).
- All workers would travel in separate vehicles to and within the project area each day.
- A maximum number of workers would be required to construct the Rebuild Project.
- All workers would travel the full length of the project area each day. Although this is true for some workers such as inspectors, other workers could be localized.

- Fuel consumption is based on the average fuel economy for standard pickup trucks of 18 miles per gallon (mpg). Again, this is likely an overestimation as more efficient vehicles may be used.
- Average helicopter fuel consumption is estimated by BPA pilots at 1.0 mpg.

Up to 24 construction workers would be at work on the transmission line during the peak construction period (6 months), and an estimated 10 workers could be present during the non-peak construction period (3 months).

BPA staff would travel to the transmission line for various purposes, such as road inspection, work inspection, staff meetings, environmental compliance monitoring, and meetings with landowners. An estimated two round trips per week from Portland, Oregon during the 9-month-long construction period would result in a total of 64 round trips at an estimated average of 160 miles per trip.

Helicopters may be used to replace some structures. After the equipment (puller and tensioner) is positioned, a sock line (usually a rope) is strung through all of the structures using a helicopter. The helicopter would likely be used for approximately two trips per week to conduct this work. An estimated two round trips per week would result in a total of 72 round trips from the Portland Airport with an estimated average of 80 miles per trip.

Fuel consumption and GHG emissions would also result from operation of on-site heavy construction equipment. Heavy construction equipment may include augers, bulldozers, excavators, graders, heavy-duty trucks, and front-end-loaders. Increased use of heavy construction equipment would occur during peak construction.

Although it is difficult to develop an accurate estimate of total fuel consumption associated with heavy construction equipment operation, the following assumptions were used.

- A maximum of 20 heavy equipment machines would be in operation during peak construction, and 10 heavy equipment machines would be in operation during off-peak construction.
- The average size of the equipment would not exceed 250 horsepower. All equipment would operate at maximum power for 8 hours per day and 5 days per week throughout the construction phase. This is an overestimation because equipment commonly operates in idle or at reduced power.
- Equipment would operate at approximately 35 percent efficiency, representing the percentage of productive energy extracted from the diesel fuel relative to the maximum potential energy within the fuel (i.e., 138,000 British thermal units per gallon of diesel) (DOE and EPA 2011).

GHG emissions associated with equipment operation were overestimated to account for all potential construction activities and associated material deliveries to and from the construction site. They are also expected to account for the GHG emissions related to temporary soil disruption and damaged vegetation from construction activities, which were not estimated separately in this analysis. GHG emissions that result from soil disturbance are short-lived and return to background levels within several hours (Kessavalou et al. 1998). Emissions from decomposing vegetation would also be relatively short-lived where vegetation would be allowed to reestablish following construction.

Operation and Maintenance

During operation and maintenance of the transmission line, the following annual activities would result in GHG emissions:

- Routine patrols (access road, structure, and vegetation inspections): 1 round trip per year, from the BPA Salem office, 200 miles round trip.
- Maintenance of roads and structures and associated hardware: 1 round trip per year, from the BPA Salem office, 200 miles.
- Emergency maintenance to address line outages, landslides, and other unpredicted events: 0.25 round trips per year (approximately 1 trip every 4 years), from BPA Salem office, 200 miles round trip.
- Natural resource review to address vegetation management issues: 0.25 round trips per year (approximately 1 trip every 4 years), from the BPA Salem office, 200 miles round trip.
- Aerial inspections by helicopter: 2 round trips from Portland Airport to Tillamook, Oregon, 160 miles round trip.

Vegetation management activities, including mowing along roadsides and weed control, would be conducted during most years. Since vegetation management does not include permanent vegetation removal, this activity was not included in GHG calculations.

Calculations of GHG emissions include operations and maintenance work for the estimated 50-year life span of the rebuilt transmission line.

Results

GHG emissions were calculated using the estimated values described above for two types of activities: construction of the Proposed Action, and ongoing annual operation and maintenance for the estimated 50-year life span of the transmission lines. Each type of activity is described separately below.

Construction Emissions

Table F-1 displays the results of calculations for the construction activities that would contribute to GHG emissions. Construction of the Proposed Action would result in an estimated 4,869 metric tons of equivalent carbon dioxide (CO_2e[1]) emissions. All GHG emissions associated with construction activities would occur in the first year. The project's contribution to GHG emissions during construction would be **low** (see Section 3.10, *Air Quality*).

[1] CO_2e is a unit of measure used by the Intergovernmental Panel on Climate Change (IPCC) that takes into account the ***global warming potential*** of each of the emitted GHGs using global warming potential factors.

Table F-1. Estimated Greenhouse Gas Emissions from Project Construction.

Estimated GHG Emissions of Construction Activities	CO_2[a] (metric tons)	CH_4 (CO_2e)[a, b] (metric tons)	N_2O (CO_2e)[a, b] (metric tons)	Total CO_2e (metric tons)[c]
Peak construction transportation	185	128	766	1,079
Off-peak construction transportation	39	26	159	224
BPA employee transportation	6	4	26	36
Helicopter operation	26	0	1	27
Peak construction: equipment operation	2,781	3	19	2,803
Off-peak construction: equipment operation	695	1	5	700
TOTAL [c]	3,731	163	975	4,869

[a] CO_2 emission factors calculated from DOE and EIA (2005). CH_4 and N_2O emission factors from EPA (2007).

[b] CH_4 and N_2O emissions were converted into units of CO_2e using the IPCC GWP factors of 21 GWP for CH_4 and 310 GWP for N_2O (ICBE 2000).

[c] The sum of the individual entries may not sum to the total depicted due to rounding.

Operation and Maintenance Emissions

Table F-2 displays the contribution to GHG emissions that would result from operation and maintenance activities. Proposed project operation and maintenance would result in an estimated 101 metric tons of CO_2e emissions over the life of the project. Given this estimate, the impact of operations and maintenance activities on GHG emissions would be **low** (see Section 3.10, *Air Quality*).

Table F-2. Estimated Greenhouse Gas Emissions from Project Operations and Maintenance.

Type of Operation and Maintenance Activity	CO_2[a] (metric tons)	CH_4 (CO_2e)[a, b] (metric tons)	N_2O (CO_2e)[a, b] (metric tons)	Total CO_2e (metric tons)[c]
Routine patrols	5	1	21	27
Maintenance work	5	1	21	27
Emergency maintenance	1	0	5	7
Natural resource review	1	0	5	7
Helicopter surveys	33	1	0	34
TOTAL[3]	46	51	4	101

[1] CO_2 emission factors calculated from DOE and EIA (2005). CH_4 and N_2O emission factors from EPA (2007).

[2] CH_4 and N_2O emissions have been converted into units of CO_2e using the IPCC GWP factors of 21 GWP for CH_4 and 310 GWP for N_2O (ICBE 2000).

[3] The sum of the individual entries may not sum to the total depicted due to rounding.

Summary of Results

The Proposed Action would result in an estimated total of 4,869 metric tons of CO_2e emissions during the construction phase, and an estimated 101 metric tons of CO_2e emissions from ongoing operation and maintenance activities over the life of the project.

To provide context for this level of emissions, EPA's mandatory reporting threshold for annual CO_2 emissions is 25,000 metric tons of CO_2e, roughly the amount of CO_2 generated by 4,400 passenger vehicles per year. The project construction emissions would be equivalent to the emissions from approximately 643 passenger vehicles during the 9-month construction period. Project operation and maintenance emissions would be equivalent to the emissions from approximately 18 passenger vehicles per year. All levels of GHG emissions are important in that they contribute to global GHG concentrations and climate change, but given the small anticipated contribution from the Rebuild Project, the impact on GHG concentrations would be **low**.

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