
Pacific Direct Current Intertie Upgrade The Dalles, Oregon to the Nevada-Oregon Border Draft Environmental Assessment

January 2014



DOE/EA-1937
DOI-BLM-OR-L050-2014-0001-EA



Contents

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION	1-1
1.1 Introduction	1-1
1.2 Need for Action.....	1-3
1.3 Purposes of Action	1-3
1.4 Cooperating Agency.....	1-4
1.5 Public Involvement	1-4
1.5.1 Scoping and Issue Summary	1-4
CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES	2-1
2.1 Proposed Action	2-1
2.1.1 Existing Right-of-Way and Transmission Line.....	2-4
2.1.2 Upgrade Activities.....	2-9
2.1.3 Construction Schedule.....	2-15
2.1.4 Ongoing Maintenance and Vegetation Management.....	2-16
2.2 No Action Alternative	2-17
2.3 Alternatives Considered But Eliminated From Detailed Study	2-17
2.4 Comparison of Alternatives	2-18
CHAPTER 3: AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES, AND MITIGATION MEASURES	3-1
3.1 Introduction	3-1
3.2 Land Use and Recreation	3-3
3.2.1 Affected Environment	3-3
3.2.2 Environmental Consequences – Proposed Action	3-8
3.9 Potential impacts to sensitive habitats, visual quality, and cultural resources are addressed in Sections 3.4, Upland Vegetation, 1.1,.....	3-11
3.9.1 Mitigation – Proposed Action	3-13

3.9.2	Unavoidable Impacts Remaining after Mitigation – Proposed Action	3-14
3.9.3	Environmental Consequences – No Action	3-14
3.10	Geology and Soils.....	3-15
3.10.1	Affected Environment	3-15
3.10.2	Environmental Consequences – Proposed Action	3-19
3.10.3	Mitigation – Proposed Action	3-22
3.10.4	Unavoidable Impacts Remaining after Mitigation – Proposed Action	3-22
3.10.5	Environmental Consequences – No Action.....	3-23
3.4	Upland Vegetation.....	3-25
3.4.1	Affected Environment	3-25
3.4.2	Environmental Consequences – Proposed Action	3-40
3.4.3	Mitigation – Proposed Action	3-51
3.4.4	Unavoidable Impacts Remaining after Mitigation – Proposed Action	3-54
3.4.5	Environmental Consequences – No Action.....	3-54
3.5	Wildlife.....	3-55
3.5.1	Affected Environment	3-55
3.5.2	General Wildlife by Ecoregion.....	3-55
3.5.3	Special Status Species or Habitats.....	3-56
3.5.4	Environmental Consequences – Proposed Action	3-64
3.5.5	Mitigation – Proposed Action	3-69
3.5.6	Unavoidable Impacts Remaining after Mitigation – Proposed Action	3-72
3.5.7	Environmental Consequences – No Action.....	3-72
3.6	Fish and Water Resources	3-73
3.6.1	Surface Water Affected Environment	3-73
3.6.2	Special Status Fish Species or Habitat Affected Environment.....	3-81
3.6.3	Groundwater Affected Environment	3-82
3.6.4	Environmental Consequences – Proposed Action	3-83
3.6.5	Mitigation – Proposed Action	3-89

3.6.6	Unavoidable Impacts Remaining after Mitigation – Proposed Action	3-91
3.6.7	Environmental Consequences – No Action	3-91
3.7	Wetlands	3-93
3.7.1	Affected Environment	3-93
3.7.2	Environmental Consequences – Proposed Action	3-94
3.7.3	Mitigation – Proposed Action	3-95
3.7.4	Unavoidable Impacts Remaining after Mitigation – Proposed Action	3-95
3.7.5	Environmental Consequences – No Action	3-96
3.8	Floodplains	3-97
3.8.1	Affected Environment	3-97
3.8.2	Environmental Consequences – Proposed Action	3-97
3.8.3	Mitigation – Proposed Action	3-98
3.8.4	Unavoidable Impacts Remaining after Mitigation – Proposed Action	3-99
3.8.5	Environmental Consequences – No Action	3-99
3.9	Visual Quality	3-101
3.9.1	Affected Environment	3-101
3.9.2	Environmental Consequences – Proposed Action	3-105
3.9.3	Mitigation – Proposed Action	3-107
3.9.4	Unavoidable Impacts Remaining after Mitigation – Proposed Action	3-108
3.9.5	Environmental Consequences – No Action	3-108
3.10	Air Quality	3-109
3.10.1	Affected Environment	3-109
3.10.2	Environmental Consequences – Proposed Action	3-110
3.10.3	Mitigation – Proposed Action	3-110
3.10.4	Unavoidable Impacts Remaining after Mitigation – Proposed Action	3-111
3.10.5	Environmental Consequences – No Action	3-111
3.11	Socioeconomics and Public Services	3-113
3.11.1	Affected Environment	3-113

3.11.2	Environmental Consequences – Proposed Action	3-116
3.11.3	Mitigation – Proposed Action	3-119
3.11.4	Unavoidable Impacts Remaining after Mitigation – Proposed Action	3-120
3.11.5	Environmental Consequences – No Action.....	3-120
3.12	Cultural Resources.....	3-121
3.12.1	Affected Environment	3-121
3.12.2	Environmental Consequences – Proposed Action	3-126
3.12.3	Mitigation – Proposed Action	3-127
3.12.4	Unavoidable Impacts Remaining after Mitigation – Proposed Action	3-128
3.12.5	Environmental Consequences – No Action.....	3-128
3.13	Noise, Public Health, and Safety	3-129
3.13.1	Affected Environment	3-129
3.13.2	Environmental Consequences – Proposed Action	3-133
3.13.3	Mitigation – Proposed Action	3-137
3.13.4	Unavoidable Impacts Remaining after Mitigation – Proposed Action	3-138
3.13.5	Environmental Consequences – No Action.....	3-139
3.14	Climate Change	3-141
3.14.1	Affected Environment	3-141
3.14.2	Environmental Consequences – Proposed Action	3-141
3.14.3	Mitigation – Proposed Action	3-142
3.14.4	Unavoidable Impacts Remaining after Mitigation – Proposed Action	3-143
3.14.5	Environmental Consequences – No Action.....	3-143
3.15	Cumulative Impacts.....	3-145
3.15.1	Past Actions.....	3-145
3.15.2	Current and Reasonably Foreseeable Future Actions.....	3-146
3.15.3	Cumulative Impact Analysis	3-149

CHAPTER 4: ENVIRONMENTAL CONSULTATION, REVIEW, AND PERMIT REQUIREMENTS4-1

4.1 National Environmental Policy Act 4-1

4.2 Land Use and Recreation 4-1

 4.2.1 Federal Land Policy and Management Act 4-1

 4.2.2 National Forest Management Act..... 4-3

 4.2.3 Farmland Protections Policy Act..... 4-3

 4.2.4 Wild and Scenic Rivers Act 4-4

 4.2.5 State and Local Land Use Planning Framework 4-5

4.3 Geology and Soils 4-6

 4.3.1 Omnibus Public Land Management Act—Paleontological Resources Preservation..... 4-6

4.4 Vegetation, Fish, and Wildlife 4-7

 4.4.1 Endangered Species Act..... 4-7

 4.4.2 Fish and Wildlife Conservation Act and Fish and Wildlife Coordination Act 4-8

 4.4.3 Magnuson-Stevens Fishery Conservation and Management Act 4-8

 4.4.4 Migratory Bird Treaty Act and Federal Memorandum of Understanding..... 4-8

 4.4.5 Bald Eagle and Golden Eagle Protection Act..... 4-9

 4.4.6 Executive Order on Invasive Species 4-10

4.5 Water Resources and Water Quality 4-10

 4.5.1 Clean Water Act 4-10

4.6 Wetlands and Floodplain Protection 4-11

 4.6.1 Executive Order on Protection of Wetlands 4-11

4.7 Air Quality..... 4-11

 4.7.1 Clean Air Act 4-11

4.8 Socioeconomics and Public Services 4-12

 4.8.1 Federal Communications Commission..... 4-12

 4.8.2 Executive Order on Environmental Justice 4-12

4.9 Cultural and Historical Resources..... 4-12

4.10	Noise, Public Health, and Safety	4-13
4.10.1	Maximum Environmental Noise Levels.....	4-13
4.10.2	The Spill Prevention Control and Countermeasures Act.....	4-13
4.10.3	Title III of the Superfund Amendments Act.....	4-14
4.10.4	Uniform Fire Code	4-14
4.10.5	Toxic Substances Control Act	4-14
4.10.6	Federal Insecticide, Fungicide, and Rodenticide Act	4-14
4.10.7	Resource Conservation and Recovery Act	4-14
4.10.8	Transportation Permits	4-15
4.11	Climate Change	4-15
4.12	Requirements Not Applicable to this Project	4-16
4.12.1	Permits for Structures in Navigable Waters	4-16
4.12.2	Safe Drinking Water Act	4-16
4.12.3	Notice to Federal Aviation Administration	4-16
4.12.4	Energy Conservation at Federal Facilities	4-16
4.12.5	National Scenic Byways Program	4-16
4.12.6	Protected Area Amendments	4-16
4.12.7	Coastal Zone Management Act	4-16
CHAPTER 5: PERSONS, TRIBES, AND AGENCIES CONSULTED.....		5-1
5.1	Federal.....	5-1
5.2	State.....	5-1
5.2.1	State of Oregon.....	5-1
5.3	Tribes.....	5-1
5.4	Local Governments and Utilities.....	5-2
5.4.1	County	5-2
5.4.2	City.....	5-2
5.4.3	Utilities	5-2

5.5	Public Interest Groups.....	5-3
CHAPTER 6: GLOSSARY AND ACRONYMS		6-1
6.1	Glossary.....	6-1
6.2	Acronyms and Abbreviations.....	6-3
CHAPTER 7: REFERENCES.....		7-1

Tables

Table 2.1-1:	Overview of Proposed Action	2-3
Table 2.1-2:	Existing and Proposed Upgraded Transmission Line Elements.	2-4
Table 2.1-3:	Equipment Used in Access Road Work	2-13
Table 2.4-1:	Comparison of the Proposed Action and No Action Alternative	2-18
Table 2.4-2:	Summary of Impacts of the Proposed Action and No Action Alternative	2-19
Table 3.2-1:	Landowners Crossed by the Transmission Line and Access Roads	3-3
Table 3.2-2:	Land Uses Crossed by the Transmission Line and Access Roads	3-3
Table 3.2-3:	Landownership Impacts	3-9
Table 3.2-4:	Land Use Impacts.....	3-9
Table 3.10-1:	NRCS Land Classifications within the Project Impact Area	3-16
Table 3.10-2:	Road Lengths in Areas of Steep Slopes	3-17
Table 3.10-3:	Existing Towers on Steep Slopes	3-19
Table 3.10-4:	Potential Hazards at New Dead-End Tower Sites.....	3-20
Table 3.10-5:	Areas of Highest Concentration of Steep Slopes	3-20
Table 3.4-1:	Upland Vegetation Types in the Project Area.....	3-27
Table 3.4-2:	Rare Plant Species Documented Along the BPA PDCI Transmission Corridor.....	3-34
Table 3.4-3:	Presence of Rare Plant Species by Tower Number Along the BPA PDCI Transmission Corridor	3-35
Table 3.4-4:	Noxious Weeds Located in the Project Area.....	3-38
Table 3.4-5:	Overall Permanent and Temporary Impacts of the Project to Vegetation Types.....	3-42
Table 3.4-6:	Upland Vegetation Impacts a	3-43
Table 3.4-7:	Impacts to Upland Vegetation Types at Existing Towers.....	3-44
Table 3.4-8:	Impacts to Upland Vegetation Types at New Dead-End Towers	3-45

Table 3.4-9: Impacts to Upland Vegetation Types for Road Improvements and New Road Construction	3-48
Table 3.5-1: Oregon Department of Fish and Wildlife Mitigation Goals and Implementation Standards by Habitat Category	3-61
Table 3.5-2: Total Acreage of Vegetation Type and ODFW Habitat Category ^a	3-63
Table 3.5-3: Potential Impacts to Sage Grouse Habitat.....	3-66
Table 3.5-4: New Right-of-way to be acquired in Sage-Grouse Habitat.....	3-66
Table 3.5-5: Raptor Nest Spatial and Seasonal Buffers.....	3-70
Table 3.5-6: Total Acreage of Vegetation Type and ODFW Habitat Category	3-71
Table 3.6-1: Fish-Bearing Perennial Streams Crossed by the Project	3-74
Table 3.6-2: Scale of Severity of Ill Effect Associated with Excess Suspended Sediment.....	3-85
Table 3.8-1: Construction Activities within a 100-Year Floodplain	3-98
Table 3.9-1: Designated BLM Site VRM Classification	3-107
Table 3.13-1: Sound Levels of Common Sources and Noise Environments.....	3-130
Table 3.13-2: Existing Audible Corona Noise Levels (dBA).....	3-130
Table 3.13-3: Predicted Audible Noise Levels (dBA).....	3-134
Table 3.13-4: Typical Construction Equipment Noise (dBA).....	3-135
Table 3.13-5: DC Magnetic-field (mG) Levels for Existing and Proposed Operation.....	3-136
Table 3.13-6: Total Electric Field Predictions for the Existing and Proposed PDCI	3-137
Table 3.14-1: Net Carbon Footprint of the Proposed Action.....	3-142

Figures

Figure 1.1-1: PDCI Overview Map	1-2
Figure 2.1-1: Project Location Map.....	2-2
Figure 2.1-2: Existing PDCI Line North of US 97-US 197 Intersection (looking north from Tower 48/1, Big Eddy-Redmond No 1 is on the right).....	2-5
Figure 2.1-3: Existing PDCI Line Irrigated Agricultural Land South of the Crooked River (Tower 91/2 looking south).....	2-6
Figure 2.1-4: Existing PDCI Line BLM Land South of US 395 (Tower 220/2 looking south).....	2-7
Figure 2.1-5: Transmission Line Towers.....	2-8
Figure 2.1-6: Original Guyed Tower Construction (circa 1969)	2-9
Figure 2.1-7: Glass Insulators on Dead-end and Rigid Insulators on Guyed Tower	2-10
Figure 2.1-8: Timing of Construction Activity	2-16

Figure 3.2-1: Landownership.....	3-4
Figure 3.2-2: Land Cover.....	3-5
Figure 3.10-1: Geologic Provinces of Oregon.....	3-15
Figure 3.4-1: EPA Level III Ecoregions of Oregon.....	3-26
Figure 3.6-1: Waterways, Fish, Wetlands and Floodplains.....	3-76
Figure 3.6-2: Duration of Exposure to Suspended Sediment	3-86
Figure 3.9-1: Celilo Converter Station South of The Dalles on US 197	3-101
Figure 3.9-2: Transmission Line Crossing of US 97 at Tower 61/1.....	3-102
Figure 3.9-3: Shrubland near Tower 207/5.....	3-102

Chapter 1: Purpose of and Need for Action

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 in the Pacific Northwest. The transmission lines move most of the high-voltage power from generation facilities 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 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 [USC] 838b(b-d)).

The Pacific Direct Current Intertie (PDCI) is an existing 846-mile long high voltage direct current (HVDC) electric power pathway directly linking the Northwest and Southern California power systems (see Figure 1.1-1). The PDCI is also known as the Celilo-Sylmar ± 500 -kilovolt (kV) transmission line. BPA owns and operates a 265-mile portion of the PDCI transmission line from its Celilo Converter Station in The Dalles, Oregon south to the Nevada-Oregon border.

BPA is proposing to upgrade its portion of the PDCI from its current ± 500 kilovolt (kV) voltage line with 3,100 *megawatt* (MW)¹ north to south transfer capability to a voltage of ± 520 kV with 3,220 MW north to south transfer capability. Equipment upgrades would improve reliability and performance of the aging line. To upgrade the line, existing transmission towers would remain in place, but these towers would be fitted with new hardware assemblies, insulators, dampers, and shunts. To protect against tower corrosion, corrosion protection *anodes* would be replaced or installed at the base of about 160 existing towers. About 1.8 miles of the existing transmission line would be *reconducted* to match the remainder of the line. In order to improve reliability of the line in the event of tower failure, 4 new *dead-end* towers would be constructed. BPA also would ensure access to the line in all areas by improving existing access roads, constructing short segments of new road, and acquiring any necessary land rights for these roads.

This Environmental Assessment (EA) was prepared for this proposal by BPA pursuant to regulations implementing the National Environmental Policy Act (NEPA) (42 USC 4321 et seq.), which requires federal agencies to assess the impacts their actions may have on the environment. BPA prepared this EA to determine if the PDCI Upgrade Project (Upgrade 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).

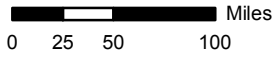
¹ Terms defined in the glossary (Chapter 6) are shown in *bold, italicized* typeface the first time they are used.

Pacific Direct Current Intertie (PDCI) Transmission Line Upgrade

Overview Figure 1.1-1

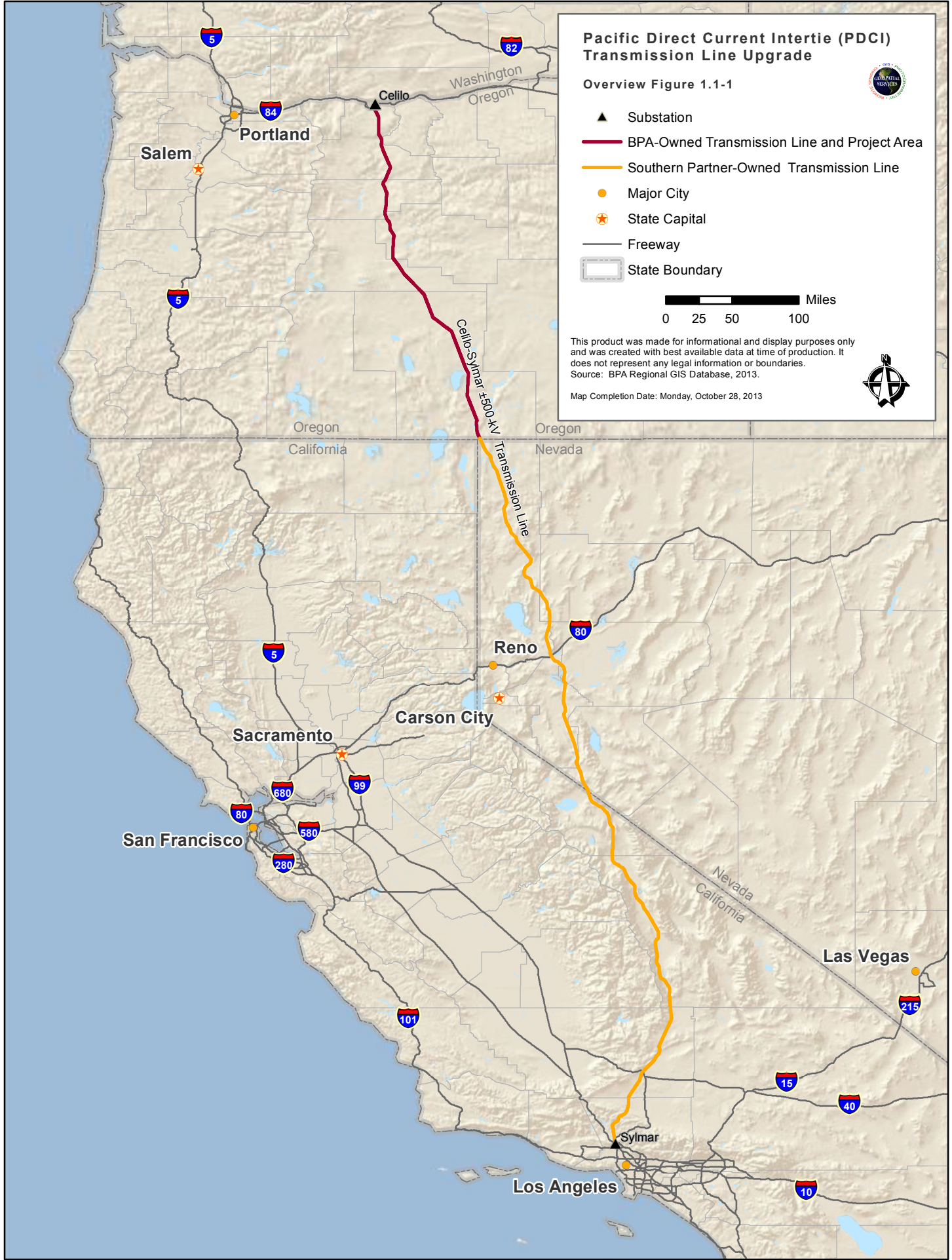


- ▲ Substation
- BPA-Owned Transmission Line and Project Area
- Southern Partner-Owned Transmission Line
- Major City
- ★ State Capital
- Freeway
- ▭ State Boundary



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. Source: BPA Regional GIS Database, 2013.

Map Completion Date: Monday, October 28, 2013



1.2 NEED FOR ACTION

BPA needs to take action to ensure the integrity and reliability of its portion of the existing PDCI transmission line.

Aging and corroding equipment. The PDCI line was built in the late 1960s and has been in service since 1970. Only routine maintenance has been performed on the line during the past four decades. As a result, excess corrosion has been identified on about 160 towers. Aging insulators and equipment also need replacement.

Does not meet transmission line policy. BPA has a policy (Transmission and Structure Usage for Transmission Line Longitudinal Failure Containment Policy) that provides requirements to limit the risk for multiple transmission towers falling over in a domino effect. The policy was revised in 2010 to be more stringent. Several straight long line sections of the PDCI line are now considered vulnerable under the policy and must be reinforced to contain the possible event of cascading tower failures.

Deficient access. There is a need to provide better access to the transmission line. Some towers do not have permanent *access roads* to reach them, which makes both normal and emergency maintenance difficult, and at times unsafe. Other roads would need to be improved to allow construction equipment and vehicles access during proposed construction, as well as year round for maintenance.

Capacity does not match other line segment. The southern portion of the PDCI line (from the Nevada-Oregon border to Sylmar) is capable of transferring 3,220 MW and the utilities (Southern Partners) that own and operate this section of line, upgraded their Sylmar Converter Station in 2004. BPA has not upgraded the capacity of its portion of the PDCI since 1984 and currently cannot transfer more than 3,100 MW on this portion. In order to ensure efficient use of the PDCI, the BPA portion of the PDCI needs to be upgraded to match the capacity of the Nevada-Oregon boarder to Sylmar section of the PDCI.

1.3 PURPOSES OF ACTION

Purposes are defined here as goals to be achieved while meeting the need for 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 National Environmental Safety Code (NESC).
- Minimize environmental impacts.
- Continue to meet BPA's contractual and statutory obligations.
- Demonstrate cost-effectiveness.

1.4 COOPERATING AGENCY

The Council on Environmental Quality (CEQ) regulations implementing NEPA allow for the designation of other federal, state, and local agencies and Indian Tribes as cooperating agencies for an EA where appropriate. Agencies or tribes may be designated a cooperating agency if they have jurisdiction by law or special expertise with respect to any environmental impact involved in a proposed project.

Parts of the existing transmission line corridor and associated access roads cross federal lands that are managed by the Bureau of Land Management (BLM). In addition, BPA is requesting a right-of-way grant for some facilities on BLM land. BLM is authorized by the Federal Land Policy and Management Act of 1976 (FLPMA) (43 USC 1701 et seq.) and its implementing regulations to issue right-of-way grants for facilities and systems located on federal land, including transmission and distribution systems. Because of BLM's role in the proposed project, BLM has agreed to participate in the EA process as a cooperating agency. BLM will use the EA to meet its NEPA obligations and to assist in its review of BPA's right-of-way application.

From BLM's perspective, the purpose and need is to respond to BPA's grant application for facilities on BLM-administered lands, and arises from the authority of the FLPMA, which establishes a multiple use mandate for management of public lands, including the siting of energy generation and transmission facilities as outlined in 43 CFR 2800.

Specifically, pursuant to 43 CFR 2801.2, BLM is authorized to grant right-of-ways and to control their use on public lands in a manner that: (a) protects the natural resources associated with public lands and adjacent lands, whether private or administered by a government entity; (b) prevents unnecessary or undue degradation to public lands; (c) promotes the use of right-of-ways in common, considering engineering and technological compatibility, national security, and land use plans; and (d) coordinates, to the fullest extent possible, all BLM actions under the regulations in this part with state and local governments, interested individuals, and appropriate quasi-public entities. Pursuant to 43 CFR 2805.10, if the BLM issues a grant, the BLM decision maker may include terms, conditions, and stipulations which she or he determines to be in the public interest.

1.5 PUBLIC INVOLVEMENT

1.5.1 *Scoping and Issue Summary*

BPA conducted public scoping outreach for the project through a public letter, a project website, and public meetings. On September 24, 2012, BPA sent a letter to 362 people potentially interested in or affected by the proposed Upgrade 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/PDCIUpgrade.

BPA identified 10 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 Burns Paiute Tribe, Cedarville Rancheria Northern Paiute Tribe, Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of the Warm Springs Reservation, Cow Creek Band of Umpqua Tribe of

Indians, Fort Bidwell Indian Community, Fort McDermitt Paiute-Shoshone Tribe, Confederated Tribes and Bands of the Yakama Nation, Summit Lake Paiute Tribe, and the Klamath Tribes. BPA requested comments from the consulting tribes, as well as information on known *cultural resources* in the project area.

BPA held three public scoping meetings, one each in Lakeview, Prineville, and The Dalles, Oregon, in October 2012. The public comment period for the project began on September 24, 2012, and BPA accepted comments from the public until October 29, 2012.

A total of 23 people attended the public scoping meetings; nine attended the Lakeview meeting, ten attended the Prineville meeting, and four attended the meeting in The Dalles. Comments were provided during the meetings, and written comments were also received from 17 individuals and agencies. Comments received during the comment period were considered in the environmental analysis and can be found in their entirety on the project website.

Comments were received on the following topics:

- **Land Use and Recreation.** Comments were expressed about potential impacts related to access constraints on private property. Several commenters requested more detail on access road improvements and shared use. Some comments asked about impacts to farmland and crop damage compensation.
- **Vegetation.** Several commenters expressed concern about noxious weeds on their property. One commenter asked that BPA consider impacts on water, fish, and wildlife from its vegetation management programs, and that BPA should assess effects of herbicides that control vegetation in the right-of-way.
- **Wildlife.** U.S. Fish and Wildlife Service (USFWS) and Oregon Department of Fish and Wildlife (ODFW) expressed concerns about impacts to sage grouse habitat, migratory birds, and pygmy rabbits. One commenter asked that BPA analyze the biological and ecological impacts of using hydroelectric generating facilities of the Federal Columbia River Power System (FCRPS) to support wind power and provide balancing reserves for fish and wildlife habitat and anadromous fish.
- **Water.** USFWS requested that BPA develop a water body crossing plan to assess current crossing conditions and to define design and monitoring practices consistent with the watershed/waterbody crossing.

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

BPA is releasing this Draft EA for review and comment. The Draft EA is posted on the project website. During the review period, BPA will accept comments orally, via e-mail, and by letter. BPA will consider all comments received during the review period in preparing the Final EA. The Final EA will include responses to all substantive comments received. A substantive comment provides new information about the project or analysis; identifies a new reasonable alternative; points out a specific relevant flaw in the analysis; suggests alternate methodologies and the reason(s) why they should be used; makes factual corrections; or identifies a different source of credible research which, if used in the analysis, could result in different effects. (BLM 2010) Based on the Final EA, BPA will determine whether to prepare an EIS or a FONSI for the Proposed Action.

Chapter 2: Proposed Action and Alternatives

This chapter describes the Proposed Action, the No Action Alternative, and other alternatives considered but eliminated from detailed study. This chapter also compares the Proposed Action and the No Action Alternative to the project purposes.

2.1 PROPOSED ACTION

The Proposed Action is to upgrade BPA's 265-mile portion of the PDCI that extends from its Celilo Converter Station in The Dalles, Oregon, south to the Nevada-Oregon border (see Figure 2.1-1). This upgrade would improve the reliability of the aging line. In addition, this upgrade would increase the north to south transfer capability of the BPA portion of the PDCI from its current transfer capability of 3,100 MW to 3,220 MW². The upgrade would allow the line to be operated at ± 520 kV in order to increase the transfer capability.

The upgraded transmission line would be similar to the existing PDCI line in design and appearance. Under the Proposed Action, BPA would leave all existing towers in their current locations within the existing BPA right-of-way. The Proposed Action would include the following activities:

- Installation and replacement of tower components, such as new hardware assemblies, insulators, dampers, and shunts.
- Installation of four new dead-end towers at select locations along the transmission line between towers 141/2 and 141/3, 159/2 and 159/3, 175/1 and 175/2, and 199/2 and 199/3.
- Replacement (reconductoring) of a 1.8-mile section of conductor to match the remaining line conductor between towers 166/5 and 168/3.
- Installation and replacement of corrosion protection *anodes* at the base of about 160 existing towers to protect against tower corrosion
- Improvement of about 210 miles of existing access roads.
- Construction of 0.6 mile of new permanent access roads.
- Use of existing access roads that do not require improvement.
- Acquisition of access road easement rights and end easement rights where changes are needed.³
- Establishment of temporary *staging areas* for storage of materials.
- Removal of vegetation where rocking is needed.
- Revegetation of areas disturbed by construction activities.

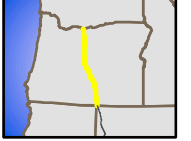
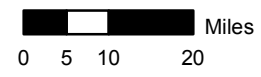
² While not a part of the Proposed Action, there is the possibility that future actions could allow the transfer capability of the PDCI to ultimately increase up to 3,800 MW. Such an increase would require BPA system upgrades, as well as upgrades by the Southern Partners to their Nevada-Oregon border-Sylmar line, that are not proposed at this time. Should a proposal for these upgrades be developed at some point in the future, BPA would conduct appropriate environmental review under NEPA at that time of its actions related to the proposal.

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

**Pacific Direct Current Intertie (PDCI)
Transmission Line Upgrade
Project Location
Figure 2.1-1**



- BPA Substations
- BPA Transmission Lines
- PDCI Transmission Line
- Proposed Dead End Structure
- County Boundaries



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. Source: BPA Regional GIS Database, 2013.

Map Completion Date: Thursday, July 25, 2013

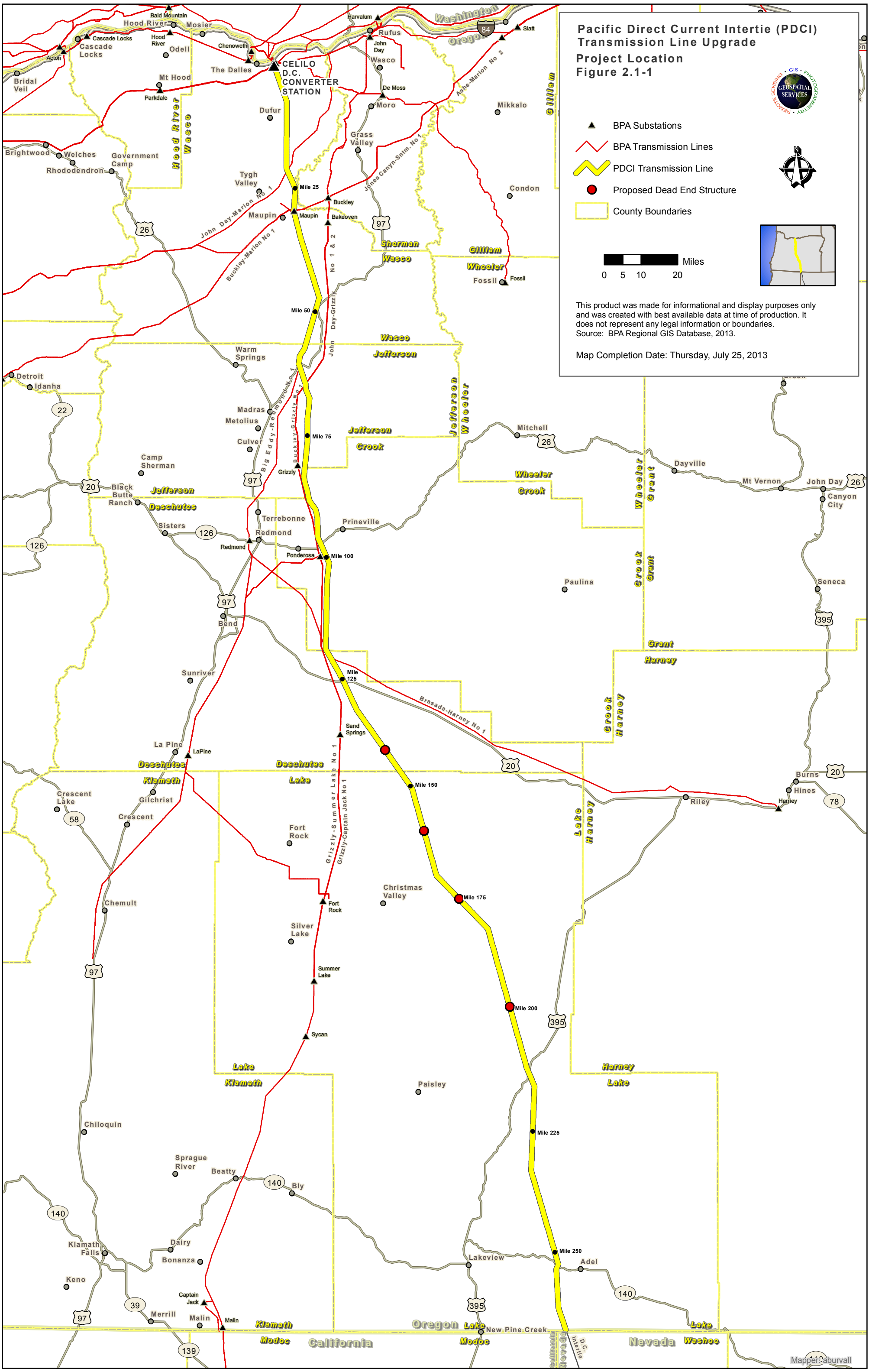


Table 2.1-1 provides a further overview of these activities. The main elements of the existing and proposed upgraded components of BPA's portion of the PDCI are identified in Table 2.1-2. The following discussion describes the Proposed Action in more detail.

Table 2.1-1: Overview of Proposed Action

Proposed Activity	Quantity
Transmission line upgrade activities	
Number of towers removed	0
Number of towers installed:	
Steel suspension	0
Dead-end	4
Total new towers	4
Total towers (new + unchanged)	1,242
Number of towers compared to existing conditions	4 new
Number of new towers outfitted with guy wires	0
Number of existing towers to be raised	0
Conductors	1.8 miles reconducted
Access Road Work	
New construction (miles)	0.6
Improvements (miles)	210.1
Total length of access road work ^a	210.8
Acquire access roads/routes easement	37.8
Release access roads easement	0.6
Travel routes (no work needed)	179.6
Culvert Replacements	1
Fords Improved ^b	1
Temporary bridges	0
Install Permanent bridges/box culverts	3
Vegetation Management	
Removal of danger trees	0
Removal of vegetation within the right-of-way	As needed
Removal of vegetation along existing access roads	As needed

Note:

^a This total includes all roads used by BPA exclusively for access to the transmission line. This total includes new and improved roads; it does not include project-specific travel routes (179.6 miles) or public roads that may be used as the primary road for access to isolated towers. Roads released as a result of the Proposed Action (0.6 miles) are also not included in this total.

^b A ford in this table is defined as a shallow road crossing of a perennial stream.

Table 2.1-2: Existing and Proposed Upgraded Transmission Line Elements.

Project Element	Existing Conditions	Proposed Line
Operating Voltage (kV)	±500	±520
Capacity (MW)	3,100	3,220
BPA corridor length (miles)	265	No change
right-of-way Width (feet)	Mile 1-57: 437.5; Mile 57-265: 300	No change
Tower towers (total number)	1,238	1,242
Suspension towers	1,180	No change
Dead-end towers	58	62
Tower height range (above ground)		
Suspension towers (feet)	90 to 150	No change
Dead-end towers (feet)	100 to 160	No change
Conductor diameter (inches)	1.8	No change

2.1.1 Existing Right-of-Way and Transmission Line

The right-of-way for BPA’s portion of the PDCI extends the entire 265-mile length of this line from BPA’s Celilo Converter Station south to the Nevada-Oregon border. For the first 56 miles south of the Celilo Converter Station, the PDCI parallels the existing Big Eddy-Redmond No. 1 230-kV transmission line. Figure 2.1-2 provides a typical view of these two lines where they parallel each other. For this segment of the PDCI, the right-of-way is 437.5 feet wide. From Mile 57 south to the Nevada-Oregon border, the PDCI line is off-center in a 300 foot wide right-of-way.

Figure 2.1-2: Existing PDCI Line North of US 97-US 197 Intersection (looking north from Tower 48/1, Big Eddy-Redmond No 1 is on the right)



The existing right-of-way crosses primarily lands managed by the BLM; approximately 137.5 linear miles of the right-of-way cross BLM lands. The existing right-of-way also crosses land in private ownership (approximately 115.0 linear miles), lands managed by the Oregon Department of State Lands (ODSL) (approximately 6.5 linear miles), and lands managed by the United States Forest Service (USFS) (approximately 4.9 linear miles). Figure 2.1-3 illustrates a typical view of the PDCI on privately-owned lands, while Figure 2.1-4 illustrates a typical view of the PDCI on BLM lands.

The existing BPA portion of the PDCI transmission line consists of 1,180 steel *suspension* towers and 58 dead-end towers, for a total of 1,238 towers. Each tower is designated by a unique number based on the miles from the Celilo Converter Station (the designated start point for the transmission line) and the number of towers within a given mile. For example, in the first mile from the Celilo Converter Station, there are three towers. The first tower is designated as Tower 1/1, the second tower is Tower 1/2, and so on, up to the third tower, which is designated as Tower 1/3. Numbering in line mile 2 begins with Tower 2/1 and ends with the eighth tower from the beginning of the line, Tower 2/5. The bottom number designates which tower it is in that mile and therefore the bottom numbering starts over at each mile. On average, there are five towers per mile of line.

Figure 2.1-3: Existing PDCI Line Irrigated Agricultural Land South of the Crooked River (Tower 91/2 looking south)



Figure 2.1-4: Existing PDCI Line BLM Land South of US 395 (Tower 220/2 looking south)

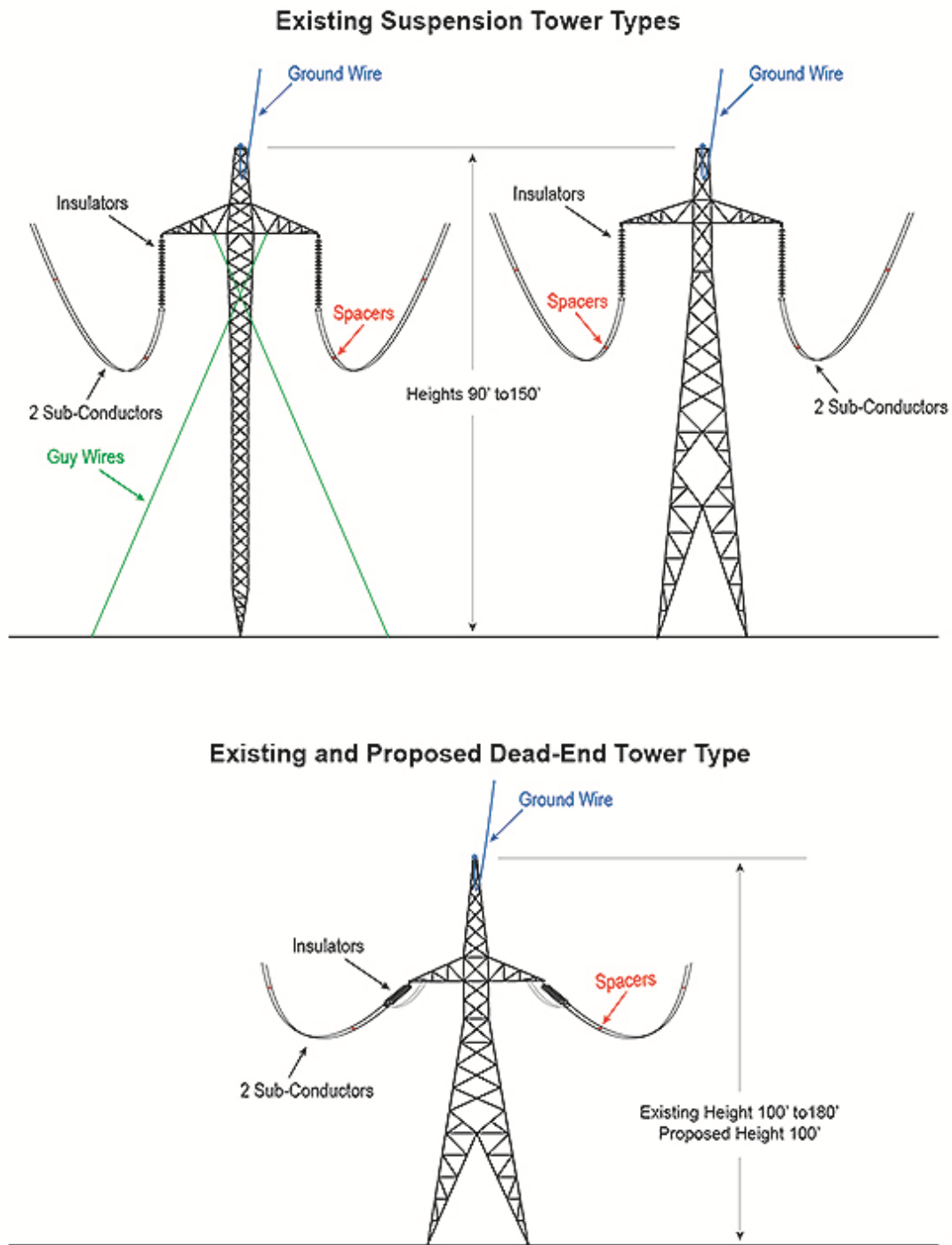


All of the existing towers for BPA's portion of the PDCI are lattice steel or aluminum. The 1,180 existing suspension towers are one of two types; they either made of aluminum, rest on a single point and are guyed (stabilized using steel cable "guy" lines), or are made of steel, rest on four legs and are not guyed (see Figure 2.1-4). The suspension towers are designed to hold up the conductors but do not have much longitudinal strength. The existing suspension towers generally range from 90 to 150 feet in height.

The 58 steel dead-end towers along BPA's portion of the PDCI are all the four-legged type (see Figure 2.1-4). Compared to suspension towers, dead-end towers are heavier, stronger towers that are designed to hold the conductor and withstand forces that may come from tension on the conductor. Because a dead-end tower can withstand more tension on the conductor, it is used when spanning a river or canyon or when there is an angle in the line that will create lateral tension. This helps meet BPA's tower policy to limit the risk for cascading tower failure. The existing dead-end towers generally range from 100 to 160 feet in height.

Both suspension and dead-end towers support the transmission line's insulators, conductors, ground wire, and other necessary components. Insulators keep conductors a safe distance from other parts of the tower and prevent electricity in the conductors from moving to other conductors, the tower, or the ground. Conductors carry electric current. **Direct-current** transmission lines, like the PDCI line, require two **conductors** to make a complete **circuit**. Each conductor is made up of subconductors. On the PDCI, there are two subconductors separated by spacers for each conductor. Overhead ground wires are used for lightning protection. If lightning strikes, the overhead ground wire takes the charge instead of the conductors.

Figure 2.1-5: Transmission Line Towers



The towers in the first eight miles from Celilo are a modified design and have a different top half than shown in this figure. Instead of a point, the steel is shaped like a giant O and is flat at the top.

2.1.2 Upgrade Activities

This section describes the various activities that would occur to upgrade the existing transmission line. In general, construction work associated with these activities would occur within the existing transmission line right-of-way. 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).

When the PDCI was built in the late 1960's, land around each tower was cleared and portions excavated. This resulted in a previously disturbed area of approximately 80 by 80 feet around and including each tower (see Figure 2.1-6). These areas have been periodically mowed to maintain access to the towers.

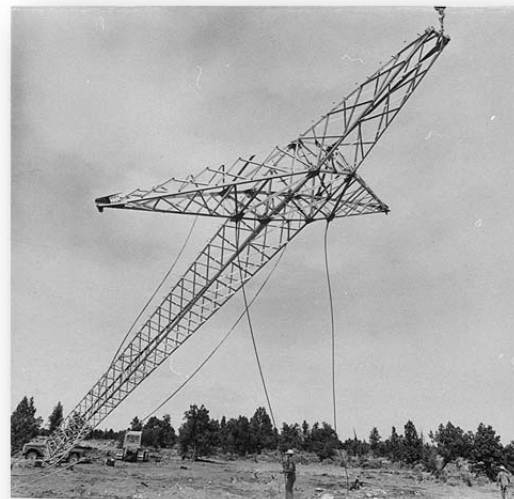
Most of the Proposed Action's ground disturbing work (not associated with access roads) would occur within this previously disturbed area. The area around each tower would be mowed where necessary. Additional grading or a rocked landing may be needed at the base of towers where soils are unstable or slopes make it difficult for construction vehicles to access the tower. Most of the towers would not have rocked landings. Except where otherwise noted, this EA considers the 80 by 80 foot area around and including each tower as predisturbed and is not part of the impact acreages calculations for land use and habitat types.

A temporary work area would be established around each predisturbed tower area. These temporary areas would be up to 175 feet by 200 feet (almost 0.7 acre), all of which would be within the previously disturbed right-of-way. Trucks and other equipment would drive and park within these areas. Existing vegetation would be crushed rather than cut. Soil disturbance would be minimized as much as possible in the temporary work area (e.g., crushing or trampling plants and leaving the root ball in place so plants could revegetate).

Figure 2.1-6: Original Guyed Tower Construction (circa 1969)



Setting the footing



Erecting the tower

Replacement of Insulators

To increase the voltage of the line, the existing insulators on each tower would be replaced by longer insulators. Most of the new insulators would be glass bells while others would be rigid polymer (see Figure 2.1-7). To replace the insulators and associated hardware, workers would need to access each tower with a bucket truck. Dead-end towers would be accessed by two bucket trucks. As stated previously, any grading or landings that would be needed in order to access the towers would occur within the 80 by 80 foot predisturbed tower area. While attending to insulators, crews would also replace hardware assemblies and dampers described below.

Figure 2.1-7: Glass Insulators on Dead-end and Rigid Insulators on Guyed Tower



Replacement of Hardware Assemblies, Dampers, and Shunts

Various pieces of hardware on the towers and associated with the conductor would need to be replaced. The overhead ground wire is attached to the top of the tower by way of insulators and hardware. The ground wire would not be replaced, but the hardware and insulators would be.

The existing vibration dampers on the conductors and overhead ground wire would be replaced. These dampers are located near where the conductors and overhead ground wires attach to the insulator assemblies. The purpose of the dampers is to absorb the small vibrations in the cables, which in turn protect the insulators and hardware from fatigue.

Shunts would be installed on all compression splice fittings. Splice fittings are located where two lengths of conductor abut. They are located mid-span and occur every mile and a half on average. The shunts are made up of aluminum alloy rods that are wrapped over the splice fitting. This provides additional mechanic strength as well as an alternate electrical path around the splice fitting.

Spacers that keep the subconductors separated would also be replaced. Spacers are located periodically along the subconductor's mid-span. They would be replaced from a spacer cart that rides on the conductors or from a bucket truck in areas with adequate ground access. The shunts would be replaced at the same time and by the same means as the spacers.

Installation of Dead-End Towers

A total of four new dead-end towers would be installed within the existing right-of-way between towers 141/2 and 141/3, 159/2 and 159/3, 175/1 and 175/2, and 199/2 and 199/3 (see Figure 2.1-1). These towers would be installed to independently carry the weight and tension of the conductors. If a series of suspension towers should fall, dead-end towers are designed to prevent a cascade (or domino) effect that could prolong an outage. The towers would be made of galvanized steel and may appear shiny for 2 to 4 years before they dull from weathering. The height of each new dead-end tower would be about 100 feet above ground.

It is assumed that an 80 by 80 foot tower impact area would be permanently impacted during the construction of each dead-end tower. Impacts within this area would result from grading, vegetation removal, and excavation. Impacts outside of the tower impact area would only be temporary in nature, a result from construction vehicles accessing the tower.

Four holes, one for each tower footing, would be dug with an excavator (drilling or blasting may occur if rock is present) and grillage footings would be put in place, buried, and the ground compacted at each tower site. Grillage footings are typically used for dead-end towers. They consist of a 10-foot by 10-foot assembly of steel I-beams that have been welded together and buried 12 to 14 feet deep for each tower footing. One leg of the tower would be bolted to each footing. Towers would be assembled at the tower site and lifted into place by a large crane (30- to 100-ton capacity).

Once the dead-end tower is constructed, the existing conductors would be cut and attached to the new dead-end assemblies (insulators and hardware where a conductor dead-ends). The left photo in Figure 2.1-7 shows the conductors attached to the dead-end assemblies and the jumper conductors hanging below the insulators. The jumper conductors allow the electricity to pass by the dead-end tower and insulators.

Replacement of Conductor Section

An approximately 1.8-mile section of line was used to test different conductor types. Different conductors were installed in the 1980s between towers 166/5 and 168/3. One of the conductors has three sub-conductors and the other has two. These subconductors are all smaller diameter than the rest of the line. The conductors in this section of line would be replaced with conductor to match the rest of the line's conductors.

A ***pulling and tensioning*** site would be established at either end of the section of conductor to be replaced. The disturbance area at each pulling site would be about 150 feet by 150 feet (0.5 acres) in size in order to accommodate equipment such as reeling trucks and tensioners. In or near sensitive areas (e.g., cultural sites and wetlands), 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 areas.

To replace this section of conductors, first the existing conductors would be removed by unclamping them from the insulator assemblies and placing them in travelers (pulleys) that would also hang from the bottom of the insulator assemblies. On one end of the reconductor section the conductor would be attached to a steel cable that would hold tension on the existing

conductor as it is pulled through the travelers. On the other end, the conductor would be rolled up on a reel as it is pulled out.

To install the new conductor, it is typical for a *sock line* (usually a rope) to be strung through all the towers. This stringing would be done using a helicopter or by workers on the ground. The sock line would pull in a hard line (typically a small stranded steel wire) through all the towers. The hard line would then pull the new conductor through the towers. Once in place, the new conductor would be tensioned and sagged in place and securely clipped into all of the insulator assemblies. The tensioner is a large piece of equipment that has multiple drums that the new conductor is fed through to hold the proper tension. For this project the sock line and helicopter may not be used. Instead, the hard line may be pulled through as the existing conductors are removed. The new conductors would be slightly more reflective than the existing conductor for the first few years after installation, until they naturally weather and dull.

Installation of Cathodic Protection

About 160 towers along BPA's portion of the PDCI have varying degrees of tower corrosion. These towers require cathodic protection to protect against further tower corrosion. This protection would be provided by installing corrosion protection anodes at these towers. On average, four to six sacrificial anodes would be installed at each of these towers, but in some instances up to 20 may be required. Installation includes burying a wire 12-18 inches deep that extends up to 30 feet from the tower and connects to a sacrificial anode. Cathodic protection installation would occur within the 80 by 80 foot predisturbed tower area.

Higher than normal levels of corrosion may have occurred at tower 265/6 because of the physical configuration of the line since it was built. BPA would test the footings of the tower to determine the amount of corrosion that has occurred. A small backhoe would be used to dig 2 to 5 feet down around each leg so that the steel could be visually inspected. If a substantial amount of corrosion has occurred it may be determined unsafe and any corroded tower footings would be replaced.

Access Road Work

The transmission line towers would be accessed from existing access roads where possible. Roads leading to the transmission line access roads are generally multiuse roads (e.g., ranch access, county roads) used by a variety of individuals for various purposes. Some are paved county roads, some are gravel under either county or private ownership, and some are natural surface roads on BLM-administered lands. Existing access roads within the right-of-way were generally created for BPA use. The existing BPA access roads for the PDCI are generally 15 feet wide and either bare soil or covered in rock.

Access road work would be needed to ensure access to most of the tower sites for construction and ongoing operation and maintenance activities. This work would include improvements to existing roads (210.1 miles), new road construction (0.6 mile), and acquisition of easements for existing access roads/routes where rights do not currently exist (37.8 miles).

Improvements to existing access roads would involve various activities, such as: blading to shape existing road surfaces and turnouts; placement of surfacing aggregate to maintain or restore existing road surfacing; removal of overgrown vegetation; cleaning existing ditches and

culverts; replacing culverts; replacing or installing bridges; and installing water bars and drain dips as needed to manage *stormwater runoff*.

New road construction would involve the construction of six short lengths of *spur road* that would extend from existing roads to tower locations. The new spur roads range from just under 100 feet long to just over 1200 feet long. Work associated with this construction would include grading operations consistent with establishing a road base; removal of vegetation within the roadway prism or along the proposed roadway; placement of road subbase 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.

Most of the improved and new access roads would be constructed to a finished 15-foot width, although some portions 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. For the purposes of this EA, it is assumed that there would be a potential permanent disturbance width of 25 feet for all new roads. Existing roads are typically 15 feet wide, therefore the potential permanent disturbance width along improved roads would be only an additional 10 feet in width (extra 5 feet on either side of the existing road). Rock would be obtained from weed-free quarries identified by the contractor.

Table 2.1-3 provides a list of equipment that would be used for access road work. A bulldozer would be used to grub out some of the smaller shrubs growing at the immediate road surface edge. Excavators or brush cutters would be used to grub for larger vegetation.

Table 2.1-3: 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	No equivalent	Diesel
Crane (300,000 pounds)	No equivalent	Diesel
Road grader	12M	Diesel
Roller compacter	CP56	Diesel
Backhoe	450E	Diesel
Work trucks	No equivalent	Diesel/gas

Access would also involve the use of existing access roads and travel routes (179.6 miles) which would not need any improvements. Access through active agricultural fields would be by way of unimproved roads. Travel routes across agricultural fields would be temporary and 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. BPA would compensate landowners for missed opportunity to plant crops or any crop damage during construction.

As part of this effort to clarify land rights, BPA would release previously acquired access road easement rights for approximately 0.6 miles of existing access road back to the underlying fee owner. Once the release is completed, BPA would have no rights to use the released road miles in the future. In locations where BPA would acquire easements for existing access roads, routes

where rights do not currently exist, or new access roads (37.8 miles), BPA would purchase easements from the underlying landowner. Access road easements would give BPA legal rights to use the roads to access the line when needed for maintenance and emergencies.

In addition to the road work that would occur, there are approximately 244 gates currently on the roadway system to discourage unauthorized access to the transmission line corridor. As part of the project, four new gates would be installed and some of the existing gates may be replaced.

Along the access roads that BPA has proposed to use for the project, there are approximately 25 *fords* that cross perennial streams. BPA is evaluating these fords and the waterways crossed to determine which can be used as-is, which would require improvements to cross, and which should not be used. To date it has been determined that three fords (one on Eightmile Creek and two on Deep Creek) would be replaced with 3-sided *box culverts* and one ford (Honey Creek) would not be used for construction.

There are also three existing culverts for access roads within the transmission corridor. One of these culverts would be replaced with a new culvert. The other two would be inspected and cleared of debris.

Establishment of Staging Areas

Up to 5 larger temporary staging areas and up to 20 smaller temporary staging areas would be established along or near the right-of-way. 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. Larger temporary staging areas could be up to 30 acres in size, and smaller temporary staging areas could be up to 5 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. It is likely that the construction contractor would identify potential areas for lease prior to construction. BPA would complete any required site-specific environmental review of the staging areas once the locations are determined.

BPA would also lease up to two material yards to hold new insulators and hardware prior to release to the construction crews. These areas would be existing vacant storage/warehouse facilities. One would be on BPA property adjacent to the Celilo Converter Station. This land is presently vacant. The other would be located off of Hwy 97 on Tumalo Road between Redmond and Bend. The site was previously developed and used as a storage facility. The lease would include existing indoor warehouse space, office space, and an outdoor storage yard. Material yard leases would be expected to run through 2017.

Right-of-way Vegetation Management

As part of BPA's vegetation management program, BPA would cut juniper trees growing within 57 spans of right-of-way in the southern half of Lake County. The juniper trees growing in the right-of-way are generally less than 5 feet tall and are sparse but localized within individual spans.

The trees would be hand cut with chainsaws or other manual methods. After cutting the trees, portions of the tree that lay higher than 4 feet would be lopped off and scattered.

Restoration of Areas Disturbed by Construction

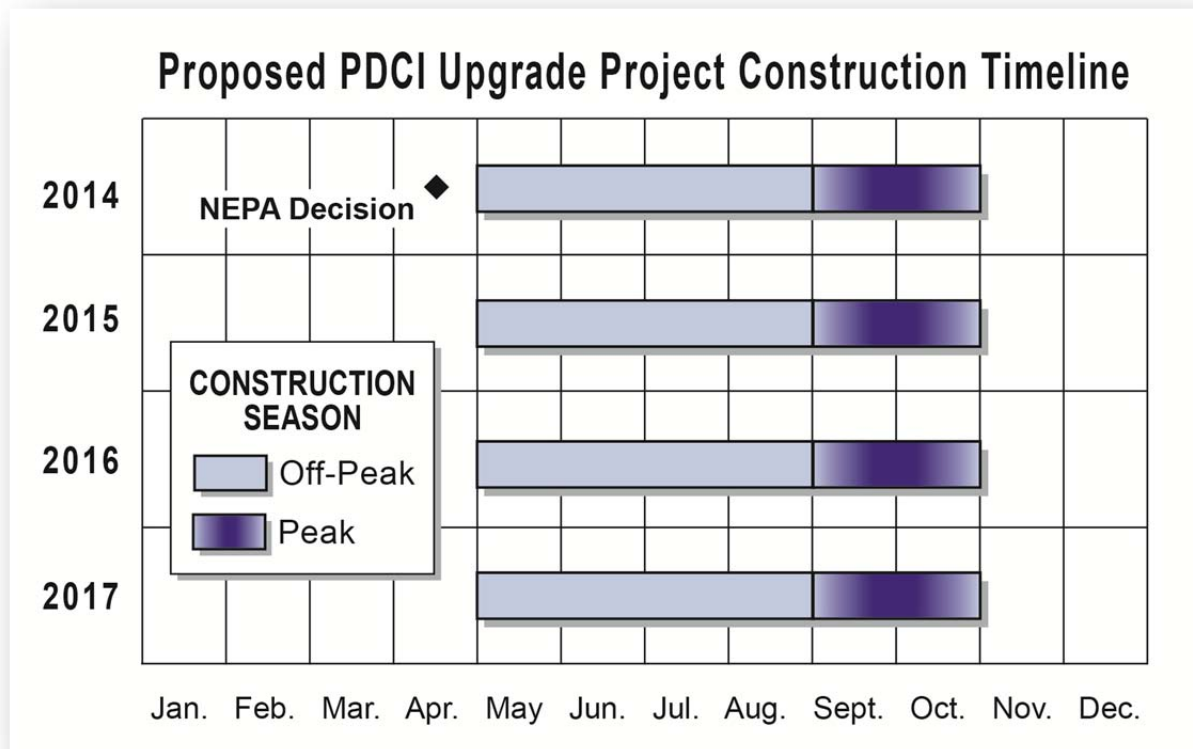
All areas disturbed by construction activities, except permanent road surfaces, would be reseeded with a predominantly native seed mix or a seed mix agreed upon with resource agencies and private landowners. The original grade and drainage patterns in sensitive areas would be restored to the extent possible.

2.1.3 Construction Schedule

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 with access road improvements in the summer construction season of 2014. The replacement of equipment on the transmission line would occur during a four week period in September/October for four years (2014 through 2017). Road improvements would occur from May to the end of October during those same years. All major construction activities would likely be completed by November 2017. Figure 2.1-8 is a schematic showing the timing of construction activity.

Up to 128 construction workers would be at work on the transmission line during the peak construction period each year and an estimated 16 workers could be present during the non-peak construction period. Crews would be working up to 12 hours per day, 6 days per week. Each crew would consist of six to eight contractor employees with a small number of support trucks delivering materials (insulators, hardware, 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 stringing site. Helicopters may be used to replace the conductor or to work in sensitive areas.

Figure 2.1-8: Timing of Construction Activity



2.1.4 Ongoing Maintenance and Vegetation Management

BPA conducts routine periodic inspections, maintenance, and vegetation management of the 15,000-mile federal transmission system in the Pacific Northwest. BPA has operated and maintained the BPA portion of the PDCI transmission line and access roads since this line was built in the 1960s. This ongoing operation and maintenance would continue whether or not the proposed rebuild project was implemented. However, because the proposed action includes replacement of worn parts of the existing transmission line and improvements to the access road system, the need for future maintenance and repairs would be less frequent and on a smaller scale than currently required. Although the proposed line upgrade would increase voltage and transfer capability, it would not require changes to the type of line maintenance or vegetation management activities required.

BPA conducts vegetation management within and along the PDCI right-of-way and access roads about every eight years to keep vegetation a safe distance from the conductor, maintain access to towers, and to help control noxious weeds. Vegetation management is guided by BPA's *Transmission System Vegetation Management Program Final Environmental Impact Statement* (BPA 2000). The vegetation management program includes working with landowners and others concerning vegetation management activities. Vegetation management methods include manual methods (e.g., hand pulling, clipping, and using chainsaws), mechanical methods (e.g., using roller-choppers and brush hogs), and/or chemical methods (herbicide use). Because the Proposed

Action includes some vegetation management, the next vegetation clearing for the line would likely not be needed for eight years following implementation of the Proposed Action.

When line and road maintenance or vegetation management is required for a BPA transmission line, BPA conducts environmental review for those site-specific maintenance activities as appropriate.

2.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, BPA would not perform a systematic upgrade of 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. Due to the age and condition of the line, BPA would replace insulators and hardware through its maintenance program. Anodes would still need to be installed at approximately 160 towers to prevent further deterioration of the steel structures; however, this would also be done as part of maintenance activities. Given the poor condition of some of the roads, it is possible that portions of the road work proposed under the Proposed Action would be funded and carried out as an operation and maintenance project in the future, independent of rebuilding the transmission line.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

In developing this EA, BPA considered whether any reroutes of its portion of the PDCI should be evaluated as an alternative to the Proposed Action. In comparison to the Proposed Action which would take place within the existing transmission line corridor, rerouting all or portions of the transmission line to a new corridor would result in a substantial increase in total project costs and additional impacts outside of the existing right-of-way. In addition, no portions of the existing line were identified where a reroute would be more environmentally advantageous as compared to simply upgrading the existing line where it currently is. BPA therefore considered but eliminated potential reroutes of the PDCI from detailed study in this EA because they would not meet the need for the project.

BPA also considered whether to upgrade its portion of the PDCI to a higher transfer capability than 3,220 MW. Two major factors resulted in this option being considered but eliminated from detailed study at this time. One factor is that while the Southern Partners have increased the transfer capability of their Nevada-Oregon border -Sylmar line to 3,220 MW, they are not currently in a position to make the necessary upgrades to their line that would be required to increase the transfer capability of their line above 3,220 MW. Without the concurrent increase above 3,220 MW of the Nevada-Oregon border -Sylmar line, it would not make sense for BPA to increase the transfer capability of its portion of the PDCI because this additional capability could not be utilized. The second factor is that to substantially increase the transfer capability of BPA's portion of the PDCI above 3,220 MW, BPA would need to make additional improvements to its transmission system beyond just the PDCI. For example, it is expected that such an increase would require BPA to reinforce its existing 500-kV John Day-Big Eddy No. 3 transmission line. BPA has determined that the extra costs of these other improvements are not justified at this time, particularly without the necessary additional improvements by the Southern Partners to their Nevada-Oregon border -Sylmar line.

While an option involving a higher transfer capability thus has been eliminated from detailed study in this EA, future actions could allow the transfer capability of the PDCI to ultimately increase up to 3,800 MW. Should a proposal for increasing PDCI transfer capability above 3,220 MW be developed at some point in the future, BPA would conduct appropriate environmental review under NEPA at that time of its actions related to the proposal.

2.4 COMPARISON OF ALTERNATIVES

Table 2.4-1 compares how well the Proposed Action and No Action Alternative meet the project purposes. Table 2.4-2 summarizes the potential environmental impacts of the two alternatives, based on the results of the full analysis as presented in Table 2.4-1.

Table 2.4-1: 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 upgraded transmission line would have the potential to operate at ± 560 kV. New dead-end towers and tower components would provide more reliability during routine operation and severe weather. Access road work would ensure that emergency repairs are done quickly.	While the existing transmission line would continue to operate at ± 500 kV, outdated and physically worn tower components would pose a greater risk for outages and unreliable service. Emergency response times could be increased by access roads that are in poor condition.
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 document.	There would be no construction-related environmental impacts; however, maintenance impacts would increase as existing towers 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 tower 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 upgraded transmission line would maintain system reliability and subsequent power delivery to BPA's customers.	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 \$46.6 million. Over the long term, the project would reduce maintenance costs.	Would avoid construction costs. Would incur maintenance costs that could be higher over time than under the Proposed Action.

Table 2.4-2: Summary of Impacts of the Proposed Action and No Action Alternative

Environmental Resource	Proposed Action	No Action Alternative
Land Use and Recreation	Direct impacts from land and vegetation disturbance disrupting ranching and farming operations, displacing crops, disturbing residents, detracting from recreation activities, and disrupting local traffic during construction. Construction impacts would be temporary. Permanent land use impacts would be minimal. Overall impacts would be <i>low</i> .	Continued operation and maintenance would result in <i>low</i> impacts similar to existing conditions; however, the frequency of maintenance activities and emergency repairs, and thus the level of impact, could increase as parts of the line and access roads continue to deteriorate.
Geology and Soils	Direct impacts from vegetation clearing, grading, and soil compaction. Indirect impacts associated with soil erosion. Impacts would be <i>low to moderate</i> . Risk of damage due to seismic hazards is <i>low</i> and impacts are expected to be <i>low</i> . Potential impacts to paleontological resources.	Direct impacts from continued operation and maintenance activities and incidental use of roads. Impacts would be <i>low</i> ; however, the frequency of maintenance activities may increase and more road improvements necessary resulting in an increase in the level of impact.
Upland Vegetation	Direct impacts from clearing and crushing vegetation, damaging plant roots, soil disturbance, and potential for spread of noxious weeds. Impacts would be <i>low to moderate</i> .	Continued levels of cyclical vegetation removal. Operation and maintenance activities would result in <i>low to moderate</i> impacts as the frequency of maintenance activities and level of impact may increase as parts of the line and access roads continue to deteriorate.
Wildlife	Direct impacts to wildlife from habitat disturbance and loss within the right-of-way. Potential indirect impacts from noxious weed infestation of habitat. Impacts would be <i>low to moderate</i> .	Continued levels of operation and maintenance, including vegetation removal, would result in <i>low to moderate</i> impacts; however, the frequency of maintenance activities, and thus the level of impact, could increase as parts of the line and access roads continue to deteriorate.
Fish and Water Resources	Direct impacts from ground disturbance and vegetation removal resulting in increased erosion, sedimentation, and in-water work turbidity. Potential impacts would include accidental chemical spills causing water contamination, stream crossings resulting in fish behavior affects, and access road work affecting hydrology and stormwater conveyance. Indirect impacts from ground disturbance increasing turbidity, vegetation removal near streams leading to increased exposure to solar radiation and increased water temperatures. Impacts would be <i>low to moderate</i> .	Continued operation and maintenance would result in <i>low to moderate</i> impacts on water resources. The frequency of maintenance activities and emergency repairs could increase as parts of the line and access roads continue to deteriorate, resulting in increased potential for impacts on fish and water resources.
Wetlands	Direct impacts from ground disturbance within a wetland affecting soils, vegetation, water quality, or hydrology or indirect impacts from activities adjacent to a wetland. Impacts would be <i>low</i> .	Continued operation and maintenance would result in <i>low to moderate</i> impacts, depending on the type of work, quality of wetland, and extent of impacts. The frequency of maintenance activities and emergency repairs could increase as parts of the line and access roads continue to deteriorate, resulting in increased potential for impacts on wetlands and wetland buffers.

Environmental Resource	Proposed Action	No Action Alternative
Floodplains	Direct impacts from ground disturbance and soil compaction within floodplains that would interfere with subsurface water flow, erosion, and increased deposition of sediment in floodplains or indirect impacts from activities adjacent to a floodplain. Impacts would be <i>low to moderate</i> .	Continued operation and maintenance would result in <i>low to moderate</i> impacts on floodplains, depending on the frequency and extent of activities within floodplains. The frequency of maintenance activities and emergency repairs, and thus the level of impact to floodplains, could increase as parts of the line and access roads continue to deteriorate.
Visual Quality	Direct visual impacts from installation of four new towers and construction of new/improved access roads. Impacts would be <i>low</i> .	Continued operation and maintenance would result in <i>low</i> impacts on visual quality.
Air Quality	Direct, temporary impacts from construction equipment and vehicles emissions in localized areas and transmission line corona emissions. Impacts would be <i>low</i> .	The potential for increased maintenance over time may contribute to slightly higher impacts than existing conditions, but they would still be considered <i>low</i> .
Socioeconomics and Public Services	Direct, short-term socioeconomic impacts during construction. Direct, long-term property and resulting indirect economic impacts. Impacts would be <i>low</i> .	Continued operation and maintenance would result in <i>no</i> impacts on socioeconomics and public services; however, the potential exists for more frequent maintenance activities which could result in <i>low</i> temporary, construction-related socioeconomic impacts.
Cultural Resources	Direct impacts from possible disruption of previously unrecorded cultural resources and archaeological sites during construction or operation and maintenance activities. Impacts would be <i>low to moderate</i> .	More frequent maintenance activities and emergency repairs could result in <i>low to high</i> impacts on previously unrecorded cultural resources and archaeological sites.
Noise, Public Health, and Safety	Direct, temporary noise impacts from construction equipment, truck traffic, and occasional use of helicopters. Temporary health and safety impacts during construction. Increase in transmission line corona noise. Increase in electromagnetic field levels during operation and maintenance. Impacts would be <i>low to moderate</i> .	Operation and maintenance would result in <i>low to moderate</i> impacts on noise, public health, and safety.
Climate Change	Direct impacts from greenhouse gas (GHG) emissions from construction equipment and increased worker traffic, vegetation removal, and operations and maintenance. Impacts would be <i>low</i> .	Continued operation and maintenance would result in <i>low</i> impacts on GHG emissions and climate change.

Chapter 3: Affected Environment, Environmental Consequences, and Mitigation Measures

3.1 INTRODUCTION

This chapter includes an analysis of the potential impacts of the Proposed Action and the No Action Alternative on human and natural resources. 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. Cumulative impacts are considered in Section 3.15.

Based on the analysis in this EA, impacts on specific resources 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 – Proposed Action
- Unavoidable Impacts Remaining After Mitigation – Proposed Action
- Environmental Consequences – No Action Alternative

Where applicable, potential impacts are presented by project component, including the following:

- Transmission Line Upgrade and New Tower Installation
- Access Roads
- Staging Areas and Tensioning Sites

3.2 LAND USE AND RECREATION

3.2.1 Affected Environment

Landownership

Landowners whose property is crossed by the existing transmission line and access roads, as well as any proposed new access roads, include private individuals, BLM (Prineville and Lakeview districts), USFS, and ODSL (Figure 3.2-1; Table 3.2-1).

Table 3.2-1: Landowners Crossed by the Transmission Line and Access Roads

Landowner	Miles of Transmission Line*	Total Miles of Access Road	Miles of Existing Access Road within Right-of-way	Miles of Existing Access Road Outside of Right-of-way	Miles of Proposed New Access Road within Right-of-way	Miles of Proposed New Access Road Outside of Right-of-way
Private	115.0	180.3	104.9	74.8	0.6	0.0
BLM Prineville District	45.7	50.3	45.3	5.0	0.0	0.0
BLM Lakeview District	91.8	144.4	87.0	57.4	0.0	0.0
USFS	4.9	5.2	4.9	0.3	0.0	0.0
ODSL	6.5	10.8	6.1	4.7	0.003	0.0
Total	263.9	391.0	248.2	142.2	0.6	0.0

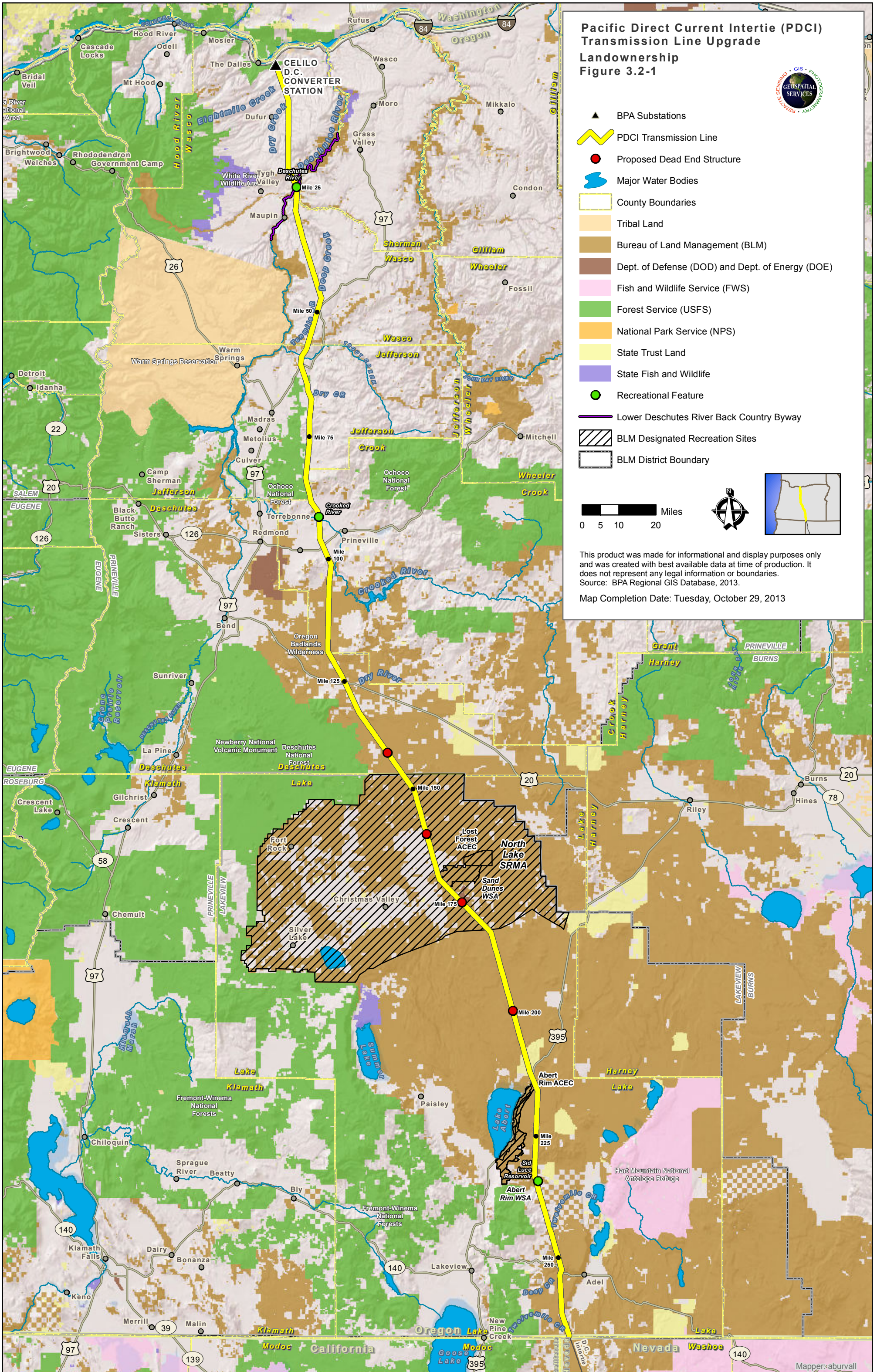
* The miles of transmission line are based on actual miles, rather than line miles.

Land Uses

Land uses along the project include rangeland, agriculture, rural residential, and recreation. Figure 3.2-2 and Table 3.2-2 show land uses crossed by the project based on data from the U.S. Geological Survey (USGS) National Land Cover Database (NLCD) (USGS 2006). On Figure 3.2-2, rangeland can be found in areas labeled ‘semi-desert land,’ ‘forest and woodland,’ and ‘shrubland and grassland,’ and rural residential is found on areas labeled ‘developed and disturbed areas.’

Table 3.2-2: Land Uses Crossed by the Transmission Line and Access Roads

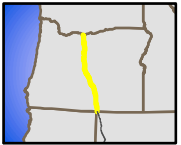
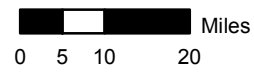
Land Use	Miles of Transmission Line	Total Miles of Access Road	Miles of Existing Access Road within Right-of-way	Miles of Existing Access Road Outside of Right-of-way	Miles of Proposed New Access Road within Right-of-way	Miles of Proposed New Access Road Outside of Right-of-way
Rangeland	226.5	325.0	212.7	111.7	0.6	0.0
Agricultural	9.7	12.1	7.4	4.7	0.0	0.0
Developed and Disturbed Areas	27.8	53.8	28.1	25.8	0.0	0.0
Total	264.0	391.9	248.2	142.2	0.6	0.0



Pacific Direct Current Intertie (PDCI) Transmission Line Upgrade Landownership
Figure 3.2-1



- BPA Substations
- PDCI Transmission Line
- Proposed Dead End Structure
- Major Water Bodies
- County Boundaries
- Tribal Land
- Bureau of Land Management (BLM)
- Dept. of Defense (DOD) and Dept. of Energy (DOE)
- Fish and Wildlife Service (FWS)
- Forest Service (USFS)
- National Park Service (NPS)
- State Trust Land
- State Fish and Wildlife
- Recreational Feature
- Lower Deschutes River Back Country Byway
- BLM Designated Recreation Sites
- BLM District Boundary



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. Source: BPA Regional GIS Database, 2013.

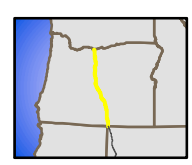
Map Completion Date: Tuesday, October 29, 2013

Pacific Direct Current Intertie (PDCI) Transmission Line Upgrade

Land Cover Figure 3.2-2

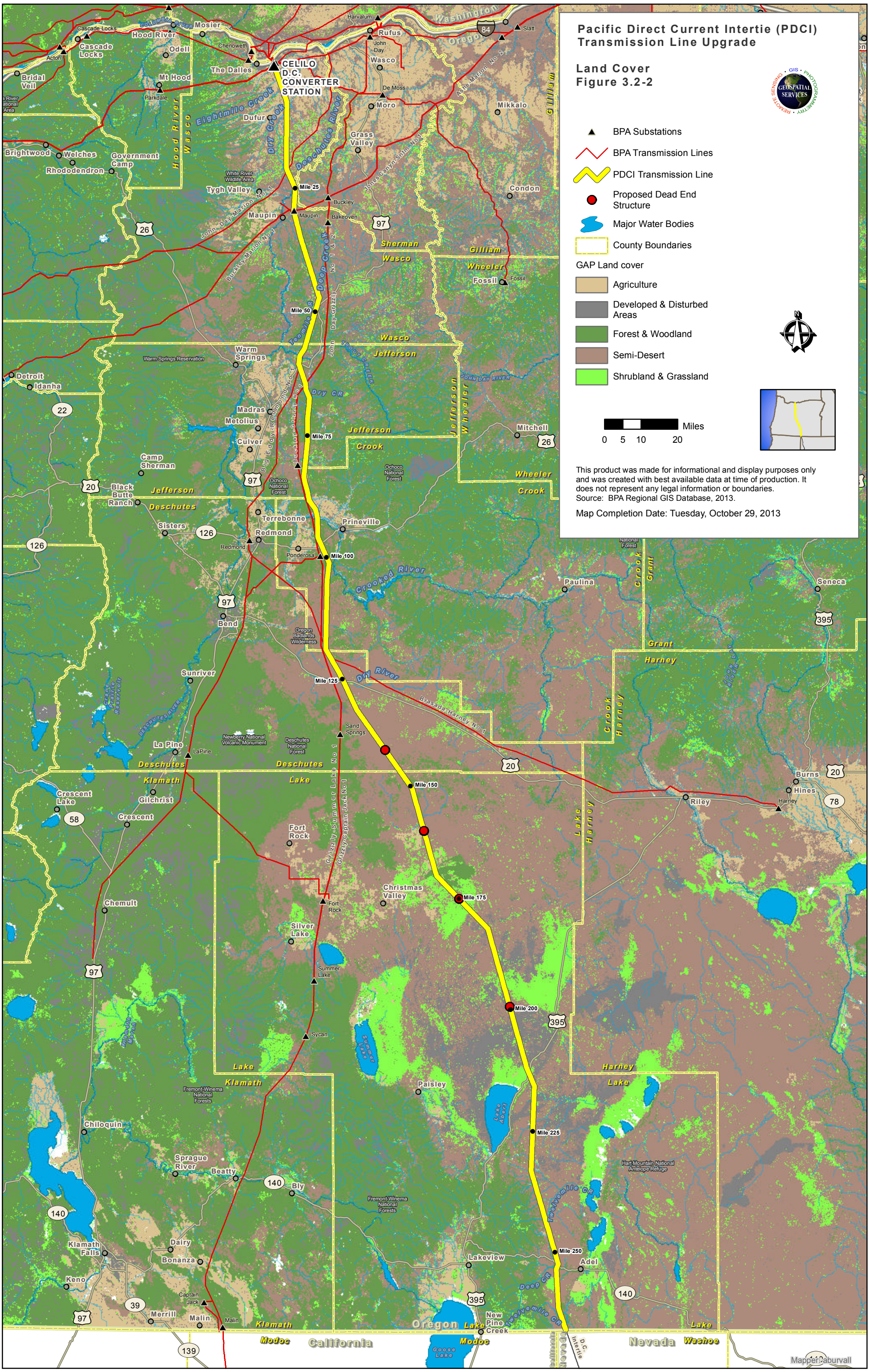


- BPA Substations
 - BPA Transmission Lines
 - PDCI Transmission Line
 - Proposed Dead End Structure
 - Major Water Bodies
 - County Boundaries
- GAP Land cover
- Agriculture
 - Developed & Disturbed Areas
 - Forest & Woodland
 - Semi-Desert
 - Shrubland & Grassland
- Miles



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. Source: BPA Regional GIS Database, 2013.

Map Completion Date: Tuesday, October 29, 2013



The BLM land is managed for uses based on Resource Management Plans (RMP). The project crosses BLM managed by the Upper Deschutes RMP (BLM 2005), Two Rivers RMP (BLM 1986), Brothers/La Pine RMP (BLM 1989), and Lakeview RMP (BLM 2003). BLM land in the Upper Deschutes RMP area is managed for vegetation, habitat, wildlife, water and air quality, fire, Special Management Areas (SMA), livestock grazing, mineral resources, forestry, military uses, visual resources, recreation, transportation and utilities, and archeological resources. BLM land in the Two Rivers RMP area is managed for wildlife and fish habitat, livestock grazing, riparian, forestry, mineral resources, land tenure and access, recreation, and SMAs. BLM land in the Brothers/La Pine RMP area is managed for forestland/woodland, recreation, natural areas, livestock grazing, wildlife habitat, fire management, and energy and minerals. BLM land in the Lakeview RMP area is managed for recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values. The existing PDCI transmission line is a mapped utility corridor in these RMPs. Use of BLM-managed land is further discussed in the rangeland and recreation sections.

Rangeland

The transmission line and access roads cross approximately 226.5 miles and 325.0 miles of rangeland, respectively. Rangelands are vast natural landscapes in the form of grasslands, shrublands, woodlands, wetlands, and deserts. The project area crosses open range shrublands, grasslands, and deserts interspersed with areas of woodlands and lands cleared in past years for grazing and other agricultural uses. Most of the crossed rangeland consists of land classified by the USGS (2006) NLCD as semi-desert, forest and woodland, shrubland and grassland (Figure 3.2-2). Forestland in the project area is typically more woodland than dense forest, composed of scattered trees. Rangeland in the project area is used for livestock grazing and provides wildlife habitat and open space for recreation.

BLM-managed land crossed by the project is used for livestock and big game grazing. The majority of the BLM-managed land crossed by the existing PDCI transmission line consists of BLM grazing allotments, where livestock operators graze their livestock. The Two Rivers RMP (BLM 1986), Brothers/La Pine RMP (BLM 1989), and Lakeview RMP (BLM 2003) all provide management direction for BLM-managed rangeland, which includes the maintenance, improvement, and long-term increase of grazing habitat.

Agricultural

The transmission line and access roads cross approximately 9.7 miles and 12.1 miles of agricultural land, respectively. The majority of agricultural land crossed by the project is within Wasco County. Crops consist mainly of grains and sweet cherries (Oregon State University Extension Service 2008). There are relatively few agricultural lands crossed by the project in Jefferson County. Crops are mixed with the largest percentage consisting of grains and seed (Oregon State University Extension Service 2008). In Crook County, agricultural land crossed by the project is concentrated between line miles 86 and 99 near the City of Prineville. Livestock is more prevalent in the Prineville Valley area and many of the crops produced are related to feed products (Oregon State University Extension Service 2008). There is little agricultural use aside from livestock and feed areas south of Prineville. In Lake County, agricultural land crossed by the project is located between line miles 156 and 182. There are no agricultural lands crossed by the project in Deschutes County.

Based on the mapped soils classified as prime and other important farmlands, the project crosses approximately 13.2 miles prime farmland (if irrigated) and 145.6 miles of farmland of statewide importance.

Residential

Rural residences are scattered throughout the project area. Based on review of aerial photography, approximately 29 residences are located within 0.25 miles of the transmission line or access roads. In Wasco County, seven residences are located in the far northern portion of the project area, near The Dalles and the Deschutes River area. Twenty-two of the residences are located in the Prineville Valley area in Crook County (between line miles 84 and 90). In Crook County, two of the residents are located within 100 feet of the right-of-way near line mile 89. No residences were identified within 0.25 miles of the project in Jefferson, Deschutes, or Lake Counties.

Recreation

Recreation areas are shown on Figure 3.2-1. Deschutes River is designated both as an Oregon Scenic and a Federal Wild and Scenic River in this area, including where the line spans the river between Tower 25/1 and 25/2. The Deschutes River area is a popular location to enjoy fishing, camping, whitewater rafting, hunting, boating, mountain biking, hiking, and beautiful scenery. The river offers a variety of opportunities for both day and overnight trips. Just off Highway 216, the Deschutes River Back Country Byway extends along the river for 24 miles to Mack's Canyon Campground. The BLM's Two Rivers Resource Management Plan (RMP 1986) provides guidance for development of lands managed by the BLM near the Deschutes River. Areas along the river are identified as having "high public resources values."

The project area includes land included in the Crooked River National Grassland (CRNG), which the line spans between Towers 81/2 and 84/5. The CRNG may be open for hunting, grazing, mineral extraction, recreation, and other uses. The CRNG is managed together with Ochoco National Forest from USFS offices in Prineville. The line spans the Crooked River in the Prineville Valley between Towers 90/3 and 90/4.

The Sid Luce Reservoir, a popular fishing location, is located within 2,000 feet of the transmission line right-of-way near Tower 234/1.

The Lakeview RMP (BLM 2003) includes management direction for Lake Abert, a BLM-designated Area of Critical Environmental Concern (ACEC), and Abert Rim, a BLM-designated Wilderness Study Area (WSA). Lake Abert is located 3.6 miles from Tower 215/2. No fish live in Lake Abert's alkaline waters; however, it has a dense population of brine shrimp that supports a variety of shorebirds and waterfowl. The lake is also an important stop on the bird migration route known as the Pacific flyway. Birding is a major activity in the area attracting many visitors in August and September during the fall migration when most shorebirds are present. The east side of Lake Abert is bounded by Abert Rim, located approximately 90 feet from Tower 213/1. Abert Rim is a steep escarpment that rises over 2,500 feet above the lake surface, one of the highest fault scarps in the United States, and the longest exposed fault scarp in North America. Abert Rim is a popular spot for wildlife viewing and hang gliding.

The BLM North Lake Special Recreation Management Area (SRMA), located in the northern area of the Lakeview District, is managed for recreation (off-highway vehicle [OHV] use, hunting, camping, picnic areas), natural areas, and wildlife habitat (BLM 2003). The Lost Forest/Sand Dunes/Fossil Lake ACEC and Sand Dunes WSA are also located in the northern area of the Lakeview District and are managed for special status plants, fire, weeds, grazing, OHV use, camping, visual resources, cultural resources, personal wood and plant collecting, and minerals (BLM 2003). ACEC designations highlight significant resources or hazards where special management measures are needed to prevent irreparable damage. Other BLM-managed land within the project area is used and managed for various recreational uses including hunting, fishing, OHV use, scenic driving, and hiking.

Transportation

In Wasco County, the transmission line corridor is located south of Interstate 84 and east of Oregon State Highway 197. Interstate 84, one of Oregon's busiest thoroughfares, travels east-west along the Columbia River. Interstate 84 begins in Portland and would be used to transport much of the equipment and materials for project construction. Most of the access roads to the transmission line originate at Highway 197, which is used moderately by tourists, local residents, and commercial trucking. The average daily traffic volume between Wasco County and the City of Madras in Jefferson County fluctuates from under 500 Average Daily Trips (ADT) to over 6,500 ADT, with the heaviest flow occurring from the Wasco/Jefferson county border south to Madras. Highway 126 runs from Madras to Prineville and is the closest highway to the transmission line. Between Madras and the City of Prineville in Crook County, the average daily traffic volume is 8,800 ADT. From Prineville, the route located closest to the transmission line includes Highway 97 to Highway 20 to Highway 395. Highway 395 heads south into Lake County, crosses the transmission line, and eventually leads into California near Lake Modoc west of the line.

3.2.2 Environmental Consequences – Proposed Action

Impacts to land use due to the project would include change in use for footprints of the four new dead-end towers, 0.6 mile of new access road, existing access road improvements, and temporary disruption of land use (harvest disruption, noise, dust, traffic) due to construction activities.

Landownership

Because the project is an upgrade of any existing line, most of the project would occur on existing easements or authorizations. The four new dead-end towers would be located on BLM-managed land (located between Towers 141/2 to 141/3, 159/2 to 159/3, 175/1 to 175/2, and 199/2 to 199/3).

Table 3.2-3 includes landownership impacts as a result of existing road improvements and new roads that would be constructed.

Table 3.2-3: Landownership Impacts

Landowner	Miles of Existing Access Road Improvements	Miles of New Access Roads
Private	90.4	0.6
BLM	113.6	0.0
USFS	0.3	0.0
ODSL	5.7	0.03
Total	210.0	0.6

For the existing access roads/routes where rights do not currently exist (37.8 miles) and new access roads (0.6 mile), BPA would acquire easements rights or a right-of-way grant from the underlying landowners (BLM, ODSL, and private), but there would be no change in landownership. Because there are minimal new access roads and there would be no change in landownership, impacts to landowners would be *low*.

Land Uses

In total, approximately 733.7 acres of land would be temporarily disturbed during construction activities, which include installation and replacement of tower components, installation of 4 new dead-end towers, installation of corrosion protection anodes, pulling sites, improvement of some existing access roads, construction of new permanent access roads, and temporary staging areas. Approximately 151.8 acres of land would be permanently converted to use of new towers and access roads. Table 3.2-4 provides an estimate of the temporary and permanent land use impacts. The following sections provide a summary of the expected impacts to current land uses.

Table 3.2-4: Land Use Impacts

Land Use	Temporary Construction Impact (acres)	Permanent Impact (acres)
Rangeland	676.7	134.6
Agricultural	54.9	16.7
Developed and Disturbed Areas	2.2	0.5
Total	733.7	151.8

Rangeland

The Proposed Action would result in some temporary impacts to livestock and an inconvenience to ranching operations during construction activities. However, impacts to rangeland during construction would be temporary and localized, and would affect a small share of the existing rangeland. During construction, approximately 676.7 acres of rangeland would be temporarily disturbed; however, this represents a small amount (0.006 percent) of the total rangeland present within the five counties crossed by the project. Further, prior to construction, BPA would develop and distribute a schedule of construction activities to potentially affected ranching operators and following construction, disturbed areas would be revegetated, with the exception of areas required to remain clear of vegetation to ensure the safety of the transmission line and access to the towers. Therefore, rangeland impacts associated with construction activities would be *low*.

The Proposed Action would not change rangeland use within the right-of-way, except where land would be permanently occupied by project components. Rangeland is a common use in the area and of the approximately 11,093,000 acres of rangeland present within the five counties, only a small amount (134.6 acres; 0.001 percent) would be permanently converted to land used for new towers and access roads. While there would be less available vegetation for livestock to consume on these 134.6 acres, on any given ranch that number would be negligible. Further, where the transmission line and access roads cross rangeland, cattle would still be able to roam in the roads unrestricted. Even at the new dead-end towers, cattle would be able to graze beneath the tower footprint, which would revegetate with low-growing grass and shrubs over time. Therefore, permanent rangeland impacts would be *low*. Impacts to vegetation and wildlife are discussed in Section 1.1, Introduction and Section 3.5, Wildlife, respectively.

Agricultural

Construction activities would occur during the summer and fall seasons over a 4-year period. The Proposed Action would result in some temporary impacts to cultivated land and an inconvenience to farmers and harvest operations during construction activities. Construction activities conducted during the growing season would displace crops and soils within the right-of-way. This displacement would be temporary and all disturbed cropland not permanently occupied would be revegetated in agreement with the property owner. During construction, approximately 54.9 acres (0.011 percent) of cultivated land within the five counties would be temporarily disturbed. Approximately 36.2 acres of prime farmland (if irrigated) and 407.2 acres of farmland of statewide importance would be temporarily impacted during construction of the Proposed Action. Of these acres, 44.3 are in agricultural use. This amount of disturbance represents a very small amount of existing agricultural land in the vicinity of the project. Because of the temporary nature of these impacts and BPA's commitment to restore disturbed areas and compensate landowners for crop damage, temporary agricultural impacts associated with these construction activities would be *low*.

The overall agricultural capacity within the five counties includes 520,000 acres of cropland. As a result of the Proposed Action access road construction and improvements, permanent impact would occur to approximately 16.7 acres (0.003 percent) of agricultural production. Approximately 3.9 acres are designated as prime farmland (if irrigated) and 56.1 acres are designated as farmland of statewide importance would be permanently impacted. Of these acres, 11.2 are in agricultural use and the remainder is mostly rangeland. Given the small area of impact compared with the overall agricultural capacity, permanent impact to agricultural land would be *low* and following construction agricultural activities would be allowed to resume.

Residential

The Proposed Action has the potential to temporarily impact residential uses during project construction activities. The increase in traffic from construction vehicles and equipment moving along local roads, and lane closures, could temporarily delay access to private residences; however, construction activities would not prevent private residential landowners from using their property. Construction activities near the two residences located within 100 feet of the existing right-of-way would likely be visible and would increase localized noise and fugitive dust levels for brief periods. Disturbance to residents from construction activities would be temporary in nature, limited in duration (on the order of hours or a few days, depending on the

specific site), and limited to within the right-of-way and along access road locations. Additionally, the overall number of residences affected at one time would be small. Overall impacts to residents would be limited to temporary construction inconveniences and would be *low*.

Recreation

The transmission line crosses the Deschutes River between Tower 25/1 and 25/2. The river is designated both as an Oregon Scenic and a Federal Wild and Scenic River at this location. The transmission line also crosses the CRNG between Tower 81/2 and 84/5. The Sid Luce Reservoir and Abert Rim would not be crossed by the transmission line or access roads, but are near Towers 234/1 and 213/1, respectively. Additionally, the new towers would be located on BLM-managed land that may be used for recreational activities including hunting and OHV use. Construction activity and short-term increases in noise and fugitive dust may temporarily detract from the enjoyment of some recreation users visiting recreation areas adjacent to the right-of-way, including the Deschutes River, CRNG, Sid Luce Reservoir, Abert Rim, and BLM-managed land. Additionally, increased traffic from construction vehicles and equipment moving along local roads and temporary lane closures would temporarily delay access to these recreation areas. These potential construction impacts to recreational areas and users would be localized, temporary in nature, and limited in duration, and are, therefore, considered *low*.

BPA roads on BLM-managed land are generally not fenced or locked, allowing improved access roads to be used by motorists and hunters. This could result in an indirect impact to rangeland, particularly in the BLM Prineville District, which is closer to larger population centers than the Lakeview District and therefore more likely to experience an increase in motorist and hunter use of improved access roads. However, this potential increase would likely be limited to BLM-designated off-highway vehicle and hunting seasons. Additionally, because most of the corridor is remote and the project would not create any new access on BLM land, potential impacts from trespassing and vandalism due to the project would be *low*. Implementation of the mitigation measures discussed below would further minimize these impacts.

Potential impacts to sensitive habitats, visual quality, and cultural resources are addressed in Sections 3.4, Upland Vegetation, 3.9, Visual Quality, and 3.12, Cultural Resources, respectively.

Transportation

The Proposed Action has the potential to result in short-term impacts on transportation from increased traffic generated by construction vehicles and disruptions to traffic from temporary single-lane closures. The temporary increase in construction-related traffic would represent a low increase in daily traffic volume compared to the ADT volumes for the roads in the project area. Up to 64 contractor employees could be employed along the transmission line corridor during peak construction, generating up to 128 additional passenger vehicle roundtrips per day. In addition, a small number of support trucks would deliver materials and equipment to work sites. At a few transmission line corridor crossings of local roads, the 1.8 miles of reconductoring between line miles 166 and 168 could require single-lane closures for short durations and would not cause impacts for extended periods (i.e., for days at a time). Lane closures may result in temporary traffic delays, depending on the local road traffic volume. However, these traffic impacts are not expected to substantially degrade traffic operation on the local roads due to the

short duration and the local road traffic levels being relatively low. Therefore, construction-related transportation impacts would be *low*. Implementation of the mitigation measures discussed below would further minimize transportation impacts.

3.2.3 Mitigation – Proposed Action

If the Proposed Action is implemented, BPA would implement the following mitigation measures to minimize impacts on land use, recreation, and transportation.

- Develop and distribute a schedule of construction activities to potentially affected landowners.
- Install No Trespassing signage along BPA access roads in areas of high potential motorist and hunter use.
- Schedule construction during periods when active farms along the corridor are likely to be fallow, where and when possible, to minimize the potential for crop damage.
- Ensure gates are closed if livestock are in the area during construction. Repair/reconstruct any fences impacted during construction activities.
- Compensate landowners for the value of commercial crops damaged or destroyed by construction activities or that cannot be planted due to construction activities.
- Revegetate disturbed areas after the conclusion of construction, with the exception of those areas required to remain clear of vegetation to ensure the safety of the transmission line and access to the towers.
- Keep construction activities and equipment clear of residential driveways, to the extent possible.
- Use water trucks or other measures to minimize fugitive dust during project construction.
- Coordinate the routing and scheduling of construction traffic with ODOT and county road staff.
- Publicize road closures and traffic delays to minimize impacts to traffic.
- Employ traffic control flaggers and post signs along roads warning of construction activity and merging traffic for temporary interruptions of traffic, where needed.
- Provide appropriate contact information for contractor liaisons and BPA staff to local residents for any concerns or complaints during construction.

3.2.4 Unavoidable Impacts Remaining after Mitigation – Proposed Action

Potential unavoidable impacts would consist of minor delays and interruptions to local traffic in the project area, generation of noise and dust in residential and recreation areas, and temporary interference with rangeland, agricultural, and recreational activities. Unavoidable long-term impacts would consist of approximately 151.8 acres of land permanently converted to a developed use.

3.2.5 Environmental Consequences – No Action

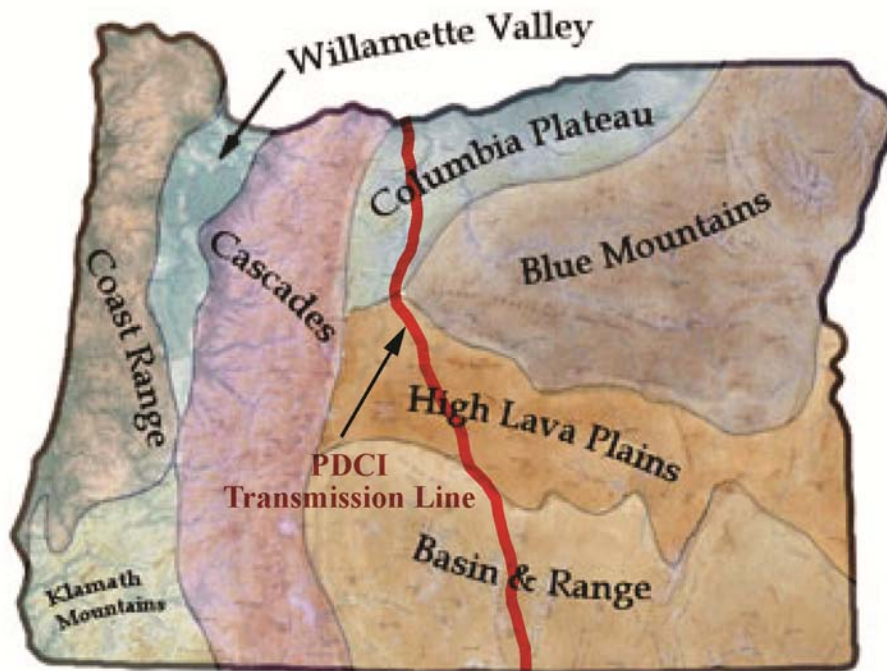
Under the No Action Alternative, BPA would not upgrade the transmission line and would continue to operate and maintain the existing transmission line in its current state. BPA would continue to attempt to maintain the existing lines and towers with more frequent maintenance activities within the corridor than under the Proposed Action. Increased maintenance and emergency repairs could result in similar impacts as described for the Proposed Action on land uses, recreation, and transportation, but with little or no notice or planning. The maintenance activities would result in temporary impacts on land use and recreation, including localized land disturbance and disruption of activities, noise and dust, and minor traffic delays similar to the impacts described under the Proposed Action.

3.3 GEOLOGY AND SOILS

3.3.1 *Affected Environment*

The northern portion of the transmission line is located within the Columbia Plateau province (Figure 3.3-1). The Columbia Plateau is dominated by the Columbia River Basalt group, a series of flood basalt flows that were formed between 17.5 and 6 million years ago when massive lava flows poured out onto what are now parts of Washington, Oregon, and Idaho (USGS 2004). This area is characterized by gently rolling hills and shallow valleys layered by fine, windborne deposits of silt that overlie Columbia River Basalt (Everard et al. 1964).

Figure 3.3-1: Geologic Provinces of Oregon



Source: Geologic provinces of Oregon- John Ame

The southern portion of the project area is located within the Basin and Range province. This province is characterized by north-south-trending linear valleys and fault block mountain ranges formed during tectonic extension that thinned and cracked the earth's crust and upper mantle beginning approximately 17 million years ago (USGS 2004). The topography of the area is generally flat valleys with rolling to somewhat steep hills.

The middle of the project area is within the High Lava Plains, a middle and late Cenozoic volcanic upland, dominated by parallel west-northwest-trending normal faults referred to as the Brothers Faults (Walker and Nolf 2006). The topography is similar to the Basin and Range province with valleys and steep hills primarily associated with fault lines.

The project area includes two alluvial fans: one in northern Wasco County and one on the border between Jefferson and Crook Counties (USGS 2013).

Geologic Hazards

The project area has varying degrees of landslide hazards, alluvial fans, soft soil earthquake hazards, expected earthquake shaking, and volcanic hazards. The majority of the landslide and alluvial fan hazards occur in southeastern Wasco, eastern Jefferson, and northwestern Crook counties. Moderate earthquake soft soil hazard areas occur throughout the project area, with areas of high hazard found in western Crook, eastern Deschutes and central Lake Counties. Expected earthquake shaking varies from moderate to violent with severe hazard areas present in all five counties, and violent hazard areas present in Wasco and Lake Counties. Volcanic hazards are centered near the Mt. Jefferson, Three Sisters, and Newberry hazard zones and range from moderate to high. These areas are west of the project area, not directly in the project area, and could represent sources of seismic activity and ash deposition. Within the proposed project area are also eight designated landslide hazard areas, four fault areas, and a low probability seismic hazard area that stretches from the southern end of Wasco County to the northern portion of Lake County (based on the risk of damage due to seismic hazards).

Soil Erosion Hazards

Soil information regarding the project area was gathered from five distinct county or area-level soil surveys: Wasco County, Northern Part; Trout Creek-Shaniko Area; Upper Deschutes River Area; Lake County, Northern Part; and Lake County, Southern Part. The soils vary based on parent material, climate, and deposition. In general terms, the soils crossed in the northern part of the project area (Wasco, Jefferson and Crook Counties) are shallow or moderately deep and susceptible to erosion without appropriate vegetative cover (USDA 1975, 1982). Soils in the mid area of the project (Jefferson) have a coarse-textured and sandy surface layer that is susceptible to wind erosion if the vegetation is removed or sparse (USDA 1999a). The southern part of the project area has a combination of volcanically derived soils from the Cascade Range and Mt. Mazama (USDA 2012) and clay and sandy soils of high salinity and alkalinity (USDA 1999).

Measuring the potential of a soil to erode involves a complex mathematical equation and results in a value called the Erodibility Index (EI). Generally, climate, soil texture, slope length, and steepness are all factors in determining the EI. The higher the EI value, the greater the potential for a soil to erode. Highly Erodible Land is defined by the Natural Resources Conservation Service (NRCS) as lands with an EI of at least 8 (USDA 2013). Lands considered highly erodible on average have an erosion rate of 20 tons per acre per year. Over the length of the project, 61 percent of the acres of soils disturbed are classified as highly erodible (Table 3.3-1) and 23 percent are not highly erodible. Ten percent of the soils have no erodibility determination and there was no available soil data on the remaining 5 percent of the soils disturbed by the PDCI line.

Table 3.3-1: NRCS Land Classifications within the Project Impact Area

NRCS Classification of Land	Total Area Soils Disturbed (Temporary and Permanent acres)	Percent of Project Impact Area
Unclassified	92.2	10.4
Highly Erodible	541.7	61.1
Not Highly Erodible	205.0	23.1
Missing data	47.8	5.4
Total	886.7	100.00

Areas of steep slopes (greater than 30% slope) are scattered throughout the project area. In general most are in the northern portion of the project area and around drainages. Seven general areas have been identified along the transmission line as having high concentrations of steep slopes and are identified in Table 3.3-2 along with the length of access roads that are presently on steep slopes.

Table 3.3-2: Road Lengths in Areas of Steep Slopes

General Area	Between Towers		Total Road Length within Steep Slope Areas (feet)
	Starting	Ending	
Deschutes River	22/1	26/5	7,379.0
Bakeoven Creek	31/1	35/1	11,701.1
Booten Creek	38/1	40/1	1196.0
Deep Creek	43/4	45/2	1851.0
Coleman Hills	208/1	212/1	2053.2
Rabbit Creek	222/1	223/1	1146.7
Twentymile Creek	263/1	263/3	2818.8

Paleontological Resources

Under the Omnibus Public Land Management Act (OPLMA) of 2009 (see Section 4.3, Geology and Soils of this EA), BLM must manage and protect paleontological resources on BLM land. Based on the BLM Instruction Memorandum No. 2008-009, Potential Fossil Yield Classification System for Paleontological Resources on Public Lands, there are five distinct classes of potential fossil yield to serve as a guideline for prediction, assessment, and mitigation of paleontological resources.

- Class 1 – **Very low**. Geologic units that are not likely to contain recognizable fossil remains.
- Class 2 – **Low**. Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils.
- Class 3 – **Moderate or Unknown**. Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential.
- Class 4 – **High**. Geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability. Surface disturbing activities may adversely affect paleontological resources in many cases.
- Class 5 – **Very High**. Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils, and that are at risk of human-caused adverse impacts or natural degradation (USDI 2008).

Public lands crossed by the transmission line were rated using the Potential Fossil Yield Classification System. Field inspections of areas considered to have paleontological potential have occurred and have further defined areas that would need special consideration during construction (Martin 2013).

Relatively few areas in the northern half of the transmission line exhibit paleontological potential and required field survey. The land around the Celilo Converter Station has potential of producing late Miocene vertebrate fossils and is designated as Class 4a for exposed areas and Class 4b for thinly covered areas. Farther south near the town of Maupin, *paleofloral* remains have been recovered from rocks considered equivalent to the John Day Formation. However, the precise *lithology* along the transmission line trace is unknown; therefore, the area is considered Class 3b (unknown potential). After field inspection, only the area around the Celilo Converter Station warranted any further paleontological consideration.

In the central portion of the project area, some exposed geologic formations in the area of USFS holdings northeast of Madras have produced both fossil plants and vertebrate remains of scientific importance. However, field inspection did not find evidence to further paleontological consideration of this area. Farther south along the transmission line east of Prineville, the line again crosses formations of that age, which in this area is relatively poorly known. As a result, a designation of Class 3a/b (moderate/unknown potential) was assigned. Field inspection did not find paleontological specimens to warrant further consideration.

The southern portion of the project area holds the greatest potential for paleontological resources. In the Fort Rock Basin, the Fossil Lake area is classically known for fossil plants, invertebrates, and all major classes of vertebrates. The site is considered the most important Quaternary age vertebrate site in the Pacific Northwest, rivaled only by Rancho la Brea (La Brea Tar Pits) in the United States (Los Angeles, California). The preservation of the fossil elements is superb; even the most delicate processes are preserved on many fossil elements. This area received the highest designation, Class 5a (very high potential with little or no soil or vegetative cover) (BLM 2008). An area to the south of Fossil Lake has produced fossils in Miocene Epoch rocks: rocks older than those from which the fossils in Fossil Lake are found. Because of the potential to find fossils and at a great diversity, this area was also designated as Class 5a.

In this southern portion of the project, the occurrence of many specimens, particularly complete skeletons, in a stratified or layered succession provides the best information concerning the changes of animals and environments over time. Given that fossils are extremely rare initially, coupled with the many possible sources of destruction over time, such instances are very rare. Areas such as the Big Badlands of South Dakota, the John Day beds in central Oregon, and the Fossil Lake area in south-central Oregon are examples of such exceptional vertebrate fossil occurrences. Stratified successions with fossil remains interbedded with volcanic ashes are the most important sources for understanding the timing of events. Volcanic tephras (ashes) contain ions that can be radiometrically dated, providing estimates of dates for the time of ash fall. Fossils preserved with a widespread tephra (e.g., Fossil Lake) were deposited at the same time providing paleochronology, an important scientific datum (Martin 2013).

Not only is the Fossil Lake area classified as the highest Potential Fossil Yield Classification in the project area, it is also listed as a BLM ACEC. The ACEC designation by BLM marks an SMA for protection of significant historic, cultural, or scenic values; fish and wildlife resources; natural process or systems; and or natural hazards. Fossil Lake is the remnant of a lakebed from a large Pleistocene-era lake and is known as a significant area for Pleistocene vertebrate fossils. The vertebrate fossils found at Fossil Lake are considered rare because they are from small mammals not normally found in such variety and volume.

3.3.2 Environmental Consequences – Proposed Action

Transmission Line Upgrade and New Tower Installation

Direct impacts on soils could result from clearing of vegetation, grading, and compaction of soils by heavy equipment during work on existing towers and installation of proposed dead-end towers. Clearing and grading, commonly with a bulldozer, remove both vegetation and the uppermost biologically active portion of the soil. Compaction from heavy equipment degrades soil structure, reducing pore space needed to retain moisture and promote gas exchange. Potential indirect impacts on soils would be associated with soil erosion, either during construction (minor sheet erosion) or after construction, before vegetation is able to reestablish. Based on the county and area-level soil surveys reviewed, the risk of erosion would be highest where the unconsolidated sediments are notably susceptible to wind and water erosion; on steep slopes and on NRCS-designated highly erodible lands. See Table 3.3-3 for the number of towers within the given area that are on slopes designated as steep. The scale of the mapping used to designate steep slope indicate the presence of steep slopes in the area of the towers and may not accurately depict truly steep slopes at the tower locations.

Table 3.3-3: Existing Towers on Steep Slopes

General Area	Between Towers		Number of Towers on Steep Slopes	Total Number of Towers
	Starting	Ending		
Deschutes River	22/1	26/5	5	23
Bakeoven Creek	31/1	35/1	4	20
Booten Creek	38/1	40/1	1	11
Deep Creek	43/4	45/2	1	7
Coleman Hills	208/1	212/1	0	21
Rabbit Creek	222/1	223/1	0	6
Twentymile Creek	263/1	263/3	3	13

The extent of impacts at any one site would depend on the quality of soils, amount of moisture in the soils, amount of surface water flowing across the site, steepness of slopes in the area, and amount of time bare soils are left unvegetated. Equipment upgrades would occur on the existing towers and would not require additional ground disturbance beyond the use of construction vehicles and equipment staging. Each new dead-end tower site could result in up to 0.6 acre of ground disturbing activity. The four sites are relatively level. Two of the tower sites are on not highly erodible land (in miles 141 and 175) and the other two sites are located on highly erodible land (miles 159 and 199). Table 3.3-4 also identifies that one of the new dead-end towers has been located within a low seismic hazard area. Implementation of the mitigation measures described below would reduce construction-related soil impacts. As a result, impacts on soils from the equipment upgrade and installation of towers are expected to be *low to moderate*.

Table 3.3-4: Potential Hazards at New Dead-End Tower Sites

Location of Dead-End Tower	Potential Hazard
141/2-141/3	Not highly erodible soils; low seismic hazard area
159/2-159/3	Highly erodible soils; no designated seismic
175/1-175/2	Not highly erodible soils; no designated seismic
199/2-199/3	Highly erodible soils; no designated seismic

Access Roads

As described in the Proposed Action and Alternatives, up to 210.1 miles of existing access roads would be improved with minor rocking/grading, and about 0.6 mile of new permanent access roads could be constructed as part of the Proposed Action. Road construction or improvements would require grading, compacting, placement of crushed rock as a road base, and replacement of culverts, as necessary. Some vegetation removal and revegetation could also take place within the right-of-way and along access roads. These activities would result in soil compaction and temporary increases in construction-related erosion and stormwater runoff. Similarly, abandoned access roads would likely degrade over time and might contribute to soil erosion.

Erosion associated with construction/improvements and subsequent use of access roads would be most notable in areas associated with creeks and streams (at or adjacent to ford crossings), or in areas with steep slopes (greater than 30 degrees). There would be about 4.9 miles of improved roads located in areas with steep slopes, generally in the northern portion of the project area and/or around drainage ways. Most of the road segments that would be located on steep terrain are very short and scattered throughout the project. Table 3.3-5 shows the seven most concentrated groupings of roads that would be improved on steep slopes. For example, along the 5 miles of transmission line in the Deschutes River area, there would be 7,284.4 feet of roads needing improvement, divided among 15 segments of road, on terrain classified as having steep slopes. Road improvements on steep slopes would include water bars and other measures to reduce erosion.

Table 3.3-5: Areas of Highest Concentration of Steep Slopes

General Area	Between Towers		Length (ft) of New and Improved Roads on Steep Slopes (# of road segments)	Length (ft) of Roads Not Needing Improvement on Steep Slopes (# of road segments)
	Starting	Ending		
Deschutes River	22/1	26/5	7,284.4 (15)	94.6 (1)
Bakeoven Creek	31/1	35/1	11,158.5 (11)	637.2 (2)
Booten Creek	38/1	40/1	711.4 (1)	484.6 (1)
Deep Creek	43/4	45/2	1,851.0 (7)	0.0 (0)
Coleman Hills	208/1	212/1	1,994.0 (6)	59.2 (1)
Rabbit Creek	222/1	223/1	1,146.7 (1)	0.0 (0)
Twentymile Creek	263/1	263/3	1,953.4 (11)	865.4 (2)

Sixty percent of the disturbed soils in the project area are designated by NRCS as highly erodible lands. With regard to these soils, the BMPs necessary to reduce erosion may include a minimization of construction-related erosion by limiting disturbance during the critical erosion period (November through March); avoiding operation of heavy equipment in wet areas to reduce soil compaction and erosion. Revegetation will take place after all construction activities are complete. These BMPs may reduce the potential for construction-related erosion on highly erodible lands.

Use of fords during construction could result in some erosion along the streambed and a transient increase in *turbidity* levels either at the time of use in perennial streams, or the next time water flows in seasonal stream channels (see Section 3.6, Fish and Water Resources). Implementation of the mitigation measures described below would reduce the potential for construction-related erosion and resultant impacts on soils in these areas and along other portions of the project area. As such, impacts associated with access road improvements are expected to be *low to moderate*.

Additional disturbance could include up to 25 temporary staging areas for material storage with priority given to pre-disturbed sites, each about 10 acres in size. A preference to previously disturbed sites would be given when selecting staging areas and erosion control measures would be determined on a site by site basis.

Paleontological Resources

The greatest potential to impact paleontological resources would be on the southern 60 miles of the project in the Fossil Lake area. Monitoring and recovery during ground disturbance are recommended mitigation strategies for the identified 60 miles, 15.5 miles of which are recommended to have pre-disturbance survey and recovery.

Mitigation strategies for the Fossil Lake area include pre-ground disturbance recovery of any specimens exposed, preparation and curation of those specimen, radiometric dating, collection and processing of anthills for microinvertebrate fossils, the addition of a clean sand layer and construction mats on roadways, and monitoring/salvage during construction activities.

The dead-end tower at line mile 175 would be erected in the Fossil Lake area and the tower at line mile 199 would be south of the Fossil Lake area. Four footings would be drilled 12 to 15 feet into the ground, which could result in drilling through unexposed fossil specimens. For the Fossil Lake area dead-end tower, boring samples would be taken prior to the drilling to provide more information on layer depths and digging techniques to be used for tower footings. Once the boring samples are complete, detailed mitigation strategies can be developed for this tower erection. For the dead-end tower south of Fossil Lake, no boring samples would be required but the drilling would be monitored for potential fossil exposures.

Mitigation strategies for the area south of Fossil Lake include pre-ground disturbance collection, radiometric dating, curation of fossil bones, collection and processing of anthills for microinvertebrate fossils, and monitoring/salvage during construction on roadways.

3.3.3 Mitigation – Proposed Action

If the Proposed Action is implemented, the following mitigation measures and BMPs, used alone or in combination, would reduce impacts on soils, landforms, and other resources.

- Space and size culverts, cross-drains, and water bars properly.
- Work as much as possible during the dry season – when streamflow, rainfall, and runoff are low – to minimize erosion, sedimentation, and soil compaction.
- Use mechanical barriers to erosion in disturbed areas, as specified in the stormwater pollution prevention plan (SWPPP).
- Use water trucks to apply water in order to reduce wind erosion near sensitive receptors.
- Minimize the work areas for heavy equipment to minimize soil compaction, particularly during the critical erosion period (November through March).
- Reseed disturbed, non-farmed areas with native species. Salvage sagebrush root balls by crushing the plants and avoiding excavation to accommodate regrowth of the slow-growing native plant.
- After construction, inspect and maintain access roads, culverts, and other facilities to ensure proper function and nominal erosion levels.
- Inspect revegetation sites to verify adequate growth, and implement contingency measures as needed.
- Monitor all identified paleontological resource areas during construction for exposed fossils.
- Perform predisturbance data recovery to identify and collect visible fossils at identified paleontological resource sites identified within Fossil Lake and south of Fossil Lake. Also perform anthill collection of microfossils in adjacent areas.
- After pre-disturbance specimen recovery on access roads and landings in portions of the Fossil Lake area, use a layer of dune sand overlain by geotextile road mats to protect the resource.
- Take boring samples prior to excavating for the tower footings in the Fossil Lake area to provide more information on fossil layer depths and to develop monitoring and digging techniques for the tower construction.
- Monitor during tower construction at the southern most new dead-end.

3.3.4 Unavoidable Impacts Remaining after Mitigation – Proposed Action

The project would temporarily disturb about 733.7 acres of soil along the entire length of the project. New access roads, road improvements, and dead-end towers would permanently impact about 151.8 acres of soil that are presently not developed. Improvements to roads could potentially lessen existing runoff erosion.

3.3.5 *Environmental Consequences – No Action*

Under the No Action Alternative, the Proposed Action would not be constructed and construction-related impacts on soil resources would not occur. Continued operation and maintenance of the existing transmission line would have *low* impacts on soils resulting from line maintenance and incidental use of access roads to maintain the transmission line infrastructure. Systematic access road upgrades for the whole line would not occur and therefore would not impact soils; however, as maintenance activities would likely increase, minor road improvements may be needed to access parts of the line. These impacts would have similar impacts on soils to those discussed above. Impacts to soils would be localized from accessing individual towers, which could lead to more erosion and compaction than under existing conditions. Minor road improvements may be needed to access the line for repairs and maintenance; road improvements would have similar impacts to those discussed above.

3.4 UPLAND VEGETATION

3.4.1 *Affected Environment*

The transmission line corridor runs north-south east of the Cascade Range within the Columbia Plateau, Blue Mountain, and Northern Basin and Range *ecoregions* of Oregon State (ODFW 2006). An ecoregion is a large area that has a distinct combination of climate, soils, and landforms (e.g., volcanoes, valleys, etc.). These environmental features strongly influence which plants and animals live in an area. The project area includes a mosaic of upland vegetation types, dominated by sagebrush shrubland, but also includes salt desert scrub shrubland, Western juniper woodland, Northeast Oregon mixed conifer forest, cottonwood riparian gallery forest, ponderosa pine forest and woodland, and ponderosa pine/Western juniper woodland (NHI 1998).

Ecuregions

As shown in Figure 3.4-1, the project area crosses three ecoregions (described below) and parallels the edge of a fourth (Eastern Cascade Slopes and Foothills). The habitat types found in these ecoregions help to generally characterize the project area and provide a framework for potential impacts to individual plant species. Ecoregions do not have definitive boundary lines; instead there is a gradation of change to an adjacent region. Because of this, areas may share characteristics of an adjacent ecoregion and seem to blend.

The **Columbia Plateau** ecoregion is made up of arid sagebrush steppe and grassland, surrounded on all sides by moister, predominantly ponderosa pine (*Pinus ponderosa*) and Douglas fir (*Pseudotsuga menziesii*) forested, mountainous ecological regions. This region is underlain by basalt up to 2 miles thick. It is covered in some places by loess soils that have been extensively cultivated for wheat, particularly in the eastern portions of the region where precipitation amounts are greater. Aromatic shrubs such as sagebrush (*Artemisia* spp.) and bitterbush (*Tridentata* spp.) dominate the shrub-steppe habitat, while native grasslands consist of forbs and bunchgrasses, which are being increasingly displaced by cheatgrass (*Bromus tectorum*) and other invasive species. Aquatic plants, rushes, and thickets of shrubs are present in herbaceous wetlands found throughout the Columbia Plateau (LandScope America 2013). The project area within the Columbia Plateau includes the Celilo Converter Station and line mile 1 to 58.

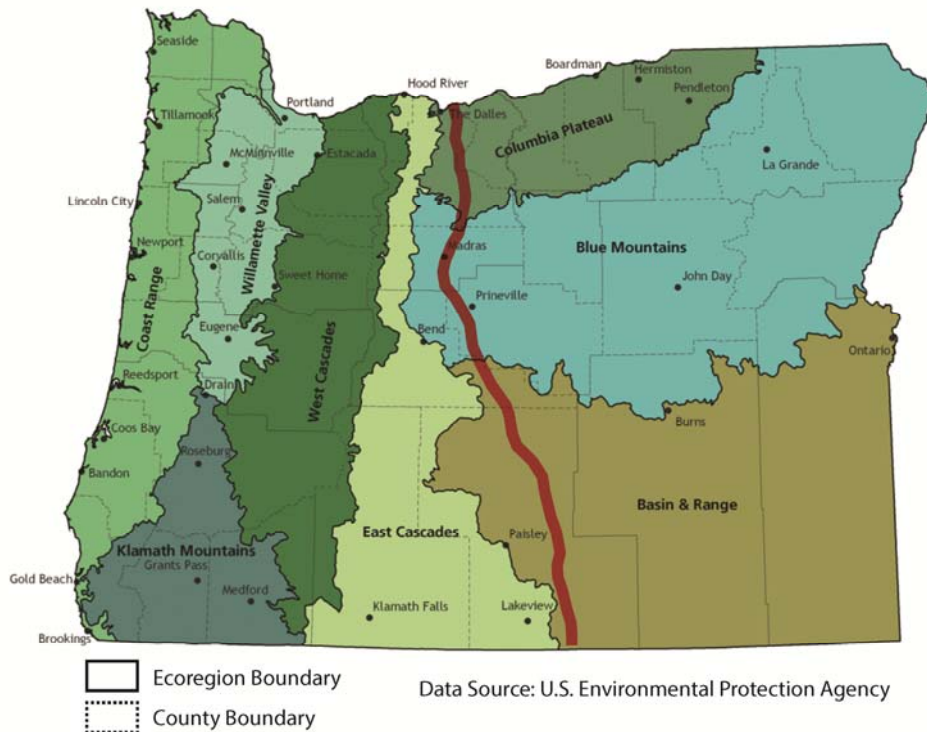
The **Blue Mountains** ecoregion is a complex mountain range that is generally lower and more open than the neighboring Cascades. Like the Cascades, the region is mostly volcanic in origin. Much of this ecoregion is grazed by cattle. Coniferous forests dominate much of the Blue Mountains, with subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii*) common at higher elevations and Douglas fir and ponderosa pine more prevalent at mid-elevations. As the elevations slope towards river bottoms, shrubs such as juniper (*Juniperus* spp.), snowberry (*Symphoricarpos* spp.), mountain mahogany (*Cercocarpus* spp.), bitterbush, and sage are common shrubs found in the higher canyons with grasslands and patches of shrub-steppe common at lower elevations (LandScope America 2013). The project area within the Blue Mountain ecoregion includes line mile 58 to 120.

The **Northern Basin and Range** ecoregion contains arid intermountain basins, dissected lava plains, and scattered mountains. Shrub communities and desert soils are common and non-mountain areas have sagebrush steppe vegetation such as cool season grasses (Idaho fescue

[*Festuca idahoensis*] and bluebunch wheatgrass [*Pseudoroegneria spicata*]). Juniper-dominated woodland occurs on rugged, stony uplands. Ranges are generally covered in sagebrush at higher elevations. Overall, the ecoregion is drier and less suitable for agriculture than the Columbia Plateau. Rangeland is common and irrigated agriculture occurs in the ecoregion's basins (OWEB 1999). The project area within the Northern Basin and Range ecoregion includes line mile 120 to 265 (55 percent of the transmission line).

The **Eastern Cascade Slopes and Foothills** ecoregion is in the rain shadow of the Cascade Mountains. Its climate exhibits greater temperature extremes and less precipitation than ecoregions to the west. Open forests of ponderosa pine and some lodgepole pine (*Pinus contorta*) distinguish this ecoregion from the higher ecoregions to the west where fir and hemlock forests are common, and the lower, dryer ecoregions to the east where shrubs and grasslands are predominant. Vegetation in this ecoregion is adapted to the prevailing dry continental climate and is highly susceptible to wildfire. Volcanic cones and buttes are common in much of the region (OWEB 1999). The project area does not cross this ecoregion but does parallel it from line mile 125 to 150 (within 5 miles) and line mile 235 to 265.

Figure 3.4-1: EPA Level III Ecoregions of Oregon



Vegetation Types

Vegetation types in the project area were defined using the Northwest GAP Analysis Project ecological systems (NHI 1998). The project crosses 8 upland vegetation cover types: sagebrush steppe, big sagebrush shrubland, low-dwarf sagebrush, salt desert scrub shrubland, modified grasslands, Western juniper (*Juniperus occidentalis*) woodland, Northeast Oregon mixed conifer forest, and cottonwood riparian gallery forest (Table 3.4-1). Descriptions of each vegetation cover type are presented in Table 3.4-1. Because the existing transmission line right-of-way and roads are maintained for low growing vegetation, the following vegetation covers are found adjacent to the project, but are not crossed by the project; Northeast Oregon mixed conifer forest, ponderosa pine forest and woodland, and ponderosa pine/Western juniper woodland. Agricultural and developed land is discussed in Section 3.2, open water is addressed in Section 3.6, and wetlands are addressed in Section 3.7.

Table 3.4-1: Upland Vegetation Types in the Project Area

Vegetation Type	Acreage in the Project Area (percentage in acres)	General Location Information
Sagebrush steppe	10,917 (32.3%)	Generally found on the northern half of the project area (0-125 line mile) as the project area transitions from big sagebrush shrubland to sagebrush steppe.
Big sagebrush shrubland	11,666 (34.5%)	Dominant vegetation type on the southern end of the project area (line mile 125-265).
Low-dwarf sagebrush	4,186 (12.4%)	Mostly present in the southern part of the alignment (line mile 150-240) in small areas interspersed with big sagebrush and sagebrush steppe.
Salt desert scrub shrubland	755 (2.2%)	Entirely located south of line mile 125. Dominant vegetation type in the central region of the project area (line mile 125-200).
Modified grasslands	187 (0.5%)	Located in very small patches in the central area of the alignment. Not a dominant vegetation type in the project area.
Western juniper woodland	5,985 (17.7%)	Scattered in the central and southern half of the alignment (line mile 75-265). The majority of this vegetation type occurs outside of BPA right-of-way because of ongoing vegetation management.
Northeastern Oregon mixed conifer forest	2 (<0.01%)	Small isolated stand of mixed conifer on the northern half of the alignment.
Cottonwood riparian gallery forest	145 (0.4%)	Isolated to riparian corridors around perennial stream systems.
Total	33,843	

Project area includes the transmission line right-of-way, access roads and 100 meters on either side.

Source: NHI 1998

At the northern end of the corridor, sagebrush steppe and agriculture are the dominant vegetation covers in Wasco and Jefferson counties with big sagebrush being a co-dominant in Jefferson County. In the central region of the corridor, western juniper woodland and big sagebrush shrubland cover types dominate in Crook and Deschutes counties. In the southern portion of the corridor, big sagebrush shrubland is dominant with salt desert scrub shrubland, sagebrush steppe and low-dwarf sagebrush found in portions of Lake County (see Figure 3.2-2).

The quality of the vegetation along the project has been modified by the initial construction of the line 40 years ago and by regular line maintenance. In addition, much of the land crossed is rangeland subject to livestock grazing or agricultural lands where vegetation structure or composition has been altered.

Sagebrush Steppe

Sagebrush steppe is commonly found in the non-cultivated portions of the Columbia River basin and Northern basin and range. Largely treeless, it includes a mosaic of grasses and shrubs, although most undisturbed area has very little bare ground and contains a larger proportion of perennial grasses than shrubs (Kagan and Caicco 1992, Mozingo 1987).

Shrub layer always contains some mixture of sagebrush and sagebrush-like vegetation. The three common subspecies of big sagebrush including Wyoming big sage (*Artemisia tridentata* var. *wyomingensis*), basin big sage (*A. tridentata* var. *tridentata*), and mountain big sage (*A. tridentata* var. *vaseyana*), will grow with shorter varieties of sagebrush including rigid (*A. rigida*), low (*A. arbuscula*), silver (*A. cana*) and three-tip (*A. tripartata*) along with rabbitbrush (*Chrysothamnus viscidiflorus* and *C. nausosus*), based on local environment and site history. Big sage species are a component but not always dominant in this vegetation type. A variety of bunchgrasses are associated with this type although they rarely comprise much of the stand due to grazing pressure. Some of the characteristic native grasses of this type are Great Basin wildrye (*Elymus cinereus*), Thurber needlegrass (*Stipa thurberiana*), Indian ricegrass (*Oryzopsis hymenoides*), bluebunch wheatgrass, Idaho fescue, bluegrass (*Poa secunda*), and sand dropseed (*Sporobolus cryptandrus*), which are particularly vulnerable to disturbance, especially that caused by grazing. In many areas, these have given way to cheatgrass and crested wheatgrass (*Agropyron cristatum*).

Within the project area, the quality of sagebrush steppe ranges from very low to good quality. Much of the project area has been degraded by unmanaged livestock grazing, right-of-way management, and altered fire regimes, which have encouraged the spread of noxious weeds (ODFW 2006). In the absence of fire, Western juniper is invading sagebrush steppe communities and converting them to Western juniper woodlands (Rowland et al. 2008).

Big Sagebrush Shrubland

Big sagebrush shrubland is the most common vegetative cover type in eastern Oregon. It appears as a mosaic with shrub-steppe communities along mountain range foothills and expansive extents in the valley bottoms. It is a medium to tall shrub community dominated by the three varieties of big sagebrush: mountain big sagebrush, basin big sage, and Wyoming big sage. These taller shrubs distinguish this vegetation type from sagebrush steppe, which is dominated by dwarf sagebrush species (Shiftlet 1994 and Dealy, et al. 1981).

Other shrubs found in this type include: bitterbrush (*Purshia tridentata*), rabbitbrush, three-tip sagebrush, silver sagebrush, and shadscale (*Atriplex confertifolia*). Herbaceous plants found in this type include pussytoes (*Antennaria corymbosa*), spreading phlox (*Phlox diffusa*), Hood's phlox (*P. hoodii*), longleaf phlox (*P. longifolia*), starved milk vetch (*Astragalus miser*), bigseed lomatium (*Lomatium macrocarpum*), nineleaf lomatium (*Lomatium triternatum*), Cusick's penstemon (*Penstemon cusickii*), and arrowleaf balsamroot (*Balsamorhiza sagittata*). Commonly

encountered native bunchgrasses include bluebunch wheatgrass, Sandberg's bluegrass (*Poa secunda*), junegrass (*Koeleria macrantha*), Idaho fescue, and Great Basin wildrye, and in more disturbed situations, bottlebrush squirreltail (*Sitanion hystrix*). Introduced annual grasses are primarily cheatgrass and crested wheatgrass, with medusahead rye (*Taeniatherum caput-medusae*) and North African wiregrass (*Ventenata dubia*) becoming more of a problem.

Within the project area, the quality of big sagebrush shrubland is from very low to high quality. Much of the project area has been degraded by unmanaged livestock grazing, right-of-way management, and altered fire regimes, which have encouraged the spread of noxious weeds (ODFW 2006). Western juniper is invading this habitat similar to sagebrush steppe communities (Rowland et al. 2008).

Low-Dwarf Sagebrush

These dwarf sagebrush types are sporadically found throughout eastern Oregon, generally on areas with shallow basalt soils. The low sagebrush cover type is most extensive east of the Guano Valley in Lake and Harney counties and in the ancient pluvial lake basins of northern Lake County. The dwarf sagebrush usually is the dominant vegetation in shallow soil, rocky conditions that exclude the formation of other sagebrush and shrub types. In most cases, they do not form extensive landscape-level covers but rather are part of the larger big sagebrush and sagebrush steppe mosaic (Hopkins 1979, Kagan and Caicco 1992, Shiftlet 1994, Dealy et al. 1981).

Dwarf sagebrush types are largely treeless with vegetation less than 2 feet high. A dwarf sagebrush shrub (black sagebrush [*Artemisia nova*], rigid sagebrush, low sagebrush, or silver sagebrush) dominates the shrub layer with occasional big sagebrush and bitterbrush. Several shrubby buckwheat species (*Eriogonum douglasii* and *E. strictum*) and purple sage (*Salvia dorrii*) are prominent on steep, rocky slopes within the cover type. The forb layer is diverse, but usually composed of ephemeral annual forbs, or scabland perennials (*Lomatium cous*, *Balsamorhiza serrata*, *B. hookeri*, *Lewisia rediviva*, *Erigeron* and *Phlox spp.*), although grasses provide most of the forb cover. Cheatgrass, Sandberg bluegrass, bottlebrush squirreltail, and onspike oatgrass (*Danthonia unispicata*) are the most frequently encountered.

This vegetation type is particularly vulnerable to disturbance, especially that caused by unmanaged grazing and vehicles. Cheatgrass usually replaces native perennial grasses in disturbed, low-dwarf sagebrush habitats (Crawford and Kagan 2002a). This vegetation type in the project area is in isolated pockets in the south. It is generally in low to high condition depending on the active presence of livestock grazing.

Salt Desert Scrub Shrubland

This vegetation type is most extensive in the alkaline playa lake basins of the Great Basin ecoregion of Harney, Lake, and Malheur counties. Within this type, vegetation composition and density varies considerably along the changing gradients of moisture, salinity, and microtopography. Vegetation includes low to tall shrub communities comprised of dispersed alkali-tolerant vegetation. This vegetation type generally occurs at lower to middle elevations. At many locations it intergrades with a number of other arid and semiarid wildlife habitats such as desert grasslands and sagebrush steppe. Salt desert scrub is a catchall term that describes several

differing environments based on soil condition and salinity levels (Mozingo 1986, Shiftlet 1994, Dealy et al. 1981).

On the most saline sites, that are also seasonally flooded, black greasewood (*Sarcobatus vermiculatus*) and winterfat (*Erotia lanata*) dominate. Sites with better drainage support a variety of shrubs and several grasses. Characteristic shrubs that are commonly associated with salt desert scrub complexes are shadscale, hopsage (*Grayia spinosa*), budsage (*Artemisia spinescens*), Mormon tea (*Ephedra viridis*), rabbitbrush, saltbush (*Atriplex nuttallii*), and greenmolly (*Kochia americana*).

Much of this habitat is in low to good condition depending on the presence of livestock, which increases shrub and annual cover and decreases bunchgrass cover (Crawford and Kagan 2002b). This vegetation type is present along the south central part of the line around fossil lake.

Modified Grasslands

Extensive grasslands of northeastern Oregon were formerly composed of native bunchgrasses. Presently, these grasslands are used primarily for pasture. Most lands in this type are seeded to cultivated grasses. Medium-tall grasslands composed of a variety of orchard and perennial bunch grasses. Shrubs are virtually nonexistent and a negligible part of total plant cover. Forbs can be diverse, but largely inconspicuous amongst the grasses (Mayfield and Kjelson 1984, Johnson and Simon 1987, Johnson and Clausnitzer 1992).

Undisturbed remnants of this type are typically dominated by bluebunch wheatgrass. Idaho fescue, Sandberg's bluegrass, and prairie junegrass are common associates. Less abundant, but common in the type are sand dropseed (*Sporobolus cryptandrus*), threeawn (*Aristida longiseta*), and needle-and-thread grass (*Stipa comata*). Forbs commonly found in this type include yarrow (*Achillea millefolium*), milk vetch (*Astragalus spp.*), arrowleaf balsamroot (*Balsamorhiza sagittata*), biscuitroot (*Lomatium macrocarpum*), phlox (*Phlox longifolia*), salsify (*Tragopogon dubius*), and mullein (*Verbascum thapsus*). Both cheatgrass and medusahead rye are common invaders in this vegetation type.

Western Juniper Woodlands

Western juniper (*Juniperus occidentalis*) is a common foothills vegetation type for many of the mountain ranges of eastern Oregon and generally occurs at middle elevations, forming a transition between habitats at higher and lower elevations. This woodland type is typified by its open canopy (less than 30 percent crown closure), single story, and short stature (6 to 20 feet tall) trees. Understory vegetation in these stands tends to be dominated by sagebrush species, although introduced annual grasses and native bunchgrasses can be important depending on site history and disturbance. Western juniper's range is increasing in Oregon and historic overgrazing and fire suppression are considered to be the primary factors for the spread of this type (Dealy et al. 1981, Monzingo 1986, Kagan and Caicco 1992).

The most frequently encountered shrubs in this cover type are sagebrush species. Big sagebrush is the most common with rigid sagebrush and low sagebrush also commonly found. Other shrubs associated with this type are mountain mahogany (*Cercocarpus ledifolius*), bitterbrush, and rabbitbrush. Grasses characterize the herbaceous layer. Cheatgrass and bottlebrush squirreltail

are typical and dominant on overgrazed or disturbed sites. Native bunchgrasses can usually be found. Idaho fescue, bluebunch wheatgrass, Thurber's needlegrass, and Sandberg's bluegrass are the most commonly encountered.

There is a combination of late successional and early successional woodland of juniper along the alignment. Much of the juniper in this area has spread because of wildfire suppression. This habitat type is managed within the BPA right-of-way; therefore, it is only present in isolated areas inside the right-of-way, but is common outside of the right-of-way.

Northeastern Oregon Mixed Conifer Forest

Northeastern Oregon mixed conifer forest is a common mid-elevation forest cover type found throughout the various mountain ranges of northeastern Oregon. It is characterized by large, mature tree species with a diverse understory of forbs, grasses, and shrubs. This cover type can take on a variety of structural and canopy appearances based on site history. Selective logging, grazing, and fire suppression effects have significantly changed the appearance of this forest type. This cover type is a popular area for wildlife due to the abundant forage (Hall 1973, Johnson and Simon 1987, Johnson and Clausnitzer 1992, Kagan and Caicco 1992, Chappell et al. 1999).

In its unaltered form, stands are typically two storied with an overstory of ponderosa pine (*Pinus ponderosa*) over smaller ponderosa, grand fir (*Abies grandis*), western larch (*Larix occidentalis*), lodgepole pine (*P. contorta*), western white pine (*P. monticola*), Douglas fir (*Pseudotsuga menziesii*), or Engelmann spruce (*Picea engelmannii*) depending on local environment. Shrub layer is prominent and diverse. Common shrubs include bigleaf huckleberry (*Vaccinium membranaceum*), rocky mountain maple (*Acer glabrum*), ninebark (*Physocarpus malvaceus*), Scouler's willow (*Salix scouleriana*), shiny-leaf spirea (*Spiraea betulifolia*), snowbrush (*Ceanothus velutinus*), bog blueberry (*V. uliginosum*), and dwarf Oregon grape (*Mahonia nervosa*). Commonly encountered forbs in this cover type include: false Solomon's seal (*Smilacina racemosa*), heartleaf arnica (*Arnica cordifolia*), rattlesnake plantain (*Goodyera oblongifolia*), white hawkweed (*Hieracium albiflorum*), bigleaf sandwort (*Arenaria macrophylla*), woods strawberry (*Fragaria vesca*), meadowrue (*Thalictrum occidentale*), sweet cicely (*Osmorhiza chilensis*), and sidebells pyrola (*Pyrola picta*).

This habitat is only present on the fringes of the 2-mile buffer and is not encountered within the impact areas of the project.

Cottonwood Riparian Gallery Forest

Varies in type from grasses and grass-like plants to shrubs, deciduous trees, and conifer trees depending on climate, terrain, soils, geomorphology, stream size, and recent flood disturbance associated with river channels, lake shores, hummocks, and wetland edges. Riparian community assemblages vary in composition throughout the project area (Kovalchik 1987 and Kagan and Caicco 1992).

The predominant tree species in the overstory is Black cottonwood (*Populus trichocarpa*). In addition to cottonwood, Eastern Oregon deciduous overstory trees include white alder, mountain alder, pacific willow (*Salix lasiandra*), non-native black locust (*Robinia pseudo-acacia*), and

quaking aspen (*Populus tremuloides*). Conifers associated with the eastern Oregon cottonwood gallery forests are ponderosa pine, Douglas fir, and in mountain settings, Engelmann spruce and lodgepole pine.

Shrub and herb layers are prominent and diverse and include Douglas spiraea (*Spiraea douglasii*), red osier dogwood (*Cornus sericea*), Nutka rose (*Rosa nutkana*), chokecherry (*Prunus virginiana*), and a variety of willow species (*Salix boothii*, *S. exigua*, *S. geyeriana*, *S. lemmonii*, and *S. bebbiana*). Forbs include speedwell (*Veronica americana*), cow parsnip (*Hieracleum lanatum*), skunk cabbage (*Lysichitum americanum*), pioneer violet (*Viola glabella*), stinging nettle (*Urtica dioica*), wide fruit sedge (*Carex eurycarpa*) and woolly sedge (*C. lanuginosa*).

This habitat is generally present at the river/stream crossings in the alignment. It is generally in good condition, but in areas of intense grazing and agriculture much of the cottonwood is absent and vegetation is predominantly willow and non-native grasses.

Summary

Overall, big sagebrush shrubland covers the most area of the upland vegetation types in the project area. It accounts for 11,666 acres (34.5 percent) within the project area. Sagebrush steppe, which is very similar to big sagebrush shrubland, is the second highest upland vegetation type encountered by the project. It accounts for 10,917 acres (32.3 percent) within the project area. Overall, the sagebrush type vegetation accounts for 26,769 acres (81.4 percent) within the project area and is the predominant upland vegetation type in the project area. Western juniper woodland (17.7 percent) is also present within the PDCI project area in a high percentage, but is often managed within BPA right-of-way.

Overall quality of the vegetation ranges from low to high because of pre-existing impacts. When the PDCI line was constructed 40 years ago much of the area was impacted (cleared) for the construction. This clearing resulted in loss of complex structure and habitat quality within the right-of-way and constructed road prism. Most of the vegetation is young and, in general, different than adjacent vegetation outside the right-of-way. Since the initial construction of the PDCI line, operation and maintenance activities have occurred that result in no large trees present within the corridor and much of the area within the road prism remaining cleared with vegetation around the towers kept low in vertical structure.

Adjacent to the roads, the vegetation is generally of low quality due to past construction, ongoing maintenance, continued vehicle use, and the presence of noxious and invasive weeds that limit structure. Generally roadside vegetation within 10 feet of the roadway is not considered good quality. Vegetation quality generally increases with distance of the right-of-way and access roads.

Currently, ongoing vegetation management activities are conducted under BPA's *Transmission System Vegetation Management Program Final EIS* (BPA 2000), which uses a variety of methods to keep plants from interfering with transmission lines and roads, including manual, mechanical, chemical, and biological methods to foster low-growing plant communities.

Rare Plants

Rare plant species include federally-listed species under the Endangered Species Act (ESA; 16 USC 1531 et seq.), as well as those listed by the state of Oregon, and species managed by the USFS and BLM.

Based on known data and field surveys it was determined that no federal- or state-listed species occur in the project area. However, numerous Oregon sensitive and strategic species, BLM special status species, USFS sensitive species, and federal species of concern occur in or adjacent to the project area. The project Baseline Habitat Characterization Report (HDR 2013a) includes a list of species that were documented or suspected to occur in the project area.

Rare Plant Survey Results

Rare plants documented along the transmission corridor during the rare plant survey effort included 7 different species: 6 vascular plants and 1 crustose lichen (Table 3.4-2 and Table 3.4-3). Although all species were considered “rare”, the 7 different species have varying designations under which their status is classified. Three of the 7 species have a rare status designation either federally or by the BLM ISSSSP program, these three plant species include:

- Idaho milkvetch – ISSSSP Strategic Status
- Lemmon’s milkvetch – ISSSSP Strategic/Sensitive Status
- Salt heliotrope – ISSSP Strategic/Sensitive Status
- Woven-spore lichen – Federal Species of Concern

The remaining 3 rare vascular plant species including, Howell’s milkvetch, beaked cryptantha, and dwarf lousewort do not have federal, state, or ISSSSP protection status, but are considered rare by Oregon Biodiversity Information Center (ORBIC). ORBIC rare plants are given a state rank of rarity, but have no legal protection status.

Table 3.4-2: Rare Plant Species Documented Along the BPA PDCI Transmission Corridor

Scientific Name	Common Name	Oregon Biodiversity Rank ^a	Federal Status ^b	Oregon Status ^c	ORBIC (2-mile Buffer) ^d	BLM Special/Sensitive Status ^e
<i>Astragalus conjunctus</i> var. <i>rickardii</i>	Idaho milk-vetch	3	—	—	X	OR-STR
<i>Astragalus howellii</i>	Howell's milk-vetch	3	—	—	X	—
<i>Astragalus lemmonii</i>	Lemmon's milk-vetch	1	—	—	—	OR-SEN
<i>Cryptantha rostellata</i> (syn. <i>C. flaccida</i>)	Beaked cryptantha	—	—	—	—	—
<i>Heliotropium curassavicum</i>	Salt heliotrope	2	—	—	X	OR-SEN
<i>Pedicularis centranthera</i>	Dwarf lousewort	3	—	—	X	—
<i>Texosporium sancti-jacobi</i>	woven-spored lichen	2	SOC	—	—	OR-SEN-

^a Oregon Biodiversity Ranks: 1. Taxa threatened with extinction or presumed extinct throughout entire range; 2. Taxa threatened with extirpation or presumed extirpated from Oregon; 3. Taxa needing more information before status is determined; 4. Taxa of conservation concern and requiring continued monitoring; EX. Extirpated from Oregon. "—" = Not listed by ORBIC.

^b Federal Status: Candidate: Those species which have been studied and the USFWS has concluded that they should be proposed for addition to the federal Endangered and Threatened species list; Species of Concern: Those species which might be in need of concentrated conservation actions. Such conservation actions vary depending on the health of the populations and degree and types of threats. "—" = Not listed.

^c Oregon Status: Endangered: Any native plant species determined to be in danger of extinction throughout all or any significant portion of its range. Threatened: Any native plant species likely to become endangered within the foreseeable future throughout all or any significant portion of its range. Candidate: Any plant species designated for study whose numbers are believed low or declining, or whose habitat is sufficiently threatened and declining in quantity and quality, as to potentially qualify for listing as a threatened or endangered species in the foreseeable future. "—" = Not listed.

^d ORBIC (2-mile buffer): ORBIC rare plant species with known populations located within 2 miles of the BPA PDCI Transmission Corridor. "X" = Present; "—" = Not present.

^e BLM Special Status/Sensitive Species Program Status: Sensitive (SEN); Strategic (STR). "—" = Not listed.

A total of 166 detections of ISSSSP listed plant populations or sub-populations were detected during the rare plant survey effort, consisting of 7 species. Of these rare plant detections, the majority (131 detections) were located along the northern portion of the line within Wasco County. Jefferson County had 22 detections, while Crook and Lake counties had 6 and 7 detections, respectively. A total of 416 plant species have been documented along the surveyed portions of the transmission corridor.

For all botanical species lists combined, a total of 416 plant species were documented, including 4 trees, 23 shrubs, 15 subshrubs, 315 forbs, 43 grasses, 5 sedges, 8 rushes, 2 ferns, and 1 crustose lichen. The highest species diversity was documented in Lake County with 324 species. Jefferson County contained the second highest species diversity with 181 species documented. Wasco County contained 140 species, Deschutes County contained 136 species, and Crook County contained the lowest species diversity with 130 species. The project Baseline Habitat Characterization Report (HDR 2013a) includes additional information on rare plant surveys.

Table 3.4-3: Presence of Rare Plant Species by Tower Number Along the BPA PDCI Transmission Corridor

Scientific Name	Common Name	Tower Location	Road Location
<i>Astragalus conjunctus</i> <i>var. rickardii</i>	Idaho milk-vetch	26/1	Not present along the roads surveyed.
<i>Astragalus howellii</i>	Howell's milk-vetch	25/1, 25/2, 26/1, 26/2, 26/3, 26/4, 26/5, 27/1, 28/1	Road to Tower 27/5, 28/1 Road between Tower 25/1-25/2, 25/2-26/2, 26/2-26/3, 26/4-26/5, 26/5-27/1
<i>Astragalus lemmonii</i>	Lemmon's milk-vetch	81/2, 81/4, 82/1, 82/2, 82/5, 82/6, 104/3, 105/6, 106/1, 106/5	Not present along the roads surveyed.
<i>Cryptantha rostellata</i> <i>(syn. C. flaccida)</i>	Beaked cryptantha	25/1, 25/2, 26/1, 26/2, 26/3, 26/4, 26/5, 27/1, 28/1, 34/2, 34/3, 61/1, 61/3	Road to Tower 27/5, 28/1, 34/3, 61/1 Road between Tower 25/2-26/1, 26/3-26/4, 26/4-26/5, 26/5-27/1, 27/5-28/1, 34/2-34/3
<i>Heliotropium</i> <i>curassavicum</i>	Salt heliotrope	Not present at a tower location	Road between Tower 167/2-167/3
<i>Pedicularis</i> <i>centranthera</i>	Dwarf lousewort	253/1, 253/2, 254/1, 254/2	Road between Tower 253/1-253/2
<i>Texosporium sancti-</i> <i>jacobi</i>	woven-spored lichen	56/1	Road between Tower 26/2-26/3

Idaho Milkvetch

A single plant comprised the only detection of Idaho milkvetch. The plant was growing within the vicinity of a tower in Wasco County, and showed evidence of grazing, most likely by cattle. Two other rare plants were within the vicinity of the Idaho milkvetch detection: Howell's milkvetch and beaked cryptantha. The Idaho milkvetch was growing in an area with big sagebrush, cheatgrass, bottlebrush squirreltail grass, western needlegrass, and other forb and grass species. The general area showed evidence of cattle grazing and cattle were in the vicinity at the time surveys were conducted.

Howell's Milkvetch

A total of 65 detections were recorded of Howell's milkvetch, all within Wasco County. These 65 populations and sub-populations consisted of a total of approximately 3,346 individual plants. These sites contained big sagebrush, rubber rabbitbrush, Sandberg bluegrass, cheatgrass, yarrow, and other forb and grass species. Beaked cryptantha was often commonly documented in the immediate vicinity of the Howell's milkvetch sites. Evidence of grazing was often evident at these sites, and poses a direct risk to the species.

Lemmon's Milkvetch

A total of 31 detections were recorded of Lemmon's milkvetch, within Crook and Jefferson counties. Seventeen of the detections were made in Crook County, and 14 detections in Jefferson County. These 31 detections consisted of 286 individual plants. These sites contained western juniper, big sagebrush, rubber rabbitbrush, Sandberg bluegrass, crested wheatgrass, cheatgrass, Hood's phlox, shaggy fleabane, buckwheat species, and other forb and grass species. Other milkvetch species co-occurred with Lemmon's milkvetch, including freckled milkvetch, curvepod milkvetch, and mourning milkvetch. Evidence of grazing was noted at many of these sites, but not necessarily by cattle. Botanists noted that while Lemmon's milkvetch seemed to be lightly grazed on by cattle or ungulates, the plants seemed to proliferate in grazed areas, whereas other milkvetch species showed signs of more aggressive grazing and lower numbers of plants in the same area.

Beaked Cryptantha

A total of 66 detections were recorded of beaked cryptantha, all within Wasco and Jefferson counties. Fifty-eight of the detections (88 percent) were within Wasco County, with the remaining eight detections (12 percent) in Jefferson County. A total of approximately 3,500 individual plants were documented. Associated species for this rare plant were similar to those documented for Howell's milkvetch, as they occurred in many of the same areas. These sites contained big sagebrush, rubber rabbitbrush, yellow rabbitbrush, Sandberg bluegrass, cheatgrass, and other forb and grass species. Evidence of grazing was often evident at these sites, but as a small annual species, beaked cryptantha was not a source of forage for animals, though it is at risk of trampling.

Salt Heliotrope

Salt heliotrope was documented at 1 site located in Lake County and just outside of the survey area. This site contained over 500 individual plants. The population had been previously documented and the location reported to ORBIC; therefore, documentation of this site during the surveys was a confirmation of the continued presence of this rare species. Although this rare plant population fell just outside of the survey area, it was located immediately adjacent to a tower access road that serves as transportation for all BPA construction equipment through the area. Salt heliotrope occurred on loose sand with associated grasses such as alkali saltgrass, thickspike wheatgrass, and Indian ricegrass.

Dwarf Lousewort

Dwarf lousewort was documented at 6 sites all located in Lake County. These 6 sites consisted of a total of 133 individual plants. Associated species for dwarf lousewort consisted of big sagebrush, rubber rabbitbrush, antelope bitterbrush, thorn skeletonweed, squirreltail bottlebrush grass, Sandberg bluegrass, and other forbs and grasses.

Woven-spore Lichen

Woven-spore lichen was documented at two sites, both in Wasco County. One site was along a transmission line access road buffer and contained six individuals. The other woven-spore lichen site was located within a transmission tower pad area, and contained 5 sub-populations and 67 individuals. Found only in the Columbia Basin Ecoregion of northern Oregon, this soil crust lichen species grows in arid and semi-arid areas, frequently in rocky soils dominated by rigid sagebrush, Sandberg bluegrass, cheatgrass, and other grass and forb species (McCune and Rosentreter 1992). This crustose lichen is found at elevations up to 3,280 feet (1,000 m) on flat ground, dead bunchgrass clumps and on small mammal scat in areas with little to no tree cover, no recent grazing, evidence of fire, or other ground disturbances (Camp and Gamon 2011). The site with 67 woven-spore lichen individuals showed evidence of recent prescribed burning of rigid sagebrush, and some burn areas were as close as 0.5 feet (0.15 m) from the rare lichens. This prescribed burning was presumed to be conducted as maintenance by BPA to remove tree and shrub species growing within the transmission corridor.

Invasive/Noxious Weeds

The term “noxious weed” is legally defined under both federal and state laws. Under the Federal Plant Protection Act of 2000 (formerly the Noxious Weed Act of 1974 [7 USC SS 2801-2814]), a noxious weed is defined as “any plant or plant product that can directly or indirectly injure or cause damage to crops, livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment.”

In addition to federal noxious weed lists, ODA maintains a list of regulated and prohibited noxious and invasive weed species. The Oregon Weed Board classifies noxious weeds into the following categories:

- “A” list designated weeds are those with 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 those with 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.
- “C” list designated weeds are nonnative plants that are already widespread in Washington or are of special interest to the state’s agricultural industry. A Class C status allows counties to enforce control if locally desired. Other counties may choose to provide education or technical support for the removal or control of these weeds.
- “T” list weeds are priority species for prevention and control by the Oregon Noxious Weed Control Program because they pose an economic threat to the state of Oregon.

Preconstruction Noxious Weed Survey Results

A preconstruction undesirable plant survey was conducted in August 2013 (HDR 2013b). A total of 23 species of noxious weeds in 660 occurrences were found to occur within the survey area (Table 3.4-4). Most of the species found were listed on more than one of the noxious weed list references, with a few exceptions. Sixteen of the species found are listed in ODA's 2013 noxious weed list (2013), 19 species are listed on the Crook County noxious weed list (updated in 2007), 12 species are listed in the Lake County noxious weed list (2013), 20 species are listed in the Deschutes County noxious weed list (2013), and 11 species are listed as weeds of concern in the Columbia Gorge CWMA.

Table 3.4-4: Noxious Weeds Located in the Project Area

Common Name	Status^a	Number of Occurrences	Gross Acres
Bull thistle (<i>Cirsium vulgare</i>)	ODA: B Crook County: C Deschutes County: C	92	33.1
Canada thistle (<i>Cirsium arvense</i>)	ODA: B Crook County: B Deschutes County: B Lake County Columbia Gorge CWMA: C	15	1.2
Chicory (<i>Cichorium intybus</i>)	Crook County: C	28	7.6
Common mullein (<i>Verbascum thapsus</i>)	Crook County: C Deschutes County: C	134	47.5
Diffuse knapweed (<i>Centaurea diffusa</i>)	ODA: B Crook County: B Deschutes County: B Lake County Columbia Gorge CWMA: C	99	47.5
Field bindweed (<i>Convolvulus arvensis</i>)	ODA: B and T Crook County: C Deschutes County: C	9	0.6
Fuller's teasel (<i>Dipsacus fullonum</i>)	Crook County: B	9	0.7
Kochia (<i>Kochia scoparia</i>)	ODA: B Crook County: C Deschutes County: B	5	14.7
Mediterranean sage (<i>Salvia aethiopsis</i>)	ODA: B Crook County: A Deschutes County: A Lake County Columbia Gorge CWMA: HI	14	1.5
Medusahead rye (<i>Taeniatherm caput-medusae</i>)	ODA: B Crook County: B Deschutes County: A Lake County	31	520.3
Puncturevine (<i>Tribulus terrestris</i>)	ODA: B Deschutes County: C Lake County Columbia Gorge CWMA: ED	2	1.7

Table 3.4-4: Noxious Weeds Located in the Project Area

Common Name	Status ^a	Number of Occurrences	Gross Acres
Rush skeletonweed (<i>Chondrilla juncea</i>)	ODA: B and T Crook County: A Deschutes County: A Lake County Columbia Gorge CWMA: ED	1	0.0008
Russian knapweed (<i>Acroptilon repens</i>)	ODA: B Crook County: B Deschutes County: A Lake County Columbia Gorge CWMA: ED	6	3.0
Russian thistle (<i>Salsola tragus</i>)	Crook County: C Deschutes County: B	105	46.8
Scotch thistle (<i>Onopordum acanthium</i>)	ODA: B Crook County: A Deschutes County: A Lake County	55	14.1
Spotted knapweed (<i>Centaurea stoebe</i> ssp. <i>micranthos</i>)	ODA: B and T Crook County: B Deschutes County: B Lake County Columbia Gorge CWMA: C	10	2.2
Squarrose knapweed (<i>Centaurea virgata</i>)	ODA: A and T Crook County: A Deschutes County: A Lake County	15	11.2
St. Johnswort (<i>Hypericum perforatum</i>)	ODA: B Deschutes County: C Lake County Columbia Gorge CWMA: C	17	2.9
Tree-of-heaven (<i>Ailanthus altissima</i>)	ODA: B Columbia Gorge CWMA: C	3	0.4
Western water hemlock (<i>Cicuta douglasii</i>)	Crook County: C Deschutes County: C Columbia Gorge CWMA: HI	1	0.001
Whitetop (<i>Lepidium draba</i> [<i>Cardaria</i>])	ODA: B Crook County: B Deschutes County: A Lake County Columbia Gorge CWMA: HI	1	0.11
Wild carrot (<i>Daucus carota</i>)	Crook County: A Deschutes County: A	1	0.0004
Yellow sweetclover (<i>Mellilotus officinalis</i>)	Crook County: C Deschutes County: C	2	0.5
Total		660	520.3

^a Status:

ODA:

A: Weed of known economic importance that occurs in the state in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states make future occurrence in Oregon seem imminent.

- B: Weed of economic importance that is regionally abundant, but which may have limited distribution in some counties.*
- T: Annually, a target list of weed species is selected that will be the focus for prevention and control by the Noxious Weed Control Program. Action against these weeds will receive priority. T-listed noxious weeds are designated by the Oregon State Weed Board and direct ODA to develop and implement a statewide management plan. T-listed noxious weeds are species selected from either the A or B list.*

Crook County: Same rating definitions as ODA.

Deschutes County:

- A: Priority noxious weed designated by the Deschutes Weed Board as a target weed species on which the Weed Control District will comply with a state-wide management plan and/or implement a county-wide plan for intensive control and monitoring. An "A" rated weed may also be a weed of known economic or ecological importance that occurs in small enough infestations to make eradication/containment possible; or one that is not known to occur here, but its presence in neighboring counties make future occurrence here seem imminent.*
- B: A weed of economic importance, which is both locally abundant and abundant in neighboring counties.*
- C: A weed that has the potential to cause harm to agriculture production and transportation systems*

Lake County: Does not rate weeds on their list.

Columbia Gorge CWMA:

- C: (Common) These weeds occur across the landscape at a level where eradication, containment, or control is not economically feasible. Management focuses on removing them from ecologically, socially, and economically important sites and slowing their spread through prevention actions. When available, biological controls should be used.*
- ED: (Early Detection) Some of these weeds are found outside the CWMA region but could invade the region at any time in the future. Some have been found in the CWMA in isolated populations. Management focuses on developing an Early Detection Rapid Response (EDRR) network of people and organizations to identify sites.*
- HI: (High Importance) These weeds can be locally abundant, but may also occur in spotty distribution across the landscape. Management focuses on inventory to determine distribution, followed by eradication of small, isolated populations, and control or containment of larger infestations.*

The northern end of the line (from line mile 1 to 91) contained the highest concentration of undesirable weed species. Of the 660 noxious weed occurrences, 454 were located from line mile 1 to 91. Many noxious weed species were found only in this section including chicory, field bindweed, Fuller's teasel, St. Johnswort, puncturevine, rush skeletonweed, squarrose knapweed, tree-of-heaven, and wild carrot. The section from line mile 91 to 214 contained relatively few occurrences (and gross acres) of noxious weeds, with 81 occurrences. The majority of noxious weed occurrences in this (approximately) middle section were Russian thistle along and within the right-of-way. There were no species unique to this stretch of line. The most southern section (from line mile 214 to 265) contained the second highest number of weeds, with 120 occurrences. Several species were unique to this area, including Mediterranean sage, Western water hemlock, whitetop, and yellow sweetclover (HDR 2013a). The project Undesirable Plant Survey Report (HDR 2013b) includes additional information on rare plant surveys.

3.4.2 Environmental Consequences – Proposed Action

Potential impacts to vegetation would include removal and disturbance (crushing, root damage) of existing vegetation communities, impact to rare plants, and the potential introduction or spread of noxious weeds. The degree and duration of impact to vegetation would depend on the type and amount of vegetation affected and the rate at which vegetation would regenerate after construction. These factors were taken into account in developing the direct impact categories (temporary and permanent) and overall impact of project actions (low, moderate, and high). No indirect impacts to vegetation are expected. Project impacts by vegetation type are listed in Table 3.4-5.

Direct impacts can either be temporary/short-term (0-3 years), long-term (3-50 years), or permanent (greater than 50 years). An example of short-term impacts would be trampling of low stature or dwarf sagebrush communities that would recover within 3 years. Mowing or blading of sagebrush communities would be considered a long-term impact, but these communities would eventually recover within 3-50 years. Permanent impacts would result from placing rock or other permanent structures that would not allow vegetation communities to grow back, resulting in a net loss of area and a permanent impact to the vegetation community. For the preparation of this EA, long-term and permanent impacts have been lumped, due to the overall effect of removing shrub communities in the project area which would result in a permanent impact in relation to the life of the project. Short-term impacts are considered temporary impacts.

The area within the predisturbed tower area (80 feet by 80 feet), as defined in the project description, was not included in the calculations of impacts because it is considered to already be developed. This area includes the existing towers and the area around it that was graded and disturbed during the original construction of the PDCI. The predisturbed tower area is also under regular vegetation management to reduce vegetation height and to control noxious weeds. Vegetation management includes manual, mechanical and chemical methods as appropriate. Vegetation management is done in accordance with BPA's *Transmission System Vegetation Management Program Final EIS* (BPA 2000).

Overall impacts are broken into a low, moderate, and high impact categories based on the effect of the project action and related short, long and permanent impacts. This is a qualitative measure of the overall effect of the specific project action on existing upland vegetation resources. Low rated impacts are those that consist primarily of actions with temporary/short term impacts or have relative small permanent impacts over the length of the project, and have limited adverse affects as a result of those impacts. Moderate impacts are those that in addition to temporary impacts also have relatively small to moderate permanent impacts over the length of the project, limited adverse affects as a result of those impacts, but have some areas with long-term restoration and/or additional mitigation measures to offset permanent impacts. Actions with high impacts are those with large areas of permanent impact, have an adverse effect on the landscape as a result of those impacts, and require extensive long-term restoration or mitigation to offset project related impacts.

Table 3.4-5: Overall Permanent and Temporary Impacts of the Project to Vegetation Types

Upland Vegetation Type	Equipment Upgrades and New Tower Construction		Access Roads (New Roads and Improvements)		Tensioning Sites		Total	
	Temporary Impacts ^a (Acres)	Permanent Impacts ^b (Acres)	Temporary Impacts ^a (Acres)	Permanent Impacts ^b (Acres)	Temporary Impacts ^a (Acres)	Permanent Impacts ^b (Acres)	Temporary Impacts ^a (Acres)	Permanent Impacts ^b (Acres)
Sagebrush steppe	262.7	<0.2	0.3	64.1	N/A	N/A	263.0	64.3
Big sagebrush shrubland	248.3	0.3	<0.1	51.3	0.4	N/A	248.7	51.6
Low-dwarf sagebrush	94.5	N/A	N/A	6.7	N/A	N/A	94.5	6.7
Salt desert scrub shrubland	17.8	N/A	N/A	6.9	N/A	N/A	17.8	6.9
Modified grasslands	4.9	N/A	N/A	N/A	N/A	N/A	4.9	0.0
Western juniper woodland	46.7	<0.2	N/A	4.6	N/A	N/A	46.7	4.7
Cottonwood riparian gallery forest	<0.1	N/A	N/A	0.3	N/A	N/A	<0.1	0.3
Total	674.9	0.6	0.3	133.9	0.4	0.0	675.3	134.5

^a Temporary impacts would recover within 3 years.

^b Permanent impacts include long term impacts and are impacts that would take longer than 5 years to recover.

Overall, the project would permanently impact 134.5 acres and temporarily impact 675.3 acres of upland vegetation within the project area. Sagebrush steppe would incur the most temporary impacts, of the total acres temporarily impacts, followed by big sagebrush shrubland and low-dwarf sagebrush. Similarly, sagebrush steppe and big sagebrush shrubland are the most impacted vegetation types for permanent impacts, however, salt desert scrub shrubland and low-dwarf sagebrush are practically tied for third most impacted. Long term impacts are expected to be minimal since the Proposed Action has limited temporary work areas that would require the removal of shrubs and/or trees.

Table 3.4-6: Upland Vegetation Impacts a

Vegetation Type	Acreage in the Project Area (Percentage of Total)	Impact in the Project Area (Percentage of Total Temporary or Permanent)	
		Temporary	Permanent
Sagebrush steppe	10,917 (32.3%)	262.9 (38.9%)	64.3 (47.9%)
Big sagebrush shrubland	11,666 (34.5%)	248.5 (36.9%)	51.6 (38.3%)
Low-dwarf sagebrush	4,186 (12.4%)	94.5 (14.0%)	6.7 (5%)
Salt desert scrub shrubland	755 (2.2%)	17.8 (2.6%)	6.9 (5.1%)
Modified grasslands	187 (0.5%)	4.9 (0.7%)	0.0 (0.0%)
Western juniper woodland	5,985 (17.7%)	46.7 (6.9%)	4.7 (3.5%)
Northeastern Oregon mixed conifer forest	2 (<0.01%)	N/A	N/A
Cottonwood riparian gallery forest	145 (0.5%)	<0.1 (<0.1%)	0.3 (0.2%)
Total	33,843	675.3	134.5

Project area includes the transmission line right-of-way, access roads and 100 meters on either side.

Temporary impacts to grassland and dwarf sagebrush communities would be short-term as these vegetation types would be expected to return to their herbaceous and low stature status within 1 to 3 growing seasons following completion of construction, cleanup, and restoration activities. Temporary impacts to sagebrush steppe, big sagebrush shrubland, salt desert scrub shrubland, Western juniper woodland, and cottonwood riparian gallery forest, would be longer term due to the time required to reestablish the vegetation characteristic of these community types and would be considered long-term impacts and because of this have been lumped in with permanent impacts. The arid environment in these regions is not conducive to plant growth, and regeneration of vegetation following construction would be slow. Moreover, the regeneration success of seeded or planted natural vegetation in these areas varies significantly and can be ineffective. Natural regeneration of these areas may take 40 to 50 years to get back to the low to moderate quality that is the current habitat within the right-of-way. These areas would be considered permanent impact areas. In sagebrush and shrubland habitats that are temporarily impacted by the project, herbaceous vegetation (either seeded or occurring naturally) would temporarily revegetate any impacted locations and minimize fragmentation impacts while sagebrush is allowed to recover and repopulate the impacted areas.

Permanent impacts caused by road improvements, new road construction, and new dead-end tower placement would lead to additional vegetation fragmentation on the landscape. The breakup of contiguous vegetation into smaller patches by new and widened roads and construction of new towers results in vegetation fragmentation and the creation of new habitat edges. Sagebrush habitats in particular, their edges play a crucial role in ecosystem interactions and landscape function, including the distribution of plants and animals, fire spread, vegetation

structure, and wildlife habitat. Because of previous impacts caused by the construction of the original transmission line and access road, limited new impacts would occur to non-fragmented habitat as a result of the project. Where roads will be widened, the linear nature of the impact limits the impact of fragmentation since the road is already on the landscape. At the four new tower locations the new towers will be placed in line with other towers and within BPA right of way, which limits fragmentation since the transmission line is already present and the new towers introduce limited impact on the landscape.

As part of BPA’s vegetation management of the project, BPA would cut juniper trees growing within 57 spans of right-of-way in the southern half of Lake County, starting at approximately tower 229/2. The juniper trees growing in the right-of-way are generally less than 5 feet tall (>50 years old) and are sparse but localized within individual spans. The trees have grown into the right of way over the last maintenance cycle and are isolated trees. Because of there isolation and location within the maintained BPA right of way, project impacts to trees is not expected to have a major impact to adjacent vegetation or create additional vegetation fragmentation.

Permanent impacts would result in loss of acreage and would require the development of a mitigation plan. Upland vegetation impacts would be mitigated through various mechanisms. Upland vegetation impacts that affect sensitive wildlife habitat and species would be mitigated with the guidance of USFWS and ODFW Mitigation Policy, as discussed in Section 3.5, Wildlife.

Transmission Line Upgrade and New Tower Installation

General Vegetation Impacts

Transmission line upgrades at existing towers would result only in temporary impacts to existing vegetation. No permanent impacts will be incurred as a result of the project through incorporation of mitigation measures to minimize said impacts. A temporary work area of 175 feet by 200 feet would be established at each tower outside the predisturbed tower area (80 feet by 80 feet). Vegetation within the temporary work area would not be removed and would incur minimal crushing or trampling where necessary to access the towers. Within the temporary work areas, impacts to vegetation are expected to be minimal and would consist primarily of damage to roots from compaction of soils by heavy equipment that could result in loss of soil productivity and short-term vegetation impacts from loss of herbaceous and other low lying vegetation due to vehicular disturbance. No permanent impacts are expected at the tower locations as a result of equipment upgrades.

Table 3.4-7: Impacts to Upland Vegetation Types at Existing Towers

Vegetation Type	Temporary Impacts (Acres)
Sagebrush steppe	247.8
Big sagebrush shrubland	237.5
Low-dwarf sagebrush	92.7
Salt desert scrub shrubland	17.6
Modified grasslands	4.9
Western juniper woodland	43.2
Cottonwood Gallery Riparian Forest	0.04
Total	643.7

Total temporary impact at existing towers would be 643.7 acres over the 265-mile corridor (Table 3.4-7). That equates to approximately 2.4 acres per mile of transmission line. Vegetation loss associated with temporary impacts at towers would only occur within the existing right-of-way and would result primarily in a temporary loss of vegetation structure and complexity of low vegetation. The vegetation quality abutting the existing towers is predominantly low because of previous construction impacts, presence of noxious weeds, active ongoing vegetation maintenance within BPA right of way, and cattle grazing. In most cases, the temporary work area is predominately a mixture of forbs/grasses, early successional sagebrush, and other shrub steppe species.

New tower installation would result in both temporary and permanent impacts to existing vegetation. A total of four new dead-end towers would be installed within the existing right-of-way (See Figure 2.1-1). Impacts incurred would be from the grading/grubbing/clearing of shrub species consistent with sagebrush shrublands, temporary disturbance/damage to low herbaceous vegetation, damage to plant roots from compaction of soils by heavy equipment, and soil disturbance and associated productivity.

It is assumed that an 80 by 80 foot tower impact area would be permanently impacted during the construction of each dead-end tower. Impacts within this area would result from clearing vegetation, grading and excavation for tower construction, and construction of rock landings (if required). Outside of the tower impact area, impacts within the temporary work area (175 foot by 200 foot) would be temporary in nature, since the areas would not be cleared or grubbed. No vegetation removal would occur in this area. Some crushing or trampling of individual shrubs would occur.

Table 3.4-8: Impacts to Upland Vegetation Types at New Dead-End Towers

Vegetation Type	Temporary Impacts (Acres)	Permanent Impacts (Acres)
Sagebrush steppe	14.9	0.15
Big sagebrush shrubland	10.8	0.3
Low-dwarf sagebrush	1.8	0.0
Salt desert scrub shrubland	0.2	0.0
Modified grasslands	0.0	0.0
Western juniper woodland	3.5	0.15
Cottonwood Gallery Riparian Forest	0.0	0.0
Total	31.2	0.6

Total temporary impacts at new towers would be 31.2 acres (Table 3.4-8) and permanent impacts would be 0.6 acres. Vegetation loss associated with temporary impacts at new towers would only occur within the existing right-of-way and would result primarily in a temporary loss of vegetation structure and complexity to low vegetation. No removal of sagebrush or other shrubs would occur in the temporary work area. Permanent impacts at each tower equates to 0.15 acres per new tower location.

All new tower impacts would occur within the exiting BPA right of way and in areas that have been previously disturbed by the construction of the transmission line and ongoing active vegetation maintenance within the BPA right of way. Vegetation quality at the new tower

locations is predominantly moderate because even though the areas between spans is not managed heavily it has been impacted by the previous construction, has limited active ongoing vegetation maintenance (tree removal), and is currently in areas of active cattle grazing. At each location the vegetation is predominately a mixture of forbs/grasses, early successional sagebrush (20-40 years), and other shrub-steppe species typical of the adjacent environment, but of generally an earlier successional period.

Signage, fences, or flagging would be installed prior to construction, where needed, to restrict vehicles and equipment to designated routes outside of sensitive vegetative communities and species habitat. In areas of temporary impact, mitigation measures would be employed to minimize impacts to the existing vegetation. Where possible vegetation would not be cleared and would only be driven on by vehicles as tower construction is occurring. If vegetation needs to be removed, it would first be trimmed with root balls retained for regrowth. This is especially important to sagebrush which has slow growth patterns and takes upwards of 40 to 50 years to reestablish.

The restoration of temporary impact locations around the towers would be completed predominantly through site seeding. Selection of the correct seed mixes based on the location and vegetation type would be completed and done in conjunction with BLM, USFS, and other stakeholders. Revegetation would be considered successful when the cover and density of native vegetation within the impacted areas are similar to adjacent undisturbed lands. Mitigation measures include at least three full seasons of post construction monitoring.

Implementation of the mitigation measures and lack of long-term and large permanent impacts would reduce construction and post-construction-related impacts of equipment upgrades at existing towers and new tower placement. With the mitigation measures in place, impacts on vegetation caused by the construction of the Proposed Action would consist mainly of temporary disturbance (674.9 acres) to low-to-moderate quality vegetation over a long distance and a relatively small area of permanent impact (0.6 acres), and as a result impacts are expected to be *low* on vegetative communities.

Rare Plants

Impacts on populations of special status plants associated with equipment upgrades and new dead-end tower construction would be avoided. It is possible individual plants may be impacted that were either not identified through surveys or were individual plants. Areas with concentrated population and high density of individual plants will be marked and avoided during construction. Construction would likely avoid most special status plant populations entirely; however, rare plant surveys have identified 24 towers with rare plant populations within the 175 foot by 200 foot temporary landing site (Table 3.4-3). This equates to 2 percent of the towers in the project corridor.

In the vicinity of special status plant populations, staking or flagging would be installed prior to construction, where needed, to restrict vehicles and equipment to designated routes. Of particular concern are towers 25/1, 25/2, 26/1, 26/2, 26/3, 26/4, 26/5, 27/1, and 28/1 where multiple rare plants populations have been identified. Where practical, rare plant populations would be avoided and/or impacts to these populations would be reduced by implementation of the mitigation measures. Impacts on special status plants from the Proposed Action are expected to

be *low* based on relative abundance and overall density within the project area, but could have *moderate* impacts at the site-specific level for certain populations.

Invasive/Noxious Weeds

Vegetation is more susceptible to infestations of invasive or noxious weed species following construction and associated vegetation and soil disturbances. During and following construction, noxious weeds could spread and colonize disturbed areas as a result of the movement of soils and materials contaminated with weed seeds and natural weed seed dispersal. Creation of new edge habitat along intact sagebrush and other vegetation communities could also impact microclimate factors such as wind, humidity, and light and could lead to a change in species composition within the adjacent vegetation communities or increase opportunities for invasion by invasive species.

Noxious weeds could adversely affect vegetation communities when they become established or when an existing noxious species' population size increases. The introduction of noxious weeds in sagebrush habitat could increase the chance of fires by replacing native forbs and grasses with monocultures of high density noxious grass species and other high density vegetation that are more susceptible to fire.

Because of the high concentrations and types of noxious weeds present on the northern and southern portions of the project area alignment (line mile 1 to 91 and 214 to 265), there is potential for infestations of noxious weeds with vehicle traffic and associated ground disturbance related to the construction of the towers. Although invasive and noxious weeds are already widespread in the general project corridor, the presence and abundance of weed species could increase in the project area as a result of construction. However, implementation of mitigation measures, such as washing equipment before and after entering construction areas and daily inspections of equipment, would reduce the spread of invasive and noxious weeds. Standard mulching and prompt revegetation through seeding and planting would make it less likely that noxious weed infestations would expand their presence in the project area.

As part of the project, BPA completed a preconstruction undesirable plant survey and report. BMPs were developed and incorporated into the mitigation measures of this EA. A total of 20 wash station locations were developed based on density of weed populations. The northern end of the line (from tower 1/1 to tower 91/2) contained the highest concentration of undesirable weed species. Wash stations in these areas are primarily for washing equipment before and after work in high concentration areas to prevent the further spread of these weeds. The section from tower 91/3 to 214/2 contained relatively few occurrences of weeds, and wash stations in these areas would primarily be to prevent the spread of weeds from the few occurrences into the clean stretches of line. The southern stretch has both clean and densely weedy sections of line, and wash stations would serve the dual purpose of preventing the spread on and off of the transmission line.

In addition, frequent weed control activities, during the site restoration and three years of post-construction monitoring, would reduce the growth and spread of noxious weeds in areas targeted for control of certain weed species. Impacts from noxious weed infestation could occur as noxious weeds establish themselves in the disturbed area surrounding towers or if they are brought into areas that do not contain infestations; however, vegetation management and

mitigation measures specific to the spread of noxious weeds within the project area would minimize that impact. As such, with regard to invasive/noxious weeds, the Proposed Action would be expected to have a *low* impact overall based on the existing relative abundance and overall density within the project area, but could have *moderate* impacts at the site-specific level for certain populations if mitigation measures are not employed.

Access Roads

General Vegetation Impacts

Road improvements along existing access roads would result in permanent impacts to existing vegetation. Existing roads would be improved to 25 feet, but where roads intersect sensitive areas (i.e. ODFW greater-sage grouse core and low density habitat, ODFW winter range for deer and elk, designated critical habitat, and rare plant populations) the roads would remain at 15 feet wide. No permanent or temporary impacts to vegetation would be expected in areas where road improvements would stay within the current footprint of the roadbed, but where the roadways are widened the permanent impact to vegetation would be the removal of vegetation and placement of roadbed material that precludes vegetation growth.

New road construction would result in permanent impacts 25 feet wide in the road footprint as well as 5 feet on either side that is considered temporarily impacted due to the possible trampling and the overflow of blading material. Table (below) shows the number of acres impacted within each upland vegetation type.

Table 3.4-9: Impacts to Upland Vegetation Types for Road Improvements and New Road Construction

Vegetation Type	Temporary Impacts (Acres)	Permanent Impacts (Acres)
Sagebrush steppe	0.3	64.1
Big sagebrush shrubland	<0.1	51.3
Low-dwarf sagebrush	N/A	6.8
Salt desert scrub shrubland	N/A	6.9
Western juniper woodland	N/A	4.6
Cottonwood Gallery Riparian Forest	N/A	0.3
Total	0.3	133.9

Total temporary and permanent impact to vegetation as a result of road improvements and new road construction would be 134.2 acres over the 265-mile corridor. That equates to approximately 0.5 acres per mile of transmission line. The overall linear nature of the road improvement impacts reduces its overall impact on the landscape from a fragmentation perspective. Much of the area proposed for removal was previously removed during the construction of the transmission line and road system and since that time vegetation has encroached into the road prism. Because of this, the vegetation community adjacent to the road is usually younger and less complex than adjacent vegetation. In general, vegetation adjacent to the roadbed is predominately a mixture of forbs/grasses, early successional sagebrush, and other shrub steppe species.

New road construction would involve the construction of six short lengths of spur road to gain access to towers currently not assessable by vehicle. The new spur roads range from just under

100 feet long to just over 1200 feet long. Three of the road segments would occur within agricultural areas and are not discussed in this section. The other 3 segments occur in disturbed sagebrush habitat. Impacts incurred would be from the permanent removal (clearing/trimming/removal) of herbaceous and shrub type vegetation and damage to plant roots from compaction of soils by heavy equipment, and soil disturbance and associated productivity. Total permanent disturbance to vegetation as a result of new road construction would be 0.9 acres. Permanent impacts result from the permanent removal of vegetation for the construction of the 25-foot roadbed. Habitat fragmentation caused by the construction of the new roads is reduced by its presence in the BPA right of way.

Vegetation quality in the location of the new road spurs can be characterized much like the location of the new towers. It is predominantly moderate quality because even though the areas between the access road and new road spur to the tower is not managed heavily it has been impacted by the previous construction, has limited active ongoing vegetation maintenance (tree removal), and active cattle grazing. At each location the vegetation is predominately a mixture of forbs/grasses, early successional sagebrush (20-40 years), and other shrub-steppe species typical of the adjacent environment but of generally an earlier successional period.

Signage, fences, or flagging would be installed prior to construction, where needed, to restrict vehicles and equipment to designated routes outside of sensitive vegetative communities and species habitat. In areas of potential temporary impact, mitigation measures would be employed to minimize impacts to the existing vegetation. Where possible, vegetation would not be cleared in these areas and would only incur crushing and slight damage as construction takes place on the new roadway. If vegetation needs to be removed, it would first be trimmed or mowed and retained for regrowth.

Only a small fraction of the entire road improvement corridor would be restored. Minimization of temporary impact areas next to the constructed/improved roadways reduces restoration to only 0.3 acres in association with new road areas. The restoration of temporary impact areas along the new roadways would be completed predominantly through site seeding. Revegetation would be considered successful when the cover and density of native vegetation within the impact areas is similar to adjacent, undisturbed lands. Mitigation measures include at least three full seasons of post construction monitoring.

Implementation of the mitigation measures would reduce construction-related impacts of road construction/improvement. With the mitigation measures in place, impacts on vegetation caused by the construction of the Proposed Action would consist mainly of disturbance to low-to-moderate quality vegetation over a long distance. Due to the overall permanent loss of 134.0 acres of vegetation and the long-term timelines (40 to 50 years) required to regenerate some of the vegetation types impacted, impacts are expected to be *low* on vegetative communities.

Rare Plants

Impacts associated with new road construction and existing road improvement on populations of special status plants would be avoided if possible. It is possible individual plants may be impacted that were either not identified through surveys or where isolated individual plants were identified. Areas with concentrated population and high density of individual plants will be

marked and avoided during construction. Construction would likely avoid most special status plant populations entirely; however, rare plant surveys have identified 2.5 miles of roads with rare plant populations. This equates to less than 1 percent of the roads with improvements in the project corridor.

No rare plants were identified in new road construction areas. Where road improvements occur within rare plant populations the roadbed would not be expanded to 25 feet, but would remain within the existing road prism of 15 feet. This would reduce overall impacts to rare plants. It is possible an individual rare plant may be present in the current roadbed and where feasible individual plants would be moved.

In the vicinity of special status plant populations, prior to construction, staking or flagging would be installed, where needed, to restrict vehicles and equipment to designated routes. Of particular concern are roads between towers 25/2 and 28/1 where multiple rare plant species and populations have been identified. Where practical, rare plant populations would be avoided by realignment of the roadway at a microsite level. Overall impacts to rare plants have been reduced because the improved roadbed would not be expanded into areas containing rare plants. Based on relative abundance and overall density within the project area, the Proposed Action is expected to have a *low* impact overall, but could have *moderate* impacts at the site-specific level for certain populations that are scattered and not concentrated on the landscape.

Invasive/Noxious Weeds

Movement of equipment on the access road system along with the importation of rock could provide opportunities for seed transport into new non-infested areas. The use of new and improved access roads after construction could also encourage the establishment and spread of invasive or noxious weeds to adjoining lands. In general, habitats with more bare ground, such as cropland, sagebrush, salt desert scrub, and relatively dry or open forests are more susceptible to invasion than areas that have relatively closed herbaceous cover or have extreme climate or soils that are tolerated by fewer noxious weeds. Due to the connectivity of lands by access roads, the potential effects of invasive or noxious weeds may not be limited to the project's area of disturbance.

As mentioned above, the northern end of the line (from line mile 1 to 91) contained the highest concentration of undesirable weed species (454 occurrences). Between line mile 91 to 214, the area contained relatively few occurrences (81 and gross acres) of noxious weeds, mainly Russian thistle along and within the road right-of-way. The most southern section (from line mile 214 to 265) contained the second highest number of weeds, with 120 occurrences. Implementation of mitigation measures such as washing stations, mulching, prompt revegetation of temporarily impacted areas, frequent weed control activities during construction, and the three years of post construction monitoring would reduce the overall cover and spread of noxious weeds in the project area. However, a number of the species observed within the project area have the potential for reintroduction from seed sources on adjacent lands. Vegetation management and mitigation measures specific to the spread of noxious weeds within the project area would minimize that impact. With regard to invasive/noxious weeds, impacts on vegetation communities and associated wildlife species road construction/reconstruction is expected to be *low*, with site-specific *moderate* impacts at populations of noxious weeds.

Staging Areas and Tensioning Sites

The tensioning sites would result in a temporary impact of 0.4 acre of big sagebrush shrubland. The contractor would locate staging areas and BPA would screen the locations before use is allowed. BPA would attempt to locate staging areas in previously disturbed. If disturbed areas are not available for use as staging areas, disturbed or common habitat types outside of sensitive habitat areas would be used. Staging areas would be returned to existing conditions to the extent practicable after construction has been completed. The impact is anticipated to be *low* because locations would be within previously disturbed areas and temporary in nature.

3.4.3 Mitigation – Proposed Action

If the Proposed Action is implemented, BPA would apply the following mitigation measures to avoid, minimize, or compensate for impacts on vegetation:

▪ General Vegetation Mitigation Measures

- ◆ Areas defined as environmentally sensitive (i.e. ODFW greater-sage grouse low and core density habitat, winter range for deer and elk, and rare plant populations) will not be expanded to 25 feet, but rather the road will only be improved within the existing 15-foot roadbed.
- ◆ Disturbed areas ready for restoration:
 - Perform seeding during the appropriate time period for germination, with a native seed mix, a seed mix recommended by BLM, USFS, or ODFW, or as agreed upon with landowners for use on their property.
 - Perform additional noxious weed treatments until restored areas are relatively weed free.
 - Monitor seed germination of seeded areas with at least 3 field visits per year until site stabilization (defined as at least 70 percent cover by native or acceptable nonnative species) is achieved; if vegetative cover is inadequate, implement contingency measures and reseed areas as appropriate to ensure adequate revegetation of disturbed soils.
- ◆ Review short term and long term impact locations for soil compaction and, if necessary, de-compact the soil.

▪ Rare Plant Mitigation Measures

- ◆ Perform a preconstruction survey and report of the right-of-way and road impact locations on federal land for special status species populations prior to construction. Use data collected in GIS to locate and mark populations in the field for avoidance.
- ◆ Relocate special status species populations, where feasible. Where relocation isn't feasible, install protective fencing around identified special status species populations before initiating construction activities in that area.
- ◆ Place "Sensitive area" signage on or near fencing around any identified sensitive species populations to indicate that construction activities are prohibited within 25 feet of sign, or a distance determined by agencies.

- ◆ Remove encroaching woody vegetation species and noxious weeds in any special status species sensitive areas using a variety of manual weed control methods; spread any vegetation removed within the vicinity of special status species sensitive areas, including wood chips, sawdust, branches, and woody debris, outside of the 25-foot buffer surrounding special status species populations.
 - ◆ Control weeds near rare plant populations by hand methods rather than herbicides to avoid impacts to rare plants.
 - ◆ Explain special status species avoidance and minimization measures to construction contractors and inspectors during a preconstruction meeting covering environmental requirements.
 - ◆ Provide contractors with preconstruction training on the identification of rare plant species that occur in the project area. Label known special status species populations as sensitive areas in construction documents and maps used by construction contractors, including a 25-foot buffer around populations.
- **Invasive and Noxious Weed Control Mitigation Measures**
- ◆ Incorporate a strategy of integrated weed management into construction layout, design, and project alternatives evaluation.
 - ◆ Survey the right-of-way and road impact locations for weed occurrence in summer 2013, mapping locations and estimating density of weed species.
 - ◆ Install stormwater Best Management Practices to prevent erosion and the potential transport of weedy material onto or off of the jobsite.
 - ◆ A Weed Management Plan (HDR 2013b) has been developed for the project and includes baseline information on known weed occurrences gathered through agency coordination and 2013 field surveys; include specific actions in the management plan to minimize spread and control infestations, including construction BMPs (as listed here), control actions (chemical, cultural, biological, and physical methods) both pre- and post-construction, and actions to be taken to monitor the spread of weeds into the project vicinity for at least 3 years after project implementation.
 - ◆ Identify existing noxious weeds along access roads and control them before construction equipment moves into relatively weed-free areas. Flag all weed populations to be avoided during construction activities.
 - ◆ Provide contractors with preconstruction training on the identification of noxious weed species that occur in the project area and explain required actions to prevent their spread. Label known noxious weed populations in construction documents and maps used by construction contractors, including a 25-foot buffer around populations.
 - ◆ Control weeds prior to construction, as possible, with a focus on species with small contained infestations. This can reduce the potential for widespread establishment and the need for long-term management.
 - ◆ Build vehicle and equipment washing stations each staging yard where vehicles and equipment in use will be washed daily prior to entering and leave the project area. Prohibit any discharge of vehicle wash water into any stream, waterbody, or wetland.

Wash all contractor vehicles and equipment using power or high pressure equipment prior to the vehicle's arrival at the project work site. The wash-down would concentrate on tracks, feet, or tires and on the undercarriage, with special emphasis on axles, frame, cross members, motor mounts, and on underneath steps, running boards, and front bumper or brush guard assemblies. Sweep out vehicle cabs and dispose of refuse in waste receptacles. The contractor, with environmental inspection oversight, ensures that vehicles and equipment are free of soil and debris capable of transporting noxious weed seeds, roots, or rhizomes before the vehicles and equipment leave the contractor yard and are allowed use of project access roads and right-of-way.

- ◆ Remove seeds, roots, and rhizomes from clearing and reclamation equipment used to move vegetation and topsoil before the equipment is moved off-site using water or compressed air and hand tools. Record cleaning sites using global positioning equipment and this information would be reported to the local contact person or agency.
- ◆ Stockpile cleared vegetation and salvaged topsoil in areas where noxious weed infestations have been identified or are noted in the field. Store cleared vegetation adjacent to the area from which it is stripped to eliminate the transport of soil-borne noxious weed seeds, roots, or rhizomes. Treat these stockpiled materials as contaminated and allow no construction equipment to work in or on them. The contractor returns topsoil and cleared vegetation from infestation sites to the areas from which they were stripped.
- ◆ Obtain all erosion control, sediment barrier installations, or mulch distribution from state-cleared sources that are free of primary noxious weeds.
- ◆ Obtain road fill materials from weed-free quarries.
- ◆ Restrict construction activities to the minimal area needed to work effectively to limit disturbance of native plant communities and prevent unnecessary spread of weed species.
- ◆ Immediately target the area for control of known or potential invasive species on the site if vegetation has been removed from the surface or soil has been disturbed. Reestablish vegetation on all bare ground (including areas denuded by fire) to minimize weed spread. Revegetate using plant materials that have a high likelihood of survival.
- ◆ Monitor all seeded sites for 3 years for weed infestation. Treat all weeds adjacent to newly seeded areas prior to planting and treat planted areas for weeds in the first growing season.
- ◆ Conduct any weed control in riparian areas using approved methods and procedures that prevent the introduction of toxic herbicides into aquatic areas. If herbicide treatment is needed in a riparian area, only herbicides that are suitable and safe for use near waterbodies will be used within 50 feet of streams and wetlands.
- ◆ Control weeds near rare plant populations by hand methods to avoid impacts to rare plants.
- ◆ Conduct a post-construction weed survey 3 years after construction of all areas disturbed by construction activities to determine if there are new weed infestations; as necessary, implement additional control measures for minimizing further weed infestations.

3.4.4 Unavoidable Impacts Remaining after Mitigation – Proposed Action

The Proposed Action would permanently impact 134.5 and have long-term impacts on 0.3 acre of upland vegetation, including some individual (not entire populations) rare plants, and would possibly contribute to the spread of existing noxious weed infestations in some areas.

3.4.5 Environmental Consequences – No Action

Under the No Action Alternative, construction-related impacts on vegetation resources would not occur in association with the Proposed Action. Instead, portions of the road would be improved on an as-needed basis as part of maintenance. Continued operation and maintenance of the existing transmission line would have impacts on vegetation resources similar to those described above, but to a smaller degree. The frequency of maintenance events and the level of associated impact could increase over time under the No Action Alternative as equipment on towers continue to age and more substantial maintenance activities are required. It is expected that insulators and other equipment on the towers would need to be replaced over the coming years. It is also foreseen that anodes would need to be added to select towers to prevent further corrosion. Gaining access to the structures as well as burying anodes would impact vegetation in the immediate vicinity of towers. Impacts to vegetation under the No Action Alternative would be *low*.

Because this work would be done as part of routine maintenance, systematic monitoring and treatment for the spread of weeds in subsequent years would not occur. The impact of the unintentional spread of noxious weeds would be *low*.

3.5 WILDLIFE

3.5.1 *Affected Environment*

The transmission line corridor runs north-south on the east side of the Cascade Range within the Columbia Plateau, Blue Mountain, Northern Basin, and East Cascade eco-regions of Oregon State (ODFW 2006). The project area includes a mosaic of habitat types, dominated by grassland and shrubland, but also includes urban, agricultural, aquatic and eastside (interior) forest and woodland habitats (Johnson and O'Neil 2001). Grassland and shrubland habitats typical of the Columbia Plateau are often found in the high desert between 2,000 and 6,000 feet and are associated with cold, wet winters and hot, dry summers.

The ORBIC Database and BLM/USFS-special status species lists were used to determine habitats and wildlife anticipated to be in the project area. Field investigations (described in more detail below) were conducted to verify species and potential habitat presence for selected species.

3.5.2 *General Wildlife by Ecoregion*

As discussed in Section 3.4.2, an ecoregion is a large area that has a distinct combination of climate, soils, and landforms (e.g., volcanoes, valleys, etc.). These environmental features strongly influence where plants and animals live and therefore, each ecoregion is also home to a unique collection of wildlife.

The 4 ecoregions that dominate the project area and related wildlife are described below.

- The **Columbia Basin** is arid and experiences extremes of temperature. Winters are bitterly cold and summers are very hot. Species of the region included in a list developed by ORBIC (2012) include painted turtle (*Chrysemys picta*), Northern sagebrush lizard (*Sceloporus graciosus graciosus*), Northern goshawk (*Accipiter gentilis*), bald eagle (*Haliaeetus leucocephalus*), Swainson's hawk (*Buteo swainsoni*), gray wolf (*Canis lupis*), white-tailed jackrabbit (*Lepus townsendii*), Washington ground squirrel (*Urocitellus washingtoni*), and grizzly bear (*Ursus arctos horribilis*).
- The flora and fauna of the **Blue Mountains** have characteristics of both the Cascades and the Rocky Mountains. Birds of the area include bald eagle, northern spotted owl, Lewis's woodpecker, Williamson's sapsucker, red-breasted nuthatch, golden-crowned kinglet, and many migratory species, with the riverbanks providing important habitat for this birdlife. Species found in this ecoregion include Rocky Mountain tailed frog (*Ascaphus montanus*), Western rattlesnake (*Crotalus oreganus*), boreal owl (*Aegolius funereus*), Northern goshawk, bald eagle, Swainson's hawk, gray wolf, white-tailed rabbit, black-tailed jack rabbit (*Lepus californicus*), wolverine (*Gulo gulo*), and desert and Rocky Mountain bighorn sheep (*Ovis canadensis nelson* and *O.c. canadensis*, respectively).
- The **Northern Basin and Range** is Oregon's true desert ecoregion and is the northern portion of the large Great Basin Desert. The hot, dry, rocky landscape of the desert is ideal for reptiles. Several of Oregon's snake and lizard species can be found in only this ecoregion. Common species in this region include blotched tiger salamander (*Ambystoma mavortium melanostictum*), Woodhouse's toad (*Anaxyrus woodhousii*), Western rattlesnake, Northern

goshawk, Swainson's hawk, bald eagle, Tule goose (*Anser albifrons elgasi*), gray wolf, wolverine, desert bighorn sheep, grizzly bear, kit fox (*Vulpes macrotis*), white-tailed antelope squirrel (*Ammospermophilus leucurus*), and Wyoming ground squirrel (*Urocitellus elegans nevadensis*).

- The **Eastern Cascades** ecoregion is a transition zone between the high mountains and the desert. A mixture of plant and animal species from these different ecosystems live here. Examples of species residing in this ecoregion include deer, elk, cougars, coyote, skunk, and chipmunks. In the Klamath/Goose Lakes Basin, which is part of the Eastern Cascade ecoregion, several marshland wildlife refuges are key to preserving regional biodiversity. Species in the Eastern Cascades include common and California mountain kingsnake (*Lampropeltis getula* and *L. zonata*, respectively), western rattlesnake, Swainson's hawk, bald eagle, acorn woodpecker (*Melanerpes formicivorus*), Northern spotted owl (*Strix occidentalis caurina*), kit fox, gray wolf, wolverine, black- and white-tailed jack rabbits, ringtail (*Bassariscus astutus*), desert bighorn sheep, grizzly bear, and Western gray squirrel (*Sciurus griseus*).

The boundaries between ecoregions are rarely as sharp as the borders between nations. Instead, ecoregions mesh together along their borders, either smoothly or in a patchwork pattern. Some plant and animal species that have been associated to a single ecosystem can shift back and forth to neighboring ecoregions.

3.5.3 *Special Status Species or Habitats*

Federally-listed Species

The following species are listed as threatened or are candidates for future listing under the federal ESA and are documented or suspected to occur within the Lakeview or Prineville districts of the BLM. Within the project area, there are no species anticipated to be present that are federally-listed as endangered or proposed for listing as endangered or threatened. Of the species discussed below, only the greater sage-grouse, Columbia spotted frog, and Oregon spotted frog (all candidate species) have the potential to occur within the project area.

Canada Lynx

Canada lynx (*Lynx canadensis*) is an ESA-listed threatened species. Revised critical habitat for Canada lynx was released in 2009 and included the North Cascades in Washington State, but does not continue south into Oregon. Canada lynx potentially could occur in Crook, Deschutes, Jefferson, Lake, and Wasco counties with recent recorded sightings (1990 to present) in Lake, Deschutes, and Wasco counties. Canada lynx inhabit mountain coniferous forests and usually concentrate winter foraging activities where snowshoe hare activity is high. Denning sites are found in forests with large woody debris to provide security and thermal cover for kittens. Intermediate-aged forests allow lynx to move between den sites and foraging areas, provide free movement within home ranges, and support random foraging opportunities (ODFW 2009). While forested areas occur near some segments of the project area, the transmission corridor does not provide suitable den or foraging habitat for Canada lynx. No observations of Canada lynx occurred during general wildlife surveys.

Federal Candidate Species

Greater Sage-Grouse

The greater sage-grouse (*Centrocercus urophasianus*) is a USFWS candidate for federal ESA listing, an ODA/ODFW state-listed vulnerable species, and an Oregon sensitive species. The transmission corridor crosses ODFW-designated greater sage-grouse core and low density core areas in several locations in Deschutes and Lake Counties. Similarly, BLM has designated Preliminary General Habitat (PGH) and Preliminary Priority Habitat (PPH) for greater sage-grouse. Many of these areas overlap with ODFW's core areas and are crossed by the project in Deschutes and Lake Counties.

As described in the project Baseline Habitat Characterization Report (HDR 2013a), there were no greater sage-grouse individuals or sage-grouse signs observed during the course of sage-grouse field surveys. Three separate incidental observations were made during surveys for other species conducted along the transmission line in spring/summer 2013. All incidental observations were in the southern portion of the project, areas of known greater sage-grouse habitat that were not part of the sage-grouse field survey effort.

Yellow-billed Cuckoo

Yellow-billed cuckoo (*Coccyzus americanus occidentalis*) is a USFWS candidate for federal ESA listing, an ODA/ODFW state-listed critical species, and an Oregon sensitive species. Very little is known about the migratory stopover habits of yellow-billed cuckoos, but they are known to breed in dense willow and cottonwood stands in river floodplains and forage for insects among foliage or in the air. No observations of yellow-billed cuckoo occurred during general wildlife surveys.

Columbia Spotted Frog and Oregon Spotted Frog

Columbia spotted frog (*Rana luteiventris*) and Oregon spotted frog (*Rana pretiosa*) are currently classified as two separate species despite being nearly identical morphologically (USFWS 2010). The two species vary genetically and occupy different habitat ranges. Oregon spotted frog is considered an ESA candidate species in all areas where it occurs. Both species are considered either critical or vulnerable by ODA/ODFW. In addition, Columbia spotted frog is an Oregon sensitive species, and Oregon spotted frog is sensitive in both Oregon and Washington. As discussed in the project Baseline Habitat Characterization Report (HDR 2013a), no spotted frogs were observed during the 2013 focused surveys, but several of the waterways that may be impacted by the project could provide suitable habitat for spotted frogs. Columbia spotted frogs have been reported in Parsnip Creek, approximately one mile from the transmission line at mile 252.

Washington Ground Squirrel

Washington ground squirrel (*Uroditellus washingtoni*) is a USFWS candidate species under the ESA, a state endangered species in Oregon, and a sensitive species in both Oregon and Washington. Although the species is associated with sagebrush-grasslands of the Columbia Plateau, recent studies indicate that silty loam soils, particularly those classified as Warden soils, may be the most important habitat feature (ODFW 2013). Warden soils do not occur within the

project area. No observations of Washington ground squirrel occurred during general wildlife surveys.

Federal Proposed Species

North American Wolverine

North American wolverine (*Gulo gulo luscus*) is proposed for listing as threatened by USFWS under the ESA. The wolverine is documented to occur or is believed to occur in all counties crossed by the project; however, wolverine require habitats with enough winter precipitation to maintain deep persistent snow late into the warm season, and are thus limited to higher elevations at the lower latitudes within its range, such as central Oregon (USFWS 2013a). In Oregon, suitable wolverine habitat is considered to be the high elevation forests of the Cascade Range and the Blue Mountains in the Wallowa Whitman National Forest. None of the land crossed by the project meets the criteria for suitable wolverine habitat. No observations of wolverine occurred during general wildlife surveys.

BLM, USFS, ODFW, and ODA Special Status Species

As part of project discussions, the BLM identified two species of interest in the project area: the western burrowing owl (*Athene cunicularia hypugaea*) and the pygmy rabbit (*Brachylagus idahoensis*). Because these species are particularly sensitive to the types of disturbance potentially associated with the proposed project and are closely monitored by BLM, surveys specific to these species were conducted as part of this environmental review. Results of the surveys and potential occurrence information for these species are included below.

Western Burrowing Owl

The western burrowing owl is a federal species of concern. The species is also protected under the Migratory Bird Treaty Act (MBTA). This owl is found in dry, open areas with low vegetation where *fossorial* mammals (i.e., species adapted for digging) congregate, such as grasslands, deserts, farmlands, rangelands, golf courses, and vacant lots in urban areas. Current breeding range for western burrowing owl spans most of central Oregon, including the project area (USFWS 2003).

As described in the Baseline Habitat Characterization Report (HDR 2013a), five burrowing owl detections were made at five different stations during broadcast call surveys. Two of these observations were in the northern region of the survey area in habitats consisting of intermixed sage and grass, while two other observations were in close proximity to each other in the middle of the survey area and could have been the same individual. The remaining observation was in the southern portion of the survey area where sagebrush habitat was predominant. Additionally, 2 incidental observations of one active burrow and 2 visual sightings of burrowing owl individuals were recorded by crews conducting other field surveys.

A total of 28 partially active burrows were located. There were 56 unoccupied burrows that met the minimum size for burrowing owl use but showed no sign of any burrowing owl activity, past or present, and were therefore labeled “inactive.” Burrow detections were distributed throughout

the project area, but there were notably more in the southern portion of the survey area where continuous sage habitat predominated.

Pygmy Rabbit

In Oregon, pygmy rabbits (*Brachylagus idahoensis*) are considered sensitive by the BLM and USFS and vulnerable by ODA and ODFW. The pygmy rabbit has been recorded historically in Crook, Deschutes, and Lake counties and were documented in Jefferson, Wasco, Deschutes and Lake counties (BLM Lakeview and Prineville districts) as recently as 2009 (ORBIC 2012).

Pygmy rabbit surveys were conducted in suitable habitat between May 28 and July 9. As described in the Baseline Habitat Characterization Report (HDR 2013a), no pygmy rabbits or sign were observed during the course of walking transects surveys. One collection of three possible burrows was observed in suitable habitat near transmission line mile 23, but no pellets or other signs of activity were observed.

Migratory Birds and Bald and Golden Eagles

The project area is located within the Pacific Flyway and therefore provides habitat to a variety of migratory birds, including raptors, land birds, and shorebirds that are protected under the MBTA (16 USC §§ 703-712). Lake Abert, located 1.5 miles west of the right-of-way, is one of Oregon's largest lakes and one of only a handful of inland nest sites for snowy plover in the state. During fall migration, tens of thousands of aquatic and semi-aquatic birds use the lake as a stopover location.

The USFWS record of known golden eagle nests includes 39 documented nests within 2 miles of the Project Area. Aerial raptor nest surveys were conducted by helicopter over a 3 week period from mid-May to early June 2013 (Pagel et al. 2010). As described in the Baseline Habitat Characterization Report (HDR 2013a), surveys were conducted along the entire corridor, but focused on suitable nesting habitat that had been identified using available GIS data, aerial photography, and field reconnaissance. Habitat types were defined using the wildlife habitat types discussed in Johnson and O'Neil (2001).

A total of 198 nests were found within 2 miles of the transmission line corridor. Of these, 50 nests were built on PDCI towers; which included 22 active common raven, 8 active red-tailed hawk, 1 active unknown species, 17 currently unoccupied unknown species, and 2 currently unoccupied golden eagle nests. Six nests were built in junipers growing within 400 feet of the transmission line, including 3 unknown species (currently unoccupied), 2 active red-tailed hawks, and 1 active golden eagle nest.

Big Game Winter Habitat

ODFW designates big game winter habitat to manage populations of deer, elk, and big horn sheep at healthy and sustainable levels compatible with the primary land use. Winter habitat includes areas identified and mapped as providing essential and limited function and values for certain big game species from December through April.

The majority of the project area is located within designated big game winter habitat, which covers more than 2 million acres of the state east of the Cascades. Existing transmission line

facilities have been previously disturbed and likely do not provide suitable habitat to wintering big game.

ODFW Habitat Categorization

Existing wildlife resources are categorized based on habitat types, qualities, and values to provide comprehensive multispecies characterizations, to facilitate impact analysis, and to frame potential mitigation actions. General vegetation conditions were collected to facilitate habitat characterization in accordance with the *ODFW Fish and Wildlife Habitat Mitigation Policy* (OAR 635-415). Selection of appropriate mitigation for vegetation habitat impacts followed guidance provided by ODFW in “Mitigation Goals and Standards” (OAR 635-415-0020 through 0025), which specifies general mitigation goals and standards for six categories of vegetation habitat. Similar to the USFWS’s “Resource Categories and Mitigation Goals,” as described in the USFWS Mitigation Policy (USFWS 1981), the ODFW mitigation goals and implementation standards are summarized in Table 3.5-1. These standards do not preclude mitigation required for compliance with federal and state laws and policies such as the ESA or the Clean Water Act (CWA). In the context of the project, however, they are intended to serve as goals for avoiding or minimizing impacts to both special and non-special-status species listed by ODFW and BLM/USFS.

The habitat categories were qualitatively categorized based on their importance to fish and wildlife, in accordance with the *ODFW Fish and Wildlife Habitat Mitigation Policy*. Habitat categories in Table 3.5-1 were developed using a combination of aerial imagery interpretation, field assessment, Northwest Regional Gap land cover classifications, species occurrence modeling, and ODFW-developed overlays for both ESA-listed and sensitive wildlife and plant species. Using this as a foundation, vegetation types were categorized (1 to 6) for the development of a wildlife habitat mitigation plan.

Table 3.5-1: Oregon Department of Fish and Wildlife Mitigation Goals and Implementation Standards by Habitat Category

Habitat Category	Habitat Importance	Mitigation Goal and Achieved by	Framework
Category 1	Irreplaceable, essential habitat; limited on a physiographic or site-specific basis	No loss of habitat quantity or quality; Avoidance	<ul style="list-style-type: none"> • Open water environments associated with streams that are mapped as ESA Critical Habitat. • Habitat within designated Critical Habitat for federally listed ESA species. • State and federally ESA-listed rare plant populations identified during preconstruction surveys. • All habitat within ODFW greater sage-grouse core habitat. • Old-growth forests. • Trees containing nesting raptors.
Category 2	Essential and limited habitat	No net loss of habitat quantity or quality and to provide a net benefit of habitat quantity or quality; In-kind, in-proximity mitigation	<ul style="list-style-type: none"> • Riparian zones around intermittent and perennial streams. • Wetlands. • Open water environments associated with streams that are not mapped as ESA Critical Habitat. • Delineated habitat or buffers (raptor nests and leks) for other state and federally sensitive/critical/rare wildlife and plant species. • Woodlands, forests, sagebrush, and grassland habitats within BPA transmission right-of-way that is located within ODFW greater sage-grouse core and low density habitat. Does not include developed/urban/agricultural habitat types.
Category 3	Essential habitat or important and limited habitat	No loss of habitat quantity or quality; In-kind, in-proximity mitigation	<ul style="list-style-type: none"> • Woodland and forests in ODFW greater sage-grouse low density areas. • Ponderosa pine woodlands (Oregon Strategy Habitat). • Sagebrush and grassland habitats outside of ODFW greater sage-grouse core and low density areas. • Degraded by human actions (i.e., unpaved roads, maintained areas within towers); typically devoid of plants or have limited plant cover and are composed of imported rock.
Category 4	Important habitat	No loss of habitat quantity or quality; In-kind or out-of-kind, in-proximity or off-proximity mitigation	<ul style="list-style-type: none"> • Early successional forests (i.e., recent clear cuts on managed timberland). • Woodland and forested habitats in nondelineated habitat or buffers (raptor nests and leks) for state and federally sensitive/critical/rare wildlife and plant species. • Degraded habitats dominated by weeds or nonnative plants. • This may include hedgerows, perennial crops, pasturelands, and non-cultivated agricultural fields. These areas provide some habitat for wildlife. • Developed/urban areas within utility easements and similar areas where maintenance and management are required at frequent (less than 5-year) intervals (developed/urban areas within BPA right-of-way). These areas are typically maintained in an early seral stage of succession (scrub-shrub or herbaceous) by frequent mowing/removal of trees or application of herbicides. Nonnative and weedy species may be mixed with native species.

Habitat Category	Habitat Importance	Mitigation Goal and Achieved by	Framework
Category 5	Habitat having a high potential to become either essential or important habitat	Net benefit in habitat quantity or quality; Actions that improve habitat conditions	<ul style="list-style-type: none"> • Degraded by human actions (i.e., unpaved roads); typically devoid of plants or have limited plant cover and are composed of imported rock. • Plant cover is minimal and may be composed of weedy and invasive species. • Annually cultivated agriculture lands with limited wildlife habitat value, such as ryegrass fields, alfalfa, and row crops. Includes farmed wetlands that are plowed on a regular basis. They have hydric soils and may be partially drained. These areas generally support ryegrass or other row crops. • They may be used as travel corridors for some species of wildlife, but they generally do not provide nesting/roosting, denning, foraging, or cover for wildlife.
Category 6	Low habitat value and low restoration potential. Not important in sustaining populations of wildlife species	Minimize impacts; Conscientious project design	<ul style="list-style-type: none"> • Developed areas such as structures, roads, parking lots, and other impervious surfaces. • Provide no wildlife value and have minimal to no mitigation potential.

Source: ODFW 2006.

Results of the vegetation habitat categorization are presented in Table 3.5-2. These results will be used to develop a wildlife habitat mitigation plan to offset project impacts to wildlife habitat.

Table 3.5-2: Total Acreage of Vegetation Type and ODFW Habitat Category^a

Vegetation Type	Habitat Category	Acreage
Agriculture		
	4	1719.6
	5	1429.8
	Subtotal	3149.4
Alkali Playa		
	1	116.1
	2	3.3
	Subtotal	119.4
Big Sagebrush Shrubland		
	1	3321.1
	2	4072.6
	3	4271.7
	Subtotal	11,665.4
Cottonwood Gallery Riparian Forest		
	1	38.6
	2	106.2
	Subtotal	144.8
Develop/Urban		
	4	809.6 ^b
	5	129.1
	6	135.4
	Subtotal	1074.1
Low-Dwarf Sagebrush		
	1	3638.4
	3	547.4
	Subtotal	4185.8
Modified Grasslands		
	1	187.0
	Subtotal	187.0
Northeast Oregon Mixed Conifer Forest		
	3	2.2
	Subtotal	2.2
Open Water		
	1	23.1
	2	49.3
	Subtotal	72.4
Sagebrush Steppe		
	1	427.1
	2	7139.1
	3	3350.7
	Subtotal	10,916.9

Vegetation Type	Habitat Category	Acreage
Salt Desert Scrub Shrubland		
	1	47.7
	2	169.6
	3	537.6
	Subtotal	754.9
Western Juniper Woodland		
	1	785.9
	2	3546.9
	3	365.1
	4	1287.0
	Subtotal	5984.9
Wetland		
	1	90.1
	2	15.2
	Subtotal	105.3
	Total Acreage	38,362.5

^a Project area includes the transmission line right-of-way, access roads and 100 meters on either side.

^b Developed, Category 4, includes predisturbed tower areas and existing access roads.

3.5.4 Environmental Consequences – Proposed Action

General Wildlife Impacts

Impacts to wildlife would include removal of relatively small amounts of habitat, potential direct strikes by construction equipment, and noise and the disturbance caused by construction activities. Different species have differing thresholds of tolerance to human caused noise and disturbance.

Transmission Line Upgrade and New Dead-end Tower Installation

Noise and activity associated with construction work would likely result in short-term behavior modification by area wildlife. The use of helicopters for some activities, such as replacing conductors or to work in sensitive areas, could temporarily displace birds and wildlife from the construction area. Habitat loss associated with tower footprints would only occur at the four new dead-end locations. Wildlife would have limited access to resources within project activity areas during construction and likely for 1 or 2 years following construction due to vegetation disturbance.

For the majority of the PDCI, tree clearing is not anticipated, however as part of BPA's vegetation management program, from mile 229 to the south, juniper trees would be cut that are growing within the right-of-way of 57 individual spans. These trees are generally less than 5 feet tall and sparsely scattered within the spans. During the aerial avian study, no nests were found in trees in this portion of PDCI. Nests located on the towers would generally be removed outside of the active nesting season (March to May), the majority of which are common raven nests. Occasionally, bird diverters could be used to deter birds from building new nests. Bald and golden eagle nests are protected under the Bald and Golden Eagle Protection Act, and will

require a permit for removal unless the nests have been inactive for more than 5 years. Several unoccupied eagle nests were identified on transmission towers, but the length of time since the last occupation could not be determined by surveys.

Indirect impacts from noxious weed infestation of wildlife habitat could occur as noxious weeds establish themselves in the disturbed area surrounding towers; however, vegetation management and mitigation measures specific to the spread of noxious weeds within the project area would minimize that impact (see Section 3.4, Upland Vegetation). As such, impacts on wildlife and their habitat associated with upgrades of existing and installation of new towers are considered *low*.

Access Roads

Approximately 0.6 mile of new access roads would be constructed and 210.1 miles of existing access roads would be improved, in many cases limited to the addition of gravel and grading within the existing road footprint. On roads requiring improvement, both construction and subsequent use would involve temporary noise and activity levels substantially higher than existing conditions. This would likely result in some short-term behavior modifications by area wildlife. An increased use of roads during construction would also result in a slight increase in noise and activity levels compared to existing conditions. However, no appreciable wildlife response to construction activities would be expected. These effects would be considered low with respect to common wildlife species, all of which can be expected to have robust populations that would be minimally affected by the temporary and localized construction activities associated with the Proposed Action. Rare species are evaluated in detail in the following sections. Impacts on wildlife and their habitat from road construction/improvement, and use of access roads are considered *low*.

Staging and Tensioning Sites

Impacts associated with staging and tensioning areas are anticipated to be *low* because BPA would attempt to locate staging areas in previously disturbed areas not currently being used by native wildlife and the tensioning sites would be located within the existing right-of-way. If disturbed areas are not available for use as staging areas, disturbed or common habitat types outside of sensitive habitat areas would be used. Staging areas would be returned to existing conditions to the extent practicable after construction has been completed.

ESA-listed Species

Greater sage-grouse, Columbia spotted frog, and Oregon spotted frog (all federal candidate species) have the potential to occur within the project area. Impacts to these species would be similar to those described above for general wildlife species with additional information provided below.

Greater Sage-Grouse

The project would cross two ODFW-designated sage-grouse core habitat areas, which directly overlap the areas designated by the BLM as PPH; one in Lake County and one in Deschutes County. Additionally, the project crosses several ODFW-designated low density habitat and BLM-designated PGH areas that overlap in the project area. Within all of these habitat areas

combined, 47 known lek sites are documented within 2 miles the project. The majority of the lek sites were documented in 2004, but seven were documented between 2007 and 2012. No additional lek sites were discovered during surveys conducted in 2013. Table 3.5-3 shows the quantity of acres of sage-grouse habitat that would be temporarily and permanently impacted by the project. Types of temporary and permanent impacts are described below.

Table 3.5-3: Potential Impacts to Sage Grouse Habitat

Sage Grouse Designated Habitat	Temporary Impacts (acres)	Permanent Impacts (acres)
Lake County core habitat/ PPH	122	2
Deschutes County core habitat/ PPH	48	2
Low density habitat/ PGH	72	4

Temporary impacts related to human disturbance associated with construction activities could disturb greater sage-grouse during the breeding season. Outside of the breeding season, greater sage-grouse using the project area would be displaced into adjacent undisturbed habitat and suitable habitat would be temporarily impacted by clearing and grading activities. Because the greater sage-grouse is a ground nester, it is sensitive to ground-clearing activities that would occur during project construction. Grouse could experience direct mortality if construction equipment strikes nests or birds that are crossing roads, or if birds are hiding in shrub cover that is removed or cleared. Additionally, all lek sites within 2 miles of construction activities have the potential to be impacted by noise, dust, and equipment operation. Agency-established timing restrictions would be implemented during the spring breeding seasons (March to August, or as indicated by agencies) to minimize direct impacts to this species. The mitigation measures described below would minimize temporary effects on sage-grouse and their habitat. As a result, direct impacts on sage-grouse from construction activities are expected to be *low to moderate*.

As a part of the project, BPA plans to acquire rights to use approximately 38 miles of access roads that currently exist but that BPA does not have legal rights to use. Of the 38 miles, 10.6 are within sage grouse designated habitat. Table 3.5-4 shows the number of miles of new access road rights-of-way that occur in sage-grouse habitat on both BLM and privately-owned lands. Any new right-of-way acquisitions in designated sage grouse habitat located on BLM-owned land would be mitigated appropriately, as developed in the BPA Mitigation Action Plan.

Table 3.5-4: New Right-of-way to be acquired in Sage-Grouse Habitat

Sage Grouse Designated Habitat	Miles of Roads on BLM Land	Miles of Roads on Private Land
Core habitat/ PPH	1.5	5.0
Low density habitat/ PGH	3.9	0.2

Sage-grouse may be subject to predation by raptors and ravens, which use transmission towers to forage, potentially resulting in a permanent impact to adjacent habitat. Studies have shown that the presence of transmission lines can provide nesting and perching habitat for raptors (Gilmer and Wiehe 1977, Knight and Kawamisha 1993), increasing their foraging frequency in an area. Reduced shrub cover coupled with increased raptor foraging has been known to significantly reduce sage-grouse nest success (Coates and Delehanty 2010). Additionally, sage-grouse are known to avoid use of areas near fences and power lines, potentially due to perching raptors (Braun 1998). However, because new tower construction would be limited to four dead-end

towers (one within a core habitat/PPH area), the Proposed Action would not significantly increase nesting and perching habitat for raptors and ravens over existing locations, resulting in a *low* potential for increased predation impacts on greater sage-grouse in the project area.

Columbia and Oregon Spotted Frogs

Available distribution information and project surveys indicate that Columbia spotted frogs and Oregon spotted frogs are not present within the project area, but the project is located within their potential range. Columbia spotted frogs have been documented approximately one mile from the project at mile 252, but have not been documented in any streams crossed by the project.

If present, spotted frogs would only be found within or closely associated with aquatic habitat. The Proposed Action has the potential to result in impacts on water quality within the project area, impacting suitable spotted frog habitat. Proposed Action activities that have the potential to affect water quality are those that disturb soil, remove vegetation, or that release pollutants into or near waterbodies within 200 feet of surface waters. Potential impacts to surface waters are discussed in Section 3.6, Fish and Water Resources. Mitigation measures discussed below and incorporated into the design of the project would minimize the potential for impacts on these species. Because activities that could reduce water quality and impact spotted frog habitat would be limited to specific locations, would be temporary, and would not exceed water quality parameters, the impacts on habitat would be *low to moderate*, depending on the amount of sediments that reached streams.

BLM, USFS, ODFW, and ODA Special Status Species

Impacts on BLM, USFS, and state special status species would be similar to those described above for wildlife species in general. Potential impacts to those species identified by BLM as particularly sensitive to project activities are discussed below.

Western Burrowing Owl

The project has the potential to impact five detected active burrows and 28 partially active burrows. Because the burrowing owl is an underground nester, it is sensitive to ground-clearing activities that would occur during project construction. Burrowing owls could experience direct mortality if construction equipment crushes burrows or strikes birds that are crossing roads, or if birds are hiding in shrub cover that is removed or cleared. Additionally, noise and dust disturbance from construction has the potential to impact foraging owls, making habitat temporarily unsuitable. Agency established timing restrictions would be implemented in areas where burrowing owls have been documented during the breeding seasons (mid-March – September; USFWS 2003) minimize direct impacts to this species. The mitigation measures described below would minimize effects on burrowing owls and their habitat. As a result, direct impacts on burrowing owls from construction activities are expected to be *low to moderate*.

Pygmy Rabbit

The project would potentially impact one collection of possible burrows around line mile 23 in Wasco County. Impacts to pygmy rabbits could result from activities such as grading, clearing, equipment operation, and vehicular travel. Pygmy rabbits could experience direct mortality if construction equipment crushes burrows or strikes rabbits that are crossing roads, or if rabbits are

hiding in shrub cover that is removed or cleared. Additionally, noise and dust disturbance from construction has the potential to impact rabbits and their breeding behavior, making habitat temporarily unsuitable. The mitigation measures described below would minimize effects on pygmy rabbits and their habitat. As a result, direct impacts on pygmy rabbits from construction activities are expected to be *low* to *moderate*.

Migratory Birds and Bald and Golden Eagles

Noise and increased human activity associated with construction of the roads and transmission line facilities could have temporary impacts on nesting and foraging activities of migratory birds and waterfowl. The intensity of the impacts would vary according to species, but impacts that are a direct result of construction activities would be temporary and are expected to be *low*.

Noise and human disturbance associated with the construction of the transmission line facilities could have a temporary impact on raptors foraging near the project area, displacing them to areas outside of the active construction zone. Any such exclusion would be localized, temporary, and would affect, at most, a very small fraction of any raptor's home range (DeLong 2004). Nesting and fledgling raptors located near project activities (distance is dependent on species) could be disturbed by noise and construction activities. Mitigation measures discussed below would minimize the potential for impacts on foraging raptors and avoid impacts to nesting raptors. Thus, direct effects of the project on raptors would likely be temporary and impact levels *low*. The transmission line could affect raptors in the long term through the risk of collision following project completion; however, this probability is *low*, and would not be higher than the risk associated with present conditions.

Golden eagle nests comprised the highest number of active nests noted within 2 miles of the project, with 8 active nests and 19 currently unoccupied nests identified. Additionally, one active bald eagle nest and one nest with abandoned eggs were observed within 2 miles of the transmission line. Noise and construction activities can disturb nesting and fledgling golden eagles, potentially causing nest abandonment. Limiting construction activities to times outside of the nesting season, as described below, would reduce the expected impacts to nesting eagles to *low*.

Big Game Winter Habitat

Approximately 60 percent of the right-of-way is located within ODFW designated big game winter habitat. Temporary impacts from noise and human activity would occur at 419 acres of deer and 295 acres of elk winter habitat. Permanent impacts to habitat from construction of new roads and towers would occur at 167 acres of deer and 121 acres of elk winter habitat.

Construction activities during winter months within big game winter habitat could displace some big game to neighboring areas due to noise and increased human activities. Construction activities will be limited to late spring and summer months, thereby avoiding impacts to big game between December and April. Therefore, impacts to big game resulting from construction activities would be *low*.

3.5.5 Mitigation – Proposed Action

The following mitigation measures and BMPs would be implemented to minimize potential construction-related impacts to wildlife habitat.

- Prepare a stormwater pollution prevention plan, addressing measures to reduce erosion and runoff and stabilize disturbed areas.
- Prohibit construction vehicles or equipment within 50 feet of any stream or wetland unless authorized by a permit or on an existing road.
- Develop a spill prevention control and countermeasure plan to minimize the potential for spills of hazardous materials.
- Make spill prevention materials and equipment available onsite.
- Maintain vehicles and equipment in good working order to prevent oil and fuel leaks.

Greater Sage-Grouse

- Limit motorized travel to designated roads, primitive roads, and trails at a minimum.
- Prohibit construction activities during the period from March 1 through May 15 within ODFW core and low density habitat, BLM PPH and PGH areas, and areas near previously identified leks.
- Limit construction of new roads to the existing BPA right-of-way in ODFW core and low density habitat, BLM PPH and PGH areas, and areas near previously identified leks.

Migratory Birds and Bald and Golden Eagle

- Where construction is required during the nesting season, survey the area of impact for nests prior to construction.
- If active migratory bird nests are encountered during the surveys, avoid land-disturbing construction activities while the birds are allowed to fledge. An appropriate species avoidance buffer, as determined in conjunction with BLM and local agencies, will apply to all active nests for migratory bird species.
- Minimize disturbance during preconstruction activities, such as land and road surveys, by remaining at least 0.5 mile from all active nests when possible.
- During construction, utilize spatial and seasonal buffers around active raptor nests as described in Table 3.5-5 below.

Table 3.5-5: Raptor Nest Spatial and Seasonal Buffers

Species	Spatial Buffer (miles)	Seasonal Buffer
Bald eagle	1.00	Jan. 1 – Aug. 31
Golden eagle	0.75	Jan. 1 - Aug. 31
Northern harrier	0.75	April 1 – Aug. 15
Ferruginous hawk	1.00	March 1 – Aug. 1
Red-tailed hawk	0.75	March 15 – Aug. 15
Sharp-shinned hawk	0.75	March 15 – Aug. 31
Swainson's hawk	0.75	March 15 – Aug. 31
Turkey vulture	0.75	May 1 – Aug. 15
Peregrine falcon	1.00	Feb. 1 – Aug. 31
Prairie falcon	0.75	April 1 – Aug. 31
American kestrel	0.05 (300 feet)	April 1 – Aug. 15
Osprey	0.75	April 1 – Aug. 31
Great horned owl	0.75	Dec. 1 – Sept. 31

Western Burrowing Owl

The following additional avoidance and minimization measures will be used, where practicable, to limit potential impacts on burrowing owls and their habitat within the project area:

- Avoid clearing, grading, and construction activities within 0.75 mile of identified burrows between March 1 and August 31.
- Implement reduced speed limits on roads adjacent to identified active burrowing owl nests between March 1 and August 31.
- If necessary, qualified biologists would work with BLM and ODFW to relocate owls during the nonbreeding season. Following relocation, inactive owl nests would be excavated and refilled to prevent reoccupation.

Pygmy Rabbit

The following additional avoidance and minimization measures will be used, where practicable, to limit potential impacts on pygmy rabbits and their habitat within the project area:

- Stack vegetation slash piles at the perimeter of the right-of-way to provide alternate habitat, whenever possible to benefit other wildlife of the region.
- Implement reduced speed limits on roads adjacent to delineated pygmy rabbit colonies near mile 23.
- If necessary, qualified biologists would work with BLM and ODFW to relocate rabbit colonies, using catch and release methods. Following relocation, unoccupied colonies would be mowed to prevent repopulations during project construction.

ODFW Habitat Categorization Mitigation

The type and amount of mitigation for unavoidable wildlife habitat impacts will be consistent with the USFWS Mitigation Policy (USFWS, 1981) and multi-species conservation strategy and guided by the ODFW Habitat Mitigation Policy and habitat categorizations. The mitigation policies provide goals and guidelines for mitigating habitat impacts. The preferred form of mitigation is avoidance and minimization of fish and wildlife losses, but when necessary compensatory mitigation for unavoidable project impacts must be considered. Table 3.5-6 provides the impact area by habitat category that will need to be considered when developing a wildlife habitat mitigation plan. This plan will be developed in consultation with BLM, ODFW, and USFWS and will be part of the BPA Mitigation Action Plan.

Table 3.5-6: Total Acreage of Vegetation Type and ODFW Habitat Category

Vegetation Type	Habitat Category	Temporary Impacts	Permanent Impacts
Agriculture			
	4	28.1	14.7
	5	29.2	5.1
	Subtotal	57.3	19.8
Alkali Playa			
	2	1.0	.05
	Subtotal	1.0	0.05
Big Sagebrush Shrubland			
	2	157.3	61.4
	3	99.5	38.2
	Subtotal	256.8	99.6
Cottonwood Gallery Riparian Forest			
	2	0.04	0.3
	Subtotal	0.04	0.3
Develop/Urban			
	4	69.4	2.5
	5	3.0	0.3
	6	1.6	0.5
	Subtotal	74.0	3.3
Low-Dwarf Sagebrush			
	2	82.2	29.8
	3	13.0	7.2
	Subtotal	95.2	37.0
Modified Grasslands			
	2	4.8	2.5
	Subtotal	4.8	2.5
Open Water			
	2	0.6	0.6
	Subtotal	0.6	0.6

Vegetation Type	Habitat Category	Temporary Impacts	Permanent Impacts
Sagebrush Steppe			
	2	189.4	69.6
	3	83.9	24.7
	Subtotal	273.3	94.3
Salt Desert Scrub Shrubland			
	2	5.4	1.8
	3	13.3	6.8
	Subtotal	18.7	8.6
Western Juniper Woodland			
	2	31.0	14.4
	3	5.7	2.8
	4	10.1	1.3
	Subtotal	46.8	18.5
Wetland			
	2	0.4	0.3
	Subtotal	0.4	0.3
	Total Acreage	828.9	284.9

**Note: Table 3.5-2 impact totals do not match assumed impacts in Section 3.2, Land Use and Recreation because habitat categories were developed using a combination of aerial imagery interpretation, field assessment, Northwest Regional Gap land cover classifications, species occurrence modeling, and ODFW-developed overlays for both ESA-listed and sensitive wildlife and plant species. Additionally, Category 1 habitats have been removed from impact consideration and will be avoided.*

3.5.6 Unavoidable Impacts Remaining after Mitigation – Proposed Action

Unavoidable impacts on wildlife in the project area would be associated with construction noise and activity and temporary and permanent loss of vegetation associated with construction and maintenance work.

3.5.7 Environmental Consequences – No Action

Under the No Action Alternative, the project construction-related impacts on wildlife would not occur. Road improvements would occur on an as-needed basis as part of maintenance activities. However, the frequency of maintenance activities and the level of associated impacts could increase over time under the No Action Alternative as towers continue to deteriorate and more substantial maintenance activities are required. It is expected that insulators and other associated equipment on the towers would need to be replaced over the coming years. Most impacts associated with maintenance activities would be to habitat directly adjacent to towers. This area was previously disturbed when the line was built, but timing restrictions associated with sensitive species would not be in place, resulting in the potential disturbance of those species if present in work areas. The resulting impacts to wildlife would be *low to moderate*. Because this work would be done as part of routine maintenance, systematic monitoring and treatment for the spread of weeds in subsequent years would not occur. The impact of the unintentional spread of noxious weeds on wildlife would be *low to moderate*.

3.6 FISH AND WATER RESOURCES

3.6.1 Surface Water Affected Environment

The affected environment for fish and water resources includes surface waters crossed by the existing transmission line right-of-way and access roads. Activities within 200 feet of streams were considered to have the potential to affect fish species and habitat. Reaches extending 500 feet downstream from in-water work areas were also considered based on the potential for temporary water quality degradation during construction.

The project right-of-way and access roads intersect 141 streams, including 78 ephemeral, 34 intermittent, and 29 perennial streams. Major rivers and tributaries intersected include Fivemile Creek, Eightmile Creek, and Fifteenmile Creek in the Fifteenmile Creek Watershed; Deschutes River, Bakeoven Creek, Trout Creek, and Crooked River in the Deschutes River Watershed; and Honey Creek and Twentymile Creek in the Warner Lakes Basin. Streams crossed only by the transmission line would not be affected by project activities.

Impaired Streams

The Oregon Department of Environmental Quality (DEQ) is required by the Clean Water Act of 1972 to establish water quality standards to protect the beneficial uses of State waters. DEQ is then required to: identify stream segments where the standards are not being met, develop a list of these water-quality limited waterbodies (called the 303(d) list), and develop a total maximum daily load (TMDL) allocation for each waterbody included on the 303(d) lists. The TMDL describes the maximum amount of pollutants that may enter a specific waterbody without violating water quality standards. When a TMDL is approved, the parameters covered are removed from the 303(d) list. The water quality status of the major streams crossed by the project is discussed in the stream descriptions in the following section.

Perennial Streams

Sixteen stream crossing improvements are located on 29 perennial streams, which include: 11 existing ford improvements, 2 box culvert replacements of existing fords, 1 existing culvert replacement, and 2 reconstructed roads. Of these streams, 13 are known fish-bearing perennial streams, which provide spawning, rearing, and migration habitat for *anadromous* fish species and foraging and overwintering habitat for *resident fish* species. Eleven of these streams are designated as critical habitat for ESA-listed fish species. In the Fifteenmile and Deschutes watersheds, eight streams are designated as critical habitat for steelhead (*Onchorhynchus mykiss*), and two are designated as critical habitat for the future recovery of bull trout (*Salvelinus confluentus*). In the Summer Lake and Warner Lakes watersheds, two streams are designated as critical habitat for the Warner sucker (*Catostomus warnerensis*). The fish-bearing perennial streams crossed and associated fish species are identified in Figure 3.6-1 and Table 3.6-1 and further discussed in the watershed sections below.

Table 3.6-1: Fish-Bearing Perennial Streams Crossed by the Project

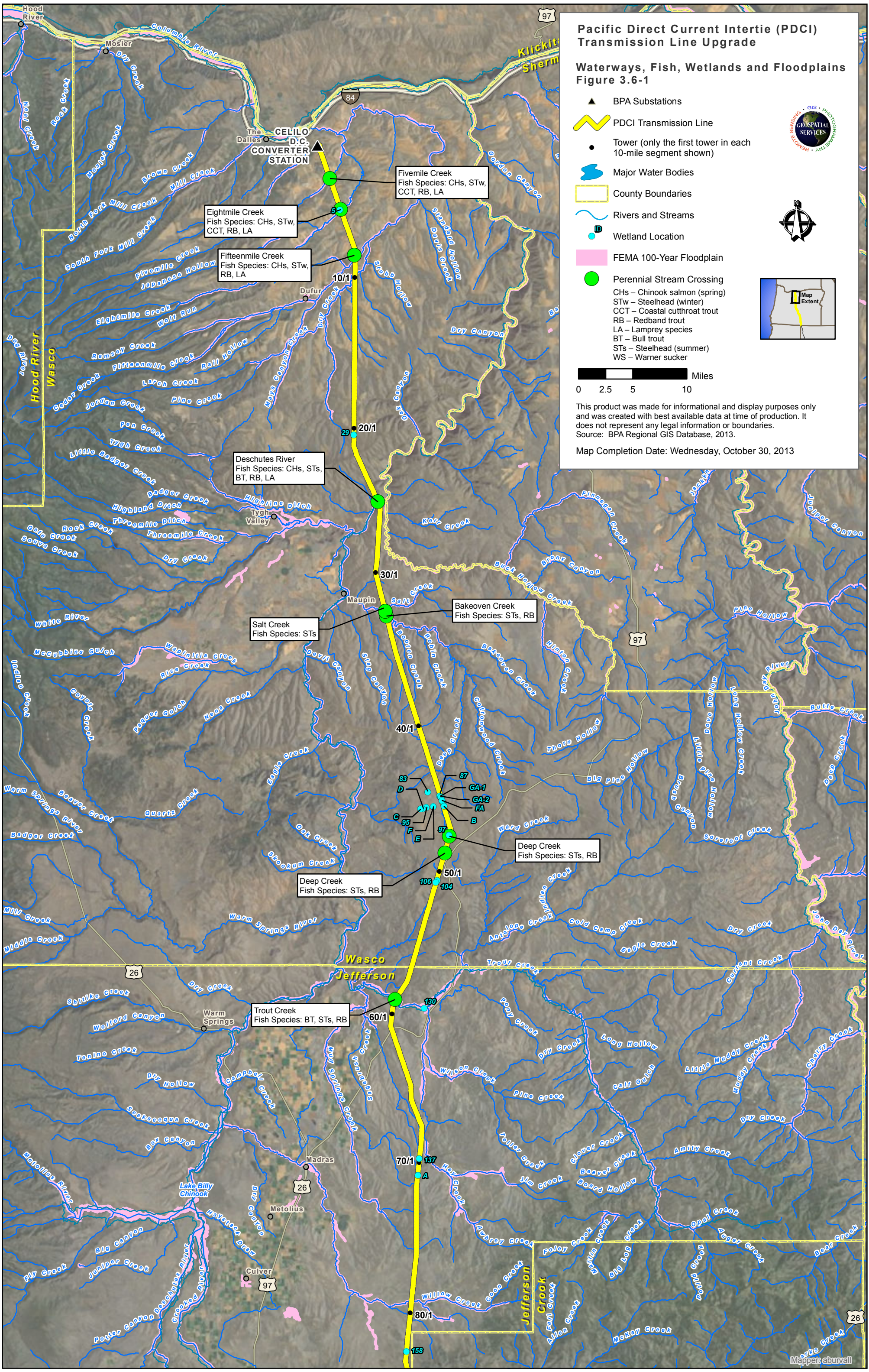
Stream	Closest Tower	Crossing Type	Fish Species
Fifteenmile Creek Watershed (Approved in-water work window August 15-October 31)			
Fivemile Creek	3/3	Transmission line only	Chinook salmon (spring)
			Steelhead (winter) ^b
			Coastal cutthroat trout
			Redband trout
			Lamprey species
Eightmile Creek ^a	5/4	Permanent bridge	Chinook salmon (spring)
			Steelhead (winter) ^b
			Coastal cutthroat trout
			Redband trout
			Lamprey species
Fifteenmile Creek ^a	8/6	Ford, no work/drive only	Chinook salmon (spring)
			Steelhead (winter) ^b
			Redband trout
			Lamprey species
Dry Creek	9/5	Transmission line only	Steelhead (winter) ^b
			Redband trout
Deschutes River Watershed (Approved in-water work window August 1-October 31)			
Deschutes River ^a	24/6	Transmission line only	Chinook salmon (spring)
			Steelhead (summer) ^b
			Redband trout
			Bull trout
			Lamprey species
Salt Creek	32/2	Ford, no work/drive only ^c	Steelhead (summer) ^b
Bakeoven Creek ^a	32/3	Ford, no work/drive only	Steelhead (summer) ^b
			Redband trout
Bakeoven Creek ^a	32/4	Modified ford	Steelhead (summer) ^b
			Redband trout
Deep Creek	44/4	Permanent bridge	Steelhead (summer) ^b
			Redband trout
Deep Creek	45/4	Permanent bridge	Steelhead (summer) ^b
			Redband trout
Deep Creek	47/4	Ford, no work/drive only	Steelhead (summer) ^b
			Redband trout
Trout Creek ^a	58/3	Ford, rock added	Steelhead (summer) ^b
			Redband trout
			Bull trout ^b

Stream	Closest Tower	Crossing Type	Fish Species
Crooked River ^a	90/4	Transmission line only	Redband trout
			Bull trout ^b
Warner Lakes Watershed (Approved in-water work window August 15-September 30)			
Snyder Creek	230/3	Temporary construction bridge	Warner sucker
			Redband trout
Honey Creek ^a	234/5	Ford, crossing avoided	Warner sucker ^b
			Redband trout
McDowellCreek	239/1	Ford, rock added	Redband trout
Twelvemile Creek	242/5	Ford, no work/drive only	Redband trout
Deep Creek	252/4	Transmission line only	Redband trout
Twentymile Creek ^a	261/1	Ford, rock added	Warner sucker ^b
			Redband trout
Twentymile Creek ^a	262/4	Ford, no work/drive only	Redband trout

^a = 303(d) listed as water quality impaired

^b = Critical Habitat

^c = Likely dry at the time of construction



Pacific Direct Current Intertie (PDCI) Transmission Line Upgrade

Waterways, Fish, Wetlands and Floodplains
Figure 3.6-1

- BPA Substations
- PDCI Transmission Line
- Tower (only the first tower in each 10-mile segment shown)
- Major Water Bodies
- County Boundaries
- Rivers and Streams
- Wetland Location
- FEMA 100-Year Floodplain
- Perennial Stream Crossing
 - CHs – Chinook salmon (spring)
 - STw – Steelhead (winter)
 - CCT – Coastal cutthroat trout
 - RB – Redband trout
 - LA – Lamprey species
 - BT – Bull trout
 - STs – Steelhead (summer)
 - WS – Warner sucker

0 2.5 5 10 Miles










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. Source: BPA Regional GIS Database, 2013.

Map Completion Date: Wednesday, October 30, 2013



Pacific Direct Current Intertie (PDCI) Transmission Line Upgrade

Waterways, Fish, Wetlands and Floodplains Figure 3.6-1

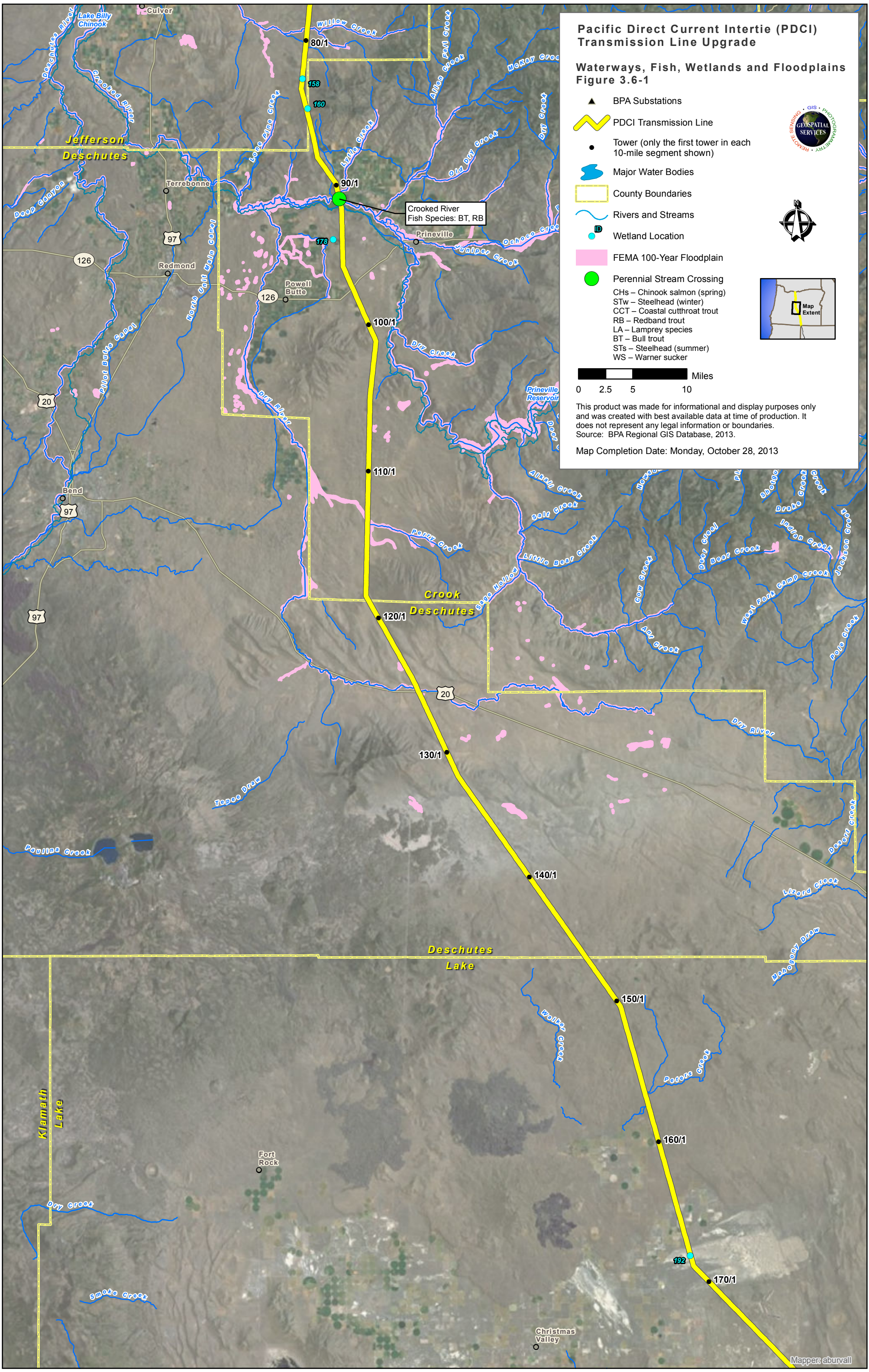
-  BPA Substations
-  PDCI Transmission Line
-  Tower (only the first tower in each 10-mile segment shown)
-  Major Water Bodies
-  County Boundaries
-  Rivers and Streams
-  Wetland Location
-  FEMA 100-Year Floodplain
-  Perennial Stream Crossing
 - CHs – Chinook salmon (spring)
 - STw – Steelhead (winter)
 - CCT – Coastal cutthroat trout
 - RB – Redband trout
 - LA – Lamprey species
 - BT – Bull trout
 - STs – Steelhead (summer)
 - WS – Warner sucker



0 2.5 5 10 Miles










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. Source: BPA Regional GIS Database, 2013.

Map Completion Date: Monday, October 28, 2013



Pacific Direct Current Intertie (PDCI) Transmission Line Upgrade

Waterways, Fish, Wetlands and Floodplains Figure 3.6-1

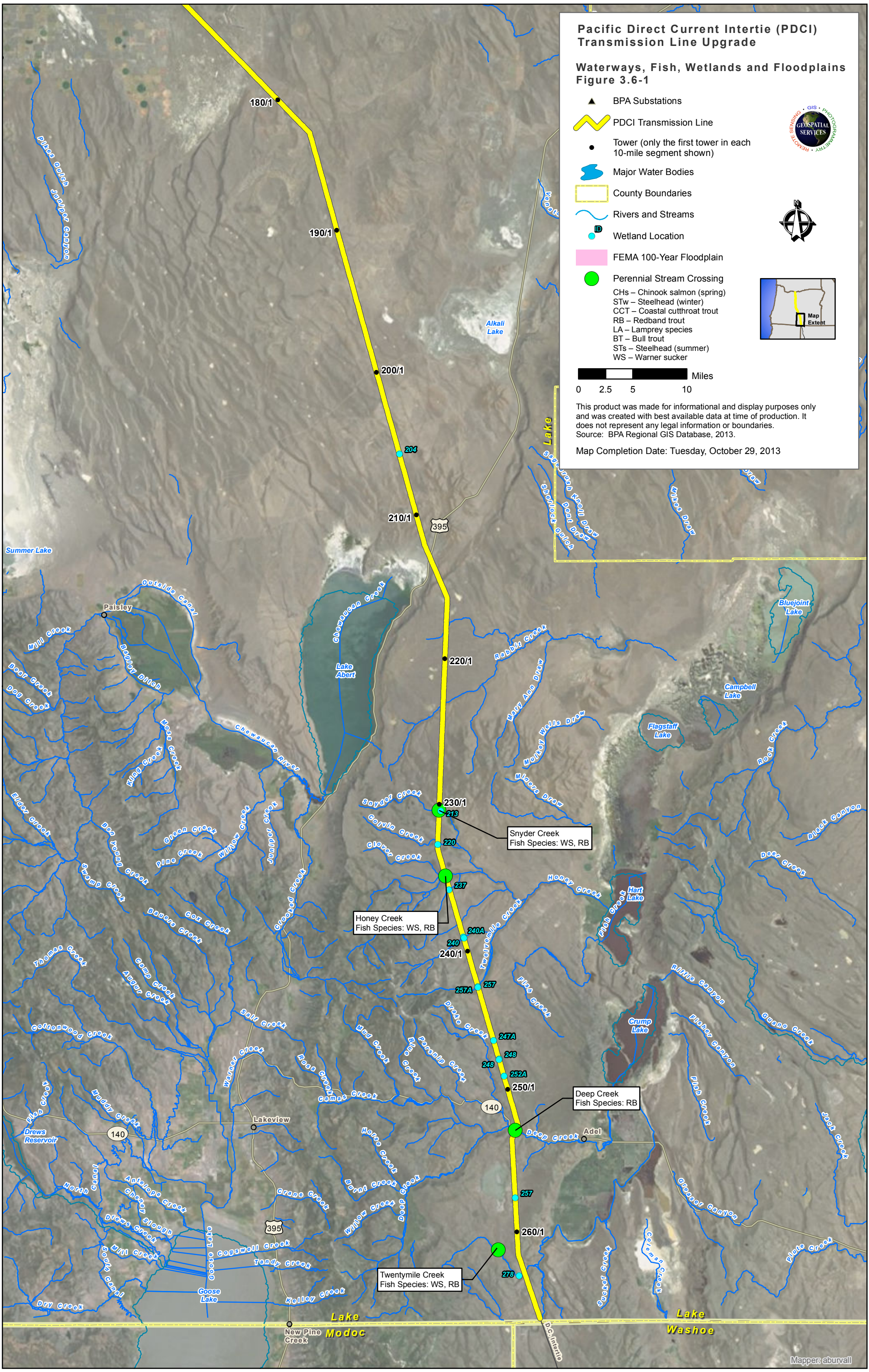
-  BPA Substations
-  PDCI Transmission Line
-  Tower (only the first tower in each 10-mile segment shown)
-  Major Water Bodies
-  County Boundaries
-  Rivers and Streams
-  Wetland Location
-  FEMA 100-Year Floodplain
-  Perennial Stream Crossing
 - CHs – Chinook salmon (spring)
 - STw – Steelhead (winter)
 - CCT – Coastal cutthroat trout
 - RB – Redband trout
 - LA – Lamprey species
 - BT – Bull trout
 - STs – Steelhead (summer)
 - WS – Warner sucker



0 2.5 5 10 Miles

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. Source: BPA Regional GIS Database, 2013.

Map Completion Date: Tuesday, October 29, 2013



Fifteenmile Creek Watershed

Within the Fifteenmile Creek Watershed (to the south of the Celio DC Converter Station; see Figure 3.6-1), in addition to various small drainages, the project crosses fish-bearing perennial streams including Fivemile, Eightmile, and Fifteenmile creeks. The project traverses the Fifteenmile Creek Subbasin from Tower 4/2 to 21/5 and crosses Fivemile Creek (between Tower 3/3 and 3/4), Eightmile Creek (between Tower 5/4 and 6/1), and Fifteenmile Creek (between Tower 8/6 and 9/1).

Fivemile, Eightmile, and Fifteenmile creeks support anadromous fish species including the easternmost run of wild winter steelhead in the Columbia River Basin (Northwest Power and Conservation Council [NPCC] 2004) and are designated as critical habitat for steelhead. Other fish species found in the project area include anadromous Pacific lamprey (*Entosphenus tridentatus*) and coastal cutthroat trout (*O. clarkii*) plus resident rainbow trout (*O. mykiss*), western brook lamprey (*Lampetra richardsoni*), sculpin (*Cottus* spp.), mountain sucker (*Catostomus platyrhynchus*), bridgelip sucker (*C. columbianus*), largescale sucker (*C. macrocheilus*), and speckled dace (*Rhinichthys osculus*). Coho (*O. kisutch*) and Chinook (*O. tshawytscha*) salmon have also been documented in the lower reaches of Fifteenmile Creek but they are believed to be hatchery strays from other watersheds (NPCC 2004). The Fifteenmile Creek Watershed does not support bull trout, and is not believed to have done so historically (NPCC 2004).

Much of the riparian areas along streams crossed by the project in the Fifteenmile Creek Watershed are impaired because of past and present agricultural activities that removed riparian vegetation or modified the stream channel. In addition, water withdrawals for irrigation reduce the amount of water available for fish. Because of the combination of reduced riparian function and extensive irrigation withdrawals, summer stream temperatures in the streams crossed by the project often exceed the lethal temperatures for trout and steelhead. Recent restoration efforts have focused on re-establishing and protecting riparian areas in the lower portion of the watershed (NPCC 2004). TMDLs for temperature were established in 2008 for Fifteenmile, Eightmile, and Dry creeks for exceeding the state water temperature standards for cold water fish. Additionally, Eightmile and Fifteenmile creeks are 303(d)-listed for sedimentation within the project area.

Deschutes River Watershed

The project traverses the Deschutes River Watershed from Tower 21/5 to 48/5, crossing various small drainages and fish-bearing perennial streams including the Deschutes River, Salt Creek, Bakeoven Creek, Deep Creek, Trout Creek, and Crooked River.

The transmission line crosses the Deschutes River at Tower 24/6. However, no work will occur within 3,245 feet (0.6 mile) of the river. The Lower Deschutes River is 303(d)-listed for temperature and pH within the project area, and for dissolved oxygen (DO) upstream of the project. DEQ has initiated the preparation of a TMDL for all 303(d)-listed parameters.

The project crosses Salt Creek at Tower 32/2 before flowing into Bakeoven Creek. Salt Creek supports, and is designated by NMFS as critical habitat, for MCR steelhead. Salt Creek is not on the 303(d) list for any water quality parameters and no TMDLs have been prepared for this

waterbody. However, the portion of Salt Creek crossed by the project has deficiencies in riparian vegetation and observed water temperature exceedances.

The project crosses Bakeoven Creek at Tower 32/4. Bakeoven Creek flows into the Deschutes River and the major tributaries to Bakeoven Creek include Deep Creek, Cottonwood Creek, Booten Creek, and Salt Creek. The project crosses Deep Creek at the upper extent of fish distribution between Towers 44/4 and 45/1, 45/1 and 45/2, 45/3 and 45/4, 47/3 and 47/4, and 48/4 and 48/5. Depending on the reach, Deep Creek is perennial and fish-bearing or intermittent.

Bakeoven and Deep creeks provide important spawning and rearing habitat for the East Side Deschutes steelhead population (part of the Middle Columbia River (MCR) steelhead DPS; NMFS 2005) and both streams are designated by NMFS as critical habitat for MCR steelhead. The Bakeoven Creek Watershed also supports resident redband (rainbow) trout (*Oncorhynchus mykiss*), whitefish (*Prosopium spp.*), and non-native brown trout (*Salmo trutta*).

Two existing fords crossing Bakeoven Creek (near Towers 32/3 and 32/4) and one existing ford crossing Deep Creek (near Tower 45/4) are located where BPA proposes to modify existing fords for project access. The transmission line crosses Deep Creek at the upper extent of fish distribution. At this location Deep Creek is a relatively small spring fed stream. Irrigation ponds at the headwaters of Deep Creek also affect the timing and amount of streamflow in this reach.

Trout production capacity is limited in the Bakeoven Creek Watershed by water temperature and degraded habitat conditions. In particular, water temperatures in Bakeoven and Deep creeks often exceed State water quality criteria for salmonid rearing during the summer months. Bakeoven Creek is listed on DEQ's 303(d) list for water temperature. Other water quality problems including elevated levels of turbidity, low dissolved oxygen, and nutrients pollution of agricultural runoff (Wasco County SWCD 2005).

The project crosses Trout Creek at Tower 59/1 and flows into the Deschutes River about 7 miles west of the transmission line. The portion of Trout Creek crossed by the project supports summer steelhead spawning and rearing, and also provides habitat for resident fish species, including, redband trout, bridgelip sucker, large scale sucker, speckled dace, long nose dace (*Rhinichthys cataractae*), red side shiner (*Richardsonius balteatus*), chiselmouth (*Acrocheilus alutaceus*), and northern pikeminnow (*Ptychocheilus oregonensis*). The section of Trout Creek crossed by the transmission line is mainly composed of moderate gradient (2 to 8 percent) streams in relatively confined valleys with limited floodplains. Narrow bands of riparian vegetation provide limited cover and shading. Trout Creek is on the 303(d) list for biological criteria, sedimentation, and temperature. DEQ has initiated the preparation of a TMDL in Trout Creek for all 303(d)-listed parameters.

The transmission line crosses Crooked River at Tower 90/4. Crooked River flows into the Deschutes River at Lake Billy Chinook. The USFWS lists the lower portion of Crooked River as critical habitat for areas of future recovery of bull trout. The Lower Crooked River is on the 303(d) list for E. coli, pH, temperature, biological criteria, and DO within the project area. The Crooked River is also 303(d)-listed for chlorophyll near the mouth, and for dissolved gas upstream of the project area. DEQ has initiated the preparation of a TMDL in the Lower Crooked River for all 303(d)-listed parameters.

Warner Lakes Watershed

Within the Warner Lakes Watershed, the project crosses fish-bearing perennial streams including Snyder Creek (Tower 230/3), Honey Creek (Tower 234/5), Deep Creek (Tower 252/4), and Twentymile Creek (Tower 261/1).

Anadromous fish are absent from Warner Lakes Watershed; however, the watershed supports two endemic fish species that are listed under the ESA: Warner sucker (*Catostomus warnerensis*) and Foskett speckled dace (*Rhinichthys osculus sp.*). Foskett speckled dace live in isolate spring habitat outside of the project area. Warner sucker inhabits the lakes and low gradient streams of the Warner Valley, including three streams crossed by the project: Honey, Snyder, and Twentymile creeks. Tributary streams to Warner Lake also support Great Basin redband trout, an ODFW sensitive species that occupy similar habitats as Warner sucker. The redband trout are native to the Warner Lakes Watershed, and recognized as a distinct biological unit of conservation by the American Fisheries Society (Williams *et al.* 1989). Other fish species present in the Warner Lakes Watershed include tui chub (*Gila bicolor*), Cowhead Lake tui chub (*Gila bicolor vaccaceps*), and speckled dace, plus non-native black crappie (*Pomoxis nigromaculatus*), white crappie (*P. annularis*), brown bullhead (*Amelurus nebulosus*), and largemouth bass (*Micropterus salmoides*) (USFWS 1998).

The project crosses two streams designated as critical habitat for Warner sucker: Honey Creek and Twentymile Creek. Honey Creek is 303(d) listed as water quality impaired for pH and temperature. Twentymile Creek is 303(d) listed for arsenic, silver, thallium, dissolved oxygen, and temperature. These streams contain primary habitat features required to support Warner sucker such as unpolluted water, intact riparian areas, and habitats with “15 to 50 feet wide channels with gravel bottom shoal and riffle areas with intervening pools” (FR 50:39117-39123).

3.6.2 Special Status Fish Species or Habitat Affected Environment

Federally-Listed Species

Steelhead

NMFS listed MCR steelhead trout as threatened under the ESA (NMFS 1999) in 1999 and reaffirmed this listing in 2006. This inland steelhead distinct population segment (DPS) occupies the Columbia River Basin. Production within the MCR steelhead DPS has declined due, in part, to losing spawning habitat because of low flows. Loss of riparian habitat and in-water structure are also threats to MCR steelhead. Blockages have prevented access to sizable steelhead production areas in the Deschutes. The Deschutes River and Fifteenmile Creek are designated critical habitat for the MCR steelhead DPS (70 FR 52630 – 52858).

Bull Trout

The USFWS listed the Columbia River populations of bull trout as threatened under the ESA in 1998 primarily due to habitat degradation and migratory barriers (63 FR 31647). The lower Deschutes River was designated as critical habitat in 2010 as an important migratory connection to the Columbia River to support a fluvial life history. However, known populations are not located within streams crossed by the transmission line. The USFWS also lists the lower portion

of Trout Creek and Crooked River as critical habitat for areas of future recovery of bull trout. These areas could offer feeding, migratory, and overwintering (FMO) habitat but are currently not occupied. The use of the Crooked River is limited by Opal Spring Dam located less than a mile upstream of Lake Billy Chinook (USFWS 2002).

Warner Sucker

Warner sucker are an endemic species to Warner Basin and inhabit the main Warner lakes (Hart Crump, and Pelican), ephemeral lakes, sloughs, and lower-gradient streams (USFWS 2013b). The Warner sucker population has declined due to habitat modification, predation by non-native fish on juvenile suckers in lake habitats, and in-water water diversions and artificial barriers that restrict movement of suckers between habitats (FR 50:39117-39123). The Warner sucker is listed as threatened under the ESA by the USFWS.

Federal Species of Concern

Great Basin Redband Trout

Great Basin redband trout maintain viable and self-sustaining populations in the Catlow, Fort Rock, Harney, Goose Lake, Warner, and Chewaucan Basins. Redband trout are adapted to arid forest and desert environments characterized by extreme fluctuations in stream flow and temperature. Two life histories help them thrive in these potentially harsh conditions. Some live year-round in the upper reaches of streams. Others are migratory and live in reservoirs and lakes, but move to streams to spawn. BLM also considers redband trout a “sensitive species” under their interagency special status/sensitive species program.

Pacific Lamprey

Pacific lamprey are a primitive anadromous fish species that occur in Columbia River tributaries, including the lower portions of Fifteenmile Creek and Deschutes River. Lamprey spend 2 to 3 years in marine environments before returning to freshwater in the spring to spawn. Lampreys spawn in gravel substrate in similar habitats used by steelhead. Lamprey numbers have declined due to fish passage barriers, poor water quality, and water diversions (USFWS 2013c).

Essential Fish Habitat

Within the project area, the Magnuson-Stevens Act designates Essential Fish Habitat (EFH) for Chinook and coho salmon. EFH occurs in Fifteenmile and Eightmile creeks and the lower Deschutes River.

3.6.3 Groundwater Affected Environment

Groundwater includes the volcanic- and sedimentary-rock aquifers, which are the prominent groundwater source in the project area. Approximately 30 percent of the fresh groundwater withdrawals from these aquifers are used for public supply, 20 percent are used for domestic and commercial, and about 50 percent are used for agricultural (primarily irrigation) purposes. The volcanic components of the aquifers consist primarily of Pliocene and younger basaltic rocks; the

sedimentary components consist primarily of semiconsolidated sand and gravel eroded mostly from volcanic rocks (Whitehead 1994).

Only one public drinking water source area was identified within the project area. This area is the 10-year time of travel zone associated with the drinking water supply wells for the city of Dufur near the northern terminus of the project.

One well was identified within the project area. This well has no associated water right according to the Oregon Water Resources Department (OWRD 2013). Two additional wells, used for crop irrigation, were identified within 0.5 mile of the project.

No designated sole source aquifers are located within the project area (EPA 2013).

3.6.4 Environmental Consequences – Proposed Action

Proposed Action activities that have the potential to affect fish and water resources are those that result in changes to water quality or quantity; soil disturbance; changes in riparian vegetation that affect shade, cover, and recruitment of wood and terrestrial insects into streams; release pollutants into or near waterbodies; or activities that directly result in death of or disturbance to fish.

Ground disturbance from construction activities associated with upgrading the transmission line, installing structures, and accessing road work could cause erosion and sedimentation that could reach streams and increase *turbidity*. Work within stream channels, including the two culvert replacements, would directly affect water quality by increasing turbidity. Indirect impacts on water quality could occur when sediment-laden runoff from construction work areas enters streams and results in increased turbidity. Ground disturbance more than 200 feet from streams is not expected to result in impacts on water quality as the vegetation and undisturbed soils between the disturbance area and the surface water would act as a filter intercepting sediments before being discharged into surface waters. Because activities that could increase turbidity would be limited to specific locations, would be temporary, and would not exceed water quality parameters, the impacts on water quality would be *low* to *moderate*, depending on the amount of sediments that reached streams.

Ground disturbing activities associated with the Proposed Action are not expected to affect groundwater quality, because these activities would not result in deep excavations that would directly reach groundwater resources. Any sediment that would be transported subsurface would likely filter out of groundwater relatively quickly and would not have any measurable impact on groundwater aquifers or exceed applicable thresholds. The ratio of the potential area of groundwater impact to the area available for groundwater recharge is extremely small. Spill prevention and response plans would be developed to reduce the potential for spills or contamination of underlying aquifers in the project area. The impact on groundwater quality is expected to be very *low*.

Vegetation removal near streams could indirectly affect water quality by increasing exposure of surface waters to solar radiation, thereby increasing water temperatures. However, riparian vegetation removal would be small relative to existing cover along a stream corridor. Additionally, implementation of mitigation measures and other BMPs would minimize potential

impacts on water quality. Impacts on water quality from vegetation removal would be *low* to *moderate*, depending on the extent of vegetation removed along each stream.

Waters could become contaminated from chemicals or other pollutants associated with construction activities. Construction activities require the use of fuel and other chemicals, such as coolants, hydraulic fluids, and brake fluids, to operate heavy equipment and vehicles. The potential risk of water quality impacts associated with accidental spills during construction would be *low*, due to the implementation of BMPs including a Spill Prevention and Treatment Plan.

Most of the activities under the Proposed Action would occur away from fish bearing streams. Impacts on fish could occur in relation to access roads where access road construction/improvement and culvert replacements are located within or near fish-bearing streams and where fish-bearing streams are crossed by fords or bridges (see Table 3.6-1 for crossings types for fish-bearing, perennial streams). These impacts are expected to be *low* to *moderate*.

Transmission Line Upgrade and New Tower Installation

Eighty-three existing and 1 new dead-end tower are located within 200 feet of a stream, many of which are intermittent streams. Clearing and grading activities associated with upgrading the transmission line would require removal or trampling of existing vegetation and soil disturbance, which could result in minor, short-term, and localized water quality effects. With the exception of tower landings that are rocked/graded, exposure of soils through these actions would make them more susceptible to erosion, which may degrade waterbodies if eroded sediments were to reach a waterbody. Each tower site would have a small area of exposed bare soil for a few weeks that might erode and be a source of sediment to nearby streams. These activities could in turn introduce sediment and increase stream temperatures in nearby streams. However, this would generally fall within the range of current conditions, as many of the existing and proposed towers are located in sagebrush-dominated land with a high percentage of exposed soil and cultivated fields that are frequently laid bare for plowing and planting. Soil compaction from heavy equipment can also degrade soil structure, reducing pore space and infiltration rates, which could lead to increased runoff volumes and erosion if erosion control measures are not implemented. The risk of erosion would be highest on steep slopes and on NRCS-designated highly erodible lands (see Section 3.3, Geology and Soils). Erosion and sediment controls would be implemented during construction to avoid or minimize these impacts to fish resources.

Installation of new towers is not expected to affect infiltration of surface water to groundwater as the new structures would result in a very small net gain in impervious surfaces and soil compaction from heavy equipment use would be small and localized.

Impacts to fish and water resources from transmission line upgrades and installation of new towers are expected to be *low*.

Access Roads

BPA proposes stream crossing improvements and the use of each stream crossing for a few days to a few weeks, depending on the number of towers accessed by the road. Improvements to

access road surface, stream crossings, or vegetation clearing may result in negative effects on water quality, habitat quality, and riparian condition.

The use of fords causes temporary increases in suspended sediment as crossing vehicles disturb the streambed and streambanks. Pulses of increased suspended sediment can affect fish behavior by displacing fish as they seek new habitat with clearer water. This behavior change induces physiological stress, reduces feeding success, and diminishes the ability to detect and avoid predators. Suspended sediment can also physically harm fish gills. The deposition of sediment can reduce the quality of substrates for spawning and bury aquatic macro-invertebrates and other fish food sources. The use of fords or addition of rock to crossings may temporarily increase stream turbidity up to 500 feet downstream of the crossing location.

Newcombe and Jensen (1996) quantified the response of fish to suspended sediment as a function of concentration and exposure duration and described the “severity of ill effect” along a 15-point scale where 0 is nil effect and 14 represents 80 to 100 percent mortality (Table 3.6-2). Low concentrations of suspended sediment over short periods may result in relatively negligible behavior effects on fish, such as alarm reaction to a sediment plume or abandonment of cover to seek refuge from the suspended sediment. Moderate or heavy concentrations of suspended sediment can have sublethal to lethal effects depending on exposure duration. For example, Goldes (1983, as cited in Newcombe and Jensen 1996) reported gill damage in rainbow trout exposed to high suspended sediment concentration (4,887 mg/l) over a moderate time frame (16 days). Likewise, Sigler et al. (1984) found that growth rates in steelhead were significantly reduced when exposed to a comparatively moderate suspended sediment concentration (102 mg/l) over a long period (1 year).

Table 3.6-2: Scale of Severity of Ill Effect Associated with Excess Suspended Sediment

Severity	Description of Effect
0	No behavior effects
1	Alarm reaction
2	Abandonment of cover
3	Avoidance response
4	Short-term reduction in feeding rates/success
5	Minor physiological stress, increased rate of coughing or respiration
6	Moderate physiological stress
7	Moderate habitat degradation; impaired homing
8	Indications of major physiological stress; long term reduction in feeding rates/success
9	Reduced growth rate, delayed hatching, reduced fish density
10	0-20% mortality, increased predation, moderate to severe habitat degradation
11	>20-40% mortality
12	>40-60% mortality
13	>60-80% mortality
14	>80-100% mortality

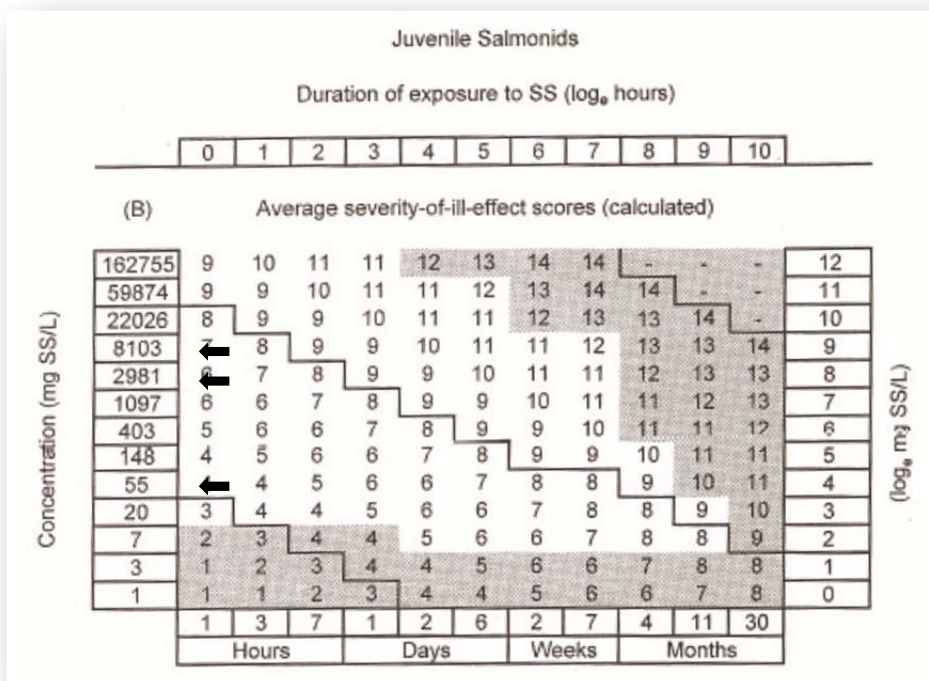
Source: Newcombe and Jensen's (1996).

The use of fords for the PDCI project is expected to cause a short term release (i.e., pulse) of suspended sediment at low concentrations as equipment crosses back and forth over streams to access the transmission line. Taylor et al. (1999) cited a study in Pennsylvania that measured very low (6 mg/l) suspended sediment concentrations following the crossing of a rock ford by a

log truck. However, Taylor et al. (1999) also referenced a Michigan study that measured suspended sediment for a ford crossing that utilized the native streambed with rocked streambanks (as proposed by BPA) and found peak increases in downstream suspended sediment concentrations up to 310 mg/l. A similar study in the Talladega National Forest in Alabama found that a pickup truck driving through a rock ford at base flow conditions created increased sediment concentrations up to 255 mg/l that lasted until 10 minutes after the vehicles passed through the ford (Blinn et al. 1998).

BPA used these recorded sediment concentration values from ford crossings (6 mg/l, 255 mg/l, and 310 mg/l) as proxy values in Newcombe and Jensen’s (1996) dose-response model to estimate the potential effect to juvenile steelhead from suspended sediment. The natural log of proxy values was compared to the severity of ill effect “look-up tables” that predicts relative effects on juvenile salmonids from suspended sediment (Figure 3.6-2).

Figure 3.6-2: Duration of Exposure to Suspended Sediment



Source: Newcombe and Jensen (1996). Matrix ranks “severity of ill effect” to sediment concentration and exposure time. The arrows indicate the range of values that may occur during the use of ford crossings for the PDCI project.

Results of this exercise indicate the use of ford crossings could have a range of effects on fish from minor behavioral effects (alarm reaction) to lesser sublethal effects, such as short-term reduction in feeding rates or minor physical stress. Newcombe and Jensen (1996) developed a similar matrix for “adult freshwater nonsalmonids” which would apply to Warner sucker. The same range of effects identified in Figure 3.6-2 would correspond to the expected response by Warner suckers but they may be more sensitive to low concentrations of suspended sediment than juvenile salmonids. These effects would only occur when equipment was fording streams and actively creating a sediment plume, which would dissipate quickly following the crossing.

Blinn et al (1998) reported that following vehicle ford crossings “the total suspended sediments returned to near zero soon after discrete disturbance events occurred [and] the interval between disturbance and return to near background level took about 18 minutes.” Therefore, BPA anticipates that there would be some level of behavior response or minor sublethal effect on fish if they are present during individual equipment crossings of fish bearing streams. However, this effect would be short lived (less than 30 minutes per crossing) and would not result in mortality or significant diminishment of fitness. To minimize effects from suspended sediment on steelhead, BPA would armor the streambanks above the ordinary high water mark to decrease chance of erosion.

In a study of water quality effects from low water crossings, USFS acknowledged three processes that vehicles driving through an unimproved ford cause peaks in turbidity or suspended sediment, which include: “[1] waves from vehicles eroding banks; [2] ruts concentrating surface runoff during storms; [3] water washing off (as they emerge from the water eroding the approach as it runs back into the stream” (Brown 1994, as cited in Clarkin et al, 2006). BPA would mitigate each of these erosion process by limiting crossing to summer (July to October) when water levels are low or dry to reduce wave erosion, surfacing roads with rock outside of ordinary high water mark, adding cross drains to manage stormwater runoff, and adding rock to ford approaches to reduce erosion as vehicles enter and exit fords.

While hardening the entire streambed with riprap has been shown to reduce sedimentation during ford crossing (Blinn et al 1998), BPA intends to utilize the existing native streambed material where possible. Because these fords are rarely used, the benefits of maintaining a native substrate composition outweigh the sediment control advantages of rocking the entire stream channel. At Fifteenmile (Tower 8/6) and Bakeoven (Tower 32/3) creeks, existing native streambed material would be utilized as it is adequately hardened by cobbles and gravel, and therefore suitable for vehicle crossings. Similarly, the crossing locations at Salt (Tower 32/2) and Deep (Tower 45/2) creeks would be unimproved ford crossings (i.e., used in their current condition) as these streams are likely to be dry at the time of construction. If water is present, then modified fords would be installed at the direction of BPA. BPA would place river rock on the upstream and downstream bank approaches at the Trout Creek crossing (Tower 58/3). BPA would install permanent bridges for the crossings of Eightmile (Tower 5/4) and Deep (Towers 44/4 and 45/4) creeks as these streams are deeply entrenched and a bridge would avoid impacts to streambeds that would be caused by an improved ford crossing. The footings for the three-sided box culverts at the Eightmile and Deep creek crossings sites would be placed landward of the ordinary high water mark, thereby effectively avoiding in-water work at these locations.

Erosion control devices, such as sediment barriers or straw mulch, would be installed along the road approach to perennial stream crossings, as appropriate. Although the intention is to construct the crossings in the dry, if low flow conditions are present, the temporary sediment control devices would ensure that large pulses of sediment are not transported downstream. Project-related turbidity has the potential to negatively affect steelhead; however, effects would be limited to the time of construction. Additionally, BPA would minimize the effects of increased turbidity and sedimentation by implementing the BMPs listed in Section 3.6.5.

Use of the ford crossing could disturb stream substrates used by steelhead or other resident fish species for spawning during periods of higher flow outside of the in-water work window when crossings would occur. To minimize the potential for long-term adverse effects to spawning

habitat, BPA would only place rocks along the streambanks (i.e., armor the entry and exit points for vehicles). This measure would reduce turbidity but would maintain the native substrate across the streambed to avoid the loss of spawning habitat. Crossings would occur in the summer (July to October) to avoid periods when steelhead are actively spawning or eggs are incubating in gravels. Although some rock added to the streambanks above the ordinary high water mark may become dislodged and enter the stream channel during equipment crossing, the loss of spawning habitat is expected to be insignificant.

The use of fords and bridges for stream crossings would maintain fish passage for streams. Three-sided box culverts would be designed to ODFW and NMFS standards for fish passage, and because no rocks would be placed along the streambed (only on the banks), no passage impediments are anticipated. However, vehicular use and rock placement at Trout Creek would temporarily reduce available habitat for rearing juvenile steelhead that may occupy stream margins at the ford locations.

As with any project that involves construction equipment operating in the stream, there is a risk of spills or leaks of fuel or other petroleum products during project activities. Risk of water contamination is greatest when equipment is operating with 200 feet of streams or ditches. The release of hazardous materials could potentially impair water quality if chemicals or other construction materials are spilled or enter waterways. In general, construction-related chemical spills could affect fish by increasing physiological stress, reducing biodiversity, altering primary and secondary production, and possibly causing direct mortality. Petroleum products also tend to form oily films on the water surface that can reduce dissolved oxygen levels available to aquatic organisms.

The only potential sources of contaminants would be construction equipment (lubricating oils and fuel). The worst-case scenario for a hazardous materials release from construction equipment would be up to 100 gallons (estimated maximum size of fuel tanks, hydraulic fluid reservoirs, etc.). At a typical construction site, most spills are less than one gallon and can be quickly controlled and cleaned up by the contractors. The most likely type of spill is from hydraulic hose failures during excavator use. Those spills are still uncommon and very limited in extent. To reduce the risk of fuel or petroleum leaks that could be toxic to fish, any large construction-related equipment that ford actively flowing creeks (e.g., excavators to access transmission pads) would be retrofitted with synthetic (i.e., vegetable) oil.

Adverse effects related to contaminant spills and leaks could occur, but would be adequately mitigated by implementing BMPs listed in Section 3.6.5. With BMPs in place, any impacts from hazardous material spills are anticipated to be discountable.

Riparian vegetation serves important functions in stream ecosystems by providing shade, sediment storage, nutrient inputs, channel and streambank stability, habitat diversity, and cover and shelter for fish (Murphy and Meehan 1991). In most cases, riparian vegetation at existing stream crossings would be left in place, unaffected; however, there may be crossings that require the removal, or trampling, of minor amounts of riparian vegetation to allow for the improvement of stream crossings. Vegetation removal would be limited to the amount necessary and would likely not exceed the 15-foot road prism on either side of the stream. If needed, only minor trimming of vegetation near the roadway would occur. Approximately 0.3 acres of cottonwood riparian gallery forest vegetation (see Section 3.4.2) would be permanently removed at two fish-

bearing perennial stream crossings: Deep Creek and Trout Creek. Vegetation removal will be limited to amount necessary and in most cases, only minor trimming of vegetation near the roadway would be needed. Most riparian vegetation near the stream crossings is herbaceous and is expected to quickly recover (within 1 to 3 growing seasons following completion of construction). Additionally, disturbed areas would be revegetated using native plant species as described in Section 3.4.3. Vegetation clearing along existing access roads is expected to have insignificant effects on fish, their habitats, or their prey assemblages.

Implementation of BMPs would minimize potential impacts on fish and water resources. The overall impacts on fish and water resources from access road construction/improvement, fords, and culvert replacements are expected to be *low to moderate*. Access road work could affect hydrology and stormwater conveyance. Although access road surfaces would be pervious, allowing stormwater infiltration, they could result in a small, incremental increase in precipitation runoff. Proper design of the road surface, including installation of cross drains, would direct the flow of surface water into vegetated areas where water would slowly infiltrate into soils. Culverts that are replaced may improve hydrology in instances where the existing culvert is undersized. Although composed of a compacted gravel surface, new and reconstructed access roads would decrease groundwater infiltration rates within their direct footprint, but would not be expected to have a noticeable effect on overall infiltration rates in the project area. Because the Proposed Action would not adversely affect hydrology, impacts would be *low*.

3.6.5 Mitigation – Proposed Action

The following mitigation measures and BMPs would be implemented to minimize potential construction-related impacts to fish and water resources.

- Design and construct access roads to minimize drainage from the road surface directly into streams.
- Size and space cross drains and water bars properly to accommodate flows and direct sediment laden waters into vegetated areas.
- Size replacement culverts large enough to accommodate predicted flows.
- Prohibit side-casting of road grading materials along roads within 300 feet of perennial streams.
- Retain vegetative buffers, where possible, to prevent sedimentation into waterbodies.
- Limit disturbance to the minimum necessary when working in or near waterbodies and install stakes or flagging to restrict vehicles and equipment to designated routes and areas.
- Review water quality mitigation measures, required BMPs, and permit requirements with construction contractors and inspectors during a preconstruction meeting covering environmental requirements.
- Conduct peak construction activities during the dry season as much as possible, to minimize erosion, sedimentation, and soil compaction.
- Prepare a stormwater pollution prevention plan, addressing measures to reduce erosion and runoff and stabilize disturbed areas.

- Delineate construction limits within 200 feet of waterbodies, as specified in the stormwater pollution prevention plan, with a sediment fence, straw wattles, or a similarly approved methods to eliminate sediment discharge into waterways and wetlands, minimize the size of construction disturbance areas, and minimize removal of vegetation, to the greatest extent possible.
- Locate tensioning sites at least 200 feet from surface waters, including wetlands.
- Install sediment barriers and other suitable erosion- and runoff-control devices, where needed, prior to ground-disturbing activities at construction sites to minimize offsite sediment movement.
- Inspect erosion and sediment controls weekly, maintain them as needed to ensure their continued effectiveness, and remove them from the site when vegetation is re-established and the site has been stabilized.
- Implement a Spill Prevention and Treatment Plan that requires storage of fuel and other potential pollutants in a secure location away from waterbodies, and that ensures that spill containment and cleanup materials are readily available on site and restocked within 24 hours if used, and that in the event of a spill, contractors are trained to immediately contain the spill, eliminate the source, and deploy appropriate measures to clean and dispose of spilled materials in accordance with federal, state, and local regulations.
- Maintain vehicles and equipment in good working order to prevent oil and fuel leaks.
- 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.
- Operate construction vehicles or equipment at least 50 feet from any stream, unless on an existing road.
- Store, fuel, and maintain vehicles and equipment in designated vehicle staging areas located a minimum of 200 feet away from any stream.
- 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; prohibit discharge of vehicle wash water into any stream without pretreatment to meet state water quality standards; inspect equipment and tanks on a weekly basis for drips or leaks and promptly make necessary repairs.
- Check all equipment used for in-water work for leaks, and, prior to entering waterways, completely clean off any external petroleum products, hydraulic fluid, coolants, and other pollutants.
- Reseed disturbed areas after construction and regrading 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.
- Monitor seed germination of seeded areas with at least three field visits per year until site stabilization (defined as at least 70 percent cover by native or acceptable nonnative species) is achieved; if vegetative cover is inadequate, implement contingency measures and reseed to ensure adequate revegetation of disturbed soils.

- Inspect and maintain access roads, culverts, and other facilities after construction to ensure proper function and nominal erosion levels.
- Cover approaches to streams and crossings of streams in clean cobble rock to minimize erosion and sedimentation from BPA and landowner use, where appropriate.
- Avoid the use of fords wherever an alternative route or method is available to minimize impacts on federally-listed fish.
- Conduct all in-water work during approved work windows.
- Conduct all culvert replacement work in dry conditions, either when there is no flow or by diverting flow from the stream culvert location during replacement, as necessary.

3.6.6 Unavoidable Impacts Remaining after Mitigation – Proposed Action

Unavoidable impacts on fish and water resources would be associated with temporary and permanent loss of vegetation and existing access road improvement, fords, and culvert replacements. Although there is the potential for temporary and localized impacts on water quality during construction, these impacts would not be permanent or long-term, and would be localized. Implementation of the mitigation measures described above would reduce these impacts. It is expected that implementation of mitigation would either return water quality to previous levels or that improvements to access road drainage would result in water quality improvements.

3.6.7 Environmental Consequences – No Action

Under the No Action Alternative, impacts related to the construction of the Proposed Action would not occur. Operation and maintenance activities would continue and would be similar to existing conditions. Access road work described under the Proposed Action would likely need to occur as an operations and maintenance activity under the No Action Alternative. Maintenance activities, especially road crossings over streams, would result in *low* to *moderate* impacts to fish and water resources as described under the Proposed Action.

3.7 WETLANDS

3.7.1 *Affected Environment*

The preliminary wetlands determination includes a 328-foot (100 meter) radius surrounding the following project features: existing towers, new dead-end towers and entire right-of-way between spans on either side of the new towers, access road construction/improvements, and tensioning and pulling sites. The preliminary wetlands determination was a desktop analysis performed using GIS data and aerial photography to map potential wetlands, followed by field survey investigations.

The field survey areas include the existing right-of-way and access roads, including areas of construction, improvement, or construction-related travel, where impacts may occur to wetlands.

Wetlands in the Project Area

A total of 281 wetlands were identified within the project area during the preliminary wetland determination phase. Of these 281, 36 wetlands (total approximately 13 acres) were delineated in the field and assessed for functions and values. Many of the wetlands identified during the preliminary wetland determination are linear wetland features associated with intermittent or ephemeral streams. Field investigations determined that most of these linear wetland features lacked indicators for wetland hydrology, vegetation, and soils, and were therefore not considered wetlands.

General Wetland Types in the Project Area

All of the wetlands that occur in the project area are freshwater wetlands. Wetlands identified in the northern portion of the alignment are mainly slope wetlands fed by localized seeps or depressional wetlands in naturally-occurring topographic depressions or manmade excavations. Scattered riverine wetlands associated with perennial streams are also located in the northern portion of the alignment. Nearly all of these wetlands are emergent wetlands that support a mixture of native and introduced species. Many of the wetlands are on agricultural land and rangeland.

Scattered small salt flat (dry lake) wetlands that receive hydrology from direct precipitation or local groundwater discharge are located in the middle of the alignment. Wetlands identified in the southern portion of the alignment are nearly all associated with perennial streams. They support predominantly native emergent and scrub-shrub vegetation communities. Many of the wetlands are on BLM land leased for livestock grazing and disturbance is mainly limited to light grazing and some irrigation ditch diversions along larger perennial streams. Eleven wetlands identified in the southern portion of the alignment during the preliminary wetland determination were inventoried by ORBIC as Special Areas of Conservation Concern⁴. These were the only ORBIC inventoried wetlands. Of these 11 wetlands, 8 did not meet the definition of a

⁴ A Special Area of Conservation Concern is a State of Oregon designation that indicates the need for careful evaluation to assure minimal impacts. These wetland types are considered difficult to replace and/or are rare (Oregon State University 2013).

jurisdictional wetland and 3 were not within areas of direct project impacts when visited in the field.

3.7.2 Environmental Consequences – Proposed Action

The Proposed Action could result in impacts to wetlands where project activities would occur within or adjacent to wetland boundaries, or if the project changes drainage and wetland hydrology. Impacts to wetlands could impact functions and values provided by wetlands: hydrologic, water quality, carbon sequestration, fish support, aquatic support, and terrestrial support. In addition, the Proposed Action has the potential to impact a wetland's condition, stressors to the wetland, and wetland sensitivity.

The Proposed Action would result in up to 0.3 acre of direct, permanent wetland impacts to nine jurisdictional wetlands as a result of access road improvements and construction of rock landings at existing towers. No direct, temporary impacts to wetlands would occur. The following sections discuss potential impacts to wetland function by project component.

Transmission Line Upgrade and New Tower Installation

No direct permanent or temporary impacts to wetlands would occur as a result of tower and cathodic protection site construction. Construction-related erosion or runoff could temporarily affect water quality of nearby wetlands. Implementation of the mitigation measures described in Section 3.7.3 and Section 3.6, Fish and Water Resources would reduce impacts associated with these activities. These indirect impacts to adjacent wetlands would be temporary and considered *low*.

Access Roads

New access roads would not be constructed within 100 feet of wetlands. Access road improvements would include placing rock, grading, and minor expansion of the existing road footprint. To minimize the impact to wetlands from access road improvements, BPA would limit work to the existing road prism, a width of 15 feet. Access road improvements would result in up to 0.3 acre of direct, permanent impacts in nine jurisdictional wetlands: WLC, WLF, WLH, WL83, WL87, WL118, WL220, and WL278. Most of these wetlands are slope or depressional emergent wetlands in the northern portion of the alignment that received low to moderate scores for ORWAP grouped services and direct impacts would result in the loss of small areas of low quality wetland that could be mitigated. WL220 in the southern portion of the alignment is also an emergent slope wetland; however, it is relatively undisturbed and supports high-quality native wetland plant community. With implementation of mitigation measures, direct impacts from road construction to wetlands are expected to be *low*.

As a result of access road improvements, permanent disturbance would occur outside of physical wetland boundaries, but adjacent to wetlands. Access road work adjacent to wetlands could result in a removal of buffer vegetation adjacent to wetlands, potentially increasing construction-related runoff and erosion. Implementation of the mitigation measures described in Section 3.7.3 and Section 3.6, Fish and Water Resources would reduce these indirect, temporary impacts. This impact would be considered *low*.

Staging Areas and Tensioning Sites

BPA would require the construction contractor to locate all staging areas at least 200 feet from wetlands in order to prevent water quality impacts from potential leaks and spills and disturbance to wildlife. Staging areas would not be located in or adjacent to wetlands and thus, would have *no* direct or indirect impacts to wetlands.

Tensioning sites would not be located within wetlands or adjacent to wetlands and thus, would have *no* direct or indirect impacts to wetlands.

3.7.3 Mitigation – Proposed Action

If the Proposed Action is implemented, the following mitigation activities would be used to reduce impacts on wetlands:

- Locate roads and construction areas to avoid wetlands, whenever possible.
- Design construction activities within wetlands to minimize unavoidable impacts, and coordinate with the Corps and DSL for appropriate permits.
- Flag or stake wetland boundaries in the vicinity of construction areas and avoid these areas during construction.
- Operate construction vehicles or equipment at least 50 feet from any wetland, unless authorized by a permit or on an existing road.
- Limit disturbance to the minimum necessary when working in wetlands or their buffers.
- Place geotextile fabric around the work area when working on structures within 25 feet of wetlands to avoid depositing excavated material into the wetlands.
- Remove and stabilize excavated materials to an upland area.
- Store fuel, refuel machinery, and stage construction vehicles or equipment at least 200 feet from wetlands and waterways and inspect regularly for leaks.
- Require an environmental specialist to meet with contractors and inspectors in the field and visit wetlands near or within construction areas to go over mitigation measures and any permit requirements.
- Install sediment barriers and other suitable erosion- and runoff-control devices, where needed, prior to ground-disturbing activities at construction sites to minimize offsite sediment movement near wetlands.
- Vegetate disturbed wetland and adjacent upland areas with appropriate native plant species and follow specific revegetation guidelines in permits.
- Construct permanent access roads with adequate cross culverts or other methods to maintain the existing hydrologic regime.

3.7.4 Unavoidable Impacts Remaining after Mitigation – Proposed Action

The Proposed Action would result in 0.3 acre of permanent and no temporary direct impacts to wetlands.

3.7.5 Environmental Consequences – No Action

Under the No Action Alternative, impacts related to the construction of the Proposed Action would not occur. Operation and maintenance activities would continue and would be similar to existing conditions. Access road work described under the Proposed Action would likely need to occur as an operations and maintenance activity under the No Action Alternative. Maintenance activities, especially access road maintenance, would result in *low* to *moderate* impacts to wetlands, depending on the type of work, quality of wetland, and extent of impacts.

3.8 FLOODPLAINS

3.8.1 *Affected Environment*

The floodplain analysis includes all areas within the existing transmission line right-of-way and access roads within the mapped extent of a **100-year floodplain**. As defined by the Federal Emergency Management Agency (FEMA), 100-year floodplains include areas with a 1 percent chance of being flooded in a given year.

FEMA has designated floodplains associated with the following creeks or rivers: Fivemile Creek, Eightmile Creek, Fifteenmile Creek, Dry Creek, Deschutes River, Crooked River, Bakeoven Creek, Trout Creek, Willow Creek, and Dry River. All of the 100-year floodplains occur in the northern half of the alignment, north of Highway 20. Other small creeks and seasonal draws traverse the project area, but no other floodplains have been designated by FEMA.

Floodplains provide flood storage capacity and can reduce flood flows as they spread across the landscape. Floodplain vegetation provides water quality functions by slowing flood flows and allowing sediments and associated pollutants to settle out. Floodplains and their associated vegetation also provide fish habitat functions by providing shade to stream channels, off-channel refuge, and rearing and foraging habitat, and by contributing organic matter to the aquatic food chain. Similarly, floodplains provide food, water, and shelter to riparian-associated wildlife.

3.8.2 *Environmental Consequences – Proposed Action*

The Proposed Action has the potential to directly affect floodplains and impair floodplain functions as a result of road improvements on existing access roads. Improvements could result in soil compaction that could interfere with the subsurface water flow in the floodplain.

Access Roads

Table 3.8-1 lists access improvements that would occur in 100-year floodplains. Approximately 5,344 linear feet of existing access road improvements would occur within six 100-year floodplains. Impacts to floodplains from access road improvements would result from activities such as vegetation removal, and grading or rocking of road surfaces. These activities could result in minor soil compaction and erosion, but would not result in major alterations to floodplain capacity or the course of flood waters. Road improvements at Fifteenmile, Bakeoven, Salt and Hay creeks would not include the addition of rock below the ordinary high water line. This would minimize floodplain impacts by not adding to any existing obstruction of water flow in the main channel of the creek due to the presence of the road. A layer of rock would be added to the two fords within the Trout Creek floodplain. The road through the Dry River floodplain would also be improved. Dry River is the remains of an ancient river that cut through Dry River Canyon (BLM 2014). There is no present day sign of flowing water (HDR 2013c); therefore, it is highly unlikely that improving the road through the floodplain would reduce the function of the floodplain.

Table 3.8-1: Construction Activities within a 100-Year Floodplain

Floodplain	Access Road Construction/Improvement	
	Access Road in Floodplain	Permanent Disturbance in Floodplain (square feet)
Fifteenmile Creek	Road improvements occur along approximately 108 linear feet in floodplain	6,112 ^a
Bakeoven Creek	Road improvements occur along approximately 1,074 linear feet in floodplain	55,000
Salt Creek	Road improvements occur along approximately 513 linear feet in floodplain	25,635
Hay Creek	Road improvements occur along approximately 524 linear feet in floodplain	26,372
Trout Creek	Road improvements occur along approximately 2,785 linear feet in floodplain	136,076
Dry River near Towers 125/2 and 125/3	Road improvements occur along approximately 340 linear feet in floodplain	16,960

^a Disturbance would be less because the ford at Fifteenmile Creek would not be improved below the ordinary high water mark.

Implementation of the mitigation measures would further reduce direct impacts on floodplains associated with access road construction. Because access road work would occur within floodplains, impacts would be *moderate*.

Staging Areas and Tensioning Sites

BPA would require the construction contractor to locate all staging areas at least 200 feet from FEMA-designated floodplains. There are no floodplains near the proposed tensioning sites. As such, *no* direct or indirect impacts on floodplains would likely occur as a result of staging areas or tensioning sites.

3.8.3 Mitigation – Proposed Action

If the Proposed Action is implemented, the following mitigation measures would reduce impacts on floodplains:

- Minimize erosion, sedimentation, and soil compaction by conducting as much work as possible during the dry season when streamflow, rainfall, and runoff are low.
- Delineate construction limits as specified in the stormwater pollution prevention plan, using sediment fence or straw wattles or similar erosion and stormwater control BMPs to eliminate discharge into floodplains. Following construction, inspect erosion and sediment controls weekly, maintain as needed, and remove from the site when no longer needed.
- Implement a spill prevention, control and countermeasures plan to minimize the potential for an accidental spill of hazardous material and the impact from accidental spill of hazardous material, should such an accident occur.
- Locate spill prevention materials onsite and with equipment.
- Seed disturbed areas after construction and regrading are complete and at the appropriate time period for germination.

- Monitor germination of seeded areas with at least three field visits per year until site stabilization (defined as at least 70 percent cover by native or acceptable nonnative species) is achieved. If vegetative cover is inadequate, implement contingency measures to ensure adequate revegetation of disturbed soils.
- Identify the locations of 100-year floodplains on project maps for contractors and restrict tensioning sites to areas outside floodplains, where possible. Locate all staging areas at least 200 feet from FEMA-designated floodplains.
- Inspect and maintain access roads, culverts, and other facilities after construction to ensure proper function and nominal erosion levels.

3.8.4 Unavoidable Impacts Remaining after Mitigation – Proposed Action

Implementation of the Proposed Action would generally result in 266,155 square feet (6.1 acres) of permanent, direct impacts in floodplains. Implementation of the mitigation measures described above would minimize impacts.

3.8.5 Environmental Consequences – No Action

Under the No Action Alternative, the Proposed Action would not be constructed and there would be no construction-related impacts to floodplains. Continued operation and maintenance of the existing transmission line would have impacts on floodplains similar to those described for the Proposed Action and would likely be *low* to *moderate*, depending on the frequency and extent of activities within floodplains.

3.9 VISUAL QUALITY

3.9.1 *Affected Environment*

Visual Character

The visual character of the project area includes the natural and built landscape features. The visual setting is of central Oregon desert, shrubland, grassland, and agriculture on both private and public lands, which include lands managed by the BLM, USFS, and ODSL. The landscape in the northern portion of the project is gently rolling hills along the Columbia Plateau, which lays to the east of the Cascade Mountain Range and contains high quality scenic views for motorists and recreation users from many locations. A majority of the landscape in the southern portion of the project is semi-arid desert with rolling hills, playas, shrubland, and grassland. There are fewer points of public access and fewer scenic views from major roadways or designated recreation areas in the southern portion. The existing transmission line is a prominent feature throughout the project area. Photographs capturing the landscape along different segments of the transmission line are provided in Figure 3.9-1 through Figure 3.9-3.

Figure 3.9-1: Celilo Converter Station South of The Dalles on US 197



Figure 3.9-2: Transmission Line Crossing of US 97 at Tower 61/1



Figure 3.9-3: Shrubland near Tower 207/5



Visual Resources

Visual resources are the visible physical features on a landscape. Prominent visual resources within the project area include rangeland, mountains, transmission lines, highways, and sensitive scenic, recreation, and residential areas. Viewer groups include motorists on nearby roads, recreational users in areas close to the right-of-way, and local residents.

Transmission Lines

The existing transmission line corridor is a prominent feature within the visual landscape. The project area also includes the BPA Grizzly-Captain Jack No. 1, Grizzly Summer Lake No. 1, Buckley-Grizzly No. 1, Big Eddy-Redmond No. 1, and John Day-Grizzly No. 1 and 2 transmission lines at various points. These lines and towers vary in size, material, shape, and visibility.

Highways

The transmission line corridor crosses six highways that offer motorists views including US 20, US 97, OR 126, OR 140, US 197, and US 395. The existing transmission line is visible to approaching motorists from a moderate distance to the intersection and for a limited duration. The exception to this occurs where the transmission line corridor generally runs parallel to US 197, from its southern terminus at US 97 north to the Celilo Converter Station. Portions of this stretch of highway are designated as a Wasco County scenic highway (Wasco County 2008). The existing transmission line is visible at points along this stretch of US 197 and is approximately 80 feet from the highway at the closest point near the substation. US 97 is the major north-south route of travel through Oregon east of the Cascades, between Bend and Biggs Junction, a segment that offers expansive views of the Cascade Mountain Range, Smith Rock, and the Deschutes and Crooked rivers.

Motorist's views of the transmission line from all major highways are intermittent or only at the transmission line crossings. The transmission lines blend with the land and are screened by the topography in areas where the major highways approach the transmission line corridor.

Scenic and Recreation Areas

The Deschutes River Scenic Waterway Recreation Area includes the Deschutes River, which is designated as an Oregon Scenic, federal Wild and Scenic River, and Recreational River Area in the lower Deschutes River area, including where the line spans the river between Tower 25/1 and 25/2. The transmission line is visible from the river at this location. The Deschutes River area is a popular location to enjoy fishing, boating, whitewater rafting, camping, hunting, mountain biking, hiking, and beautiful scenery.

The transmission line crosses the edge of the CRNG, between Towers 63/1 and 64/4, 65/5 and 66/2, and 81/1 and 85/1 for a total distance of 4.9 miles. The CRNG, which is a unique landscape that offers a variety of recreational activities including hunting, fishing, boating, hiking, rock climbing, and OHV use. The Crooked River is a designated Recreational River for 17.8 miles southeast from the CRNG boundary, including where the transmission line spans the Crooked River between Tower 90/4 and 91/1. The existing views east of the transmission line from this area are intermittent due to the rolling hill terrain.

The Sid Luce Reservoir, a popular fishing location, is located approximately 0.25 mile east of the transmission line.

Informal recreation use, such as hunting, fishing, and OHV use, also occurs on BLM-managed land in the southern portion of the transmission line.

Recreation users would have intermittent views of the existing transmission line while travelling to and from some recreation areas, such as where the existing transmission line crosses the Deschutes River, CRNG, and Crooked River.

BLM-Managed Land

As discussed in Section 3.2, Land Use and Recreation, the project area is located within BLM Prineville and Lakeview districts. The Two Rivers RMP (BLM 1986), Brothers/La Pine RMP (BLM 1989), and Lakeview RMP (BLM 2003) provide the management direction for BLM-managed land. To maintain the scenic values of the public lands, BLM has developed a visual resource management (VRM) system that provides a way to identify and evaluate scenic values to determine the appropriate levels of management. It also provides a way to analyze potential visual impacts and apply visual design techniques to ensure that surface-disturbing activities are in harmony with their surroundings. BLM's VRM system consists of two stages:

Inventory (Visual Resource Inventory): The inventory stage involves identifying the visual resources of an area and assigning them to inventory classes using BLM's visual resource inventory process. The process involves rating the visual appeal of a tract of land, measuring public concern for scenic quality, and determining whether the tract of land is visible from travel routes or observation points.

Based on the VRI, BLM's RMPs assign VRM classes with established objectives. The VRM classes include:

- Class I Areas: Preserve the existing character of landscapes.
- Class II Areas: Retain the existing character of landscapes.
- Class III Areas: Partially retain the existing character of the landscape.
- Class IV Areas: Allow major modifications of existing character of landscapes.

The VRM class objectives include:

- Class I Objective: To preserve the existing character of the landscape. The level of change to the characteristic landscape should be very low and must not attract attention.
- Class II Objective: To retain the existing character of the landscape. The level of change to the characteristic landscape should be low.
- Class III Objective: To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate.
- Class IV Objective: To provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high.

Analysis (Visual Resource Contrast Rating): The analysis stage involves determining whether the potential visual impacts from proposed surface-disturbing activities or developments will meet the management objectives established for the area, or whether design adjustments will be required.

The VRM classes of designated visual resources near new tower locations are included in Table 3.9-1 and the analysis of potential visual impacts is discussed in Section 3.9.2.

Residential Areas

Rural residences are scattered throughout the project area. Approximately 29 residences are located within 0.25 mile of the line or access roads. In Wasco County, seven residences are located in the far northern portion of the project area, near The Dalles and the Deschutes River area. Twenty-two of the residences are located in the Prineville Valley area in Crook County (between Towers 84/1 and 90/4). No residences were identified within 0.25 mile of the project in Jefferson, Deschutes, or Lake counties.

Few residents have direct views of the existing transmission line due to topography, distance, and position. However, all residents near the project area would likely have intermittent views while commuting.

3.9.2 Environmental Consequences – Proposed Action

Construction activities including ground disturbance, vegetation removal, construction vehicles, stockpiled equipment and materials, and lighting would result in temporary visual modifications. For motorists, recreation users, and local residents traveling on roadways, the views of construction areas would be short-term in duration. Recreation users would also have views of construction activities where the transmission line crosses recreational areas such as the Deschutes River, CRNG, and Crooked River. Construction activities would also detract from the scenery of these recreation areas and along US 197 (the Wasco County designated scenic highway) near the Deschutes River. Few residents have direct views of the transmission line, but in these limited areas, residential viewers would have a direct view of construction activities, which would temporarily modify the visual landscape. All these visual impacts would be localized, temporary, and short-term in duration. Construction-related visual impacts would be further reduced through the implementation of the mitigation measures. Therefore, visual impacts as a result of construction activities are expected to be *low*.

Transmission Line Upgrade and New Tower Installation

Recreation users would have intermittent views of the existing transmission line and infrastructure where the line crosses the Deschutes River, CRNG, and Crooked River. The existing line is generally only visible in the immediate vicinity, when next to or under the line at these crossing locations. Additionally, the existing corridor is already a prominent element in the visual landscape. The new, long-term impacts on visual resources would therefore be from the addition of four new dead-end towers and new/improved access roads. The four new dead-end towers would be visible to approaching motorists, recreation users, and the few private landowners in the area for a limited duration as they travel along the nearby roads. However, as the new towers will be placed over

15 miles apart, the number of visible towers would increase by 0 to 2 from any given location. Therefore, the incremental alteration to the viewshed from the new dead-end towers is minimal.

BLM-Managed Land

The four new dead-end towers would permanently impact a total of 0.6 acre (0.15 acre each) on BLM-managed land in the Prineville and Lakeview districts that is used for recreation, such as OHV use, hunting, and camping. The 4 new dead-end towers may result in long-term visual impacts to users of BLM-managed land in the vicinity.

One of the new towers would be located between Towers 141/2 and 141/3 on undesignated BLM-managed land in the Prineville District. According to the Brothers/La Pine RMP (BLM 1989), BLM land in this area is managed for forestland/woodland, recreation, natural areas, livestock grazing, wildlife habitat, fire management, and energy and minerals. The new tower would occupy 0.15 acre of land classified as VRM Class IV (BLM, 1982), which is not located in or adjacent to an area designated as having high or scenic visual qualities (BLM 1989). Activities in areas that are not designated as having high or scenic visual qualities may change the landscape, but are to be designed to minimize adverse effects on visual quality (BLM 1989).

The new tower would be visible from undesignated BLM land surrounding the new tower; however, these surrounding lands already have a view of an existing transmission line and towers. Depending on distance, topography, and vegetation, up to 98 existing towers can be viewed from any given viewpoint. With the installation of 1 new tower in the Prineville District, the number of visible towers would increase by 0 to 1 from any given location. Because the existing transmission line and up to 98 existing towers would be visible from nearby undesignated BLM land, the addition of 1 new tower would not change the existing landscape. Further, the new tower would not be located on or near land designated as having high or scenic visual quality.

Three of the new towers are located between Towers 159/2 and 159/3, 175/1 and 175/2, and 199/2 and 199/3 on BLM-managed land in the Lakeview District. According to the Lakeview RMP (BLM 2003), BLM land in this area is managed for recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values. The transmission line crosses through the North Lake SRMA Addition, which is managed for recreation (OHV use, hunting, camping, picnic areas), natural areas, wildlife habitat, and VRM Classes II, III, and IV (BLM 2003). However, the PDCI transmission line is included as an existing utility corridor in the RMP. The new towers would occupy a total of 0.44 acre of land classified as VRM Class IV. VRM Class IV (modification of the landscape character) includes areas where changes may subordinate the original composition and character; however, they should reflect what could be a natural occurrence within the characteristic landscape (BLM 2003).

Depending on distance, topography, and vegetation, up to 98 existing towers can be viewed from any given viewpoint. With the installation of 3 new towers in the Lakeview District, the number of visible towers would increase by 0 to 2 from any given location, including nearby designated BLM sites (see Table 3.9-1). Because the existing transmission line and up to 98 existing towers would be visible from nearby designated BLM sites, the addition of new towers would not modify the existing landscape character.

Table 3.9-1: Designated BLM Site VRM Classification

BLM Designated Site	VRM Class	Number of Visible Existing Towers	Number of Visible New Towers
Lake Abert ACEC/Abert RIM WSA	I/II	Not analyzed as new towers would not be visible from this area.	0
North Lake SMRA	II/III/IV	98	2
Lost Forest/Sand Dunes/Fossil Lake ACEC	I/III	88	2
Sand Dunes WSA	I	98	2

The new towers would be designed to minimize adverse effects on visual quality being made of dulled, galvanized steel. Galvanized towers are a gray earth tone in color and will weather to a dark earth tone over time. The use of the dulled, galvanized gray steel is extremely effective when towers break the skyline and the sky becomes the background. The neutral color mitigates the visual impacts of the skyline break and effectively minimizes visual resource impacts for variable factors such as changing light and atmospheric conditions. Where towers do not break the skyline, the gray color will also blend in with the naturally created shadows present in the landscape from topographic variation, changing light, and changing weather conditions.

While the quality of public views is an integral part of recreational activity, the existing transmission line corridor and towers are already a prominent element of the landscape and would therefore not result in a change to the existing landscape character. Additionally, the transmission line is located within a designated utility corridor and new towers would not be located within areas of high designated visual quality or within a higher VRM classification than that of the surrounding area. Further, local visual effects would be reduced through the implementation of design features and mitigation measures.

Access Roads

Construction of 0.6 mile of new access roads under the Proposed Action would represent a permanent change to the visual landscape that could be visible to some viewers. The new access road construction would occur in desert sage brush and grassland habitat, which would require the removal of vegetation and placement of gravel. This would create a contrasting straight line of brown against the surrounding green and brown shrub and grass vegetation communities, presenting a degree of contrast in the visual setting not currently present in some of the areas proposed for new access roads. However, new access roads consist of short lengths of spur road extending from existing roads to tower locations. The background viewshed would remain unbroken by intrusions and the access roads would be visually subordinate to the surrounding landscape and existing transmission line. For improved roads, there would be little to no visual difference as they are an existing line on the landscape.

3.9.3 Mitigation – Proposed Action

If the Proposed Action is implemented, BPA would implement the following mitigation measures to minimize impacts on visual resources.

- Provide a schedule of construction activities to the owners/managers of potentially affected recreational facilities to allow the owners to advise visitors and appropriately schedule any events that could be adversely affected by construction activities.

- Schedule all construction work during daylight hours to avoid use of nighttime illumination of work areas.
- Develop and distribute a schedule of construction activities to potentially affected landowners along the transmission line corridor.
- Keep construction activities and equipment clear of residential driveways, to the greatest extent possible.
- Locate construction staging areas away from sensitive viewers (e.g., residences) as much as possible.
- Require contractors to maintain clean construction sites.
- Incorporate BMPs for the control of erosion and dust associated with construction of access roads to minimize permanent visual impacts on nearby residential viewers.
- Revegetate temporarily disturbed areas after the conclusion of construction, with the exception of those areas required to remain clear of vegetation to ensure the safety of the transmission line and access to the towers.

3.9.4 Unavoidable Impacts Remaining after Mitigation – Proposed Action

If the Proposed Action is implemented, motorists, recreational users, and residents would be exposed to views of construction activities. Although these views would be temporary and mitigation measures would minimize impacts, visual impacts associated with construction would be unavoidable. The four new dead-end towers and new/improved access roads would result in a permanent visual change.

3.9.5 Environmental Consequences – No Action

Under the No Action Alternative, the existing transmission line would not be upgraded and therefore, the permanent visual impacts related to the project would not occur. Continued operation and maintenance of the existing transmission line and access roads would result in visual impacts on motorists, recreational users, and residents similar to existing conditions. These visual impacts are expected to be *low*.

3.10 AIR QUALITY

3.10.1 *Affected Environment*

The project crosses the air sheds of Wasco, Jefferson, Crook, Deschutes, and Lake counties. Oregon Department of Environmental Quality (ODEQ) and the U.S. Environmental Protection Agency (EPA) regulate air quality in these counties. 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. ODEQ, which is responsible for maintaining compliance with the NAAQS in Oregon, has established State Ambient Air Quality Standards (SAAQS) that are at least as stringent as the NAAQS. For each of the six criteria pollutants, the NAAQS and SAAQS are defined as a maximum concentration above which adverse effects on human health may occur.

Geographic areas in which the ambient concentrations of a criteria pollutant exceed the NAAQS are classified as *nonattainment areas*. Federal regulations require states to prepare statewide air quality planning documents called State Implementation Plans (SIPs) that establish methods to bring air quality in nonattainment areas into compliance with the NAAQS and to maintain compliance. Nonattainment areas that return to compliance are called maintenance areas. No part of the project area is designated as a nonattainment or maintenance area for criteria pollutants (ODEQ 2013).

CO is an air pollutant generally associated with transportation sources. The highest ambient CO concentrations often occur near congested roadways and intersections during periods of low temperatures, light winds, and stable atmospheric conditions. Because the traffic volumes on rural highways near the project rarely result in substantial congestion, it is unlikely that CO levels exceed standards.

Ozone is primarily a product of more concentrated motor vehicle traffic 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 monitor ozone in the project area (ODEQ 2012). Ozone concentrations are likely to be less than the 8-hour average standard of 0.075 parts per million, because the area is sparsely developed and traffic levels are relatively low.

Particulate matter (PM) is generated by industrial emissions, residential wood combustion, motor vehicle tailpipes, and fugitive dust from roadways and unpaved surfaces. Two forms of particulate matter are regulated by EPA: particulate matter less than 10 micrometers in size (PM₁₀) and particulate matter less than 2.5 micrometers in size (PM_{2.5}). PM_{2.5} has a greater health effect than PM₁₀ at locations far from the emitting source, because it remains suspended in the atmosphere longer and travels farther. ODEQ monitors, or has monitored, particulate matter at three locations in the project area – in The Dalles, Wasco County; in Prineville, Crook County; and in the Lakeview, Lake County (ODEQ 2012).

ODEQ measured PM_{2.5} in the City of The Dalles from 2002 through 2004. During this period, no exceedances of the 24-hour or annual mean PM_{2.5} NAAQS were recorded.

ODEQ has measured PM_{2.5} in the City of Prineville since 2009. No exceedances of the 24-hour or annual mean PM_{2.5} NAAQS have been recorded at this site since 2009.

ODEQ measured PM₁₀ within the City of Lakeview PM₁₀ maintenance area, located approximately 18 miles west of the PDCI alignment, from 2002 through 2006. During this time, no exceedances of the 24-hour PM₁₀ NAAQS were recorded. ODEQ measures PM_{2.5} seasonally during winter months in the City of Lakeview. No exceedances of the annual mean PM_{2.5} NAAQS have been recorded at this site; however PM_{2.5} levels have shown exceedances of the 24-hour PM_{2.5} NAAQS in 2009, 2010, and 2011, which is primarily due to the use of wood stoves in the winter time when inversions frequently occur in the Goose Lake Valley. PM₁₀ and PM_{2.5} concentrations in the vicinity of the PDCI alignment are likely to be less than the NAAQS, because the area has very different topography (allowing more efficient dispersion), is more sparsely developed, and traffic levels are relatively low.

3.10.2 Environmental Consequences – Proposed Action

Local emissions of criteria pollutants could increase as a result of project construction equipment and activities. Air quality could be affected during the estimated 21 months of project construction but would mostly be affected during peak construction (4 months).

An increase in particulate matter would be the main air quality concern. Fugitive dust could be created during tower construction, access road work, travel on unpaved surfaces, and other soil-disturbing activities. Although construction activities could increase dust and particulate levels, impacts would be low because they would be temporary and would occur in localized areas. Particulate matter levels would be partially reduced by spraying water on road surfaces during dry periods.

The operation of heavy equipment during construction could result in temporary increases in CO, carbon dioxide, sulfur oxides, oxides of nitrogen, and volatile organic hydrocarbons. The increase in vehicle emissions from construction equipment would be temporary and localized to specific work areas, and would change on a daily or weekly basis. The increase in vehicle and equipment emissions would likely be relatively small comparable to current emission levels found in surrounding agricultural and rural areas. For these reasons, impacts on air quality from construction activities would be *low*.

3.10.3 Mitigation – Proposed Action

If the Proposed Action is implemented, BPA would implement the following mitigation measures to minimize impacts on air quality.

- Use water trucks to control dust during construction, as needed.
- Set a speed limit for construction vehicles on unpaved access roads of no greater than 15 miles per hour to minimize dust.
- Ensure that all vehicle engines are maintained in good operating condition to minimize exhaust emissions.

3.10.4 Unavoidable Impacts Remaining after Mitigation – Proposed Action

There could be temporary increases in criteria pollutants during construction. Corona emissions under the Proposed Action would be similar to levels present under existing conditions. Although these impacts could not be totally mitigated or avoided, they would not be expected to violate the NAAQS and would be considered *low*.

3.10.5 Environmental Consequences – No Action

Under the No Action Alternative, the existing transmission line would not be upgraded, and, therefore, impacts related to construction of the Project would not occur. Operation and maintenance activities would continue and be similar to existing conditions. The corona effect resulting from operation of the existing transmission line would continue to have a *low* impact on air quality. Maintenance activities would likely increase as existing towers deteriorate over time and more tower repair and replacement could be required compared to existing conditions. Ongoing maintenance of existing access roads may be needed over time, but no new access roads would be constructed. Maintenance activities would continue to result in *low* impacts on air quality from emissions of criteria pollutants from vehicular traffic and equipment, mainly from the generation of dust and particulates in work areas.

3.11 SOCIOECONOMICS AND PUBLIC SERVICES

3.11.1 Affected Environment

Population Characteristics

The five counties crossed by the corridor, have a combined 2010 population of 233,539 persons, which is about 6.1 percent of the state's population of 3,831,074 persons (U.S. Census Bureau 2010). Deschutes County is the most populated of the five counties, with a population of 157,733 persons in 2010. Lake County is the least populated county with a population of 7,895 persons in 2010. From 2010 to 2012, the overall five-county area experienced a growth rate greater (approximately 4.1 percent) than the state (approximately 1.8 percent) (U.S. Census Bureau, Population Division 2012). However, Crook and Lake counties experienced a population decrease (-1.2 percent and -1.6 percent, respectively) from 2010 to 2012.

The 2012 population density of the five-county area was 13 persons per square mile, with a range of 1 person per square mile in Lake County to 55 persons per square mile in Deschutes County. However, the transmission line corridor is located in rural areas with low population densities and as discussed in Section 3.2, Land Use and Recreation.

Housing Characteristics

In 2010, approximately 19 percent of housing units were vacant (22,235 units) within the five-county area (U.S. Census Bureau 2010). Of the five-county area, Lake County experienced the highest vacancy rate of 23.9 percent in 2010. All of the five counties have a substantially higher vacancy rate than that of the state (9.3 percent).

Property Taxes and Values

State and local property taxes help support the activities of local taxing districts, such as schools and local government services, and are paid by private property owners unless in a tax-exempt status. All federal, state, and local government real property is exempt from paying property taxes. 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 encumbrance.

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 and/or existing access roads are used to access the project corridor, and no new acquisition would be made, no additional compensation is paid.

As described in Section 3.2, Land Use and Recreation, rural residences are scattered throughout the project area. Twenty-nine residences are located within the within 0.25 mile of the transmission line or access roads. In Wasco County, seven residences are located in the far

northern portion of the project area, near The Dalles and the Deschutes River area. Twenty-two of the residences are located in the Prineville Valley area in Crook County (between Towers 84/1 and 90/4). No residences were identified within 0.25 mile of the project in Jefferson, Deschutes, or Lake Counties.

Economic Characteristics

Between 2007 and 2011, the leading industries within the five-county area are educational services, and health care and social assistance (18.8 percent); retail (12.3 percent); and arts, entertainment, and recreation, and accommodation and food services (11.6 percent) (U.S. Census Bureau, American Fact Finder 2012). Construction provided 9.2 percent of employment within the five-county area.

Between 2007 and 2011, the average unemployment rate in the five-county area ranged from 6.9 percent in Wasco County to 14.5 percent in Crook County and 15.2 percent in Jefferson County (U.S. Census Bureau, American Fact Finder 2012). Lake County's unemployment rate was the same as the state average of 9.8 percent, followed by Deschutes County's unemployment rate of 10.7 percent.

In 2011, the median household income in the five-county area ranged from approximately \$35,517 to \$47,924 and statewide average median income in 2013 is \$46,876 (USDA 2011). In 2011, the per capita income in the five-county area ranged from \$20,300 in Jefferson County to \$27,965 in Deschutes County (76 to 105 percent of the statewide average, respectively; Oregon Employment Department 2012).

Environmental Justice

Environmental justice, as described under Executive Order 12898 of 1994, directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority or low-income populations.

The minority and low-income population data within the state, five counties, and census tracts that the transmission line corridor crosses, are discussed in the following sections.

Minority Populations

The EPA Office of Environmental Justice has defined the term "minority" for environmental justice purposes to include Hispanics, Asian-Americans and Pacific Islanders, African-Americans, and American Indians and Alaskan Natives. A threshold of 50 percent is used as an indicator for whether a minority population is meaningfully greater than that represented within the state as a whole.

The average minority population for the five-county area between 2007 and 2011 was 9 percent, less than the state's minority population of 15 percent (U.S. Census Bureau, American Fact Finder 012). The five-county area percent minority population does not surpass the minority threshold (50 percent) established as an indicator for whether a minority population is meaningfully greater than that represented within the state as a whole. However, of the seven census tracts that the transmission line corridor crosses, Census Tract 1 in Deschutes County and Census Tract 9708 in Wasco County have a higher American Indian and Alaska Native

population (7 percent and 15 percent, respectively) than that of the five-county area (3 percent) or the state (2 percent). Census Tract 9707 in Wasco County has a much higher Hispanic or Latino population (38 percent) than that of the five-county area (9 percent) or the state (11 percent). Census Tracts 9707 and 9708 in Wasco County have a greater overall minority population (28 percent and 22 percent, respectively) than that of the five-county area (9 percent) or the state (15 percent). Each of the minority populations in these census tracts surpasses the 50 percent minority threshold, indicating that the minority populations are meaningfully greater than the state.

Low-Income Populations

Based on the U.S. Census Bureau Poverty Status definition, from 2007 to 2011, an average of 14 percent of the population was below poverty level in the five-county area, which is just less than the state (15 percent) (U.S. Census Bureau, American Fact Finder 2012). Of the census tracts that the transmission line corridor crosses, Census Tract 9502 in Crook County (17 percent), Census Tract 9601 in Lake County (25 percent), and Census Tracts 9707 and 9708 in Wasco County (40 percent and 25 percent, respectively) have a greater population below poverty level than that of the state or the five-county area.

From 2007 to 2011, the five-county area had an average median household income of \$49,847, essentially the same as the state median income of \$49,850. The five-county area median income level does not meet the “very low income” threshold for poverty status (i.e., 50 percent of the state median income or \$24,925) or “low income” threshold for poverty status (i.e., 80 percent of the state median income or \$39,880). However, of the census tracts that the transmission line corridor crosses, all but two census tracts Census Tract 9601 in Lake County has a median household income (\$24,968) that falls below the 80 percent “low income” threshold of the state’s median income, meeting federal low-income criteria.

Public Services

The primary providers of electricity in the area are Pacific Power, electric cooperatives, and Public Utility Districts, and city electric utilities. Natural gas is provided by NW Natural and Cascade Natural Gas. Public water in the area is provided by municipal systems and water divisions.

Many entities are responsible for providing solid waste disposal in the five-county area. Each of the five counties, with the exception of Jefferson County, has at least one active permitted landfill and all of the counties include at least one transfer station and/or composting facility.

Fire protection services in the area are provided by the Dufur, Juniper Flat, Mid-Columbia, Mosier, Pine Hollow, Shaniko, and Tygh Valley fire departments in Wasco County; the Camp Sherman, Crooked River Ranch, Jefferson County, Three Rivers, and Warm Springs fire departments in Jefferson County; the Crook County Fire Department and Central Oregon Helibase in Crook County; the Black Butte Ranch, City of Bend, Cloverdale, La Pine, Oregon Outback, Redmond, Sisters-Camp Sherman, and Sunriver fire departments in Deschutes County; and the Christmas Valley, Fremont, Lakeview, New Pine Creek, Paisley, Silver, and Thomas Creek/Westside fire departments in Lake County. The area is also served by the Lakeview

Interagency Fire Center, Oregon State Forestry District, Oregon Department of Forestry, and the USFS. Emergency response services are also provided by these fire departments and districts.

Police protection in the five-county area is provided by city Police Departments, county Sheriff Departments, U.S. Bureau of Indian Affairs, and forest rangers.

Hospitals and medical facilities in the area include Mid-Columbia Medical Center in Wasco County, Mountain View Hospital in Jefferson County, Pioneer Memorial Hospital in Crook County, St. Charles Medical Center in Deschutes County, and Lake District Hospital in Lake County.

The five-county area is served by 19 school districts providing kindergarten through twelfth grade education including 4 in Wasco County, 4 in Jefferson County, 1 in Crook County, 4 in Deschutes County, and 6 in Lake County. Students are transported to schools by an extensive system of school-bus routes.

3.11.2 Environmental Consequences – Proposed Action

Population and Housing Availability

During peak construction, up to 16 work crews (up to 128 workers) would work along various segments of the corridor. It is anticipated that construction workers would commute to the worksite from areas approximately 25 to 75 miles depending on where the construction contractor is based. If a local contractor is used, it is likely nearly all workers would commute.

If construction workers (and possibly some dependents) are from out of the area they would require temporary lodging in the local area during construction. Within the five-county area in 2010 there were 22,235 vacant units available. Additionally, there are motels, hotels, RV parks, and campgrounds available throughout the rural areas along the corridor. A number of the temporary lodging facilities have kitchen units and could be used for the construction duration.

If a local construction contractor from one of the five counties is used, it is likely that nearly all construction workers would commute daily and there would be no impact on local populations or housing. The limited number of construction workers coming from outside the area would be temporary and distributed throughout the five-county area. Therefore, because most construction workers would commute and there is available housing for those that would temporarily move to the area, the temporary impact to local populations and housing are considered *low*.

Employment and Income

Project construction would require up to 128 construction workers during the peak construction period (4 months) and up to 48 workers during the non-peak construction period (17 months), each working up to 72 hours per week for approximately 21 months (between May and November over 4 construction seasons). This would have a minimal impact on the number of available jobs and unemployment rate in the five-county area. Between 2007 and 2011, there was an average of approximately 9,488 construction jobs (U.S. Census Bureau, American Fact Finder 2012). The average 2007-2011 unemployment rate in the five-county area ranged from

6.9 percent in Wasco County to 15.2 percent in Jefferson County (U.S. Census Bureau, American Fact Finder 2012).

Total project costs, including environmental review, design and engineering, and construction costs are estimated at \$46.6 million. Project construction costs are estimated at approximately \$30 million (2014 dollars). The Proposed Action would stimulate the Oregon economy during preconstruction environmental review, design, and engineering and the five-county area's economy during construction through payroll, material purchases in the area, and related indirect and induced spending, or "multiplier effects". During construction, up to 128 workers would be employed. Indirect and induced employment would create additional jobs in the five-county area. Net income earned by construction workers is estimated to be approximately \$5 million (over 21 months, including overtime). An estimated 5 to 10 percent of total project costs would involve local purchases of fuel, vehicle parts, and other goods and services in the five counties.

Purchases of local goods and materials and other spending by construction workers would result in economic benefits. Non-local workers spend an estimated 40 percent of their net pay locally (BPA 2003). Both salary and material purchases would have additional multiplier effects that would create added short-term indirect and induced income.

Construction employment and expenditures would benefit the local economy. The economic benefit, is small relative to the amount of economic activity in the five counties, and would occur for a limited time during construction. Therefore, the overall impact of construction-related activities on the five-county area economy, while positive, is expected to be *temporary and low*.

As discussed in Section 3.2, Land Use and Recreation, project construction would result in some disturbance to rangeland and agricultural land and temporary interference grazing and agricultural operations. During construction, approximately 676.7 acres (0.006 percent) of rangeland and 64.9 acres (0.011 percent) of agricultural land in the five-county area would be temporarily disturbed. This disturbance to agricultural operations could temporarily hinder employment in that industry. However, as included in Section 3.11.2, BPA would implement mitigation measures, including developing and distributing a schedule of construction activities to potentially affected farm operators along the transmission line corridor to allow planting, harvesting, and operation and maintenance activities to be scheduled around construction. Additionally, BPA would revegetate disturbed areas after the conclusion of construction, with the exception of those areas required to remain clear of vegetation to ensure the safety of the transmission line and access to the towers. Following construction, a relatively small amount of rangeland (134.6 acres; 0.001 percent) and agricultural land (16.7 acres; 0.003 percent) in the five-county area would be permanently converted to a developed use. To minimize this impact, BPA would compensate landowners for the value of commercial crops damaged or destroyed by construction activities. Because the construction disruptions would be temporary, and mitigated to the extent possible, and the amount of land permanently impacted is low, the economic impact would be *low*.

After construction, the upgraded transmission line would have limited economic impacts in the local area. Existing BPA staff would be responsible for operation and maintenance of the transmission line and associated facilities. No existing employees would be required to relocate to the project area. Local expenditures on project-related goods and services would be *none* to

low. However, the upgraded transmission line may contribute to regional stability and economic growth by reliably meeting power demands.

Property

Due to the presence of an existing transmission line along the corridor, local properties would not be subject to the presence of a new transmission line corridor. However, some short-term property impacts to property owners would occur during project construction activities. To minimize property impacts, BPA would compensate landowners for the value of commercial crops damaged or destroyed by construction activities and revegetate disturbed areas following construction, with the exception of those areas required to remain clear of vegetation to ensure the safety of the transmission line and access to the towers. Because disturbance from construction activities would be temporary in nature, limited in duration (on the order of hours or a few days, depending on the specific site), limited in area, and mitigated to the extent possible, temporary construction impacts would generally be *low*.

BPA roads on BLM property are generally not fenced or gated and access roads could be used by motorists and hunters who could be a nuisance to landowners. However, because most of the corridor is remote, potential impacts from trespassing and vandalism would be *low*.

Property Value

Some short-term impacts on property value and salability could occur on an individual basis during construction; however, the Proposed Action involves upgrading an existing transmission line without replacing existing towers, and would have no appreciable impacts on property values over the long term. Therefore, property value impacts would likely be *none* to *low*.

Property Taxes

Construction of the Proposed Action would not affect the amount of property taxes collected by the counties crossed by the existing transmission line. Property owners would continue to pay property taxes in accordance with existing valuations as no property devaluations would be likely. Possible encroachments outside of the existing right-of-way include the small areas where new access roads would be constructed. No direct beneficial tax effects would occur because sales of privately owned property to BPA for transmission line and access road rights-of-way are not subject to real estate tax. Therefore, there would be *no* property tax impacts.

Environmental Justice

The data provided in Section 3.11.1 indicate that of the seven census tracts that the transmission line corridor crosses, the minority populations in Census Tract 1 in Deschutes County and Census Tracts 9707 and 9708 in Wasco County surpass the 50 percent minority threshold, representing a meaningfully greater percentage than for the state.

Census Tract 9502 in Crook County, Census Tract 9601 in Lake County, and Census Tracts 9707 and 9708 in Wasco County have a greater population below poverty level than that of the state or the five-county area. Additionally, the median family income for Census Tract 9601 in Lake County falls below the 80 percent “low income” threshold of the state’s median income.

Although there are high minority and low-income populations within census tracts crossed by the transmission line, there is already an existing transmission line through the corridor, the corridor passes through a very sparsely populated area, and only 2 residences are located within 100 feet of the existing right-of-way. The project would not have a disproportionately high and adverse affect on minority or low-income or minority individuals or households or have a high impact on any individual or population. Additionally, the mitigation measures listed in Section 3.11.3 would minimize impacts. Therefore, while minority and low-income individuals may experience construction-related impacts in the same manner as other individuals, temporary construction impacts are considered to be *low* to environmental justice populations and all individuals and households potentially affected by the project.

Public Services

Dust suppression and truck washing would require the use of washing stations and water trucks; however, it is anticipated that a sufficient water supply would be provided by the local water providers with negligible impact on the local water supply. Construction waste would be recycled or taken to local landfills/transfer stations, with no anticipated impact to the operation of these waste facilities.

During construction work on dead-end towers adjacent to highways, guard structures may be placed over local utility lines and roadways to ensure continued service, public safety, and safe passage in the event the conductor line or other materials were dropped during construction.

Construction plans would incorporate fire prevention measures to limit the potential effects of the Proposed Action on fire departments/districts. Increased truck traffic associated with the Proposed Action would result in minimal delays on roadways throughout the project area; however, impacts would be temporary and localized. With implementation of mitigation measures, these delays are not expected to disrupt the ability of emergency service personnel to respond to emergencies. Medical facilities are located within the area and would likely be able to treat any injuries that may occur during construction without interfering with their ability to serve the larger community.

Because construction workers would likely commute to the worksite, an increase in local school student enrollment is not expected. Because most of the construction would occur from the late spring through early fall, it would only overlap with the end and beginning of the school year. However, roadway delays would be temporary and localized and with implementation of mitigation measures, impacts to school transportation services are expected to be minimal.

Because construction-related impacts on public services would be temporary and would result in minimal localized effects, the Proposed Action is expected to have *low* or *no* impact to public services.

3.11.3 Mitigation – Proposed Action

If the Proposed Action is implemented, BPA would implement the following mitigation measures to minimize impacts on socioeconomics and public services:

- Employ a lands liaison, who would be available to provide information, answer questions, and address concerns during project construction.

- Develop and distribute a schedule of construction activities to potentially affected landowners along the transmission line corridor.
- Schedule construction during periods when active farms along the corridor are likely to be fallow, where possible, to minimize the potential for crop damage.
- Compensate landowners for the value of commercial crops damaged or destroyed by construction activities.
- Revegetate disturbed areas after the conclusion of construction, with the exception of those areas required to remain clear of vegetation to ensure the safety of the transmission line and access to the towers.

3.11.4 Unavoidable Impacts Remaining after Mitigation – Proposed Action

Implementation of the mitigation measures described above would help to minimize some of the socioeconomic and public service impacts associated with construction-related disturbance. However, during construction, potential unavoidable impacts including temporary impacts on housing availability during construction, conflicts with grazing and agricultural operations, and temporary property impacts, including land disturbance, generation of noise and dust, and minor delays and interruptions to local traffic, would still remain after mitigation. These temporary construction impacts would short-term and are considered to be *low*.

A relatively small amount of rangeland (134.6 acres; 0.001 percent) and agricultural land (16.7 acres; 0.003 percent) would be permanently converted to a developed use. Because the construction disruptions would be temporary and the amount of land permanently impacted is low, the economic impact to grazing, timber, and agricultural operations would be *low*.

3.11.5 Environmental Consequences – No Action

Under the No Action Alternative, the existing transmission line would not be upgraded and there would be *no* socioeconomic impact related to the construction of the Proposed Action. BPA would continue to operate and maintain the existing transmission line in its current state. As line components continue to fail intermittently, the ability of BPA to provide reliable electric service for its customers would be adversely affected and the maintenance concerns would persist. 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, which could result in *low* temporary, construction-related socioeconomic impacts, such as land disturbance, generation of noise and dust, and minor delays and interruptions to local traffic, and utility service interruption. It might be possible to plan some of this maintenance, but it is expected that the majority of repairs would occur on an emergency basis as various parts of the line continue to deteriorate. 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, it is possible that the road work proposed under the Proposed Action would be funded and carried out as an operation and maintenance project in the future, independent of rebuilding the transmission line.

3.12 CULTURAL RESOURCES

3.12.1 Affected Environment

Cultural resources include things and places that demonstrate evidence of human occupation or activity related to history, architecture, archaeology, engineering, and culture. *Historic properties*, as defined by 36 CFR 800, the implementing regulations of the National Historic Preservation Act (NHPA; 16 USC 470 *et seq.*), are a subset of cultural resources that consists of any district, site, building, structure, artifact, ruin, object, work of art, or natural feature important in human history that meets defined eligibility criteria for the National Register of Historic Places (NRHP).

The NHPA requires that cultural resources be inventoried and evaluated for eligibility for listing in the NRHP and that federal agencies evaluate and consider effects of their actions on these resources. Cultural resources are evaluated for eligibility in 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 in the NRHP.

Historic properties include prehistoric resources that predate European contact and settlement and historic resources that post-date that time. Traditional Cultural Properties (TCP) are another type of property that can be eligible for inclusion in the NRHP because of their association with the cultural practices or beliefs of a living community that are rooted in that community’s history and are important in maintaining the continuing cultural identity of the community (Parker and King 1998).

The area of potential effects (APE), defined in 36 CFR 800.16(d), for cultural resources includes the existing right-of-way, the new/improved access roads that extend outside of the right-of-way, staging areas, and pulling sites.

The APE is located in two different culture areas. The northern third of the APE is located within the southern portion of the Columbia Plateau region. The southern two-thirds of the APE is located in the Northern Great Basin region, which is within the High Lava Plains and the Basin and Range provinces.

Columbia Plateau

While it is uncertain when people first arrived in the Columbia Plateau, there is evidence of the Clovis culture, small groups of hunter-gatherers who made a distinctive type of stone point, in a few different areas including a cache of 14 Clovis projectile points discovered near Wenatchee, Washington. By 11,500 years before present (BP), another tradition or culture group is seen throughout the Columbia Plateau and Great Basin. The people of this tradition were highly mobile bands of hunter-gatherers with low population densities. Their subsistence practices were dependent on floral and faunal resources that varied regionally as well as seasonally.

The Windust Phase is also recognized on the Columbia Plateau from 11,000 to 8,000 BP and sites from this period generally consist of sparse artifact scatters covering an area no larger than a few hundred square meters. This suggests a small group size and a high mobility of the group. Site types include caves, rock shelters, and open areas with sites frequently reused over long periods of time. During the Windust Phase, evidence of intensification of fishing is first seen in the Plateau. This is shown in the artifact record through large quantities of anadromous and residential fish remains and associated fishing artifacts such as grooved net sinkers, gorges, and harpoon parts.

From about 9,000 to 4,000 BP there is an expansion of reliance on plant gathering seen at archaeological sites with a high number of milling stones. Other artifacts during this time include edge-ground cobbles, ovoid knives, and stemmed *projectile points*. Around 4,500 BP the climate changed to a more temperate, moist climate and the inhabitants of the area adapted by becoming more sedentary and with it an increase in population. It was also during this period that pole and brush winter houses and subterranean pit houses were first used. There was an increase in the documentation of upland and interior sites during this period, as well as a transition from short-term sites that reflect broad-spectrum hunting and gathering to more long-term occupation sites in non-permanent structures.

The Plateau Period is identified as occurring from about 3,000 BP to 200 BP, with a return to drier conditions after 2,800 BP. The drier conditions affected the distribution of plant and animal resources and likely narrowed resources into fewer productive areas. Archaeological evidence indicates that people were traveling more between resources and living in denser communities of longhouses and pit houses after 1,500 BP. During this period there was development of permanent settlements, social complexity, and more elaborate art. In addition, the classic Plateau culture emerged with a society based on fishing, hunting, gathering, and trading. Fish and botanical resources became the primary food sources during this period, while big game became secondary. Petroglyphs and pictographs reached their climax of use during this time and portable rock sculptures were first seen. Projectile points become smaller with the introduction of the bow and arrow around 2,000 BP.

Ethnographically, the Columbia Plateau was traditionally used by the Western Columbia River Sahaptins (Sahaptins), also known as the Warm Spring Indians, the Wasco, and the Wishram. The Sahaptins obtained about 60 percent of their food from gathering, which was largely done by women. The women gathered various berries, including chokecherries and black huckleberries; nuts, such as acorns and hazel nuts; and roots, including bitterroot, camas, and yampah. The Sahaptins participated in salmon harvests with other native groups in places along the Columbia River including two of the most significant places at The Dalles and Celilo Falls. Cultural material used for fishing included spears, a variety of nets, hook lines, and net sinkers. The Sahaptins practiced a seasonal land use pattern and wintered in either an A-shaped, tule mat covered lodge or longhouse, or a circular subterranean structure with a supported roof frame. Summer shelters were either a circular mat covered tepee or a rectangular open-walled structure with a covered roof. The villages and camps generally consisted of extended family groups who shared living spaces. The Wasco subsistence practices and material culture were similar to that of the Sahaptins, except that fish comprised a majority of their diet. The Wasco also harvested sea lions and seals and gathered plants including roots, tubers, bulbs, berries, nuts, and leaves.

Northern Great Basin

The Northern Great Basin region has a prehistory stretching back to the late Pleistocene/early Holocene. With recent radiocarbon dates from the Paisley Caves, the Connley Caves, Fort Rock Cave, and other sites, indications are that humans occupied this region back to as early as 15,500 BP. From 15,700 BP to 12,900 BP, known as the Paisley period, there is evidence of the hunting of megafauna based on projectile points or fragments found in association with Pleistocene animals such as camel, horse, and bison. Sites from this period also contain evidence of stone and bone tool use on mountain sheep, fish, and waterfowl. Geomorphological studies of the area support the possibility of late Pleistocene hunters using the margins of the many shallow lakes of the region to forage for large mammals.

The Fort Rock period, beginning in 12,900 BP and continuing until approximately 9,000 BP, is marked by a time of cooler conditions than the previous period. Evidence at archaeological sites suggests that there was an intensive winter occupation of the caves around ancient lakes and the marshes as they developed, and a summer occupation of upland sites. The summer sites show a focus on foraging and plant resources, while a range of spring and fall sites are in other ecological settings. Marsh and lake resources were represented by waterfowl, fish, hares, rabbits, cattails, and bulrushes, while the upland sites show evidence of use of bison, elk, mountain sheep, pronghorn antelope, deer, and grouse.

Following the Fort Rock period, the Lunette Lake period began around 9,000 BP and continued until 6,000 BP, and includes the eruption of Mount Mazama at about 7,600 BP. Pre-eruption, the period was marked by intense drying, causing many of the lakes to disappear. Settlement of the area was marked by a change to highly mobile hunting and foraging activities, resulting in an increase in number of sites, but none with houses or other features indicating a more sedentary pattern. While the eruption of Mount Mazama around 7,600 BP was a major event, the archaeological record does not show any long-term abandonment of the Fort Rock Basin. Plant communities began to become more homogenous causing the inhabitants of the area to be more mobile to maintain the same levels of subsistence they previously practiced. Beginning around 7,500 BP, side-notched projectile points become common and are used on throwing spears or darts fitted to *atlatls*.

The Bergen period, beginning around 6,000 BP and continuing to approximately 3,000 BP, consists of climatic shifts from cooler and moist conditions to warmer and moister. During this period water levels rose in lakes, ponds, and marshes and there is evidence of village sites with multiple houses and storage pits. The archaeological sites from this period show a two-village system where people occupied sites in the vicinity of good root crops, seeds, rabbits, squirrels, fish, and waterfowl in the spring and summer and in the winter moved to villages where more seeds, larger game, and firewood were available. Throughout the region, there is an increase in archaeological sites from the previous period indicating an increase in the population of the area. During the Bergen period, there were two peaks of occupation; one early in this period and one toward the end. The archaeological sites from this period show the increased population in the increased amount of artifacts at the site and large-volume cache pits.

Following the Bergen period, the Boulder Village period began around 3,000 BP and continued until the contact period with the Euro-American settlers began. The climate during this time fluctuated from very wet periods to drought periods and resulted in less-predictable wetland

areas. Due to the fluctuating precipitation, people occupied the Klamath Basin more regularly and Fort Rock, Summer Lake, Warner Valley, and Harney basins less often. During this period, boulder and stone house rings and pit house sites appeared on the edges of marshes, ponds, and lakes giving the residents better access to upland resources. Around 2,000 BP, smaller projectile points began to dominate the stone tools which are a hallmark of bow and arrow technology.

Ethnographically, the Great Basin area was occupied by the Northern Paiute and included areas of California, western Nevada, and central and southeast Oregon. Pre-contact, the Northern Paiute were semi-nomadic people who lived in politically distinct and ecologically defined subgroups, although they were linked by a common language. The Northern Paiute made seasonal rounds based on the exploitation of wetland resources and the harvesting and storage of edible plants, fish, small mammals, water fowl, and large ungulates. While there was a focus on seasonal wetland resources, the Northern Paiute also followed a seasonal pattern that involved crossing large desert environments to which they were well adapted. Plants made up most of the Northern Paiute diet and they utilized roughly 150 different varieties. The Northern Paiute also hunted large and small game including deer, pronghorn antelope, elk, rabbits, and marmots and also different types of waterfowl. The Northern Paiute groups lived in semi-nomadic communities of individual families that came together multiple times a year within a shared foraging district. When the individual households were separate, they would camp in small groups or independently. House structures were conical and made of grass and tule mats over a willow pole framework. Their winter camps were usually comprised of two or three related families and spaced around the landscape to spread out the use of water and fuel supplies. By the mid-1800s the Northern Paiute were in possession of Euro American goods through trade. With the flood of immigrants into the area from the mid- to late 1800s the Northern Paiute's ways of life were changed dramatically with the introduction of diseases, the overharvesting of wild game, the introduction of livestock that over grazed the land, and the eventual creation of reservations. The federal government attempted to move the native inhabitants onto the reservations, but many resisted. It was not until after the Snake Indian War that many Oregon Northern Paiute joined other native people on reservations.

Historic Period

The first non-native peoples into the project area were generally U.S. Government explorers and trappers. The most famous of the explorers are Meriwether Lewis and William Clark who documented their travels along the Columbia River just north of the northern end of the project area. Less than a decade after the Lewis and Clark exploration, other parties travelled through the region, including the Hudson's Bay Company, which established Fort Vancouver as an outpost that was its headquarters for its trading operations in Oregon Territory. The first fully documented visit to Lake County by a non-native group occurred in 1843 by Captain John Charles Fremont of the U.S. Army expedition from The Dalles. By the mid-1800s there was a growing awareness in the east of the rich agricultural resources of the Willamette Valley in Oregon. Due to this growing awareness, a series of migrations passed through Oregon including the Oregon Trail route, which followed the Columbia River and terminated in The Dalles. Some migrating groups went through central Oregon including in 1846 when a new trail, the Applegate Trail, was established passing through the Oregon High Desert.

By the mid-1850s, areas of central Oregon had been settled and political changes brought more land seekers, government officials, and U.S. soldiers into the area. Due to the increased Euro-

American settlement and the growing conflicts between the indigenous groups, a major treaty was negotiated in 1855 with many of the tribes of Oregon and Washington. This included the Sahaptin peoples who ceded some 10 million acres to the U.S. The treaty also established the Warm Springs Reservation, which was home to Wasco, Western Columbia River Sahaptins, and eventually Northern Paiute. Lake County was not permanently settled until after the Snake Indian war, which lasted from 1864 to 1868.

By the 1860s, north and south-central Oregon had changed significantly with permanent Euro-American settlement of the area. The original Homestead Act of 1862 allowed settlers to claim up to 160 acres of land on which they could obtain title. The Desert Land Act of 1877 allowed a settler to purchase up to an additional 640 acres at 25 cents per acre if they irrigated the land and grew crops within three years. These new settlers increased demand for food which increased the amount of ranchers in Oregon. It was at this time that large herds of cattle and sheep were established and new ranches were appearing all around central Oregon. Starting in the 1890s there were a series of open range conflicts between the sheepherders and cattle operators. The sheep were outnumbering the cattle and competing for the available food, which led to overgrazing. There are accounts of cattle operators or supporters killing hundreds or even thousands of sheep. In addition to ranchers, some settlers employed dry farming methods to grow crops such as wheat, lentils, or alfalfa.

The arrival of the railroad in the first decades of the 1900s increased the farmer's prosperity, though drought conditions around 1920 reversed that trend. The railroad into Oregon connected central Oregon to major transportation routes along the Columbia River and with it came the lumber industry to harvest and process the region's pine forests. As the railroad grew, so did the timber industry, and by the end of the 1930s nearly every community in central Oregon was involved in the lumber economy in some capacity. Most of the area has also been farmed, ranched, and harvested since the mid-20th century. The transmission line was constructed in the late 1960s to transmit power from the Columbia River down to southern California.

Archaeological Resources

In compliance with the NHPA, BPA is identifying and documenting cultural resources in the APE and evaluating them for eligibility for listing in the NRHP. BPA conducted background research and field surveys to identify previously undocumented sites and to determine any impacts the project may have on the resources. Background research indicated that 167 cultural resource reports had been produced within a mile of the APE and at least 69 of the surveys intersected with the APE boundaries. These surveys identified at least 88 archaeological sites within the APE. BPA conducted a field survey to identify previously unrecorded archaeological sites and re-locate previously recorded sites. The field survey identified 126 newly identified sites and 66 that were previously recorded (the 66 sites actually represent 71 site locations, but in five instances two sites were combined into one). There were also 272 isolated finds (defined by SHPO guidelines as 10 artifacts or less). BPA is currently in the process of determining which sites can be avoided, which sites are eligible for the NRHP, and which sites need more testing before a determination of their eligibility is made.

Built Resources

BPA is also evaluating *built resources* for inclusion in the NRHP. Background research identified seven previously documented built resources within one mile of the APE. Of these seven resources, only five intersect the APE and are generally canals or ditches related to irrigation systems. The survey identified 22 built or aboveground resources in the APE.

BPA has also identified its transmission line as a potential historic property under its Multiple Property Document (MPD) that has criteria for evaluating its historic transmission system. The MPD was consulted on with the Oregon SHPO and with the Keeper of the NRHP and both concurred on the final document in 2010. The MPD details BPA's historic context and includes individual Registration Forms for each property type. Resources are nominated to the NRHP under criterion "A" for their association with design, construction, and operation of the BPA Transmission System in the Pacific Northwest. Some properties may gain additional significance under criterion "C" for architectural design or their association with key technologies in the area of electrical transmission (Kramer 2010). BPA will evaluate the PDCI transmission line for its inclusion in the NRHP.

Traditional Cultural Properties (TCPs)

TCPs may be a single site, a district, or a *cultural landscape*. They may be archaeological, historic, or *ethnographic* in nature. Ethnographic is defined here as identifying with a specific culture or group. The TCP setting is variable and may include urban neighborhoods, rural communities, natural settings, or prominent landform features. Many Native American communities, displaced from their traditional homelands by European settlement, maintain ongoing cultural links with their historic traditional use areas. They recognize TCPs that are often outside of their modern reservation settings based on pre-European contact settlement and subsistence activities. These TCPs include traditional hunting areas, plant gathering and fishing sites, village locations, archaeological sites, rock image sites, places of historical importance, places that are featured in tribal legends, historic trails, burial grounds, ceremonial use areas, and sacred landscapes.

BPA is consulting with the Klamath Tribes, the Summit Lake Paiute Tribes, the Fort McDermitt Paiute-Shoshone Tribes, the Fort Bidwell Indian Community of the Fort Bidwell Reservation of California, the Cow Creek Band of Umpqua Tribe of Indians, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes of the Umatilla Indian Reservation, the Cedarville Rancheria Northern Paiute Tribe, and the Burns Paiute Tribe to determine if there are any TCPs present within the APE and to determine any impact the Proposed Action or the No Action Alternative may have on identified TCPs. In discussions with the Klamath Tribe and the Fort Bidwell Indian Community, both have identified that there are TCPs within the APE. If TCPs are determined to be impacted BPA will work with the tribe to minimize impacts and mitigate if necessary.

3.12.2 Environmental Consequences – Proposed Action

Construction activities, including the installation of the new dead-end towers and access road construction/improvements, have the potential to affect cultural resources, including human remains, not currently known to exist in the APE. While most of the proposed work will be on

existing towers, access road construction/improvements could impact archaeological sites on the ground. BPA will evaluate any site that may be impacted by the Proposed Action for its eligibility to the NRHP. BPA will consult with the SHPO, affected tribes, and other federal agencies, where applicable, to avoid or minimize impacts to the sites. The PDCI transmission line itself has been recommended eligible to the NRHP, and this project because of its minor impact on the line, is considered to have no adverse effect on historic properties. Depending on the level and amount, impacts on resources protected by NHPA are expected to be *low to moderate* with the implementation of mitigation measures included below. BPA is also consulting with affected tribes to determine if there are any TCPs that may be affected by the Proposed Action. BPA will work with the affected tribes to avoid and minimize any effects to TCPs.

Unknown cultural resources could be disturbed through accidental discovery. The Proposed Action could result in adverse impacts on these previously undiscovered resources, depending on the extent of the resource sites and their proximity to construction activities. Ground disturbance associated with upgrading the transmission line and completing access road work could damage or destroy presently unknown cultural resources. In the event that a previously undocumented resource is disturbed from project construction, the characteristics of the site could be adversely affected such that cultural information could be lost or damaged. There could be a temporary increase of access to lands within the area during project construction that could result in vandalism and looting of cultural resource sites. Impacts on resources would be *low to moderate* with the implementation of mitigation measures included below and the temporary nature of the access, depending on the level and amount of disturbance and the eligibility of the resource.

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.

- Restrict work areas, such as through the installation of exclusion fencing and matting, to avoid disturbance to archaeological and cultural resource sites.
- Employ tribal monitors to be present during all ground-disturbing activities with the potential to affect cultural resources.
- Implement BPA's Inadvertent Discovery Procedure for projects. Should ground-disturbing activities reveal any unknown 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 archaeologist, any affected federal landowners 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 project construction. The area around the discovery will be secured and the BPA archaeologist, the State Historic Preservation Officer, affected federal landowners, and the affected tribes would be contacted immediately.
- Minimize construction footprints in areas containing identified *ethnobotanical* species of concern, where practical.

- Minimize workspace footprints within any identified TCP boundaries, as much as practical.
- Revegetate TCP disturbance areas with native seed and vegetation species, as developed through consultation with interested tribes.

3.12.4 Unavoidable Impacts Remaining after Mitigation – Proposed Action

In the event that resources eligible for listing under the NRHP are adversely affected by the Proposed Action, BPA would implement appropriate measures to mitigate for these impacts, in consultation with the SHPO and tribes, as described above. In addition, disturbance of previously undocumented cultural resources could occur through inadvertent disturbance or destruction during project construction. Even with mitigation, the integrity of these sites could be affected and sensitive cultural information in an intact setting could be lost. With the implementation of mitigation measures included in Section 3.12.2, impacts would be *low* to *moderate*, depending on the level and amount of disturbance.

3.12.5 Environmental Consequences – No Action

Under the No Action Alternative, the existing transmission line would not be upgraded and impacts related to the Proposed Action would not occur. Operation and maintenance activities would continue and would be similar to existing practices; however, the frequency and scope of maintenance activities could increase as existing tower components deteriorate, and more repairs are required, which could result in ground disturbance that would have the potential to affect cultural resources. Impacts associated with continued routine maintenance of the existing line as well as additional emergency repairs could range from *low* to *high*, depending on the level and amount of disturbance, the location of the disturbance (i.e., within a TCP or not), and the eligibility of other resources for listing under the NRHP.

3.13 NOISE, PUBLIC HEALTH, AND SAFETY

3.13.1 *Affected Environment*

Noise

Noise-sensitive land uses include the 29 residences within 0.25 mile of the right-of-way, recreation areas, and other areas where noise can affect how outdoor areas are used or enjoyed.

Noise is generally defined as unwanted sound and is a fluctuating pressure wave. Noise is measured in terms of the sound pressure level expressed in decibels (dB). The number of fluctuation cycles or pressure waves per second of a particular sound is the frequency of the sound. The human ear is less sensitive to higher and lower frequencies than to mid-range frequencies. Therefore, sound level meters used to measure environmental noise generally incorporate a filtering system that discriminates against higher and lower frequencies in a manner similar to the human ear to produce noise measurements that approximate the normal human perception of noise. Measurements made using this filtering system are termed “A-weighted decibels,” abbreviated as dBA. Noise levels referred to in this EA are stated as hourly-equivalent sound pressure levels (L_{eq}) in terms of dBA.

Noise levels decrease with distance from a noise source. The L_{eq} noise level from a line source, such as a road, decrease by 3 to 4.5 dBA for every doubling of distance between the source and the receiver. The L_{eq} noise level from a point source, such as a generator, decreases by approximately 6 dBA for every doubling of distance between the source and the receiver. Subjectively, a 10-dBA change in noise levels is perceived by most people to be approximately a twofold change in loudness (e.g., an increase from 50 dBA to 60 dBA causes the perceived loudness to double). Generally, 3 dBA is the minimum change in outdoor sound levels that can be perceived by a person with normal hearing. Sound levels produced by common noise sources and expected in common types of environments are shown in Table 3.13-1.

Sources of noise associated with the project include corona noise from the transmission line and vehicle noise during construction. When the strength of the electric field at points on the surface of a high voltage transmission line exceeds a certain level, a small amount of energy is released by a partial electrical discharge (called corona) that can lead to audible noise. The direct current (DC) corona noise levels associated with the operation of the PDCI were calculated using mathematical algorithms and a computer program called CORONA 3 that was developed by BPA and are tailored to a dry eastern Oregon climate. Table 3.13-2 presents calculated existing noise levels from the transmission line corona at an altitude of 6,300 feet which is the highest elevation expected. Noise levels would be lower at lower altitudes; approximately 1 dBA lower for each 1,000-foot decrease in altitude.

Table 3.13-1: Sound Levels of Common Sources and Noise Environments

Noise Sources (Distance from the Receiver)	Sound Level (dBA)	Subjective Evaluations	Possible Effects on Humans
Human threshold of pain Jet aircraft takeoff (50 feet)	140	Deafening	Continuous exposure can cause hearing damage
Siren (100 feet) Jackhammer, power drill	130		
Loud rock band Auto horn (3 feet)	120		
Busy video arcade Baby crying	110		
Lawn mower (3 feet) Noisy motorcycle (50 feet)	100	Very Loud	
Heavy truck at 40 mph (50 feet) Shouted conversation	90		
Kitchen garbage disposal (3 feet) Busy urban street, daytime	80	Loud	Speech interference
Normal automobile at 65 mph (25 feet) Vacuum cleaner (3 feet)	70		
Large air conditioning unit (20 feet) Normal conversation (3 feet)	60	Moderate	Sleep interference
Suburban area (daytime) Light auto traffic (100 feet)	50		
Library Quiet home Suburban area (nighttime)	40	Faint	
Soft whisper (15 feet) Rural area (nighttime)	30		
Broadcasting studio	20	Very Faint	
Threshold of human hearing	0-10		

Source: EPA, 1971a.

Note: Both subjective evaluations and physiological responses are continuous, without true threshold boundaries. Consequently, there are overlaps among categories of response that depend on the sensitivity of the noise receptors.

Table 3.13-2: Existing Audible Corona Noise Levels (dBA)

Line Case	Weather Condition	Median Audible Noise at Right-of-way (-75 feet) (dBA)	Median Audible Noise at Profile Peak (dBA)	Median Audible Noise at Right-of-way (225 feet) (dBA)
Existing	Fair	44.2	52.0	40.6
Existing	Foul	38.2	46.0	34.6

Source: Exponent, 2013.

There are no federal regulations applicable to noise generated by the Proposed Action. However, the EPA has established a guideline of 55 dBA for the annual average day-night level (L_{dn}) in outdoor areas (EPA 1978). In computing this value, a 10 dB correction (penalty) is added to night-time noise between the hours of 10 p.m. and 7 a.m. An L_{dn} of 55 dBA is equivalent to a continuous or steady noise level with an L_{eq} of 49 dBA.

State noise regulations include ambient noise limits for vehicles operated near noise-sensitive properties and for permanent stationary industrial facilities. The state defines a noise-sensitive property as real property normally used for sleeping, or normally used as schools, churches, hospitals, or public libraries. Properties used in industrial or agricultural activities are not considered noise-sensitive property unless it meets the above criteria in more than an incidental manner. For the purposes of this analysis, noise-sensitive properties are generally restricted to residential properties since there are no schools, churches, hospitals, or public libraries near the PDCI alignment. However, special recreational areas with high public resource values were also considered. These include:

- The Deschutes River between Tower 25/1 and 25/2. The Deschutes River is designated both as an Oregon Scenic and a Federal Wild and Scenic River in this area, including where the line spans the river.
- The CRNG, which the line spans between Tower 81/2 and 84/5.
- The Crooked River in the Prineville Valley between Tower 90/3 and 90/4.

According to Oregon rules, noise from vehicles should not to exceed 60 dBA during daytime hours (7:00 a.m. to 10:00 p.m.) (OAR 340-035-030). Noise levels from existing industrial noise sources (permanent stationary noise sources) should not exceed 55 dBA during the day or 50 dBA during the night near noise-sensitive properties, or 50 dBA during the day or 45 dBA during the night near “quiet areas” as defined in OAR 340-035-035. However, there are no designated quiet areas east of the Cascade Mountains. BPA seeks to comply with state noise regulations where practicable. Construction noise is exempt from state regulations and there are no applicable noise ordinances in in Wasco, Jefferson, Crook, or Lake Counties.

Section 8.08 of the Deschutes County (Noise Control) regulates construction noise. The Deschutes County Code prohibits unreasonably loud or raucous noise, including construction such as excavation, demolition, alteration or repair of any building, street, sidewalk, driveway, sewer or utility line between the hours of 10:00 p.m. and 7:00 a.m., except by variance.

Public Health and Safety

Electric and Magnetic Fields

All electrical wires, from transmission lines to household wiring, produce electric and magnetic 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. Throughout a home, the electric field strength from wiring and appliances is typically less than 0.01 kV per meter (kV/m). However, fields of 0.1 kV/m and higher can be found very close to electrical appliances.

There are significant distinctions between DC and alternate current (AC) fields, so it is important to recognize that the PDCI produces DC fields. The electric fields created by DC transmission

lines are often called static fields, which are the same as the static electric fields a person can experience with “static cling” on clothing or by rubbing a balloon. AC electric fields, on the other hand, are capable of inducing currents and voltages in conductive objects. Static and magnetic fields occur naturally. The earth creates a static magnetic field from the current flowing within its core.

The DC electric and magnetic fields associated with the operation of the PDCI were calculated using mathematical algorithms and a computer program developed by BPA (known as ANYPOLE). The BPA algorithms were developed based on empirical data collected on the PDCI in Oregon and also on a DC test line, and so are tailored to a dry eastern Oregon climate.

There are no nationally recognized regulatory standards/limits for electric fields from DC transmission lines. DC electric-field levels of 25 kV/m and 28 kV/m are suggested as limits for perception of the field (National Radiological Protection Board of Great Britain (NRPB [NRPB 2004]), the International Committee on Electromagnetic Safety (ICES [ICES 2002]) respectively).

All BPA lines are designed and constructed in accordance with the NESC, which specifies the minimum allowable distance between the conductors and the ground surface or other objects. These requirements determine the edge of the right-of-way, the minimum height of the conductors, and the closest point that houses, other buildings, and vehicles are allowed to the transmission line. The strength of the electric field from transmission lines depends on the voltage and design of the transmission line and on the distance the electric field is measured from the transmission line. Electric field strength decreases rapidly with distance.

Short-term effects from transmission line electric fields include experiencing shocks from ion collection on a person or object, and perceiving the electric field. Under certain conditions, a spark-discharge or shock can be experienced when a person contacts objects in an electric field. These effects typically occur in fields associated with DC transmission lines with high corona values, creating charged ions, and could occur under the upgraded transmission line.

Primary shocks are those that result in direct physiological harm. These shocks will not occur from spark discharges under the existing line or upgraded line because the charge collected by large objects due to ion flow will be limited by the leakage current to the ground, and grounding practices eliminate large stationary objects as sources of these types of shock. BPA transmission lines are designed so that the electric field would be below levels where primary shocks could occur from even the largest (ungrounded) vehicles expected under the line. Secondary shocks are defined as those that could cause an involuntary and potentially harmful movement, but no direct physiological harm.

Several scientific and governmental agencies have established guidelines for limits of exposure to magnetic fields, including the NRPB (NRPB 2004), the ICES (ICES 2002), and the International Commission on Non-Ionizing Radiation Protection (ICNIRP [ICNIRP 1994]). These guidelines range from 400 gauss (G) to 4,000 G. The earth’s magnetic field is approximately 525 milligauss (mG) in central Oregon. At the edge of the right-of-way the magnetic field from the PDCI line would be much lower than the earth’s magnetic field. There are no applicable regulations for the regulation of magnetic fields in Oregon.

The corona ionization process on transmission line conductors generates amounts of non-coherent radio noise (Maruvada 1982). This radio noise from a DC transmission line can produce interference to amplitude-modulated (AM) signals, such as a commercial AM radio audio signal, or before the advent of digital television broadcasts, the video portion of an analog broadcast television station. Near overhead DC transmission lines, a potential for interference with AM radio signals exists when the receiver is close to the transmission line.

There are no documented toxic or hazardous material sites along the transmission line right-of-way. Unreported hazardous waste sites or contamination could be encountered in the project area. These sites may include illegal waste sites, illicit drug labs, or unreported spills of petroleum products or pesticides.

Fires in the project area have started by natural and human causes. Fire danger is the highest in the summer because of hot dry conditions and the frequency of lightning strikes. One of the largest fires on record to cross the PDCI line in Oregon was the Sharptop fire in 1983. It was started by lightning and burned over 81,000 acres in the Lake Abert area. Other large fires that have occurred in the project area include the 64,000 acre Razorback fire of 2011, the 28,000 acre White River fire of 2002, and the 10,000 acre Abert fire of 2000.

Most of the transmission line crosses BLM or privately owned land. Fire protection is provided by city fire departments (e.g., The Dalles, Bend and Redmond) and fire protection districts staffed mostly by volunteer firefighters (e.g., Lakeview, Paisley, Prineville, Madras and Christmas Valley). The project area is also protected by hotshot crews and interagency resources that are coordinated by the Northwest Interagency Coordination Center and the Pacific NW Wildfire Coordination Group.

3.13.2 Environmental Consequences – Proposed Action

Noise

The Proposed Action would result in direct noise impacts in locations where increased noise affects noise-sensitive receptors. The upgraded transmission line would continue to produce corona generated audible noise. Corona noise would increase with altitude. Table 3.13-3 presents predicted noise levels from the transmission line corona at an altitude of 6,300 feet which is the highest elevation of the PDCI. Noise levels would be lower at lower altitudes; approximately 1 dBA lower for each 1,000-foot decrease in altitude. The results show that unlike AC transmission lines, the audible noise from DC corona is higher during fair conditions than foul weather conditions.

Noise levels at the edge of a minimum assumed 75 foot right-of-way are predicted to be below the state or Oregon's 55 dBA residential daytime noise impact threshold, and below Oregon's 50 dBA residential nighttime noise impact threshold under the existing condition, and for the proposed 520 kV line and 560 kV design options in both fair and foul weather conditions. In addition, the predicted noise levels at the edge of the right-of-way are would not exceed EPA's established L_{dn} guideline of 55 dBA (an L_{dn} of 55 dBA is equivalent to a continuous or steady noise level with an L_{eq} of 49 dBA). Predicted noise levels for each weather condition and line voltage option are presented in Table 3.13-4.

Table 3.13-3: Predicted Audible Noise Levels (dBA)

Line Case	Weather Condition	Median Audible Noise at Right-of-Way Edge (75 feet) (dBA)	Median Audible Noise at Profile Peak (dBA)	Median Audible Noise at Right-of-Way Edge (225 feet) (dBA)
Existing	Fair	44.2	52.0	40.6
Existing	Foul	38.2	46.0	34.6
±520 kV	Fair	46.3	53.8	42.7
±520 kV	Foul	40.3	47.8	36.7
±560 kV	Fair	48.9	56.1	45.3
±560 kV	Foul	42.9	50.1	39.3

Source: Exponent 2013.

The greatest increase in corona-related noise levels at the edge of the right-of-way is at 75 feet from the centerline at the western edge of the right-of-way closest to the negative pole. For the ±520-kV configuration in Table 3.13-3, the maximum predicted increase in noise levels is 2 dBA above existing levels. For the ±560-kV configuration, the maximum predicted increase in noise levels is 5 dBA above existing levels. Generally, 3 dBA is the minimum change in outdoor sound levels that can be perceived by a person with normal hearing and a 5 dBA change is a noticeable change for most people. Therefore, noise impacts resulting from the transmission line under the ±520-kV configuration would be *low*. Noise impacts resulting from the transmission line under the ±560-kV configuration would be *low to moderate* depending on the proximity of residences to the right-of-way.

Noise impacts would also occur from construction-related activities associated with upgrading the transmission line, conducting access road work, and using area roads for construction activities. Construction activities would result in temporary, intermittent, and transient noise as construction activities progress along the right-of-way. Use of conventional equipment during construction is estimated to produce a maximum noise level of 98 dBA at 50 feet. Table 3.13-4 presents some typical construction equipment noise levels at 50 feet.

Construction noise levels at noise-sensitive properties in the vicinity of the project would vary over time and would be dependent on the number and type of equipment being used at any one location. Other factors that would affect construction noise levels include topography, vegetation, humidity, temperature, and wind direction. Noise from construction vehicles and increased work trips would temporarily contribute to existing traffic noise on local roads and on regional highways such as I-84, OR 216, US 197, and US 97 in Wasco County; US 97 and US 26 in Jefferson County; US 26, OR 370, OR 126, and OR 27 in Crook County; US 20 in Deschutes County; and US 395 and OR 140 in Lake County, but is not predicted to result in substantial increases in average traffic noise levels.

Table 3.13-4: Typical Construction Equipment Noise (dBA)

Types of Activities	Types of Equipment	Approximate Noise Levels at 50 Feet
Materials Handling	Concrete mixers	75-87
	Concrete pumps	81-83
	Cranes (movable)	76-87
	Cranes (derrick)	86-88
Stationary Equipment	Pumps	69-71
	Generators	71-82
	Compressors	74-87
Impact Equipment	Pneumatic wrenches	83-88
	Rock drills	81-98
Land Clearing	Bulldozer	77-96
	Dump truck	82-94
Grading	Scraper	80-93
	Bulldozer	77-96
	Dump truck	82-94

Source: EPA, 1971b.

Construction noise would also include helicopter use for some activities, such as replacing conductors or to work in sensitive areas. It is estimated that helicopters would be used for approximately 4 months (80 work days) over the 4 years of construction. An estimated 2 round trips from within 75 miles of the project area each day would result in a total of 160 round trips at an estimated 150 miles per trip. However, the use of helicopters in any one area would be temporary and intermittent.

The majority of the project alignment right-of-way is located far from population centers and borders mostly undeveloped land. Noise impacts during construction would be limited to a few areas, primarily on the northwest side of Prineville, where houses are located near to the right-of-way. In the area northwest of Prineville, there are 24 residences within 0.25 mile of the right-of-way. There are an additional five residences within 0.25 mile of the right-of-way in other parts of the PDCI alignment. The closest residences are two homes located on Lucas Lane, approximately 7.1 miles northwest of Prineville, and are 50 feet or less from the edge of the right-of-way. Construction work in this area may include grading to level a landing area within the predisturbed tower area to allow equipment to safely replace the insulators and associated hardware. Construction work would also include access road improvements for construction and ongoing operation and maintenance activities. The duration of construction activities in any given location is expected to be relatively limited in duration. Construction would be limited to daylight hours (7:00 a.m. to 6:00 p.m.). Noise-sensitive properties close to construction zones could be exposed to noise levels above ambient levels, and some residents could be exposed to higher noise levels from helicopter use. Construction noise would result in a temporary increase in ambient noise for some sensitive receptors, the impact would be considered *low* primarily because of the low number of sensitive receptors and because the noise increases would be temporary.

Public Health and Safety

The difference between magnetic-field levels under existing conditions compared to the Proposed Action is small (Exponent 2013). The magnetic-field levels calculated for the 520 kV and 560 kV design options considered for the PDCI upgrade would affect compass readings on the right-of-way, but this impact will diminish quickly as distance from the right-of-way edge increases. Magnetic-field levels would be well below the 4,000 G limits for magnetic-field exposure suggested by the ICNIRP. Table 3.13-5 presents the calculated magnetic field values for the right-of-way line at 75 feet from the PDCI centerline, at the right-of-way line at 225 feet from the PDCI centerline, and at the peak modeled value within the right-of-way.

Table 3.13-5: DC Magnetic-field (mG) Levels for Existing and Proposed Operation

Line Case	Current (A)	Line Height (feet)	DC magnetic-field (mG) at Right-of-way (-75 feet)	DC magnetic-field (mG) at Profile Peak	DC magnetic-field (mG) at Right-of-way (225 feet)
Existing	3,100	25.5	145	912	16
±520 kV	3,100	26.5	143	869	16
±560 kV	3,410	28.0	155	890	18

Source: Exponent 2013.

The analysis for the ion-enhanced electric fields in foul weather conditions shows that the change in the calculated levels from the existing design to the 520 kV design at the right-of-way edge is an increase of 12 percent; and an increase of up to 26 percent between the existing design and the 560 kV design. However, the ion-enhanced electric fields are predicted to be below the NRPB (NRPB 2004) lower range of perceptibility of 25 kV/m (Exponent 2013). Ion-enhanced electric-field levels are lower during fair weather conditions.

The median ion-enhanced electric-field levels under the PDCI line (within the right-of-way) ranges between approximately 55 kV/m and 64 kV/m. These levels exceed the upper limit of perceptibility of 28 kV/m recommended by ICES (ICES 2002) in all cases including existing conditions (Exponent 2013). Since the median ion-enhanced electric-field levels within the right-of-way under the Proposed Action are very similar to existing conditions, it is not expected that existing activities would be precluded from the right-of-way or adjacent or nearby areas as a result of the project. Table 3.13-6 presents the calculated range of total electric field predictions for the existing and proposed PDCI 520 kV and 560 kV designs under foul weather conditions.

Near overhead DC transmission lines, a potential for interference with AM radio signals exists when the receiver is close to the transmission line. Impacts would be expected rarely along the northern portion of the PDCI due to the location of the line and scarcity of residences in this region. Radio noise would only affect AM car radio reception at road crossings when a driver passes under the DC transmission line.

Table 3.13-6: Total Electric Field Predictions for the Existing and Proposed PDCI

Line Case	Weather Condition	Median Electric Field at Right-of-way (-75') (kV/m)	Median Electric Field at - Profile Peak in Right-of-way (kV/m)	Median Electric Field at + Profile Peak in Right-of-way (kV/m)	Median Electric Field at Right-of-way (225') (kV/m)
Existing	Foul	-16.2	-58.0	55.4	2.6
±520 kV	Foul	-18.2	-61.3	59.1	3.0
±560 kV	Foul	-20.4	-63.6	61.6	3.4

Source: Exponent 2013.

Interference to FM radio reception, cell phone use, or GPS signals would not be expected due to the signal processing techniques and frequencies used by these devices. Based on the analysis of health and safety risks from the transmission line, the public health and safety impacts would be **low**.

Health and safety risks associated with the construction of the project could include increased risk of electrical shocks or fires from high-voltage equipment and increased risk of fires and injury from the use of heavy equipment and hazardous materials, such as fuels, cranes, helicopters, and other activities associated with working near high-voltage lines. Secondary shocks could occur under the PDCI line when making contact with ungrounded objects such as vehicles. However, such occurrences are anticipated to be very infrequent.

In addition, there are potential safety issues with more traffic on the highways and roads during construction. Because standard construction safety procedures would be required and employed, impacts on public health and safety would be **low**.

Operation and maintenance activities would result in similar health and safety risks as construction activities. Because standard safety procedures would be required and employed, impacts on public health and safety would be **low**.

3.13.3 Mitigation – Proposed Action

Noise

If the Proposed Action is implemented, BPA would implement the following mitigation measures to avoid or minimize noise impacts.

- Employ a lands liaison, who would be available to provide information, answer questions, and address concerns during project construction.
- Schedule all construction work during daylight hours.
- Locate construction equipment as far away from noise-sensitive uses as possible.
- Require sound control devices on all construction equipment powered by gasoline or diesel engines that are at least as effective as those originally provided by the manufacturer.
- Operate and maintain all construction equipment to minimize noise generation.

Public Health and Safety

If the Proposed Action is implemented, BPA would implement the following mitigation measures to reduce or minimize impacts on public health and safety.

- Design, construct, and operate the upgraded transmission line to meet the NESC.
- Employ a lands liaison, who would be available to provide information, answer questions, and address concerns during project construction.
- Prepare a Safety Plan in compliance with state requirements before starting construction;
- Specify how to manage hazardous materials, such as fuel and any toxic materials found in work sites; include a Fire Prevention and Suppression Plan, and detail how to respond to emergency situations; keep the Safety Plan on site during construction and maintain and update, as needed.
- Require the construction contractor to hold safety meetings with workers at the start of each work week to review potential safety issues and concerns.
- Require monthly meetings, attended by the construction contractor and BPA staff, to discuss safety issues.
- Employ traffic control flaggers and post signs along roads warning of construction activity and merging traffic for temporary interruptions of traffic, where needed.
- Secure the work area at the end of each workday, as much as possible, to protect the general public and to safeguard equipment.
- Install temporary guard structures (wood-pole towers) over local utility lines and county roads, where needed, to ensure continued service and safe passage when the conductor is replaced, or, if guard structures are not used along some county roadways, employ flaggers to ensure safe passage.
- Ground fences and other metal structures on and near the right-of-way during construction to limit the potential for nuisance shocks.

3.13.4 Unavoidable Impacts Remaining after Mitigation – Proposed Action

Noise

During periods of construction and maintenance, noise from construction vehicles would result in an increase over existing ambient noise levels after implementation of mitigation. Although construction noise would result in a temporary increase in ambient noise for some sensitive receptors, the impact would be considered *low to moderate*, depending on the proximity of sensitive noise receptors to the noise disturbance, because the noise increases would be temporary and localized.

Public Health and Safety

Health and safety risks associated with the project could include increased risk of electrical shocks or fires from high-voltage equipment and increased risk of fires and injury from the use

of heavy equipment and hazardous materials. These impacts would be *low* with implementation of the mitigation measures listed above.

3.13.5 Environmental Consequences – No Action

Noise

Under the No Action Alternative, the existing transmission line would not be upgraded; therefore, impacts related to construction of the project would not occur. Operation and maintenance activities would continue and would be similar to existing conditions. Maintenance of access roads would be needed and some road work proposed under the project may take place as an operations and maintenance activity. Maintenance activities would result in *low* to *moderate* impacts on noise, similar to the impacts described above. The existing transmission line would continue to generate *low* levels of corona noise.

Public Health and Safety

Under the No Action Alternative, the existing transmission line would not be upgraded; therefore, the safety and EMF changes related to the construction of the project would not occur. Operation and maintenance activities would continue and standard safety procedures would be required and employed. External factors such as weather or collisions with the line would have a greater chance of causing a failure on the PDCI than on a new line. If such a failure of existing towers or components would occur, it would result in downed lines with a high potential for causing fires and presenting a public safety hazard. Because of the absence of large numbers of people in the vicinity of the PDCI, the possibility of direct contact with the downed electrical lines would be low.

3.14 CLIMATE CHANGE

3.14.1 *Affected Environment*

Greenhouse gas emissions include the fossil fueled vehicles and equipment used for construction and maintenance activities. **Greenhouse gases** (GHG) 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 is largely cyclical. For instance, 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, available to be taken up again by new plants (Ecological Society of America 2008). In forests, the carbon can be stored for long periods of time, and because they are so productive and long-lived, forests have an important role in carbon capture and storage and can be thought of as temporary carbon reservoirs. There is also a large amount of GHGs stored deep underground in the form of fossil fuels, and soils store carbon in the form of decomposing plant material, serving 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 (CO₂), nitrous oxide (N₂O), and methane (CH₄) emissions increase when soils are disturbed (Kessavalou *et al.* 1998), and burning fossil fuels releases GHGs that have been stored underground for thousands of years and cannot be readily replaced. Increased GHG levels result in a build up of heat in the atmosphere, which causes warming of the planet through a greenhouse-like effect (U.S. Energy Information Administration 2009a). Increasing levels of GHGs could increase the Earth's temperature by between 2.0 and 11.5 degrees Fahrenheit by 2100 (EPA 2013).

The principal GHGs emitted into the atmosphere through human activities are CO₂, CH₄, N₂O, and fluorinated gases, such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆) (EPA 2013). CO₂ is the major GHG emitted, and the burning of fossil fuels accounts for 84 percent of all U.S. GHG emissions (EPA 2013, U.S. Energy Information Administration 2009b). CO₂ enters the atmosphere primarily through electricity generation and transportation activities, with lesser quantities from industrial, residential, and commercial activities. As a result of human activities, CO₂ levels have increased to 379 parts per million within the last century, which is a 36 percent increase (Intergovernmental Panel on Climate Change 2007). These specific GHGs are discussed in more detail in Appendix A.

3.14.2 *Environmental Consequences – Proposed Action*

GHG emissions resulting from the Proposed Action were calculated using the methodology described in the GHG technical report (see Appendix A). GHG emissions were determined for construction activities that produce GHG emissions. Construction activities associated with upgrading the transmission line, including permanent vegetation removal for installation of additional towers and new/improved roads. GHG emissions associated with construction activities would occur over a period of approximately 21 months.

The Proposed Action would result in an estimated total of 12,155 metric tons of *carbon dioxide equivalent* (CO_{2e})⁵ emissions over the 21-month construction period (see Table 3.14-1). Detailed information related to GHG calculations is presented in Appendix A.

Table 3.14-1: Net Carbon Footprint of the Proposed Action

Activity	Total CO ₂ Emissions (metric tons)	Total N ₂ O Emissions (metric tons)	Total CH ₄ Emissions (metric tons)	Total CO _{2e} Emissions (metric tons)
Construction	8,143	10.5	25.8	11,927

To provide context for this level of emissions, the EPA mandatory reporting threshold 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 project construction would be equivalent to the emissions generated by about 1,200 passenger vehicles per year. The U.S. Geological Survey (USGS 2008) has reviewed the latest science on GHG emissions and concluded it is currently beyond the scope of existing science to identify a specific source of GHG emissions and designate it as the cause of specific climate impacts at a specific location. Therefore, given the low GHG contribution, the impacts of construction activities on regional or global GHG emissions would be *low*.

3.14.3 Mitigation – Proposed Action

If the Proposed Action is selected, BPA would implement the following mitigation measures to avoid or minimize GHG emissions.

- Encourage carpooling and the use of shuttle vans among construction workers to minimize construction-related traffic and associated emissions.
- Locate staging areas as close to construction sites as practicable to minimize driving distances between staging areas and construction sites.
- Locate staging areas in previously disturbed or graveled areas to minimize soil and vegetation disturbance where practicable.
- Encourage the use of the proper size of equipment for the job to maximize energy efficiency.
- Ensure that all vehicle and equipment engines are maintained in good operating condition to minimize exhaust emissions.
- Turn off equipment engines when not in use to minimize exhaust emissions.
- Use alternative fuels for generators at construction sites, such as propane or solar, or use electrical power where practicable.
- Recycle or salvage non-hazardous construction and demolition debris where practicable.
- Use local rock sources for road construction where practicable.

⁵CO_{2e} is a unit of measure used by the Intergovernmental Panel on Climate Change that takes into account the global warming potential of each of the emitted GHGs using global warming potential factors.

- Revegetate disturbed areas after the conclusion of construction, with the exception of those areas required to remain clear of vegetation to ensure the safety of the transmission line and access to the towers.

3.14.4 Unavoidable Impacts Remaining after Mitigation – Proposed Action

Implementation of mitigation measures described above and in Section 3.10, Air Quality, would help to reduce GHG emissions. However, unavoidable impacts would include slight increases in GHG releases. These impacts would be *low* for the reasons discussed in Section 3.14.2.

3.14.5 Environmental Consequences – No Action

Under the No Action Alternative, the existing transmission line would not be rebuilt and the impacts related to the construction of the Proposed Action would not occur. Operation and maintenance activities would continue similar to existing conditions. Maintenance activities would likely increase as existing towers deteriorate, and more repair and replacement could be required, resulting in increased GHG emissions to the Proposed Action (88 CO₂ and 229 CO_{2e} metric tons). Maintenance of access roads would be needed and road work would likely need to take place as an operations and maintenance activity. The maintenance activities would result in very minor increases in GHG emissions. Because the increase would be small, the impacts on GHG emissions and climate change are expected to be *low*.

3.15 CUMULATIVE IMPACTS

Cumulative impacts are the 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. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

This section of the EA describes existing development from past actions, as well as present and reasonably foreseeable future development within the five counties crossed by the project. Potential cumulative impacts also are analyzed and described within the five-county area, the area in which each environmental resource potentially affected by the proposed project is assessed. The past, present, and reasonably foreseeable future actions provide the context in which to assess the cumulative impacts of these actions in combination with the Proposed Action.

3.15.1 Past Actions

The CEQ issued cumulative impact guidance on June 24, 2005, that states the “environmental analysis required under NEPA is forward-looking,” and review of past actions is required only “to the extent that this review informs agency decision-making regarding the Proposed Action.” Use of information on the effects of past action may be useful in two ways: one is for consideration of the Proposed Action’s cumulative effects and secondly as a basis for identifying the Proposed Action’s direct and indirect effects.

The CEQ stated that “[g]enerally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.” This is because a description of the current state of the environment (i.e., “Affected Environment” sections) inherently includes the effects of past actions. Further, the “CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions.” Information on the current environmental condition is more comprehensive and more accurate for establishing a useful starting point for a cumulative effects analysis than attempting to establish such a starting point by adding up the described effects of individual past actions to some environmental baseline condition in the past that, unlike current conditions, can no longer be verified by direct examination.

As such, the nature and extent of existing development that has resulted from past actions in the vicinity of the proposed project is largely described earlier in this chapter in the “Affected Environment” sections for each environmental resource. In general, this development began to occur in north and south-central Oregon in the mid-19th century with permanent Euro-American settlement of the area. The original Homestead Act of 1862 allowed settlers to claim up to 160 acres of land to obtain title. The Desert Land Act of 1877 allowed a settler to purchase up to an additional 640 acres at 25 cents per acre if they irrigated the land and grew crops within three years.

These new settlers increased demand for food which increased the amount of ranching in Oregon, including in the vicinity of the Proposed Action. Large herds of cattle and sheep were

established and new ranches began appearing in central Oregon. In addition to ranchers, some settlers employed dry farming methods to grow crops such as wheat, lentils, or alfalfa. The arrival of the railroad into Oregon in the first decades of the 1900s allowed for even more expansion of ranching and farming in the area, although periodic drought conditions during that period put limits on that expansion. The railroad also connected central Oregon to major transportation routes along the Columbia River; this facilitated access by the timber industry to harvest and process the region's pine forests. As the railroad grew, so did the timber industry and by the end of the 1930s nearly every community in central Oregon was involved in the lumber economy in some capacity.

Most of the area in the vicinity of the Proposed Action has continued to be farmed, ranched, and harvested since the mid-20th century. A network of local roads and state and county highways in the area have been developed, which has facilitated access to land and further development. Typical development that has occurred in the general vicinity of the Proposed Action has been rural residences, agricultural-related uses, and smaller communities. The transmission line itself was constructed in the late 1960s to transmit power from the Columbia River down to southern California.

3.15.2 Current and Reasonably Foreseeable Future Actions

Current actions are those projects, developments, and other actions that are currently underway, either because they are under construction or are occurring on an ongoing basis. Reasonably foreseeable future actions generally include those actions formally proposed or planned, or highly likely to occur based on available information. Various sources, including local, state, and federal agency websites and city and county staff, were consulted to obtain information about any current and potential future development in the project vicinity. The following describes these current and reasonably foreseeable future actions.

Transmission Line Projects

It is reasonably foreseeable that BPA will perform maintenance on the PDCI. This would include helicopter patrols every few months as well as a ground patrol once a year. Transmission line maintenance crews would replace or repair equipment found to be damaged (for example, insulators that have been shot out). Crews would control vegetation on an 8-year cycle. This would include mowing around towers and cutting juniper or tall growing trees within the right-of-way. Vegetation management would be performed under BPA's *Transmission System Vegetation Management Program Final EIS* (BPA 2000).

BPA has several transmission line projects that are either underway or that are reasonably foreseeable. BPA is in the process of constructing its Big Eddy-Knight Transmission Project in Wasco County, Oregon and Klickitat County, Washington. This project consists of a new, approximately 28-mile-long, 500-kV transmission line and ancillary facilities between BPA's existing Big Eddy Substation in The Dalles, Oregon, to a new Knight Substation connected to an existing BPA line about 4 miles northwest of Goldendale, Washington. BPA began constructing this line in late September 2011. It is estimated that the line will be completed and energized in winter 2014.

BPA also is planning to implement a project that will upgrade its Celilo Converter Station, which is the northern terminus of the PDCI, near The Dalles, Oregon. This converter station is reaching the end of its service life and has outdated technology and equipment that has resulted in ongoing reliability and maintenance issues. The upgrade will replace the aging four converter terminal with a modern two converter terminal. Construction is planned to start in early 2015, with the new equipment in service by early 2016.

BPA also is planning to conduct routine transmission maintenance projects to maintain existing transmission infrastructure. For example, BPA will begin a pole replacement project on a portion of its Big Eddy-Redmond No. 1 transmission line in Deschutes County in fall 2013. This project will involve replacing 45 deteriorating wood pole towers along this line over a 4-week period. BPA also is planning to perform routine maintenance work on the conductor for this line in Wasco County. The proposed work includes resagging the transmission line and replacing some transmission line hardware, insulators, and conductor. Construction is expected during fall 2013.

While not proposed at this time, with future BPA system upgrades as well as upgrades by the Southern Partners to their portion of the line, the PDCI would be capable of a transfer capacity of up to 3,800 MW.

Pipeline Projects

There are two pipeline projects in the project vicinity. The Ruby Pipeline Project involves approximately 675 miles of 42-inch natural gas transmission pipeline that extends from Malin in southern Klamath County, Oregon through the southern portion of the project area, Nevada, and Utah to Wyoming. Pipeline construction began in 2010 and the pipeline was in-service in 2011. Ruby Pipeline LLC has funding in place for habitat conservation and restoration projects that will occur over the next 10 years. The USFS Norton Water Transmission Line project, located in the CRNG, would include replacement of an existing, damaged aboveground 0.28-mile 18-inch-diameter water irrigation pipeline with a 24-inch-diameter above- and underground pipeline. Construction is expected to occur in October 2013.

Wind and Geothermal Projects

Reasonably foreseeable wind and geothermal projects have been proposed at various locations in the project vicinity. The Brush Canyon Wind Energy Project in Wasco and Sherman counties would involve construction of up to 223 turbines. An approximately 32-mile, 230-kV overhead transmission line would interconnect this wind project to BPA's Buckley substation, located approximately 10 miles southwest of the incorporated city of Grass Valley. Project construction is expected to occur in 2015.

The Summit Ridge Wind Project in Wasco County would involve construction of up to 87 wind turbines. An approximately 8-mile, 230-kV overhead transmission line would interconnect this wind project to BPA's Big Eddy to Maupin-Redmond transmission line. Construction is expected to begin in late 2013.

The Midnight Point and Mahogany Geothermal Exploration Project in Lake County would include drilling, testing, and monitoring of up to 16 geothermal wells, including improvement to

existing access roads and the installation of new access roads. Project construction is expected to occur between 2013 and 2016.

Mineral Exploration Projects

The Rabbit Basin Sunstone Mineral Exploration project in Lake County would involve feldspar mineral exploration activities including cross-country travel, access roads, and excavation. Exploration activities are expected to begin in 2013 and continue into the foreseeable future. The Tucker Hill Perlite Mine project in Lake County would involve expansion of an existing 23-acre perlite mine to 70 acres with activities consisting of quarry expansion; drilling and bulk sampling (including drill roads and pad); and removal and stockpiling of growth media. These activities are expected to occur between 2013 and 2028.

Restoration/Habitat Improvement Projects

The Creek and Riparian Enhancement Project in Lake County involves habitat restoration, including adding passage and screening to creek diversions, stream bank stabilization, and riparian area restoration. This project is currently being implemented. In addition, juniper reduction activities are planned at various locations in primarily sagebrush steppe to improve habitat into the foreseeable future. It is also reasonably foreseeable that ongoing vegetation, noxious weed, and fire management activities will continue to be undertaken by multiple agencies in all counties into the foreseeable future.

Resource Use Projects

BLM projects in the Prineville and Lakeview districts include ongoing grazing.

Transportation Projects

In addition to general roadway maintenance and improvement projects such as repaving, shoulder widening, drainage improvement, signal and signage replacement, sidewalk and ADA ramp upgrade, and cross walk restriping, the following are reasonably foreseeable transportation-related projects in the vicinity of the Proposed Action:

- O'Neil Highway at BNSF Railroad/Prineville Junction project in Redmond includes realignment of O'Neil Highway to North Canal Boulevard and the US 97 interchange at the north end of Redmond. The road and bridge improvements include realignment of O'Neil Highway at Prineville Junction and just west of Lone Pine Road in Crook County, new bridge on the O'Neil Highway that crosses over the Burlington Northern Santa Fe (BNSF) Railway line, new bridge on O'Neil Highway/Pershall Way that crosses over US 97, and improvements along North Canal Boulevard.
- US 97/Murphy Road: Brookwood - Parrell project in Bend consists of an extension and realignment of Murphy Road from Parrell Road across US 97 to Brookwood Blvd. Road and bridge improvements include realignment and extension of Murphy Road, new bridge on Murphy Road that crosses over US 97 (Bend Parkway), new southbound flyover bridge from 3rd Street to US 97., Modification of accesses at 3rd Street/Murphy Road and US 97 and Pinebrook Blvd, realignment of the existing northbound exit from US 97 to 3rd Street, and

roundabout construction. Construction is expected to occur from summer 2013 through fall 2014.

- US 97 at 1st Street project in La Pine includes realignment of 1st Street and Reed Road, construction of a left hand turn lane from US 97 to Reed Road, construction of a right hand turn lanes for US 97 southbound traffic to 1st Street, and westbound Reed Road traffic onto northbound US 97; construct sidewalks along 1st Street between US 97 and Huntington Road. Construction is expected to occur in 2014.
- US 97 at Cherry Lane project includes removing the south bound passing lane on US 97 at Cherry Lane, widening US 97 for turn pockets at Cherry Lane and Cora Drive, realigning Cora Drive with US 97, realigning Clark Drive with Cora Drive , and flattening side slopes and remove barrier along the east side of US 97 at Hilltop Lane. Construction is expected to occur in 2014.
- US 26 at Dover Lane project consists of realigning Dover Lane at the intersection of US 26 and widening shoulders on US 26 near the intersection with Dover Lane. Construction is expected to occur in 2014.

Land Use Development Projects

Proposed projects in each county include additional agricultural development projects, residential remodels or new developments, and minor commercial remodels and expansions. Recent new commercial development proposals include a restaurant, bed and breakfast, and aircraft fuelling station in Deschutes County and a commercial cheese operation in Crook County. Industrial developments include the potential for expansion of existing data centers and development of new data centers in Crook County near the City of Prineville.

At the City of The Dalles, Google has received land use approval to expand its data center with construction of a new, 164,000 square foot 2-story building on the 37-acre property. Google is currently in the building permit process and construction is expected to begin in 2013. Walmart has received approval to build an approximately 150,000 square feet supercenter on 15 acres. Construction is expected to begin in spring 2014. The Port of The Dalles has received approval to develop an industrial subdivision with infrastructure and roadway systems construction expected to begin in spring 2014. Developments currently under construction include a Goodwill store, a retail center with a fast food restaurant and coffee drive through, and an 89-unit Fairfield Inn.

At the City of Maupin planned projects include construction of a new library and City Hall building within the next few years, pending receipt of funding. Planned projects within the City of Prineville include new residential developments, construction of a new 20-acre Prineville healthcare campus at the Ochoco Mill site expected to begin early 2014, and construction of a new elementary school expected to begin early 2014.

3.15.3 Cumulative Impact Analysis

The following subsections describe the cumulative effects that the Proposed Action, in combination with the past, present, and reasonably foreseeable future actions identified above, would have on the various environmental resources discussed in this EA. Cumulative impacts from the combination of these actions could occur for each of the environmental resources.

Overall, the Proposed Action in combination with past, present, and reasonably foreseeable future actions would result in *low to moderate* cumulative impacts to all assessed resources.

Land Use and Recreation

Land use in the project vicinity has incrementally changed due to past and present disturbance from grazing, agriculture, vegetation maintenance, infrastructure placement (including roadways/highways, transmission lines, and pipelines), and residential development. This trend would continue, although current land use is not expected to change much in the near future. The areas that the transmission line traverses are mostly rural in nature.

The Proposed Action would result in impacts similar to planned or ongoing road work projects including noise, dust, vegetation clearing, and traffic delays that would add to the cumulative impacts to local residences and recreation users. Construction-related activities could also temporarily displace some crops and grazing animals. Construction of the Celilo Converter Station is expected take one year and would overlap during the summer/fall construction of the Proposed Action during that year, which could contribute incrementally to increases in traffic congestion, particularly along Interstate 84. However, because of the temporary and localized nature of these activities, and relatively low amount of impact to existing land uses, the incremental contribution of the Proposed Action along with the reasonably foreseeable projects would have a *low* cumulative impact on land use. Additionally, the mitigation measures would reduce the contribution of the Proposed Action to potential cumulative impacts on land uses.

Geology and Soils

The principal past, ongoing, and reasonably foreseeable activities that affect soils in the vicinity of the Proposed Action are related to farming and grazing. Implementation of the mitigation measures described above would ensure that the Proposed Action would not contribute significantly to cumulative soil impacts. As such, the contribution of the Proposed Action to cumulative impacts would be considered *low*.

Vegetation

Agricultural activities, predominantly dryland wheat production, grass seed, and alfalfa, have cumulatively altered the vegetation in the region, predominantly in the central and north areas of the corridor, by completely removing native vegetation communities. Livestock grazing on rangelands occurs 94 percent of the region. The development of road and utility corridors and commercial and residential uses also has contributed to the cumulative impact to native vegetation communities in the vicinity of the project. If substantial additional development occurs on private lands in the area, a more extensive shift away from native vegetation communities could occur but that is not likely in the foreseeable future due to the remoteness of the corridor.

Past and present activities, such as ranching, agriculture, and road construction, also have resulted in the substantial introduction and spread of noxious weeds in the project corridor and general vicinity. The spread of noxious weeds will continue as a result of ongoing and reasonably foreseeable actions.

The Proposed Action would be expected to have a minimal contribution to cumulative impacts on vegetation, compared to the combined impacts of past, ongoing, and future vegetation-altering activities. The amount of vegetation that would be affected by the Proposed Action is small compared to the area affected by agricultural activities, livestock grazing, wildfire, vegetation control along roads and other utility corridors, and commercial and residential development in the area. Accordingly, due to the linear nature of the project and the pre-existing condition of the vegetation, in combination with mitigation measures and actions, the project would have a *low* impact in regard to loss to vegetation communities and associated wildlife habitat.

Construction activities associated with the Proposed Action could contribute to cumulative noxious weed impacts because corridors can act as a path for the movement of weed species and because of the difficulty of controlling many weed species. The potential contribution of the proposed project would, however, be minimized by project-related mitigation measures designed to minimize the spread of new noxious weed infestations and colonization in the project area. The contribution of the Proposed Action to the spread of noxious weeds thus would be considered a *low to moderate* cumulative impact.

Wildlife

Past and present development and other activities have had a cumulative adverse impact on wildlife species and their habitat in the project vicinity. The clearing and conversion of land for home sites, communities, utility infrastructure, and other uses since the 19th century has resulted in the cumulative loss of wildlife habitat. Agricultural operations have resulted in disturbed grasslands and cropland dominating the area. Existing roads in the project vicinity have led to increased disturbance from human activity, increased landscape fragmentation and the presence of wildlife travel barriers, lost habitat, and spread of noxious weeds. This habitat loss and modification has resulted in the displacement of wildlife species. Wildlife species also have been directly affected by hunting and trapping activities, as well as incidental harm and killing from other human activities in the area. Reasonably foreseeable future actions involving development would be expected to incrementally add to these cumulative impacts.

The Proposed Action would contribute, although in only a minor way, to these cumulative impacts on wildlife and wildlife habitat, through temporary disturbance during construction and permanent removal of extremely small areas of wildlife habitat. Because the construction of new towers and access roads associated with the Proposed Action is fairly limited, the cumulative impacts related to habitat fragmentation are considered *low*. Additionally, transmission corridors can act as a path for the movement of difficult to control weed species and thereby degrade wildlife habitat through the spread of weed species, especially with regard to grazing and browsing species like deer and elk. Following construction, continued operation and maintenance activities could aid in the spread of noxious weeds, but would not increase above existing levels, making the associated cumulative impacts *low*.

Fish and Water Resources

Ongoing agriculture and grazing are responsible for most of the impacts on fish and water resources and water quality. Vegetation control along roads and utility corridors also affects water resources. Vegetation control routinely occurs along highways, county roads, residential

roads, and utility corridors. Vegetation control activities typically include herbicide applications to control vegetation and noxious weeds and mechanical vegetation removal. BPA performs similar vegetation control activities along its transmission line right-of-way.

Past, current, and likely future activities and projects are expected to have a cumulative effect on fish and water resources. However, compared to the combined cumulative impacts of past and ongoing waterbody alteration, the incremental contribution of the Proposed Action to cumulative impacts on fish and water resources is considered *low*.

Wetlands

Past, present, and future actions in the project vicinity have cumulatively affected wetlands through destruction and degradation of wetlands. These actions include farming, ranching, and utility and road construction and maintenance. Riparian and wetland areas have been cumulatively degraded and frequently have incurred major vegetation impacts and changes as a result of livestock use. Statewide, approximately 38 percent of wetlands are estimated to have been converted to other uses (DSL 2004). Some NWI-mapped wetlands on or near the right-of-way no longer exist due to agricultural activities. Wetland hydrology has been altered from its natural condition in many areas, affecting wetland functions and values.

Potential cumulative impacts to wetlands could result if other projects and actions were to affect wetland functions and values. The Proposed Action would result in impacts similar to those of road work and would add to the cumulative impacts to wetlands from other road projects in the area. However, because of the temporary and localized nature of the project activities, relatively low amount of impact to existing wetlands, and implementation of the mitigation measures, the contribution of the Proposed Action to cumulative impacts on wetlands would be considered *low*. In addition, wetlands are regulated by federal, state, and local agencies and impacts from other projects would likely require compensatory mitigation to replace the loss of wetland functions and area.

Floodplains

Past, present, and future activities in the project vicinity that have cumulatively adversely affected floodplains include utility and road construction and maintenance, agricultural activities, logging, and residential development.

Potential cumulative impacts on floodplains could result from increased compaction, erosion, or temporary removal of vegetation within or near floodplains. No future BPA projects were identified within the project area aside from planned or ongoing road work projects. Some residential development, additional agricultural use, and planned or ongoing county road work may also occur, but it will be limited. The Proposed Action would result in impacts similar to those of road work and would add to the cumulative impacts to floodplains from other road projects in the area. However, because of the temporary and localized nature of the project activities, relatively low amount of impact to floodplains, and implementation of the mitigation measures, the contribution of the Proposed Action to cumulative impacts on floodplains would be considered *low*.

Visual Quality

Visual resources in the project vicinity have incrementally changed due to past and present development, although current views are not expected to change much in the foreseeable future. Most visual impacts from the Proposed Action would be temporary and localized, except for some permanent changes to views from the addition of 4 new dead-end towers and access road construction. Because of the temporary nature of construction activities, limited use where the new towers would be located, and minimal length of new access road extending from existing roads, the contribution of the Proposed Action to cumulative impacts on visual resources would be *low*.

Air Quality

Vehicular traffic, logging activities, residential wood burning, road and transmission line maintenance, and operation of commercial and industrial facilities are all sources of air pollutants that will continue to emit pollutants. Current activities in the project area do not currently violate NAAQS, with the exception of very localized and periodic exceedance of the PM_{2.5} standards in the City of Lakeview. While the Proposed Action would cumulatively contribute a small amount to overall air pollutant levels, it is unlikely that cumulative concentrations would result in new violations of the NAAQS, or exacerbate existing violations of the NAAQS.

Socioeconomics and Public Services

Past and present population growth, housing development, agricultural and timber operations, and public service operations have occurred in the project vicinity. Growth and development trends are expected to continue, but would not change much in the near future. The areas that the transmission line traverses are mostly rural in nature, which is likely to remain the same.

Most of the reasonably foreseeable projects identified are linear, associated with transmission lines and roads. Some residential development and additional agricultural and timber operations may also occur, but it will be limited. The Proposed Action would result in impacts similar to planned or ongoing road work projects, including an increase in temporary housing/lodging demand, economic benefits, timber/agricultural production impacts, and property impacts, which would result in a cumulative socioeconomic impact. However, because of the temporary and localized nature of these activities and *low* impact to existing socioeconomics and public services within the five-county area, the incremental contribution of the Proposed Action along with the reasonably foreseeable projects would have a *low* cumulative impact on socioeconomics and public services. Additionally, the mitigation measures would further reduce the contribution of the Proposed Action to potential cumulative impacts on socioeconomics. Further, the Proposed Action would provide more reliable, electrical power and access to high speed communications, which would have a cumulative socioeconomic benefit in the western region.

Cultural Resources

Cultural resources 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 the construction of the transmission line, construction of roadways, and farming and ranching activities. The extent of looting of and vandalism to

cultural resources in the project vicinity is unknown. These cumulative impacts include disturbance of cultural sites, reduction of the cultural integrity of certain sites, and removal of cultural artifacts.

Implementation of the mitigation measures would minimize impacts and would reduce the potential for the Proposed Action to contribute incrementally cumulative impacts on cultural resources within 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 under the NRHP.

Noise

Noise levels in the project vicinity are cumulatively affected by the existing transmission lines, existing traffic, recreational activities, existing residential uses and any residential construction in the area, agricultural and silvicultural activities, and any infrastructure maintenance projects carried out by local, state, and federal governments. Depending on the timing and proximity of these other activities, the Proposed Action in combination with any nearby and concurrent activities could result in cumulatively increased noise levels in the short term during project construction. However, because construction noise impacts would be temporary, they would not contribute to long-term cumulative noise impacts in the project vicinity.

Minor increases in corona-related noise levels from the transmission line of up to 3 dBA at the edge of the right-of-way under the 520 kV design option and would contribute to cumulative noise impacts in the project vicinity in some areas, and under certain weather conditions. If the southern portion of the PDCI is upgraded, then the line may be upgraded to 560-kV. This would increase the ambient noise contribution at the edge of the right-of-way to 5 dBA above existing levels, thereby increasing cumulative noise impacts in the project vicinity.

Public Health and Safety

The Proposed Action would slightly increase the overall level of DC magnetic field exposure along the corridor under the 560 kV design option. The Proposed Action slightly increases the overall level of total electric field along the corridor under both the 520 kV and the 560 kV design options.

Climate Change

There has likely been a cumulative effect on GHG contributions from past and current activities in the project area such as roadway and utility infrastructure construction, maintenance, and operation; and farming activities. As described above in Section 3.14.2, the impacts of the Proposed Action on GHG concentrations would be *low*. Impacts would be further reduced through implementation of the mitigation measures identified in Sections 3.14.2 and 3.10.3. All levels of GHG emissions contribute to global GHG concentrations and climate change; however, given the small amount of contribution, the Proposed Action's incremental impact on GHG concentrations and climate change would be *low*. This would also be the case when combined with other reasonably foreseeable future projects and activities in the project area, which are expected to be minimal and consisting of planned or ongoing road work projects, some residential development, and additional agricultural use.

Chapter 4: Environmental Consultation, Review, and Permit Requirements

This chapter addresses statutes, implementing regulations, and executive orders potentially 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. Persons, tribes, and agencies consulted are listed in Chapter 5 of this EA.

4.1 NATIONAL ENVIRONMENTAL POLICY ACT

This EA was prepared pursuant to regulations implementing NEPA (42 USC 4321 *et seq.*), which require federal agencies to assess the impacts that their actions may have on the environment. NEPA requires 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 Proposed Action would cause any significant environmental impacts that would warrant preparation of an EIS, or if it is appropriate to prepare a Finding of No Significant Impact.

4.2 LAND USE AND RECREATION

4.2.1 *Federal Land Policy and Management Act*

The Federal Land Policy and Management Act (FLPMA; 43 USC 1701 *et seq.*) requires that the BLM manage the public lands based on the principle of “multiple use and sustained yield,” protecting environmental, ecological, recreational, and other values while also recognizing “the Nation’s need for domestic sources of minerals, food, timber, and fiber from the public lands.” The FLPMA establishes a multiple use mandate for management of federal lands, including energy generation and transmission facilities as outlined in 43 CFR 2800. The FLPMA requires that BLM prepare land use plans (RMPs) providing broad-scale multiple use direction for management of public lands. The FLPMA also requires that all approved management actions conform to the goals and management direction contained in the applicable land use plan (43 CFR 1610.5-3).

BLM is authorized by the FLPMA and its implementing regulations to issue right-of-way grants for facilities and systems, including transmission and distribution systems. Specifically, pursuant to 43 CFR 2801.2, it is BLM’s purpose to grant rights-of-way and to control their use on public lands in a manner that: (a) protects the natural resources associated with public lands and adjacent lands, whether private or administered by a government entity; (b) prevents unnecessary or undue degradation to public lands; (c) promotes the use of rights-of-way in common, considering engineering and technological compatibility, national security, and land use plans; and (d) coordinates, to the fullest extent possible, all BLM actions under the regulations in this part with state and local governments, interested individuals, and appropriate quasi-public entities. In fulfilling these obligations, the BLM decision maker may include terms, conditions, and stipulations which she or he determines to be in the public interest. BPA is coordinating with BLM to meet their requirements for crossing BLM-managed land and has submitted an SF-299 Application for Transportation and Utility Systems and Facilities on Federal Lands to obtain right-of-way for the construction of new access roads on BLM lands.

Conformance with Prineville District Resource Management Plans

The Proposed Action is in conformance with the Two Rivers RMP/Record of Decision (ROD) (BLM 1986), Brothers/La Pine RMP/ROD (BLM 1989), and Upper Deschutes RMP/ROD (BLM 2005).

The Proposed Action would conform to the Two Rivers RMP's Utility and Transportation Corridor's management direction that states, "No additional crossing sites on the BLM managed portions of the Deschutes and John Day rivers will be permitted. No facilities will be allowed parallel to the railroad right of way in the Deschutes Canyon. Applicants will be encouraged to locate new facilities...adjacent to existing facilities to the extent possible... All designated areas of critical environmental concern and wilderness study areas will be considered right-of-way exclusion areas. Public lands will continue to be available for local rights of way, including multiple use and single use utility/transportation corridors following existing routes, communication sites, and roads" (page 32).

The Brothers/La Pine RMP's Rights of Way and Utility and Transportation Corridors Management Direction states, "Public lands will continue to be available for rights-of-way, including multiple use and single use utility/transportation corridors following existing routes, communication sites and roads... All designated areas of critical environmental concern and wilderness study areas will be considered right-of-way exclusion areas. Federally designated wild and scenic rivers, as well as rivers identified as having special status plant or animal species will be avoidance areas. Areas having high or sensitive visual qualities will be avoided or appropriate mitigation measures taken. Public lands will continue to be available for local rights-of-way, including multiple use and single use utility/transportation corridors following existing routes, communication sites and roads" (pages 29 and 33).

The Proposed Action would conform to the Upper Deschutes RMP's Transportation and Utilities Objective TU – 1 to "provide new or modified rights-of-way for transportation/utility corridors and communication/energy sites to meet expected demands and minimize environmental impacts" (page 135). The guidelines for the objective state that "BLM administered lands will continue to be available for rights-of-way, including multiple use and single use utility/transportation corridors, following existing routes, and roads" (page 135), "all areas having high or sensitive (VRM classifications 1-3) visual qualities will be avoided or appropriate mitigation measures taken" (page 136), and "applicants are encouraged to locate new facilities adjacent to existing facilities to the extent technically and economically feasible and meet resource objectives" (page 136).

Conformance with Lakeview District Resource Management Plan

The Proposed Action is in conformance with the Lakeview RMP/ROD (BLM 2003). Specifically, the existing BPA PDCI Project is located within a designated utility corridor (see Map L-8).

Approving the utility line upgrade and issuing a new right-of-way would also conform with the Lands and Realty Management Goal 2 to "Meet public needs for land use authorizations such as rights-of-way, leases, and permits" (page 93).

The management direction states, “Applications for rights-of-ways, leases, permits, and other forms of land use authorization, with exception of rights-of-way corridors within WSAs and SMAs (which are addressed separately) will be processed in a timely fashion, on a case-by-case basis, in compliance with the NEPA process.” In addition it states, “Subject to further NEPA compliance, the upgrading/expansion of existing rights-of-way and issuance of new rights-of-way will be allowed within existing corridors...” (page 94). “Applicants for electrical transmission lines greater than 69 kilovolts, all mainline fiber optics facilities, and pipelines greater than 10 inches in diameter will be encouraged to locate their facilities within designated corridors. A width of 2,000 feet (1,000 feet each side of centerline) is considered an appropriate/reasonable width to provide engineering flexibility, system compatibility, and reliability factors, and will be used for purposes of this plan.” (page 94). However, the management direction goes on to include, “The existing electrical transmission line through the Fossil Lake will be identified as a right-of-way corridor up to 1000-feet wide for future utility lines or other rights-of-way.” (page 62).

4.2.2 National Forest Management Act

The National Forest Management Act reorganized, expanded, and otherwise amended the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on national forest lands. The National Forest Management Act requires the Secretary of Agriculture to assess forest lands, develop a management program based on multiple-use, sustained-yield principles, and implement a resource management plan for each unit of the National Forest System. It is the primary statute governing the administration of national forests.

The Ochoco National Forest Land and Resource Management Plan (USFS 1989), which includes the CRNG, was prepared in compliance with the Forest and Rangeland Renewable Resources Planning Act, as amended by the National Forest Management Act of 1976, and NEPA. The plan guide establishes management standards and guidelines for the Ochoco National Forest.

The transmission line crosses the edge of the CRNG. However, the transmission line is an existing use, located within an existing right-of-way, and located within an existing corridor. Further, new dead-end towers and access roads are not proposed within the CRNG. Any new or additional right-of-way for access roads on this federal land could require issuance of a Special Use Permit by the USFS under the National Forest Management Act. BPA would obtain real property rights as appropriate for these public lands. BPA will continue to coordinate with the USFS concerning potential permitting requirements.

4.2.3 Farmland Protections Policy Act

The Farmland Protection Policy Act (FPPA) (7 USC 4201 *et seq.*) requires that federal agencies avoid the unnecessary and irreversible conversion (directly or indirectly) of farmland to nonagricultural uses by ensuring that their proposed actions are consistent with federal, state, and local programs and policies designed to protect farmland. The Act’s purpose is to minimize the number of federal programs that contribute to the unnecessary and irreversible conversion of agricultural land to nonagricultural uses.

For the purposes of the FPPA, farmland includes prime farmland, unique farmland, and farmland of statewide or local importance, as defined below.

- Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion. Prime farmland may include land that meets these criteria but that currently supports livestock or timber production, but does not include land already in or committed to urban development or water storage.
- Unique farmland is land other than prime farmland that is used for production of specific high-value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of specific crops when treated and managed according to acceptable farming methods.
- Farmland of statewide or local importance includes land outside of prime or unique farmland that is important for the production of food feed, fiber, forage, or oilseed crops, as determined by the appropriate state or unit of local government with jurisdiction over an area.

Each NRCS field office maintains a list of mapped soil units that meet each of the above definitions.

There are limited exemptions to compliance with the FPPA, including construction within an existing right-of-way purchased on or before August 4, 1984. Given that that the PDCI transmission line corridor was built in the late 1960s, replacement of the infrastructure within the BPA right-of-way would not be subject to compliance with the FPPA. Construction of new infrastructure on farmland outside of the existing right-of-way would require an assessment of potential effects on protected farmlands by NRCS. However, there would be no infrastructure or development on farmland outside of the existing right-of-way or in association with the additional acquired right-of-way.

As discussed in Section 3.2, Land Use and Recreation, based on the mapped soils classified as prime and other important farmlands, approximately 36.2 acres of prime farmland (if irrigated) and 407.2 acres of farmland of statewide importance would be temporarily impacted during construction of the Proposed Action. Approximately 3.9 acres of prime farmland (if irrigated) and 56.1 acres of farmland of statewide importance would be permanently impacted. Of these acres, only 11.2 are in agricultural use.

4.2.4 Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act (16 USC 1271-1287) establishes a national wild and scenic rivers system and prescribes the methods and standards through which additional rivers may be identified and added to the system. The Act provides three levels of protection: wild, scenic, and recreational. There are four primary federal agencies charged with protecting and managing wild and scenic rivers, including BLM, NPS, USFWS, and USFS. The Wild and Scenic designation protects a river's outstandingly remarkable values, free-flowing condition, and existing uses; prohibits federally-licensed dams and other federally-assisted water resource projects that would

negatively impact the river's outstanding values; generally establishes a 0.25-mile protected corridor from the ordinary high water mark on both sides of the river; and requires preparation of a comprehensive management plan that addresses resource protection, development of lands and facilities, user capacities, and other management practices.

The NPS Wild and Scenic Inventory (2012) of listed and proposed rivers was reviewed to determine if any of the rivers in the project area qualify as wild, scenic, or recreational. The transmission line right-of-way crosses the Deschutes River and Crooked River. Some portions of both rivers are designated as a wild, scenic, or recreational river, including where the existing transmission line spans these rivers. However, the transmission line is an existing use, located within an existing right-of-way, and located within an existing corridor. The transmission line improvements within the 0.25-mile protected river corridor would occur within the existing right-of-way. Further, new dead-end towers and new/improved access roads are not proposed within the 0.25-mile protected river corridor.

4.2.5 State and Local Land Use Planning Framework

As a federal agency, BPA is not required to obtain state and local land use approvals or permits unless Congress has not waived federal sovereign immunity in these areas. BPA will, however, strive to meet or exceed the substantive standards and policies of state and local environmental regulations to the maximum extent practical.

Oregon has a statewide planning program, which is supported by 19 statewide planning goals. The goals express the state's policies on land use and related topics. The goals are adopted as administrative rules (Oregon Administrative Rules [OAR] Chapter 660, Division 015) and are achieved through local comprehensive planning. State law requires counties to have a comprehensive plan and zoning ordinance, consistent with the statewide planning goals, to implement the statewide planning goals. The following describes the county plans and ordinances that guide land use in the area affected by the Proposed Action.

Wasco County Comprehensive Plan and Land Use and Development Ordinance

In Wasco County, the transmission line crosses land zoned as Exclusive Farm Use (EFU). The purpose of this zoning designation is to preserve and maintain agricultural lands for farm use and to limit conflicting uses. If within or adjacent to a public right-of-way, utility facility services lines under 200 feet in height, and accessory facilities or structures, are permitted without review on lands designated EFU. Therefore, the Proposed Action would be consistent with the Wasco County Comprehensive Plan (2010) and Wasco County Land Use and Development Ordinance (2012).

Jefferson County Comprehensive Plan and Zoning Ordinance

In Jefferson County, the transmission line crosses land zoned as EFU and Rangeland. The purpose of the EFU zoning designation is to preserve agricultural lands for farm use. The purpose of the Rangeland zoning designation is to preserve lands for livestock grazing. If within or adjacent to a public right-of-way, utility facility services lines and accessory facilities or structures are permitted outright on lands designated EFU and Rangeland. Therefore, the

Proposed Action would be consistent with the Jefferson County Comprehensive Plan (2010a) and Zoning Ordinance (2010b).

Crook County Comprehensive Plan and Zoning Ordinance

In Crook County, the transmission line crosses land zoned as EFU. Utility facilities necessary for public service, including transmission towers under 200 feet in height, are permitted outright. Therefore, the Proposed Action would be consistent with the Crook County Comprehensive Plan (2003a) and Zoning Ordinance (2003b).

Deschutes County Comprehensive Plan Deschutes County Zoning Ordinance

In Deschutes County, the transmission line crosses land zoned as EFU. The purpose of the EFU zoning designation is to preserve and maintain agricultural lands and to serve as a sanctuary for farm uses. If within or adjacent to a public right-of-way, utility facility service lines and accessory facilities or structures are permitted outright on lands designated EFU. Therefore, the Proposed Action would be consistent with the Deschutes County Comprehensive Plan (2005) and Zoning Ordinance (2012).

Lake County Comprehensive Plan Zoning Ordinance

In Lake County, the transmission line crosses land zoned as EFU. The purpose of the EFU zoning designation is to preserve productive agricultural land for continued agricultural use. Utility facilities necessary for public service, including transmission towers under 200 feet in height, are permitted outright. Therefore, the Proposed Action would use an existing corridor and would be consistent with the Lake County Comprehensive Plan (1982) and Zoning Ordinance (1989) to the extent practicable.

4.3 GEOLOGY AND SOILS

4.3.1 Omnibus Public Land Management Act—Paleontological Resources Preservation

The OPLMA of 2009, Public Law 111-011, Title VI, Subtitle D on Paleontological Resources Preservation (known as PRPA; 123 Stat. 1172; 16 USC 470aaa) requires the Secretaries of the Interior and Agriculture to manage and protect paleontological resources on federal land. BPA has ranked and performed field investigations on sites that contain potential paleontological resources in accordance with OPLMA. The area of primary concern is in the Fossil Lake area of Lake County. BLM has identified this area as an ACEC. Mitigation measures, including recovery, avoidance, and monitoring have been proposed for areas of potential resources and are described in Section 3.3, Geology and Soils.

4.4 VEGETATION, FISH, AND WILDLIFE

4.4.1 *Endangered Species Act*

The ESA of 1973 (16 USC 1531 *et seq.*) as amended in 1988, 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 wildlife and freshwater species and by NMFS for marine and anadromous species. The ESA defines procedures for listing species, designating critical habitat for listed species, and preparing recovery plans. It also specifies prohibited actions and exceptions.

Section 7(a) of the ESA requires federal agencies to ensure that the actions they authorize, fund, and carry out do not jeopardize 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 (BA) addressing the potential effects their actions have on listed or proposed endangered species and critical habitats.

The project area is within the potential habitat range of four federally-listed plant species of concern: Cliff paintbrush (*Castilleja Rupicola*), Sessile mousetail (*Myosurus Sessilis*), Peck's penstemon (*Penstemon Peckii*), and Woven-spored lichen (*Texosporium Sancti-Jacobi*) (USFWS 2013d). Potential impacts to these species are discussed in Section 3.4, Wetlands. No populations of federally listed plants were found during plant surveys of the project area in 2013, which included the entire length of the existing transmission line right-of-way and off- right-of-way access roads. These areas were surveyed during August 2013. Impacts to populations of special status plant species would be reduced by implementation of the mitigation measures identified in Section 3.4, Wetlands.

For fish and wildlife species, BPA used the USFWS, NMFS, and BLM species lists and the ORBIC Database to determine which endangered and threatened fish and wildlife species and critical habitat occur in the project area: Canada lynx (*Lynx canadensis*) is an ESA-listed threatened species that could potentially occur in Crook, Deschutes, Jefferson, Lake, and Wasco Counties with recent recorded sightings (1990 to present) in Lake, Deschutes, and Wasco Counties. No observations of Canada lynx occurred during general wildlife surveys.

The USFWS also identified four candidate species: greater sage grouse (*Centrocercus urophasianus*), yellow-billed cuckoo (*Coccyzus americanus occidentalis*), Columbia spotted frog (*Rana luteiventris*), Oregon spotted frog (*Rana pretiosa*), and Washington ground squirrel (*Spermophilus washingtoni*) that may be present in the project area. The greater sage grouse has been documented and observed within the vicinity of the project area. Yellow-billed cuckoo and Columbia and Oregon spotted frogs have not been documented within the project area and were not observed during project surveys. Washington ground squirrel has previously been documented in the Prineville BLM District, but potential occurrence is limited to Gilliam County (more than 25 miles east of the project area). Washington ground squirrel was not observed during project surveys. Potential impacts are discussed in Section 3.5, Wildlife.

In addition, the USFWS lists indicate that two fish species, bull trout (*Salvelinus confluentus*) and Warner sucker (*Catostomus warnerensis*), both listed as threatened, occur within the project

area. Potential impacts are discussed in Section 3.6, Fish and Water Resources, and a Biological Assessment has been prepared for consultation with USFWS on these fish species.

NMFS lists indicate that MCR steelhead DPS (*Oncorhynchus mykiss*), listed as threatened, occur within the project area and a Biological Assessment has been prepared for consultation with NMFS on this fish species.

4.4.2 Fish and Wildlife Conservation Act and Fish and Wildlife Coordination Act

The Fish and Wildlife Conservation Act of 1980 (16 USC 2901 *et seq.*) encourages federal agencies to conserve and promote conservation of nongame fish and wildlife and their habitats. In addition, the Fish and Wildlife Coordination Act (16 USC 661 *et seq.*) requires federal agencies with projects affecting water resources to consult with USFWS and the state agency responsible for fish and wildlife resources. The analyses in Section 3.5, Wildlife and Section 3.6, Fish and Water Resources, indicate that the Proposed Action would have *low* to *moderate* impacts on wildlife and fish resources, with implementation of appropriate mitigation.

BPA has coordinated, and will continue to coordinate, with BLM, USFWS, NMFS, and ODFW biologists concerning Proposed Action activities with the potential to affect fish and wildlife. The USFWS, NMFS, and ODFW will be sent copies of this Draft EA and mitigation measures designed to avoid and minimize impacts to wildlife, fish, and their habitat as identified in Section 3.5, Wildlife and Section 3.6, Fish and Water Resources.

4.4.3 Magnuson-Stevens Fishery Conservation and Management Act

Public Law 104–297, the Sustainable Fisheries Act of 1996, amended the Magnuson-Stevens Fishery Conservation and Management Act (16 USC 1801 *et seq.*). Under Section 305(b)(4) of the Act, BPA is required to consult with NMFS for actions that adversely affect EFH. EFH can include all streams, lakes, ponds, wetlands, and other viable water bodies, and most of the habitat historically accessible to salmon necessary to fish for spawning, breeding, feeding or growth to maturity. NMFS is required to provide EFH conservation and enhancement recommendations.

Within the project area, the Magnuson-Stevens Act designates EFH for Chinook and Coho salmon. EFH occurs in Fifteenmile and Eightmile creeks and the lower Deschutes River. The potential effects on EFH are discussed in Section 3.6, Fish and Water Resources.

4.4.4 Migratory Bird Treaty Act and Federal Memorandum of Understanding

The Migratory Bird Treaty Act (16 USC 703–712) 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. Under the Act, 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.

Executive Order 13186 directs federal agencies whose actions may negatively affect migratory bird populations to work with USFWS to develop an agreement to conserve migratory birds.

BPA, through the U.S. Department of Energy (USDOE), and USFWS have a memorandum of understanding (MOU) to address how both agencies can work cooperatively to address migratory bird conservation. It includes specific measures to consider implementing during project planning and implementation. The MOU was originally created in 2006 and was recently updated to ensure it met the stated purpose and scope of responsibilities identified in Executive Order 13186 (USDOE and USFWS 2013).

The Proposed Action may affect migratory birds through 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 transmission line is designed with conductors spaced far enough apart to prevent electrocution of raptors. The larger conductor that would be used could make it more visible to birds, decreasing the potential for collisions. Bird diverters may also be used. Potential impacts and mitigation measures are discussed in Section 3.5, Wildlife.

Other measures recommended under the MOU address migratory bird habitat. One measure advocates for construction outside the nesting season, but it would not be possible to schedule all construction activities outside of the nesting season. The combination of heavy rains in fall, winter, and early spring; fragile soils; and steep slopes make it inadvisable to construct during the rainy season. Compaction and disturbance of wet soils are harmful to habitats and cause roads to deteriorate. Avoidance and minimization measures outlined in Section 3.5.4 would be implemented: construction activities would not occur within buffer areas surrounding active nests and vegetation clearing would occur prior to the onset of breeding season in certain areas. The control of noxious weed species to avoid degradation of wildlife habitat would also be implemented as discussed in Section 3.5, Wildlife.

Construction, operation, and maintenance of the Proposed Action would result in a similar level of impact on migratory birds as it would on other birds and wildlife described in Section 3.5.4. Construction, operation, and maintenance of the Proposed Action would result in *low* impacts on migratory birds, as a result of loss of habitat or direct mortality, as discussed in Section 3.5, Wildlife.

4.4.5 Bald Eagle and Golden Eagle Protection Act

The Bald Eagle and Golden Eagle Protection Act (16 USC 668–668d) prohibits the taking or possessing of and commerce in bald and golden eagles, with limited exceptions. Because the Proposed Action would not involve knowing take or other acts in wanton disregard of bald or golden eagles, implementation of the project would not be expected to violate the provisions of the Bald Eagle and Golden Eagle Protection Act.

As discussed in Section 3.5, Wildlife, the USFWS record of known golden eagle nests includes 39 documented nests within 2 miles of the project area. Project surveys identified 6 active and 41 inactive golden eagle nests in the project area. Additionally, one active bald eagle nest was observed along the transmission line. However, with the implementation of mitigation measures, impacts to eagles and nests are expected to be *low*. The transmission line is designed with conductors spaced far enough apart to prevent electrocution of raptors and the larger conductor that would be used could make it more visible to birds, decreasing the potential for collisions. In

certain areas, bird diverters may also be used. These design features and mitigation would help avoid and minimize impacts on eagles and other birds.

4.4.6 Executive Order on Invasive Species

In February 1999, Executive Order 13112, Invasive Species, was released. This order states that federal agencies must identify actions that affect the status of invasive species, prevent the introduction of invasive species, and control and monitor invasive species. With regard to invasive/noxious weeds, as discussed in Section 3.4, Wetlands, the Proposed Action would be expected to have a *low* impact overall based on the existing relative abundance and overall density within the project area, but could have *moderate* impacts at the site-specific level for certain populations.

4.5 WATER RESOURCES AND WATER QUALITY

4.5.1 Clean Water Act

The Clean Water Act (33 USC 1341, 1342, 1344) regulates discharges into waters of the United States. The various sections applicable to the Proposed Action are discussed 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 project's 404 permit application for compliance with Section 401.

Section 402

This section authorizes stormwater discharges under the National Pollutant Discharge Elimination System. EPA Region 10 has a general permit for federal facilities for discharges from construction activities. BPA would determine the need to issue a Notice of Intent to obtain coverage under the EPA general permit and is preparing a Stormwater Pollution Prevention Plan to address stabilization practices, structural practices, stormwater management, and other controls (see Section 3.6, Fish and Water Resources).

Section 404

Authorization from the U.S. Army Corps of Engineers is required in accordance with the provisions of Section 404 when dredged or fill material is discharged into waters of the United States, including wetlands. Impacts on wetlands are described in Section 3.7, Wetlands, and other regulations pertinent to wetlands and floodplains are described in Section 4.6, below. Wetlands along the right-of-way and new/improved roads were delineated in summer 2013. BPA will coordinate with the U.S. Army Corps of Engineers to determine the need for permitting under Section 404. If the project activities are covered under an existing Nationwide Permit (33 Code of Federal Regulations [CFR] 330.1), all conditions of the permit would be followed.

Oregon's Removal Fill Law

Oregon's Removal Fill Law (Oregon Revised Statute [ORS] 196.795-990), administered by DSL, requires a permit for 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 DSL to determine which activities are subject to the Removal Fill Law. BPA submitted the wetland delineation report prepared for this project to DSL for review in September 2013.

4.6 WETLANDS AND FLOODPLAIN PROTECTION

As part of the NEPA review, the U.S. Department of Energy's 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 and 11990.

Wetland management, regulation, and protection are addressed in several sections of the Clean Water Act, including Sections 401, 402, and 404 (see Section 4.5, above). Wetlands are also addressed in a combination of other state and federal laws, including the Coastal Zone Management Act, ESA, NHPA, Rivers and Harbors Act, and Wild and Scenic Rivers Act. The Proposed Action would result in up to 0.3 acre of direct, permanent wetland impacts as a result of access road improvements and construction of rock landings at existing towers. Potential impacts to wetlands from the Proposed Action are discussed in Section 3.7, Wetlands.

Approximately 5,344 linear feet of existing access road improvements would occur within six FEMA-mapped 100-year floodplains. Potential impacts on floodplains from the Proposed Action are discussed in Section 3.8, Floodplains.

4.6.1 Executive Order on Protection of Wetlands

Executive Order 11990 was released in May 1977, directing federal agencies to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. As discussed in Section 3.7, Wetlands, with project design adjustments and implementation of mitigation measures under the Proposed Action, impacts to wetlands would be minimized.

4.7 AIR QUALITY

4.7.1 Clean Air Act

The federal Clean Air Act (42 USC 7401 et seq.), requires EPA and individual states to carry out a wide range of regulatory programs intended to assure attainment of the NAAQS. In Oregon, EPA has delegated authority to ODEQ. Because the Proposed Action would occur in an area that is currently in attainment for the NAAQS and because no stationary sources of air emissions would occur, construction activities associated with Proposed Action are exempted from state regulation.

4.8 SOCIOECONOMICS AND PUBLIC SERVICES

4.8.1 Federal Communications Commission

Federal Communications Commission regulations require that transmission lines be operated so that radio and television reception would not be seriously degraded or repeatedly interrupted. While the Proposed Action is not expected to increase electromagnetic interference above existing levels, any complaints about electromagnetic interference would be investigated.

4.8.2 Executive Order on Environmental Justice

In February 1994, Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, was released to federal agencies. This order states that federal agencies must 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 (see Section 3.11, Socioeconomics and Public Services).

4.9 CULTURAL AND HISTORICAL RESOURCES

Several laws and regulations are in place to govern 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 resources related laws and regulations include:

- Antiquities Act of 1906 (16 USC 431–433)
- Historic Sites Act of 1935 (16 USC 461–467)
- Section 106 of the NHPA of 1966 (16 USC 470 *et seq.*), as amended
- Archaeological Data Preservation Act of 1974 (16 USC 469 a–c)
- Archaeological Resources Protection Act of 1979 (16 USC 470 *et seq.*), as amended
- Native American Graves Protection and Repatriation Act (25 USC 3001 *et seq.*)
- Executive Order 13007 Indian Sacred Sites
- American Indian Religious Freedom Act of 1978 (42 USC 1996, 1996a)
- Oregon state law (ORS 97.740–97.760, 358.905–358.955, and 390.235) defines state regulation of archaeological and historic sites
- ORS 390.235 contains information on permits 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 in 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 SHPO, BLM archaeologist, Oregon State archaeologist, and the following tribes:

- Burns Paiute Tribe
- Cedarville Rancheria Northern Paiute Tribe
- Confederated Tribes and Bands of the Yakama Nation
- Confederated Tribes of the Umatilla Indian Reservation
- Confederated Tribes of the Warm Springs
- Cow Creek Band of Umpqua Tribe of Indians
- Fort Bidwell Reservation
- Klamath Indian Tribes
- Summit Lake Paiute Tribe
- Fort McDermitt Paiute and Shoshone Tribes

The cultural resources report for the PDCI Upgrade Project was submitted to the tribes, SHPO, BLM archeologist, and Oregon State archaeologist in August 2013. BPA evaluated historic transmission line facilities, as described in Section 3.12, Cultural Resources, for eligibility to the NRHP.

4.10 NOISE, PUBLIC HEALTH, AND SAFETY

4.10.1 Maximum Environmental Noise Levels

The federal Noise Control Act of 1972 (42 USC 4901 *et seq.*) requires that federal entities, such as BPA, comply with state and local noise requirements. Environmental noise limits relevant to the Proposed Action are regulated by the state of Oregon, which establish limits on levels and duration of noise. Temporary construction is exempted from state regulations and there are no applicable noise ordinances in Wasco, Jefferson, Crook, or Lake Counties. The analysis in Section 3.13, Noise, Public Health, and Safety, indicates that the Proposed Action would have low to moderate impacts, with implementation of appropriate mitigation.

4.10.2 The Spill Prevention Control and Countermeasures Act

The Spill Prevention Control and Countermeasures Act 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 Proposed Action.

4.10.3 Title III of the Superfund Amendments Act

Title III of the Superfund Amendments and Reauthorization Act 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. No hazardous materials sites are located within the project area.

4.10.4 Uniform Fire Code

The development of a Hazardous Materials Management Plan may be required by local fire districts in accordance with the Uniform Fire Code. BPA will develop and implement such a plan, if required.

4.10.5 Toxic Substances Control Act

The Toxic Substances Control Act (15 USC 2601 *et seq.*) 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 Proposed Action would not contain PCBs. Any equipment removed that may have PCBs would be handled according to the disposal provisions of this act.

4.10.6 Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act (7 USC 136 (a-y)) registers and regulates pesticides. BPA uses herbicides (a kind of pesticide) during vegetation management in accordance with BPA's *Transmission System Vegetation Management Program Final Environmental Impact Statement* (2000). Herbicides are used on transmission line rights-of-way, along access roads, and in substation yards to control vegetation, including noxious weeds. When BPA uses herbicides, the date, dose, and chemical used are recorded and reported to state government officials. Herbicide containers are disposed of according to Resource Conservation and Recovery Act (RCRA) standards discussed in Section 4.10.7, below.

4.10.7 Resource Conservation and Recovery Act

RCRA (42 USC 6901 *et seq.*), 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. In BPA's experience, typical construction and maintenance activities have generated 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 under the Proposed Action. 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 the contractor notify the Contracting Officer's Technical Representative immediately. Other conditions such as large dump sites, drums of unknown substances, suspicious odors, and stained soil must also be reported immediately. The Contracting Officer's Technical Representative will coordinate with the appropriate BPA personnel. In addition, the contractor will not be allowed to disturb such conditions until the Contracting Officer's Technical Representative has given the notice to proceed.

4.10.8 Transportation Permits

According to the Oregon Revised Statutes Chapter 818 (Vehicle Limits), oversize or overweight vehicles need transportation permits to travel on highways and local public roads in the state. The construction contractor for the Proposed Action would consult with Oregon Department of Transportation and county public works departments to secure necessary permits for oversize or overweight vehicles used for project construction.

4.11 CLIMATE CHANGE

Gases that absorb infrared radiation and prevent heat loss to space are called greenhouse gasses (GHGs). Models predict that atmospheric concentrations of all GHGs will increase over the next century, but the extent and rate of change is 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* 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 2010).
- 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 calculated for the Proposed Action construction activities that would produce GHG emissions: construction of the transmission line and permanent vegetation removal for installation of four additional towers and new/improved roads. GHG emissions would be below EPA's mandatory reporting threshold. The impact of the Proposed Action on GHG concentrations would be *low*, as discussed in Section 3.14, Climate Change.

4.12 REQUIREMENTS NOT APPLICABLE TO THIS PROJECT

4.12.1 Permits for Structures in Navigable Waters

The project would not involve construction, removal, or rehabilitation of any structures in navigable waters.

4.12.2 Safe Drinking Water Act

No drinking water systems are affected by the project, and no pollutants are expected to reach drinking water supplies.

4.12.3 Notice to Federal Aviation Administration

The Federal Aviation Administration (FAA) requires reporting of structures taller than 200 feet above ground or established within a prescribed distance from an airport listed by FAA. The final locations, structures, and structure heights of the Proposed Action would not meet these criteria and would not be reported to FAA.

4.12.4 Energy Conservation at Federal Facilities

Energy conservation practices are not relevant because no federal buildings would be constructed.

4.12.5 National Scenic Byways Program

The National Scenic Byways Program designates scenic and historic roads as All-American Roads and National Scenic Byways based on their scenic, historic, recreational, cultural, archeological, or natural intrinsic qualities (National Scenic Byways Program 2011). The management and protection of these scenic byways is carried out by the state departments of transportation under the Oregon Scenic Byway Program (OAR 734-032). There are no designated All-American Roads, National Scenic Byways, State Scenic Byways, or State Tour Routes in the project area.

4.12.6 Protected Area Amendments

The Northwest Power Planning Council's Protected Area Amendments to the Pacific Northwest Electric Power Planning Council Designation Act of 1980 are not applicable to the Proposed Action.

4.12.7 Coastal Zone Management Act

Because the Proposed Action is not within Oregon's coastal zone, BPA is not subject to consistency requirements of the Coastal Zone Management Act.

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 this EA are listed below by category.

5.1 FEDERAL

U.S. Army Corps of Engineers
U.S. Department of Agriculture Forest Service
U.S. Department of Interior Bureau of Land Management
U.S. Department of Interior Fish and Wildlife Service
U.S. House of Representatives – Greg Walden, Representative
U.S. Senate –Jeff Merkley, Senator
U.S. Senate –Ron Wyden, Senator

5.2 STATE

5.2.1 *State of Oregon*

Department of Fish and Wildlife
Department of Environmental Quality
Department of State Lands
Governor John Kitzhaber
House of Representatives District 55 – Mike McLane
House of Representatives District 59 – John Huffman
State Historical Preservation Office
State Land Board
State Senate District 28 – Doug Whitsett, Senator
State Senate District 30 – Ted Ferrioli, Senator

5.3 TRIBES

Burns Paiute Tribe
Cedarville Rancheria Northern Paiute Tribe
Confederated Tribes and Bands of the Yakama Nation
Confederated Tribes of the Umatilla Indian Reservation
Confederated Tribes of Warm Springs
Cow Creek Band of Umpqua Tribe of Indians
Fort Bidwell Indian Community
Fort McDermitt Paiute and Shoshone Tribes
Klamath Indian Tribe
Summit Lake Paiute Tribe

5.4 LOCAL GOVERNMENTS AND UTILITIES

5.4.1 County

Wasco County

Board of County Commissioners

Jefferson County

Board of County Commissioners

Crook County

Crook County Courthouse

Deschutes County

Board of County Commissioners
Deschutes County Courthouse

Lake County

Commissioners Office

5.4.2 City

City of Lakeview

Honorable Mike Patrick, Mayor

City of Prineville

Honorable Betty Roppe, Mayor

City of The Dalles

Honorable Jim Wilcox, Mayor

5.4.3 Utilities

Portland General Electric Company

5.5 PUBLIC INTEREST GROUPS

1000 Friends of Oregon (Jason Miner, Executive Director, Portland)
Alliance for Responsible Land Use
Audubon Society of Portland
Audubon Society of the East Cascades
Canaries Who Sing
Contra Costa Mineral and Gem Society
Friends of the Oregon Badlands Wilderness
Hunters for Conservation
Mule Deer Foundation
Native Plant Society of Oregon
Northwest Rafters Association
Oregon Bow Hunters
Oregon Environmental Council
Oregon Hunters Association
Oregon Natural Desert Association
Oregon Wild
Oregon Wild Conservation and Restoration
Public Lands Foundation
Range Ecology Group
Rocky Mountain Elk Foundation
Sierra Club
Sierra Club of Oregon
Siskiyou Audubon Society
State of Oregon Museum of Anthropology
Trout Unlimited, Deschutes Chapter #552
Warm Springs Power Enterprise
Wild Sheep Foundation
Wilderness Watch

Chapter 6: Glossary and Acronyms

6.1 GLOSSARY

access roads	Roads and spurs that provide access to corridor and tower sites during construction and operation and maintenance
anadromous	Species that hatch in freshwater mature in saltwater, and return to freshwater to spawn, e.g., salmon, steelhead, trout, sturgeon, and shad.
anodes	The positively charged pole of a corrosion cell at which oxidation occurs.
atlats	A device for throwing a spear or dart that consists of a rod or board with a projection (as a hook) at the rear end to hold the weapon in place until released
best management practices	An innovative and improved environmental protection tool, practice, or method that has been determined to be the most effective, practical means of avoiding or reducing environmental impacts; a method, activity, or procedure for reducing the amount of pollution entering a water body. BMPs may include schedules of compliance, operation and maintenance procedures, and treatment requirements.
box culvert	A structure that allows water to flow under a road, railroad, trail, or similar obstruction.
built resources	Built environment that includes historic sites, buildings, structures, objects, districts, and landscapes.
circuit	The complete path of an electric current, including usually the source of electric energy.
conductor	The wire cable strung along a transmission line through which electricity flows.
corona	The glow around a conductor at high potential.
cultural landscape	Cultural properties representing the combined works of nature and man.
cultural resources	Historic, archaeological, or paleontological resources, including properties of traditional and cultural significance, sacred sites, Native American human remains, and associated objects, which are entitled to special consideration under federal statute, regulations, and executive orders.
culvert	A pipe or concrete box structure that drains open channels, swales, or ditches under a roadway or embankment. Typically, a culvert is not connected to a catch basin or manhole along its length.
current	The flow of an electrical charge through the transmission line conductor (as compared to voltage, which is the force that drives the electrical charge).
dead-end tower	A heavy tower designed for use where the transmission line loads the tower primarily in tension (pull) rather than compression (downward push).
ecoregion	Large area that has a distinct combination of climate, soils, and landforms.
erosion	The movement of soil and surface sediments caused by wind and water.
ethnographic	Identifying with a specific culture or group.
extant population	Population still in existence.
ford	A shallow place in a body of water, such as a river, where one can cross by walking or riding an animal or vehicle.
fossorial	Species adapted for digging
greenhouse gases	Chemical compounds found in the Earth's atmosphere that absorb and trap infrared radiation as heat.
historic properties	Any district, site, building, structure, artifact, ruin, object, work of art, or natural feature important in human history that meets defined eligibility criteria for the National Register of Historic Places.

impairment span	A span (stretch between two towers) where the conductor-to-ground clearance is not sufficient for the power rating of the line.
lithology	General physical characteristics of a rock or rock unit.
loess	Silt-sized sediment that is formed by the accumulation of wind-blown dust.
megawatt	One million watts
noxious weeds	Plants that are injurious to public health, crops, livestock, land or other property, as identified by state law.
Paleofloral	Prehistoric plant species.
pulling site	A staging area located at the beginning of a segment along the transmission line where equipment (i.e., a puller) is set up and used to pull the conductor through the transmission line.
reconducted	To replace the cable or wire on a transmission line.
resident fish	Fish species that reside in fresh water throughout their lives.
sock line	A line used to install the conductor through a tower. The sock line is used to pull the hard line through the transmission line, which is then used to pull the conductor through.
spur road	A short length of new road extending an existing road network.
staging areas	The area cleared and used by BPA or BPA's contractor to store and assemble materials or towers immediately before and during construction.
stormwater runoff	The portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a drainage system into a defined surface waterbody or treatment facility.
suspension towers	Towers designed to support conductors strung along a virtually straight line with only small turning or descending or ascending angles. Approximately 5 suspension towers are used to a mile.
tensioning site	A staging area located at the end of a segment along the transmission line where equipment (i.e., a tensioner) is set up and used to tighten the conductor along the transmission line.
turbidity	A condition in water caused by the presence of suspended material resulting in scattering and absorption of light rays.
wetlands	Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not usually include those artificial wetlands intentionally created from non-wetland sites, including, but not limited to irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities. However, wetlands may include artificial wetlands intentionally created from non-wetland areas to mitigate conversion of wetlands, if permitted by the appropriate authority.

6.2 ACRONYMS AND ABBREVIATIONS

AC	alternate current
ACEC	Areas of Critical Environmental Concern
ADT	average daily trip
AM	amplitude-modulated
APE	area of potential effect
BA	Biological Assessment
BLM	Bureau of Land Management
BMP	best management practice
BP	before present
BPA	Bonneville Power Administration
CEQ	Council on Environmental Quality
cfs	cubic feet per second
CH ₄	methane
CO	carbon monoxide
CO ₂	carbon dioxide
CO _{2e}	carbon dioxide equivalent
Corps	United States Army Corps of Engineers
CRNG	Crooked River National Grassland
CWA	Clean Water Act
CWMA	cooperative weed management areas
dB	decibel
dBA	adjusted decibel
DC	direct current
DEQ	Department of Environmental Quality
DO	dissolved oxygen
DPS	distinct population segment
DSL	Department of State Lands
EA	Environmental Assessment
EFH	essential fish habitat
EFU	Exclusive Farm Use
EI	Erodibility Index
EIS	Environmental Impact Statement
EMF	electric and magnetic field
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FCRPS	Federal Columbia River Power System
FEMA	Federal Emergency Management Agency
FLPMA	Federal Land Policy and Management Act
FMO	feeding, migratory, and overwintering
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
FSM	Forest Service Manual

G	gauss
GHG	greenhouse gas
GIS	Geographic Information System
HFC	hydrofluorocarbons
HUC	hydrologic unit code
HVDC	high voltage direct current
ICES	International Committee on Electromagnetic Safety
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ISSSSP	Interagency Special Status/Sensitive Species Program
kV	kilovolt
kV/m	kilovolt per meter
L _{dn}	day-night level
L _{eq}	equivalent noise level
LM	line miles
MBTA	Migratory Bird Treaty Act
MCR	Middle Columbia River
mG	milligauss
MOU	Memorandum of Understanding
MPD	Multiple Property Document
MW	megawatt
N ₂ O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESC	National Environmental Services Center
NHPA	National Historic Preservation Act Statute
NLCD	National Land Cover Dataset
NPCC	Northwest Power and Conservation Council
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRPB	National Radiological Protection Board of Great Britain
NWI	National Wetlands Inventory
OAR	Oregon Administrative Rule
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ODSL	Oregon Department of State Lands
OHV	off-highway vehicle
OHWM	ordinary high water mark
OPLMA	Omnibus Public Land Management Act
ORBIC	Oregon Biodiversity Information Center
ORS	Oregon Revised Statute
ORWAP	Oregon Rapid Wetland Assessment Protocol
OWRD	Oregon Water Resources Department
PCB	polychlorinated biphenyls

PDCI	Pacific Direct Current Intertie
PFC	perfluorocarbons
PGH	Preliminary General Habitat
PM	particulate matter
PM ₁₀	particles of 10 micrometers (microns) or less
PM _{2.5}	particles less than 2.5 micrometers (microns) in aerodynamic diameter
PPH	Preliminary Priority Habitat
PRPA	Paleontological Resources Preservation
RCRA	Resource Conservation and Recovery Act
RMP	Resource Management Plan
SAAQS	State Ambient Air Quality Standards
SF ₆	sulfur hexafluoride
SIP	State Implementation Plan
SMA	Special Management Area
SRMA	Special Recreation Management Area
SSS	Sensitive or Special Status
SWPPP	Stormwater Pollution Prevention Plan
TCP	Traditional Cultural Properties
TMDL	total maximum daily load
USC	United States Code
USDOE	United States Department of Energy
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VRM	Visual Resource Management
WSA	Wilderness Study Area

Chapter 7: References

- Adamus, P., J. Morlan, and K. Verble
2010 Manual for the Oregon Rapid Wetland Assessment Protocol (ORWAP). Version 2.0.2. Oregon Dept. of State Lands, Salem, OR.
- Atzet T., D. White, L. McCrimmon, P. Martinez, P. Fong, V. Randal.
1996 Field Guide to the Forested Plant Associations of Southwestern Oregon. USDA Forest Service, Portland, OR.
- Blinn, C.R., R. Dahlman, L. Hislop, and M. A. Thompson
1998 Temporary Stream and Wetland Crossing Options for Forest Management. General Technical Report NC-202, North Central Research Station, MN.
- Bonneville Power Administration (BPA)
2000 *Transmission System Vegetation Management Program Final Environmental Impact Statement*. May 2000. Available online at:
http://efw.bpa.gov/environmental_services/Document_Library/Vegetation_Management/FEIS0285.pdf.
2001 BPA Manual Chapter 820: Real Property Acquisition. January 16, 2001. Available online at:
<http://www.bpa.gov/EBR/BPAManual/toc.htm#PART: PROPERTY AND SUPPLY MANAGEMENT>.
2003 Raymond-Cosmopolis Transmission Line Rebuild Project Final Environmental Assessment. August 2003. Available online at:
http://efw.bpa.gov/environmental_services/Document_Library/Raymond_Cosmopolis/FEA1425web.pdf.
- Braun, Clait E.
1998 Sage Grouse Declines in Western North America: What are the Problems? Colorado Division of Wildlife. Proc. Western Assoc. State Fish and Wildlife Agencies 78:000-000.
- Bureau of Land Management (BLM)
1982 Draft Brothers Grazing Management Program Environmental Impact Statement. Available online at:
http://www.blm.gov/or/districts/prineville/plans/files/brothers_lapine_deis.pdf.
1986 Two Rivers Resource Management Plan. June 1986. Available online at:
www.blm.gov/or/districts/prineville/plans/files/pdo_tworivers_06_1986.pdf.
1989 Brothers/La Pine Resource Management Plan. July 1989. Available online at:
http://www.blm.gov/or/districts/prineville/plans/files/brothers_lapine_rmp.pdf.
2003 Lakeview Resource Management Plan and Record of Decision. November 2003. Available online at:
<http://www.blm.gov/or/districts/lakeview/plans/lakeviewrmp.php>.
2005 Upper Deschutes Resource Management Plan. October 2005. Available online at:
<http://www.blm.gov/or/districts/prineville/plans/deschutesrmp/>. 2010 Examples of Substantive Comments, July 2010. Available online at:
http://www.blm.gov/wo/st/en/prog/planning/nepa/webguide/document_pages/6_9

[2_1_examples.html](#). 2014 BLM recreation website, accessed Jan 2, 2014.
http://www.blm.gov/or/resources/recreation/site_info.php?siteid=401

- Burke, J. L., K. K. Jones, and J. M. Dambacher
2010 Habrate: A Limiting Factors Model for Assessing Stream Habitat Quality for Salmon and Steelhead in the Deschutes River Basin. Information Report 2010-03, Oregon Department of Fish and Wildlife, Corvallis.
- California Burrowing Owl Consortium (CBOC)
1993 Burrowing Owl Survey Protocol and Mitigation Guidelines. Prepared by The California Burrowing Owl Consortium. April 1993. Available online at:
<http://www.dfg.ca.gov/wildlife/nongame/docs/boconsortium.pdf>.
- Clarkin, K., G. Keller, T. Warhol, and S. Hixson
2006 Low-Water Crossings: Geomorphic, Biological, and Engineering Design Considerations. 0625 1808P. San Dimas, CA: U.S. Department of Agriculture, Forest Service, San Dimas Technology and Development Center. 366 p.
- Camp, Pamela and John G. Gamon
2011 Field Guide to the Rare Plants of Washington. Seattle, WA: University of Washington Press, 2011. 408 pp. Illustrated. ISBN 9780295990927.
- Chappell, H.N., C.E. Prescott, and L. Vesterdal
1999 Long-Term Effects of Nitrogen Fertilization on Nitrogen Availability in Coastal Douglas-Fir Forest Floors. Soil Science Society of America. 63:1448 – 1454. September 1999.
- Coates, Peter S. and David J. Delehanty
2010 Nest predation of greater sage-grouse in relation to microhabitat factors and predators. Journal of Wildlife Management. 74(2): 240 – 248
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe
1979 Classification of Wetlands and Deepwater Habitats of the United States. Government Printing Office, Washington, D.C.
- Crawford, Rex C. and Jimmy Kagan
2002 No. 17. Dwarf Shrub-steppe and No 18 Desert Playa and Salt Scrub Shrublands. Available online at:
http://www.cbfwa.org/fwprogram/reviewcycle/fy2002cp/projects/extras/25098x/whr_cd/docs/defs/WHDF_H17.HTM and
http://www.cbfwa.org/fwprogram/reviewcycle/fy2002cp/projects/extras/25098x/whr_cd/docs/defs/WHDF_H18.HTM.
- Crook County
2003a Crook County Comprehensive Plan. Adopted 1978. Codified January 2003.
2003b Crook County Zoning Ordinance.
- Cushman, Kathleen and Christopher Pearl
2007 A Conservation Assessment for the Oregon Spotted Frog (*Rana pretiosa*). USDA Forest Service Region 6. USDI Bureau of Land Management, Oregon and

Washington. March 2007. Available online at:
http://fresc.usgs.gov/products/papers/1578_Pearl.pdf.

Dealy, J., D. Leckenby, D. Concannon.

1981 Wildlife habitats in managed rangelands - the Great Basin of southeastern Oregon. USDA Forest Service, Portland, Or. GTR-PNW-120.

DeLong, J. P.

2004 Effects of management practices on grassland birds: Golden Eagle. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Wildlife Research Center Online. Available online at:
<http://www.npwrc.usgs.gov/resource/literatr/grasbird/goea/goea.htm>.

Department of State Lands (DSL)

2004 Just the Facts...Wetland Functions and Assessment. Oregon Department of State Lands Wetland Program, Salem, OR.

Deschutes County

2005 Deschutes County Comprehensive Plan.
2012 Deschutes County Zoning Ordinance.

DSL, United States Environmental Protection Agency, and U.S. Army Corps of Engineers

2010 *Guidance for Using the Oregon Rapid Wetland Assessment Protocol (ORWAP) in the State and Federal Permit Programs*. April 2010.

Ecological Society of America

2008 Jan-Peter Mund (Topic Editor). Soil Carbon Sequestration Fact Sheet. In C. J. Cleveland (ed.), *Encyclopedia of Earth*. Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment. Available online at:
http://www.eoearth.org/article/Soil_carbon_sequestration_fact_sheet. Accessed on: April 22, 2013.

Environmental Laboratory

1987 Corps of Engineers Wetland Delineation Manual. Technical Report Y-87-1. Department of the Army, Waterways Experiment Station. Vicksburg, Mississippi.

Environmental Protection Agency (EPA)

1971a *Community Noise*.
1971b *Noise from Construction Equipment and Operations, Building Equipment and Home Appliances*. December, 1971.
2013 *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011*. Available online at: <http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html>. Accessed on: April 30, 2013.

Everard, T. Harrison, Norman C. Donaldson, Fred R. McCreary, Arnold O. Ness, and Stefen Krashevski

- 1964 Soil Survey of Walla Walla County, Washington. February. Prepared for the U.S. Department of Agriculture, Soil Conservation Service, in cooperation with the Washington Agricultural Experiment Station.

Exponent

- 2013 *Bonneville Power Administration: Pacific DC Intertie Transmission Line – Modeling and Health and Environmental Assessment of the Electrical Environment.* May 21, 2013.

Gauger, J. R.

- 1985 *Household Appliance Magnetic Field Survey.* IEEE PAS-104, No.9:2436-244.

Gilmer, David S. and John M. Wiehe

- 1977 Nesting by ferruginous hawks and other raptors on high voltage powerline towers. US Fish and Wildlife Service Publications. Paper 249.

Hall, F.C.

- 1973 Plant communities of the Blue Mountains in eastern Oregon and southeastern Washington. Region 6 Area Guide 3-1. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. 62 p. Hamer Environmental
2013 Draft BPA PDCI Rare Plant Survey. Portland, Oregon.

HDR Engineering, Inc. (HDR)

- 2013a Baseline Habitat Characterization Report prepared for Bonneville Power Administration by HDR and Hamer Environmental. October 2013.
2013b Undesirable Plant Survey Report prepared for Bonneville Power Administration by HDR. September 16, 2013.
2013c Wetland Delineation Report prepared for Bonneville Power Administration by HDR. August 2013.

Intergovernmental Panel on Climate Change

- 2007 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 4. Prepared by the National Greenhouse Gas Inventories Programme: Eggleston H. S., L. Buendia, K. Miwa, T. Ngara, and K. Tanabe (eds.). Japan: Institute for Global Environmental Strategies.

International Committee on Electromagnetic Safety on Non-Ionizing Radiation (ICES)

- 2002 *C95.6 IEEE Standard for safety levels with respect to human exposure to electromagnetic fields, 0-3 kHz.* IEEE.

International Commission on Non-Ionizing Radiation Protection (ICNIRP).

- 1994 *Guidelines on limits of exposure to static magnetic fields.* Health Physics 66:100-106.

Jefferson County

- 2010a Jefferson County Comprehensive Plan. Adopted December 27, 2006, Amended January 27, 2010.

- 2010b Jefferson County Zoning Ordinance. Adopted December 27, 2006, Amended July 14, 2010.
- Johnson, C. and R. Clausnitzer
1992 Plant associations of the Blue and Ochoco Mountains. USDA Forest Service, PNW, Portland, Or. R6-ERW-TP036-92.
- Johnson, C. and S. Simon
1986 Plant associations of the Wallowa-Snake Province Wallowa-Whitman National Forest. USDA Forest Service, PNW, Portland, Or. R6-ECOL-1986.
- Johnson, D.H., and T.A. O'Neil, (eds.)
2001 Wildlife-habitat relationships in Oregon and Washington. Corvallis, OR: Oregon State University Press. 736 p.
- Kagan, J. and S. Caicco
1992 Manual of Oregon actual vegetation. US Fish & Wildlife Service, Biological Resources Division-GAP analysis program, Portland, Or.
- Kessavalou, Anabayan, John W. Doran, Arvin R. Mosier, and Rhae A. Drijber.
1998 Greenhouse Gas Fluxes Following Tillage and Wetting in a Wheat-fallow Cropping System. *Journal of Environmental Quality* 27:1105–1116.
- Knight, Richard L. and Jack Y. Kawashima
1993 Responses of raven and red-tailed hawk populations to linear right-of-ways. *Journal of Wildlife Management*. 57(2): 266 – 271.
- Kovalchik, B.
1987 Riparian zone associations; Deschutes, Winema, Ochoco, and Fremont National Forests. USDA Forest Service, PNW, Portland, Or. R6-ECOL-TP-279-87.
- Kramer, George
2010 *Bonneville Power Administration Pacific Northwest Transmission System, Multiple Property Documentation Form*. National Register of Historic Places, National Park Service. Prepared for the Bonneville Power Administration. Kramer and Company, Ashland, OR.
- Landscape America
2013 Ecoregions in Washington. Available online at: http://www.landscape.org/washington/natural_geography/ecoregions/. Accessed on: July 11, 2013.
- Lake County
1982 Lake County Comprehensive Plan. Adopted May 1980, Amended April 1982.
1989 Lake County Zoning Ordinance. Adopted May 1980, Amended September 1989.
- Martin, Dr. James E.
2013 Confidential report prepared for the Bonneville Power Administration. Paleontological Resources Survey and Analysis: Report 2 and July 2013

- Maruvada, PS
1982 *Corona-generated space charge environment in the vicinity of HVDC transmission lines*. IEEE Trans. on Electrical Insulation. Vol. EI-17:125-130.
- Mayfield, M. and J. Kjelman
1981 Boardman research natural area, supplement #17. Supplement to Federal Research Natural Areas in Oregon and Washington. USDA Forest Service, PNW, Portland, Or.
- McCune, B. and R. Rosentreter
1992 *Texosporium sancti-jacobi*, a rare western North American lichen. *The Bryologist* 95:329-333. Miller, D. A.
1974 Electrical and magnetic fields produced by commercial power systems. Pages 62–70 in Llaurodo, J. G. et al. (ed.), *Biological and Clinical Effects of Low-Frequency Magnetic and Electric Fields*. Charles C. Thomas, Springfield, IL. 345 pp.
- Mozingo, H.
1987 *Shrubs of the Great Basin*. Univ. of Nevada Press, Reno, NV.
- Murphy, M.L. and W.R. Meehan
1991 *Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitat*. American Fisheries Society, Special Publication No. 19, Bethesda, Maryland.
- National Institute of Environmental Health
2002 *EMF Electric and Magnetic Fields Associated with the Use of Electric Power: Questions and Answers*. Research Triangle Park, NC: National Institute of Environmental Health Sciences of the U.S. National Institutes of Health.
1999 *Health Effects from Exposure to Powerline Frequency Electric and Magnetic Fields*. NIH Publication No. 99-4493. National Institute of Environmental Health Sciences of the U.S. National Institutes of Health, Research Triangle Park, NC.
1998 *Assessment of Health Effects from Exposure to Powerline Frequency Electric and Magnetic Fields: Working Group Report*. NIH Publication No. 98-3981. National Institute of Environmental Health Sciences of the U.S. National Institutes of Health, Research Triangle Park, NC.
- National Marine Fisheries Service (NMFS)
1999 *Endangered and Threatened Species: threatened Status for Two ESUs of Steelhead in Washington and Oregon*. 64 Federal Register 14518. March 25.
2005 *5-Year Review: Summary & Evaluation of Middle Columbia River Steelhead*. Northwest Region, Portland, OR.
- National Park Service (NPS)
2012 *Wild and Scenic Inventory*. Available online at: <http://www.nps.gov/ncrc/programs/rtca/nri/states/or.html>.
- National Radiological Protection Board (NRPB)
2004 *Documents of the NRPB. Advice on limiting exposure to electromagnetic fields (0-300 GHz)*. Volume 15(2). Chilton, Didcot, Oxon OX11 0RQ.

National Scenic Byways Program

- 2011 America's Byways Fact Sheet. Available online at:
http://byways.org/press/fact_sheet.html.

Newcombe, C.P. and J.O. Jensen.

- 1996 Channel Suspended Sediment and Fisheries: A Synthesis for Quantitative Assessment of Risk and Impact. North American Journal of Fisheries Management. 16:693-727, 1996.

Northwest Habitat Institute (NHI)

- 1998 Oregon Gap Analysis. Corvallis, Oregon. Available online at:
http://www.nwhi.org/nhiweb/projects.html/#or_veg.

Northwest Power and Conservation Council (NPCC)

- 2004 Draft Fifteenmile subbasin plan. Prepared by Wasco County Soil and Water Conservation District and Fifteenmile Coordinating Group.

Oregon Biodiversity Information Center (ORBIC)

- 2012 Rare, Threatened and Endangered Species of Oregon, Oregon Biodiversity Information Center, Portland, OR.

Oregon Department of Environmental Quality (ODEQ)

- 2012 2011 Oregon Air Quality Data Summaries. June, 2012.
2013 Air Quality Maintenance and Nonattainment Areas. Available online at:
<http://www.deq.state.or.us/aq/planning/index.htm>. Accessed on: May 3, 2013.

Oregon Department of Fish and Wildlife (ODFW)

- 2006 Oregon Conservation Strategy. Oregon Department of Fish and Wildlife, Salem, Oregon. Available online at:
http://www.dfw.state.or.us/conservationstrategy/docs/document_pdf/b-habitat_11.pdf.
- 2009 Species Fact Sheet Canada Lynx (*Lynx Canadensis*). Available online at:
<http://www.fws.gov/oregonfwo/species/Data/CanadaLynx/>. Updated October 30, 2009. Accessed on: June 17, 2013.
- 2011 Core Area Approach to Habitat Mitigation for Greater Sage-Grouse in Oregon. Available online at:
http://www.dfw.state.or.us/wildlife/sagegrouse/docs/Sage_Grouse_Core_Areas_Fact_Sheet.pdf. July 15, 2011.
- 2013 Species Fact Sheet Washington Ground Squirrel (*Uroditellus washingtoni*). Available online at:
<http://www.fws.gov/oregonfwo/Species/Data/WashingtonGroundSquirrel/default.asp>. Updated on April 23, 2013. Accessed on: June 17, 2013.

Oregon Department of Geology and Mineral Industries

- 2013 Volcanic hazards. Available online at:
<http://www.oregongeology.org/sub/earthquakes/volcanoes.htm>. Accessed on: September 18, 2013.

Oregon Employee Development Department

- 2012 Covered Employment and Wages Summary Report. Available online at:

<http://www.qualityinfo.org/olmisj/OlmisZine>.

Oregon Global Warming Commission

- 2010 Interim Roadmap to 2020. October 29, 2010. Available online at:
http://www.keeporegoncool.org/sites/default/files/Integrated_OGWC_Interim_Roadmap_to_2020_Oct29_11-19Additions.pdf.

Oregon State University Extension Service

- 2008 Oregon Agricultural Information Network (OAIN). Available online at:
<http://oain.oregonstate.edu/>. Accessed on: March 22, 2013.

Oregon Water Resources Department (OWRD)

- 2013 Water Rights Mapping Tool. Available online at:
<http://apps.wrd.state.or.us/apps/gis/wr/Default.htm>. Accessed on: April 16, 2013.

Oregon Watershed Enhancement Board (OWEB)

- 1999 Oregon watershed assessment manual: Salem, Oregon. Available online at:
http://www.oweb.state.or.us/OWEB/docs/pubs/OR_wsassess_manuals.html.

Pagel, J. E., D. M. Whittington, and G. T. Allen

- 2010 Interim Golden Eagle technical guidance: inventory and monitoring protocols; and other recommendations in support of eagle management and permit issuance. U.S. Fish and Wildlife Service, Division of Migratory Bird Management. 30 pp. Parker, Patricia L. and Thomas F. King
1998 *Guidelines for Evaluating and Documenting Traditional Cultural Properties*. U.S. Department of Interior, National Park Service. Washington, D.C.

Rowland, Mary M. Lowell H Suring, Robin J. Tausch, Susan Geer, and Michael J. Wisdom

- 2008 Characteristics of Western Juniper Encroachment into Sagebrush Communities in Central Oregon Available online at:
<http://www.fs.fed.us/wwetac/publications/Juniper-in-Oregon.pdf>.

Sage-grouse National Technical Team

- 2011 A report on national greater sage-grouse conservation measures. December 21, 2011.

Shiftlet, T.

- 1994 Rangeland cover types of the United States. Society for range management. Denver, Col.

Sigler, J.W., T.C. Bjornn, and F.H. Everest

- 1984 Effects of chronic turbidity on density and growth of steelhead and Coho. Transactions of the American Fisheries Society 113: 142-150.

Taylor, S.E., R.B. Rummer, K.H. Yoo, R.A. Welch, and J.D. Thompson

- 1999 What we know and don't know about water quality at stream crossings. Journal of Forestry. August 1999.

Topik, C., N. Halverson, and T. High.

1988 Plant associations and management guide for the ponderosa pine, Douglas fir, and grand fir zones, Mt. Hood National Forest. USDA Forest Service, PNW, Portland, Or. R6-ECOL-TP-004-88.

U.S. Army Corps of Engineers (Corp)

2008 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (Version 2.0), ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-08-28. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

U.S. Census Bureau

2010 2010 Census Data. Available online at: <http://www.census.gov/2010census/data/>.

U.S. Census Bureau, American Fact Finder.

2012 2007-2011 American Community Survey Five Year Estimates. Available online at: <http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>.

U.S. Census Bureau, Population Division

2012 Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2012. December 2012.

U.S. Department of Agriculture (USDA)

1975 Soil Conservation Service. 1975. Soil Survey of Trout Creek-Shaniko Area, Oregon.

1982 Soil Survey of Wasco County, Oregon, Northern Part.

1999a Natural Resources Conservation Service. 1999. Soil Survey of Upper Deschutes River Area, Oregon, includes parts of Deschutes, Jefferson, and Klamath Counties.

1999b Natural Resources Conservation Service. 1999. Soil Survey of Lake County, Oregon, Southern Part.

2011 Economic Research Service County Level Data Sets – Median Household Income. Available online at: http://www.ers.usda.gov/data-products/county-level-data-sets/unemployment.aspx?reportPath=/State_Fact_Sheets/UnemploymentReport&start_year=2009&end_year=2010&fips_st=41.

2012 Natural Resources Conservation Service. 2012. Soil Survey of Lake County, Oregon, Northern Part, Parts of Lake and Klamath Counties.

2013 Natural Resources Conservation Service. As acquired on June 26, 2013 from <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/?cid=stelprdb1041925>

U.S. Department of Energy and U.S. Fish and Wildlife Services (USFWS)

2013 Memorandum of Understanding between United States Department of Energy and the United States Fish and Wildlife Service Regarding Implementation of Executive Order 13186, “Responsibilities of Federal Agencies to Protect Migratory Birds.” September 12, 2013.

U.S. Department of the Interior (USDI)

2008 Bureau of Land Management Instruction Memorandum No. 2008-2009, Potential Fossil Yield Classification (PFYC) System.

U.S. Energy Information Administration

- 2009a Energy and the Environment. Greenhouse Gases Basics. Available online at: http://tonto.eia.doe.gov/energyexplained/index.cfm?page=environment_about_ghg. Accessed on: January 29, 2010.
- 2009b Emissions of Greenhouse Gases Report. DOE/EIA-0573(2008). Available online at: <http://www.eia.doe.gov/oiaf/1605/ggrpt/>. Accessed on: July 19, 2010.

U.S. Environmental Protection Agency (EPA)

- 1978 *Protective Noise Levels. Condensed Version of EPA Levels Document. (No. PB82-138827)*. U.S. Environmental Protection Agency, Washington, DC.
- 2010 Climate Change – Regulatory Initiatives: Greenhouse Gas Reporting Program. Available online at: <http://www.epa.gov/climatechange/emissions/ghgrulemaking.html>.
- 2013 Sole Source Aquifer Maps. Region 10. Updated April 16, 2013. Available online at: <http://yosemite.epa.gov/r10/water.nsf/Sole+Source+Aquifers/ssamaps>. Accessed on: April 16, 2013.

U.S. Fish and Wildlife Service (USFWS)

- 1981 U.S. Fish and Wildlife Service Mitigation Policy. Federal Register Volume 46, No. 15. Friday, January 23, 1981.
- 1998 Recovery Plan for the Native Fishes of the Warner Basin and Alkali Subbasin. Portland, Oregon. 86 pp.
- 2002 Chapter 7, Deschutes Recovery Unit, Oregon. 62 p. In: U.S. Fish and Wildlife Service. Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan. Portland, Oregon.
- 2003 Status Assessment and Conservation Plan for Western Burrowing Owl in the United States. Biological Technical Publication BTP-R6001-2003. Available online at: <http://www.fws.gov/mountain-prairie/species/birds/wbo/Western%20Burrowing%20Owlrev73003a.pdf>.
- 2008 Yellow-billed Cuckoo. Oregon Fish and Wildlife Office. Available online at: <http://www.fws.gov/oregonfwo/species/data/yellowbilledcuckoo/>. Last updated April 17, 2008. Accessed on: June 13, 2003.
- 2009 Species Assessment and Listing Priority Form for the Columbia spotted frog (Great Basin DPS). Available online at: http://ecos.fws.gov/docs/candforms_pdf/r8/D027_V01.pdf.
- 2010 Species Fact Sheet: Columbia spotted frog (*Rana luteiventris*). Oregon Fish and Wildlife Service. Available online at: <http://www.fws.gov/oregonfwo/Species/Data/ColumbiaSpottedFrog/>. Updated November 10, 2010. Accessed on: February 26, 2013.
- 2012 Species Fact Sheet: Oregon spotted frog (*Rana pretiosa*). Oregon Fish and Wildlife Office. Available online at: <http://www.fws.gov/oregonfwo/Species/Data/OregonSpottedFrog/>. Updated February 22, 2012. Accessed on: June 14, 2013.
- 2013a Species profile for the North American wolverine (*Gulo gulo luscus*). U.S. Fish and Wildlife Service Environmental Conservation Online System. <http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?scode=A0FA#lifeHistory>. Updated June 16, 2013. Accessed on: June 17, 2013.

- 2013b Species Fact Sheet: Warner sucker. Available online at: <http://www.fws.gov/oregonfwo/Species/Data/WarnerSucker/>. Last updated February 5, 2013. Access on: May 20, 2013.
- 2013c Species Fact Sheet: Pacific Lamprey. Available online at: <http://www.fws.gov/oregonfwo/Species/Data/PacificLamprey/>. Last updated February 25, 2013. Accessed on: May 20, 2013.
- 2013d Federally Listed, Proposed, Candidate, Delisted Species and Species of Concern By Oregon County. Available online at: <http://www.fws.gov/oregonfwo/Species/Lists/>.

U.S. Forestry Service (USFS)

- 1989 Ochoco National Forest Land and Resource Management Plan. Available online at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5260372.pdf.

U.S. Geological Survey (USGS)

- 2004 Geological Provinces of the United States: Records of an Active Earth. Available online at: <http://geomaps.wr.usgs.gov/parks/province/>. Accessed on: May 7, 2013. Last updated January 13, 2004.
- 2006 National Gap Analysis Program (GAP) Land Cover. 2006. Available online at: <http://gapanalysis.usgs.gov/gaplandcover/>. Accessed on: March 22, 2013.
- 2008 The Challenges of Linking Carbon Emissions, Atmospheric Greenhouse Gas Concentrations, Global Warming, and Consequential Impacts. May 14, 2008. Available online at: http://www.usgs.gov/climate_landuse/info_quality_docs/director_memo_14may08.pdf.

Ulmschneider, H.

- 2008 Surveying for Pygmy Rabbits (*Brachylagus idahoensis*); Interagency Pygmy Rabbit Working Group, Bureau of Land Management, Boise District, Idaho.

Volland, L.

- 1985 Plant associations of the central Oregon pumice zone. USDA Forest Service, PNW, Portland, Or. R6-ECOL-104-1985.

Walker, George W. and Bruce Nolf

- 2006 High Lava Plains, Brothers fault zone to Harney Basin, Oregon. U.S. Geological Survey. Circular 838. Available online at: http://www.cr.nps.gov/history/online_books/geology/publications/circ/838/sec5.htm.

Wasco County

- 2008 Wasco County Comprehensive Plan. Community Facilities and Services. June 25 2008.
- 2010 Wasco County Comprehensive Plan. June 1, 2010.
- 2012 Wasco County Land Use and Development Ordinance. April 2012.

Wasco Country Soil and Water Conservation District (SWCD)

- 2005 Bakeoven Watershed Assessment and Action Plan. Wasco County, The Dales, OR.

Whiteaker, L., J. Henderson, R. Holmes, L. Hoover, R. Leshner, J. Lippert, E. Olson, L. Potash, J. SeEVERS, M. Stein, N. Wogen.

1998 Survey protocols for survey & manage strategy 2 vascular plants. V 2.0. Bureau of Land Management. Available online at:
<http://www.blm.gov/or/plans/surveyandmanage/SP/VascularPlants/cover.htm>.

Whitehead, R.L.

1994 Ground Water Atlas of the United States; Idaho, Oregon, Washington. HA 730-H. US Geological Survey. Available online at:
http://pubs.usgs.gov/ha/ha730/ch_h/index.html. Accessed on: April 16, 2013.

Williams, I., J. Johnson, D. Hendrickson, S. Contreras-Balderas, J. Williams, M Navarro-Mendoza, D. McAllister, and J. Deacon

1989 Fishes of North America Endangered, Threatened, or of Special Concern: 1989. *Fisheries*. Vol.14, no. 6, pp. 2-20.

Appendix A

Greenhouse Gases Technical Report

Introduction

Greenhouse gases (GHG) are chemical compounds found 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 2009). The average temperature on Earth has risen by 1.5 degrees Fahrenheit over the past century (EPA 2013a). Most of the warming has been caused by GHG emissions (EPA 2013a). Scientists predict that the temperature will rise another 2 to 11.5 degrees Fahrenheit over the next century (EPA 2013a).

The principal GHGs emitted into the atmosphere through human activities are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and fluorinated gases (EPA 2012):

- **Carbon dioxide** is the major GHG emitted (EPA 2013b; Houghton 2010). CO₂ 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. CO₂ emissions resulting from the combustion of coal, oil, and gas constitute 84 percent of all U.S. GHG emissions (EPA 2013b). Before the industrial revolution, CO₂ concentrations in the atmosphere were roughly stable at 280 parts per million. As a result of human activities, by 2010 CO₂ levels had increased to 390 parts per million, which is a 40 percent increase (EPA 2013a).
- **Methane** is emitted during the processing and transport of fossil fuels, through intensive animal farming, and by the degradation of organic waste. Concentrations of CH₄ in the atmosphere have increased more than 2.5 times from preindustrial levels (EPA 2013a).
- **Nitrous oxide** is emitted during agricultural and industrial activities and during the combustion of fossil fuels and solid waste. Atmospheric levels of N₂O have increased 18 percent since the beginning of industrial activities (EPA 2013a).
- **Fluorinated gases**, including hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆), are synthetic compounds emitted through industrial processes. They sometimes replace ozone-depleting compounds such as chlorofluorocarbons (CFCs) in insulating foams, refrigeration, and air conditioning. Although fluorinated gases are emitted in small quantities, they have the ability to trap more heat than CO₂ and are considered gases with a high global warming potential (EPA 2013a).

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 is 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 federal **Clean Air Act** establishes regulations to control emissions from large generation sources such as power plants. Limited regulation of GHG emissions occurs through a review of new sources.
- The U.S. Environmental Protection Agency (EPA) has issued the **Final Mandatory Reporting of Greenhouse Gases Rule** 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 EPA, although no other action is required (40 CFR Parts 86, 87, 89 et al. Final Rule October 30, 2009).
- **Executive Orders 13423 and 13514** require federal agencies to measure, manage, and reduce GHG emissions by agency-defined target amounts and dates.
- In 2007, Oregon passed **House Bill 3543** establishing goals for reducing GHG emissions to 1990 levels by 2020. Additionally, **OAR 340-215-0010** requires certain facilities annually register and report their annual GHG emissions to DEQ.

Activities Contributing to GHG Emissions

The Proposed Action would involve upgrading the existing PDCI transmission line. Under the No Action Alternative, the transmission line would not be upgraded and ongoing operation and maintenance activities would continue. Implementation of the Proposed Action would contribute to an increase in GHG concentrations through the construction activities, requiring the use of gasoline and diesel-powered vehicles, including cars, trucks, construction equipment, and helicopters.

Methods Used to Calculate GHG Emissions

Project construction would take approximately 21 months (between May and November for road construction for 4 construction seasons), with peak construction activity, including road construction and tower work, occurring during a 4-month-long period (mid-September through mid-October for 4 construction seasons). Non-peak construction activities would include road improvements, installing and removing BMPs, establishing staging areas, moving equipment and materials into and out of the project area, and site preparation and restoration work.

The transportation components of GHG emissions were estimated 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 4-month-long peak construction period and the 17-month-long 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:

- 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 project.
- The round-trip distance to the project area would be within 75 miles of the project area.
- Fuel consumption is based on the average fuel economy for standard pickup trucks of 17 miles per gallon (EPA 2013c). Again, this is likely an overestimation as more efficient vehicles may be occasionally used.
- Average helicopter fuel consumption is estimated by BPA pilots at 1 mile per gallon.

Up to 128 construction workers would be at work on the transmission line during the peak construction period (4 months) and an estimated 16 workers could be present during the non-peak construction period (17 months). Workers would be on site up to 6 days per week.

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 1 round trip 2 times per week from the Portland, Oregon BPA Headquarters to Prineville during the 21-month-long construction period would result in a total of 168 round trips at an estimated 300 miles per trip.

Helicopters may be used to replace the conductor or to work in sensitive areas. It was assumed that the helicopter would be used for approximately 4 months (80 work days) to conduct this work. An estimated 2 round trips from within 75 miles of the project area each day would result in a total of 192 round trips at an estimated 150 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. Similar to the transportation activities listed above, increased use of heavy construction equipment would occur during peak construction.

Although it is difficult to develop an accurate estimation of total fuel consumption associated with heavy construction equipment operation, the following assumptions were used:

- A maximum of 30 equipment machines would be in operation during peak construction and 10 equipment machines would be in operation during non-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 a significant 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., 128,450 British thermal units per gallon of diesel) (AFDC 2013).

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 low levels of 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.

Results

GHG emissions were calculated using the estimated values described above for construction activities as discussed below.

Construction Emissions

Table D-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 6,207 metric tons of CO₂e⁶ (equivalent carbon dioxide) 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*.

Table D-1: Estimated GHG Emissions from Project Construction

Estimated GHG Emissions of Construction Activities	CO ₂ (metric tons)	CH ₄ (CO ₂ e) ¹ (metric tons)	N ₂ O (CO ₂ e) ¹ (metric tons)	Total CO ₂ e (metric tons) ³
Peak construction transportation	509.4	333.7	1994.9	2838.0
Non-peak construction transportation	277.1	181.6	1085.2	1543.9
BPA employee transportation	28.5	18.7	111.7	158.9
Helicopter operation	65.0	1.2	0.3	66.4
Peak construction equipment operation	3,005.5	3.2	20.1	3,028.7
Off-peak construction: equipment operation	4,257.8	4.5	28.4	4,290.7
TOTAL³	8143.28	542.8	3240.54	11926.59

¹ CO₂ emission factors calculated from DOE and EIA 2011. CH₄ and N₂O emission factors from EPA 2013b.

² CH₄ and N₂O emissions have been converted into units of equivalent carbon dioxide (CO₂e) using the Intergovernmental Panel on Climate Change global warming potential (GWP) factors of 21 GWP for CH₄ and 310 GWP for N₂O (ICBE 2000).

³ The sum of the individual entries may not sum due to rounding.

⁶ CO₂e is a unit of measure used by the Intergovernmental Panel on Climate Change that takes into account the global warming potential of each of the emitted GHGs using global warming potential factors.

Summary of Results

To summarize, the Proposed Action would result in an estimated total of 11,927 metric tons of CO₂e emissions during the construction phase.

To provide context for this level of emissions, EPA's mandatory reporting threshold for annual CO₂ emissions is 25,000 metric tons of CO₂e, roughly the amount of CO₂ generated by 4,400 passenger vehicles per year. The annualized project construction emissions would be equivalent to the emissions from approximately 1,200 passenger vehicles per year. All levels of GHG emissions contribute to global GHG concentrations and climate change; however, given the small anticipated contribution, the Proposed Action's impact on GHG concentrations would be *low*.

References

Alternative Fuels Data Center (AFDC)

- 2013 Alternative Fuels Data Center – Fuel Properties Comparison. Available at: http://www.afdc.energy.gov/fuels/fuel_comparison_chart.pdf. Accessed on: April 29, 2013.

U.S. Department of Energy (DOE) and Energy Information Administration (EIA)

- 2011 Documentation for Emissions of Greenhouse Gases in the U.S. 2008. DOE/EIA-0638. Available online at: [http://www.eia.gov/oiaf/1605/ggrpt/documentation/pdf/0638\(2008\).pdf](http://www.eia.gov/oiaf/1605/ggrpt/documentation/pdf/0638(2008).pdf). Accessed on: April 29, 2013.

U.S. Energy Information Administration (EIA)

- 2009 Energy and the Environment. Greenhouse Gases Basics. Available online at: http://tonto.eia.doe.gov/energyexplained/index.cfm?page=environment_about_ghg. Accessed on: April 29, 2013.

U.S. Environmental Protection Agency (EPA)

- 2012
2013a Climate Change Science Overview. Available online at: <http://www.epa.gov/climatechange/science/overview.html>. Accessed on: May 2, 2013.
2013b Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011. Available online at: <http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html>. Accessed on: April 30, 2013.
2013c Model Year 2013. Fuel Economy Guide. Available online at: <http://www.fueleconomy.gov/feg/pdfs/guides/FEG2013.pdf>. Accessed on April 29, 2013.

Houghton, R.A.

- 2010 How well do we know the flux of CO₂ from land-use change? *Tellus B*62:337-351. doi:10.1111/j.1600-0889.2010.00473.x.

International Carbon Bank and Exchange (ICBE)

2000 Calculating Greenhouse Gases. Available online at:
<http://www.icbe.com/emissions/calculate.asp>. Accessed on: April 29, 2013.

Kessavalou, A., J. W. Doran, A. R. Mosier, and R. A. Drijber

1998 Greenhouse Gas Fluxes Following Tillage and Wetting in a Wheat-fallow Cropping System. *Journal of Environmental Quality* 27:1105–1116.

