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PROPOSED

COLUMBIA WIND FARM #1

JOINT NEPA/SEPA

DRAFT

ENVIRONMENTAL IMPACT STATEMENT

Proposed by: Conservation and Renewable Energy System

Lead Agencies:

Bonneville Power Administration

Klickitat County, Washington

DOE/EIS-0206

Cover Memo

This Draft Environmental Impact Statement (DEIS) addresses the Columbia Wind Farm #1 (Project) proposal for construction and operation of a 25 megawatt (MW) wind power project in the Columbia Hills area southeast of Goldendale in Klickitat County, Washington. The Project would be constructed on private land by Conservation and Renewable Energy System (CARES) (the Applicant). An Environmental Impact Statement is required under both NEPA and SEPA guidelines and is issued under Section 102 (2) (C) of the National Environmental Policy Act (NEPA) at 42 U.S.C. 4321 et seq and under the Washington State Environmental Policy Act (SEPA) as provided by RCW 43.21C.030 (2) (c). Bonneville Power Administration is the NEPA lead agency; Klickitat County is the nominal SEPA lead agency and CARES is the SEPA co-lead agency for this DEIS.

The Project site is approximately 395 hectares (975 acres) in size. The Proposed Action would include approximately 91 model AWT-26 wind turbines. Under the No Action Alternative, the Project would not be constructed and existing grazing and agricultural activities on the site would continue.

Interested citizens, agencies, and tribes are invited to review this DEIS and provide written comments on or before May 1, 1995. Written comments should be addressed to Kathy Fisher - ECN3, Bonneville Power Administration, 905 NE 11th Avenue, Portland, Oregon 97232, (503) 230-4375 or Curt Dreyer, Klickitat County Planning Director, 228 West Main, Room 150, Goldendale, Washington 98620, (509) 773-5703. A Public Hearing to accept oral comments is scheduled on April 5, 1995, at 7:00 in the evening at the Klickitat County Public Utility District No. 1 hearing room in Goldendale, Washington (1313 South Columbus).

All comments received will be responded to in a Final EIS. The Final EIS will be used prior to the decision making process to determine if the Proposed Action should be given permits and approval needed for construction and operation of the Project.

Fact Sheet

Joint NEPA/SEPA Document
This Draft Environmental Impact Statement (DEIS) is a joint document issued under the National Environmental Policy Act (NEPA) and Washington State Environmental Policy Act (SEPA) as provided by under RCW 43.21C.030 (2) (c) and Section 102 (2) (C) of NEPA, 42 U.S.C. 4321 et seq.

Nature and Location of the Proposal
Conservation and Renewable Energy System (CARES), a joint operating agency under Washington State statutes, proposes to construct and operate the 25 megawatt (MW) Columbia Wind Farm #1 (Project) in the Columbia Hills area of Klickitat County, Washington known as Juniper Point. The CARES proposal was developed in response to the Bonneville Power Administration's (BPA) September 1992 *Request for Proposals (RFP) for a Wind Energy Demonstration Project.*

The legal description of the approximately 395 hectare (975 acre) site is Section 18, T3N, R17E, and the south half of Section 13, T3N, R16E. CARES proposes to have 91 wind turbines and associated facilities installed and operating with the intent of generating electricity from the available wind resources to sell to the BPA.

This EIS evaluates the No Project Alternative, which would avoid site-specific environmental impacts from this Project but would limit BPA's ability to diversify the long term power supply prospects in the region and CARES' ability to demonstrate the viability of renewable wind energy in the region. Under the No Action Alternative, the Project would not be constructed and existing grazing and other activities on the site would continue.

Tiered Environmental Review
This draft EIS is tiered to the environmental review of BPA's Resource Programs, which guide BPA's selection of alternative energy resources to meet the region's long term power needs. The February 1992 Resource Programs EIS (RP EIS), a programmatic document that evaluates the environmental tradeoffs among generic resource types and the cumulative effects of adding these resources to the existing system, is incorporated by reference into this EIS. This EIS is tiered to the RP EIS and evaluates the site-specific impacts from the proposed Project.

Project Applicant
Conservation and Renewable Energy System, a joint operating agency in the State of Washington

Tentative Date for Implementation
The Columbia Wind Farm #1 is proposed to begin construction by July 1995 and operation by January 1996.

Lead Agencies
Klickitat County is the nominal SEPA lead agency and CARES is the SEPA co-lead agency for the EIS. The U.S. Department of Energy, BPA is the lead agency under NEPA.

Responsible Officials and Contacts
SEPA: Curt Dreyer, Klickitat County Planning Director, 228 West Main, Room 150, Goldendale, Washington 98620, (509) 773-5703.
NEPA: Kathy Fisher - ECN3, Bonneville Power Administration, P.O. Box 3621, Portland, Oregon 97212, (503) 230-4375

Potentially Required Permits, Licenses, and Other Approvals Include:

APPROVAL	RESPONSIBLE AGENCY
Conditional Use Permit	Klickitat County
Building Permit(s)	Klickitat County
NPDES General Permit	Washington Department of Ecology
Section 404 Nationwide Permit for a stream crossing	U.S. Army Corps of Engineers
Electrical Permit(s)	Washington Department of Labor and Industries
ESA Section 7 Consultation	U.S. Fish and Wildlife Service
Power Purchase Agreement	Bonneville Power Administration

Authors and Principal Contributors

	EIS Preparation
Jones & Stokes Associates, Inc.	Avian Resources
	Other Wildlife
	Noise
	Air Quality
	Aesthetics
	Hydrology
	Botanical

R.W. Beck	Earth Land Use, Recreation, and Socioeconomics Transportation Public Services and Utilities Health and Safety
Archaeological and Historical Services Historical Research Associates, Inc.	Cultural Resource Inventory Oral Histories

Date of Issuance of Draft EIS
March 17, 1995

Joint NEPA/SEPA Public Comment Hearing on Draft EIS
April 5, 1995

Date Comments are Due on Draft EIS
May 1, 1995 (Received by Klickitat County Planning Department or the Bonneville Power Administration)

Nature and Date of Final Actions
The final actions will be decided by various permitting agencies, including a Conditional Use Permit issued by the Klickitat County Board of Adjustment. A hearing before the Board of Adjustment is expected in May/June 1995. Other permit decisions are expected in the third quarter of 1995. Final action by the BPA will be the execution of a Power Purchase Agreement with CARES. All of these dates are subject to change.

Type and Timing of Subsequent Environmental Review to Which the Lead Agencies Have Made Commitments
Not applicable.

Location of Background Environmental Data
Background material for this EIS, including supporting technical reports, are available during the Draft EIS comment period at the Klickitat County Planning Department, 228 West Main, Room 150, Goldendale, Washington, 98620, and at the Bonneville Power Administration, 905 NE 11th Avenue, Public Information Office, Portland, Oregon 97232. Supporting technical reports to this EIS include the following appendices:

- *Botanical Resources Technical Report for the Conservation and Renewable Energy System* Columbia Wind Farm #1 EIS, Jones & Stokes Associates, Inc., (February 3, 1995)
- Technical Report: A Cultural Resources Survey of the Proposed CARES Columbia Wind Farm #1 Klickitat County, Washington. Short Report 444,

Archaeological and Historical Services, Eastern Washington University (February 1995)

- Avian Use of proposed KENETECH and CARES Wind Farm Sites in Klickitat county, Washington, Jones & Stokes Associates, Inc., (January 1995).

These appendices have been distributed to county libraries and to resource agencies with expertise or jurisdiction over biological or cultural resources (see Part 6, Distribution List).

Cost to the Public for a Copy of the EIS

$24.00	per copy of the DEIS
$ 4.00	per copy of the Botanical Resources Technical Report
$ 4.00	per copy of the Cultural Resources Survey Report
$24.00	per copy of the Avian Use Report

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SUMMARY

S.1. Background

The Pacific Northwest Electric Power Planning and Conservation Act (Act) provides the framework for regional energy resource planning by the Bonneville Power Administration (BPA). Under the Act, the Northwest Power Planning Council (Council) develops a regional conservation and electric power plan. Every two years, BPA develops a Resource Program to translate the Council plan into a specific set of near-term actions with associated budgets.

One of the objectives of the Act is to encourage the development of renewable resources in the Pacific Northwest. Correspondingly, the Council's 1991 Power Plan identified the need to determine the cost and availability of new cost-effective resources, such as wind energy, through research and demonstration programs. BPA's 1992 Resource Program recognized the Resource Supply Expansion Program (RSEP) as the primary mechanism to achieve this objective. Through the RSEP, a wind power strategy was developed that acknowledged BPA should help host utilities develop small-scale wind demonstration projects. Implementing the wind power strategy would enable Northwest utilities to address regional barriers to cost effective wind development and gain hands-on experience with the operation and integration of commercial wind farms.

In September 1992, BPA issued a *Request for Proposals (RFP) for a Wind Energy Demonstration Project* to implement the RSEP wind strategy. Six proposals for the acquisition of output with utility services were received and underwent a four stage evaluation of both price and non-price factors. Based on the overall project scores, the combination of the Columbia Wind Farm #1 and the Wyoming Windplant #1, located in Carbon County, Wyoming, was determined to offer the best demonstration value to BPA. These two proposals were designated for further consideration by BPA. A third proposal, the Washington Windplant #1 in Benton County, Washington was identified as an alternate in the event negotiations were unsuccessful for the other two proposals.

Because development of the proposals could result in significant impacts on the human environment, the responsible federal and state agencies are preparing environmental impact statements (EIS). Each of the two proposals being considered by BPA is being evaluated independently because they are not alternatives to one another under the National Environmental Policy Act (NEPA). The Bureau of Land Management and BPA are preparing a NEPA EIS for the Wyoming Windplant in Carbon County, Wyoming. BPA and Klickitat County are jointly preparing a NEPA and Washington State Environmental Policy Act (SEPA) EIS for the Columbia Wind Farm. Both EISs are tiered to BPA's RP EIS, discussed in Section S.4.

The Columbia Wind Farm #1 (Project) was proposed to BPA by Conservation and Renewable Energy Systems (CARES), a joint operating agency under Washington State statutes. The charter and current members of CARES are the Public Utility Districts of Benton, Clallam, Franklin, Grays Harbor, Klickitat, Okanogon, Pacific, and Skamania counties. CARES' mission is to develop energy conservation, renewable energy, and other high-efficiency energy resources to assist in meeting the electric power service requirements in the Pacific Northwest.

As proposed, CARES would contract with the FloWind Corporation (FloWind) of San Rafael, California, for the construction and initial operation of the Project. FloWind and CARES are negotiating to lease the site from the property owner, Columbia Aluminum, Inc. CARES would sell bonds, with BPA guarantees and backing, in order to finance construction of the Project. If approved, BPA, through execution of a Power Purchase Agreement (PPA), would agree to purchase up to 25 MW of electricity generated by the Project in accordance with terms negotiated as a result of the *RFP* selection process.

S.2. Purpose Of and Need For Action

S.2.1 Need for Action (Agency Goals)

In the face of regional growth and increasing constraints on the existing energy resource base, BPA needs to acquire resources that will contribute to diversification of the long term power supply prospects in the region. A diverse resource portfolio is considered necessary to protect BPA and its customers against risk.

Non-federal agency needs include CARES' need to facilitate the development of conservation and renewable energy projects in the State of Washington and Klickitat County's need to decide whether to issue a Conditional Use Permit (CUP) for the Project.

S.2.2 Purposes to Satisfy the Need (Agency Objectives)

The Project is designed to achieve the agency objectives described below.

BPA:

- Test the ability of wind energy to provide a reliable, economical, and environmentally acceptable energy resource in the region.
- Assure consistency with BPA's statutory responsibilities, including the Act, while taking into consideration the Council's Conservation and Electric Power Plan and Fish and Wildlife Program.
- Assure consistency with BPA's Resource Programs EIS Record of Decision.

CARES:

- Provide the experience in serving the needs and managing the power output of a wind energy facility to one or more of the CARES member utilities.

Klickitat County:

- Assure consistency and compatibility with the Klickitat County Comprehensive Land Use Management Plan.

BPA, CARES, and Klickitat County:

- Restore and enhance environmental quality and avoid or minimize possible adverse environmental effects.

S.2.3 Agency Decisions

Potential decisions to be supported by this EIS include:

- BPA execution of a Power Purchase Agreement with CARES.
- Klickitat County issuance to CARES of a Conditional Use Permit and building permits.
- CARES' project planning and implementation.
- Identification of appropriate Project mitigation requirements to include in the PPA and CUP.

S.3. Relationship to Other Environmental Review

In February 1993, BPA published the Resource Programs EIS (RP EIS), a programmatic document that evaluates the environmental tradeoffs among generic resource types and the cumulative effects of adding these resources to the existing system. Based on the RP EIS, BPA adopted the Emphasize Conservation Alternative. This alternative emphasizes conservation and efficiency improvements, supplemented by renewable and thermal resources, as the most cost-effective and environmentally responsible option for BPA's long term conservation and generation resource acquisition objectives. As a renewable resource, the Project would implement one element of BPA's Emphasize Conservation Alternative. As discussed in the RP EIS, this document is tiered to the RP EIS and will evaluate the site-specific impacts from the proposed Project.

This EIS also analyzes the potential cumulative environmental impacts from development of this Project and another wind energy facility proposed by Kenetech Windpower, Inc. (Kenetech) on adjacent and nearby lands. The 115 MW facility, known as the Washington Windplant™ #1, would occupy approximately 12,000 acres in the Columbia Hills to the west, north and east of the Project site. BPA and Klickitat County commissioned a Cumulative Impact Study (CIS) to analyze the potential cumulative impacts of both wind energy projects, and included it in this document.

S.4. Proposed Action and Alternatives

S.4.1 Existing Setting

The Project site is located at Juniper Point in the Columbia Hills area of Klickitat County, Washington. The Columbia River, just south of the Project site, serves as a major barge transportation route and recreational resource. The Columbia River has been highly developed with dams and associated hydroelectric generating facilities. One such facility - John Day Dam - is located below the Project site. A large industrial facility - Columbia Aluminum - is located adjacent to John Day dam. Wind data collected over the years in the Columbia Hills and at Juniper Point has determined that the Project site has a sufficient wind resource to support a commercial-scale wind power project.

The Project is owned by Columbia Aluminum, Inc. The site has been used for grazing for more than a century. Prior to European settlement and private ownership of the land, the Columbia Hills were used by Native American tribes and bands which ceded the lands to the U.S. government pursuant to the Treaty of June 9, 1855. This treaty created the Yakima Indian Reservation, approximately 28 km (17 miles) to the north. Traditional cultural use of the Project lands by Native American is discussed in Section 2.4.

The Project site is zoned Extensive Agriculture. The proposed Project would reduce the amount of land on the site available for agricultural use by about 2 percent. The compatibility of the Project with agricultural uses is discussed in Section 2.8.

The Project would add additional utility facilities to the site. A natural gas pipeline runs north-south through the central portion of the site. Several public and private communication facilities are located on the Project site and to the west on Luna Point. The Projects potential impacts on public utilities and services are discussed in Section 2.12.

S.4.2 Proposed Action

CARES proposes to construct and operate the 25 megawatt (MW) Columbia Wind Farm #1 (Project) in the Columbia Hills area of Klickitat County, Washington known as Juniper Point. BPA proposes to purchase the electricity generated by the project.

CARES would execute an agreement with CARES' contractor, FloWind. FloWind would install approximately 91 wind turbines and associated facilities to generate electricity.

The Project would be located on lands leased from Columbia Aluminum, approximately 9.6 km (6 mi.) southeast of Goldendale, Washington on a ridge approximately 3.2 km (2 mi.) north of the Columbia River. A Project location map is included in Figure S.1. The legal description of the approximately 395 hectare (975 acre) site is Section 18, T3N, R17E and the south half of Section 13, T3N, R16E. The site and surrounding lands are zoned for extensive agriculture. Current uses of the site include cattle grazing and radio communications.

The Project's construction and operation would include:

- install concrete pier foundations for each wind turbine;
- install 91 model AWT-26 wind turbines using 43 m (140 ft.) high guyed tubular towers on the pier foundations;
- construct a new 115/24-kv substation on the Project site;
- construct a 149 m^2 (1600 ft x 14 $ft.^2$) steel operations and maintenance building;
- install approximately 25 pad mount transformers at various locations along the turbine access roads;
- install approximately 4.0 km (1.4 mi.) of underground 24 kv power collection lines to collect power from individual turbines to the end of turbine strings;
- install approximately 1.2 km (13,000 ft.) of underground communication and transmission lines from each turbine to a pad mount transformer;
- install approximately 5.6 km (3.5 mi.) of 24 kv wood pole transmission lines to deliver electricity from the pad mount transformers to the Project substation;
- install approximately 3.2 km (2.0 mi.) of 115 kv wood pole transmission lines to deliver electricity from the Project substation to the Public Utility District No. 1 of Klickitat County (PUD) 115 kv Goldendale line;
- interconnect with the BPA transmission system through the Goldendale line and Goldendale substation owned by the PUD;
- reconstruct, upgrade, and maintain approximately 8.0 km (5.0 mi.) of existing native surface roads;
- construct and maintain approximately 6.4 km (4 mi.) of a new graveled roads along the turbine strings and to individual turbines; and
- install meteorological towers guyed with rebar anchors at various locations on the Project site.

Table S.1 summarizes the features of the proposed Project.

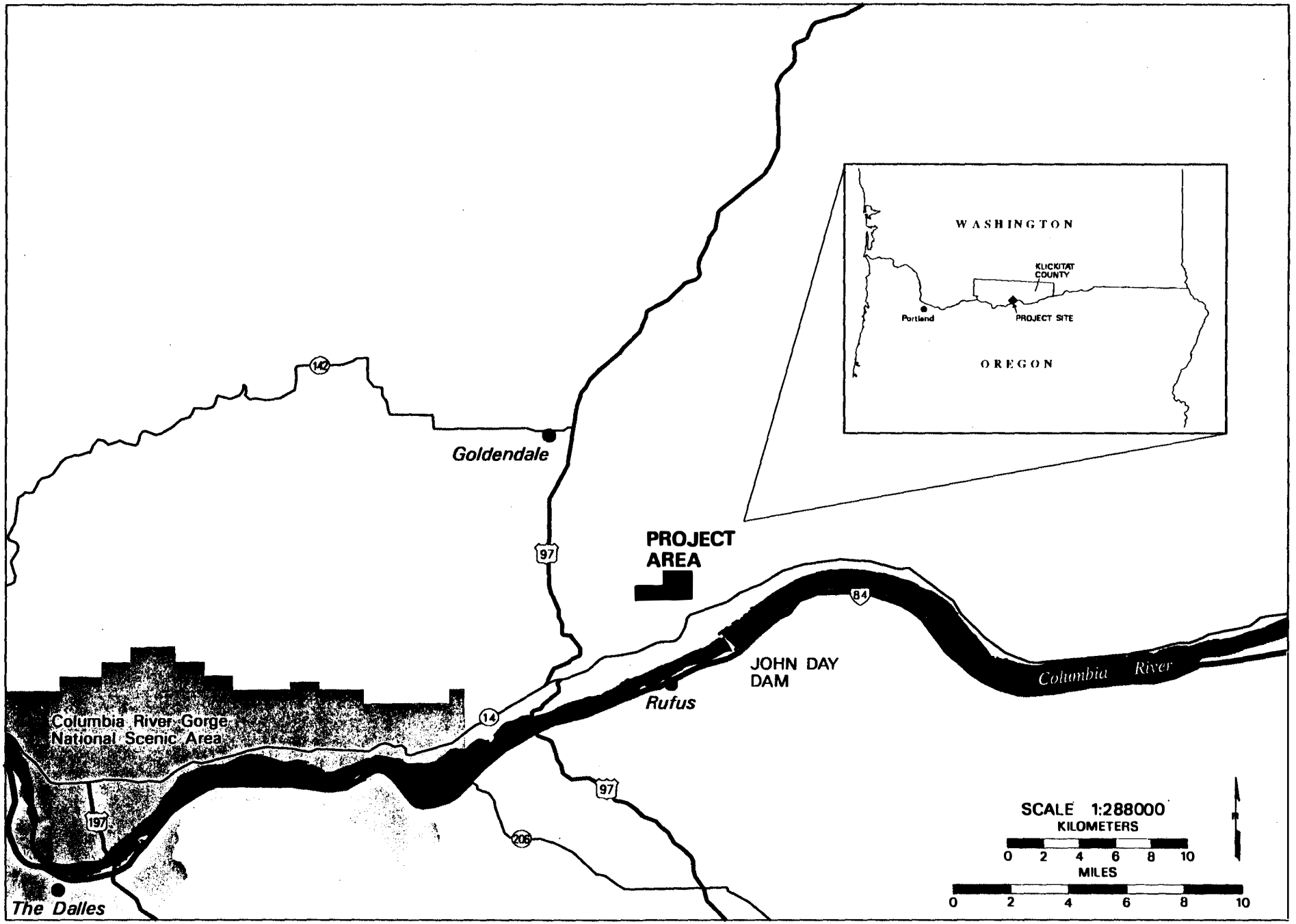


Figure S.1 Project Location

Table S.1 Summary of Proposed Project Features

Features	Area Temporarily Disturbed		Area Permanently Occupied	
	hectares	Acres	hectares	Acres
Turbine Strings Development[1]	20	50	5.4	13
Overhead Powerline	4	10	3.1	8
New Primary Access Road[2]	N/A	N/A	N/A	N/A
Substation	0.5	1	0.5	1
Upgraded Access Road	11	28	10	25
Maintenance Facility	0.4	1	0.4	1
Construction Staging Area	2	5	N/A	N/A
TOTAL (rounded to closest hectare/acre)	**38**	**95**	**19**	**48**

1 Estimates 100-foot disturbance corridor along turbine strings that includes turbines, towers, foundations, transformer pads, underground lines, new turbine string and individual turbine access roads. New roads are estimated to be 12 feet wide plus associated drainage ditches.

2 All primary access roads are existing and would be upgraded; all new roads are included in the turbine string development amounts.

S.4.3 Alternatives Considered but Eliminated from Detailed Study

S.4.3.1 Alternative Energy Resources

BPA's RP EIS compared alternative energy resources such as conservation, renewable resources, efficiency improvements, cogeneration, combustion turbines, nuclear power, and coal. The RP EIS evaluated the environmental trade-offs among generic resource types and the cumulative effects of adding various combinations of these resources to BPA's generating system.

The Project would implement BPA's decision to test wind energy in the region. Accordingly, it focuses on a specific wind energy demonstration project and does not duplicate the RP EIS's analysis of alternative resource types need not be duplicated.

S.4.3.2 Proposals Submitted in Response to the BPA *RFP*

BPA is prevented by law from owning any generating resources and uses a variety of approaches, such as competitive solicitations, to facilitate development of a project. Since experience has shown that competitive solicitations usually result in offers totaling many more proposals that needed to satisfy the request, BPA developed a multi-stage evaluation process, documented in BPA's RP EIS. BPA prepares site specific environmental review of a proposed project prior to executing a PPA. Such review is limited to analysis of reasonable alternatives.

As discussed in S.1, BPA received and evaluated six separate proposals for wind energy demonstration projects under the *RFP* solicitation. The environmental data obtained from the project proponents furnished BPA with background information about potential impacts to natural resources, recreation resources, cultural and historical resources, aesthetics and noise, public lands, public health and safety, and consistency and compatibility with existing land uses and land use plans. BPA rated each proposal based on the evaluation of the responses to the checklist. The environmental rating was incorporated into the demonstration value rating and, together with ratings for system cost and project feasibility, determined the overall project score.

Based on the overall project scores, the combination of the Columbia Wind Farm #1 and the Wyoming Windplant #1, located in Carbon County, Wyoming, offered the best demonstration value to BPA. BPA chose these two projects for further consideration in a negotiation group. BPA identified a third proposal, Kenetech's Benton County Washington Windplant™ #1 located in the Rattlesnake Hills area as an alternate in the event negotiations were unsuccessful for the other two proposals. Since then, Kenetech abandoned the Benton County, Washington site as an unfeasible project, and the lead agencies determined that it is not a reasonable or feasible alternative to the Columbia Wind Farm #1.

The four proposals not designated for the negotiation group are not reasonable alternatives to meet BPA's objective to test wind energy. Therefore, collective consideration of all potential actions is not practical or reasonable.

To meet the objectives of NEPA and SEPA to inform the public and agency decisionmakers regarding the environmental consequences of the proposed action, this EIS includes a discussion of the potential environmental consequences of the Benton County Washington Windplant™ project proposed under the BPA *RFP*. The site was located in the vicinity of Rattlesnake Mountain on the Hanford Nuclear Reservation and included a portion of the National Environmental Research Park at Hanford and Arid Lands Ecology Reserve. Development of the Rattlesnake Mountain site would have conflicted with federal policies for the Research Park and Ecological Reserve at Hanford. For this reason and because of the potential environmental impacts identified during preliminary work on the site, Kenetech determined that the Rattlesnake Mountain site was not available for development of the Project and the lead agencies determined that it was not a reasonable or feasible alternative to the Proposed Action. Although the Benton County Washington Windplant™ is not a reasonable alternative, the environmental information will be used to provide a comparative analysis with the potential environmental consequences from the Project.

Implementing the proposed action will not foreclose future consideration of other potential BPA energy resource actions by this or other resource demonstration mechanisms.

S.4.4 No Action Alternative

EIS's must consider the alternative of not taking the proposed action. In this Project, the No Action Alternative would limit BPA's ability to diversify the long term power supply prospects in the region. BPA has not purchased wind-generated power before. If BPA does not purchase the energy output associated with this Project, then BPA would forego the opportunity to address regional barriers to cost effective wind development and to gain experience with the operation and integration of commercial wind farms. BPA is not likely to pursue another wind demonstration project in the Pacific Northwest given BPA's current financial situation and it is unlikely the Project would be otherwise implemented without a commitment from another party to acquire the energy output. If Klickitat County does not issue the permits required for construction and operation of the Project, it can not be constructed on the Project site. In either case, none of the environmental impacts or benefits associated with the Project would occur.

The lack of a suitable wind energy demonstration project in the region could lead to delayed implementation of BPA's and the Council's renewable energy development objectives and could prompt the increased development of other energy resource alternatives. Without the knowledge and experience gained through a demonstration project, proposed wind energy projects could continue to be too costly to qualify for selection through a competitive acquisition process. This could lead to development of the competitively priced energy resources, most notably gas-fired combustion turbines.

S.5. Major Conclusions, Areas of Controversy and Uncertainty, and Issues to be Resolved

Washington SEPA rules require that EIS summaries identify major conclusions, significant areas of controversy, and issues to be resolved, including the environmental choices to be made among alternative courses of action and the effectiveness of mitigation measures. Based on the environmental review conducted for this EIS and, without considering recommended mitigation measures, the following potentially significant adverse impacts were identified for the proposed Project:

- Erosion and sedimentation during Project construction.
- Disturbance of certain high-quality native plant communities occurring in shrub-steppe habitat.

- Impacts to western gray squirrel habitat and potential disturbance during nesting.
- Impacts to special-status raptors from collision with wind turbines.
- Disturbance of cultural sites that are potentially eligible for listing in the National Register of Historic Places.
- Potential aesthetic impacts to views along Hoctor Road and to certain views near Maryhill and at other locations near the Columbia River.
- Potential exceedence of the night time noise standard (50 dba[1]) at some residential locations.
- Potential schedule conflicts with repairs planned for Hoctor Road in the summer of 1995.
- Potential for obstruction of line-of-sight microwave signal transmission at certain turbine locations.

These impacts can largely be avoided, minimized, and/or otherwise mitigated as shown in Table S.2.

Table S.2 Summary of Impacts and Mitigation

Impact	Mitigation
Erosion and sedimentation	Employ Best Management Practices to stabilize soils and control runoff, and remove sediments prior to discharging runoff into intermittent streams and drainages.
Disturbance to shrub-steppe habitat	Alter the location of Project transmission lines. Flag construction limits. Apply intensive reseeding, restoration, and ongoing weed control efforts.
Western Gray Squirrel	Retain oak vegetation Restrict construction activity near nest sites during the breeding season.
Potentially eligible cultural sites	Flag the sites and restrict construction activities from flagged area.
Noise	Modify the turbine layout.
Conflicts with Hoctor Rd. repair schedule	Coordinate construction activities with County Department of Public Services. Time construction in areas that do not have to be accessed from Hoctor Rd. to coincide with the time-critical construction activities that may occur on Hoctor Rd.
Line-of-sight microwave transmissions	Relocate individual turbines to avoid signal paths.

[1] dBA = A-weighted decibels.

Even with the above mitigation measures, there would continue to be some potential for significant adverse impacts to occur to a few environmental resources on a few areas of the site. These and other areas of uncertainty identified in the EIS include:

1) **Impacts to High-Quality Douglas' Buckwheat-Sandberg's Bluegrass Plant Communities.** High-quality examples of this native plant community exist in shrub-steppe habitat located on the Project site. This community exists across a narrow, natural range in Washington in shallow, rocky soils occurring along portions of the crest of the Columbia Hills. These soils exhibit a crust of lichens and mosses. Because of the low productivity and water-retention capabilities of these soils, the crust plays a critical role in the ecology of this community. The soil crust can be easily disturbed by construction activity. Efforts to restore this community have not been documented and therefore may not be successful. Increased erosion and potential for establishment of invasive weeds could result if restoration efforts prove unsuccessful.

2) **Avian Impacts.** Year-long avian studies suggest the Project site is used by resident raptor populations and by migrating raptors and passerines such as the western bluebird. However, the Project site does not appear to be a major migratory flyway. The Project proposal includes installation of raptor protection measures on powerlines and power poles and the use of tubular rather than lattice towers to minimize avian impacts. However, some incidental raptor mortality may be unavoidable. Bald eagles, a federal threatened species, winter in the vicinity of the site and some mortality due to collision would be possible. Klickitat County provides only minor bald eagle wintering habitat relative to eastern Washington as a whole. Therefore, regional population levels are unlikely to be significantly affected by the proposed Project even if collisions do occur, although the local population may be reduced.

3) **Aesthetics.** With mitigation, the Project would continue to be visible to viewers along Hoctor Road, portions of US-97, near Maryhill, and from locations along I-84 and SR-14. Although mitigation can reduce aesthetic impacts by ensuring that the site is free from clutter and removal of inoperative turbines, research suggests that some viewers would find the Project visually displeasing while others would view it favorably.

S.6. Timing of Possible Approval

Washington State SEPA rules require that an EIS address the benefits and disadvantages of implementing a proposal at some future time [WAC 197-11-440(5)]. In addition, NEPA regulations require discussions of the short-term uses of man's environment and the maintenance of long-term productivity and any irreversible or irretrievable commitments of resources that would result from implementation of a proposal (40 CFR §1502.19).

The Project would negligibly reduce the amount of land available for grazing, but would provide a source of additional income to the site owner, Columbia Aluminum, Inc. The Project would utilize wind, a renewable resource, for power generation and would not result in the irreversible or irretrievable commitment of resources since areas of the site occupied by Project features could be returned to agricultural use if the Project were decommissioned.

Deferring approval would provide time for additional studies of avian use, but could result in cancellation of the Project due to changing financial considerations which may affect BPA's operations. If so, BPA and CARES would not have the opportunity to test the ability of wind energy to provide a reliable, economical, and environmentally acceptable energy resource in the region. If BPA misses this opportunity to develop experience with wind energy, future energy resource acquisitions may favor fossil fuel generating resources as discussed in S.4.4 (No Action) with comparatively greater environmental impacts on a per-MW basis. The CARES' member utilities would also miss the opportunity to gain experience with wind as a generating resource. Given the relatively low level of expected impacts that may result from construction and operation of the Project with the mitigation measures identified in Section 1.1.6 and Chapter 2 of this EIS, the benefits of approval at this time may exceed the benefits of additional studies.

CHAPTER 1.0 -- Alternatives Including the Proposed Action

1.1 Overview

1.1.1 Existing Setting

The Project site is located at Juniper Point in the Columbia Hills area of Klickitat County, Washington. The Columbia River, just south of the Project site, serves as a major barge transportation route and recreational resource. The Columbia River has been highly developed with dams and associated hydroelectric generating facilities. One such facility - John Day Dam - is located below the Project site. A large industrial facility - Columbia Aluminum - is located adjacent to John Day dam. Wind data collected in the Columbia Hills and at Juniper Point has determined that the Project site has a sufficient wind resource to support a commercial-scale wind power project.

The Project site is owned by Columbia Aluminum, Inc. The site has been used for grazing for more than a century. Prior to European settlement and private ownership of the land, the Columbia Hills were used by Native American tribes and bands which ceded the lands to the U.S. government pursuant to the Treaty of June 9, 1855. This treaty created the Yakima Indian Reservation, approximately 28 km (17 miles) to the north. Traditional cultural use of the Project lands by Native American is discussed in Section 2.4.

The Project site is zoned Extensive Agriculture. The proposed Project would reduce the amount of land on the site available for agricultural use by about 2 percent. The compatibility of the Project with agricultural uses is discussed in Section 2.8.

The Project would add additional utility facilities to the site. A natural gas pipeline runs north-south through the central portion of the site. Several public and private communication facilities are located on the Project site and to the west on Luna Point. The Projects potential impacts on public utilities and services are discussed in Section 2.12.

1.2 Proposed Action

The proposed federal action is BPA's execution of an agreement to acquire up to 25 MW of electricity generated by the Project. Proposed state and local agency actions include CARES' planning and implementation of the Project and Klickitat County's action on the Project Conditional Use Permit (CUP) application.

As the Project owner, CARES has applied for a CUP from the County. Under a Construction Development Agreement (CDA) with CARES, FloWind would lease the site from the landowner to construct and initially operate the Project. CARES would own the Project and sell the electricity generated by the Project to BPA.

The Klickitat County PUD #1 (PUD) , a member utility of CARES, would provide maintenance of the Project substation and other high voltage equipment, transmission of Project output from the Project 115-kV transmission line to the point of interconnection with the BPA system at the PUD's Goldendale substation, and maintenance of the dedicated Project 115-kV transmission line. This dedicated transmission line would be constructed as part of the Project and ownership would be transferred to the PUD upon completion of the Project.

1.2.1 Project Location and Existing Uses

The Project site is located in and around Juniper Point in the Columbia Hills area of Klickitat County, Washington, 9.6 km (6 miles) southeast of Goldendale, Washington on a ridge approximately 3.2 km (2 miles) north of the Columbia River. The legal description of the 395 hectare (975 acre) site is Section 18, T3N, R17E, and the south half of Section 13, T3N, R16E.

CARES and FloWind are negotiating a lease agreement with Columbia Aluminum, Inc., the site owner, for the construction and operation of the Project. The site and surrounding lands are zoned Extensive Agriculture in the Klickitat County Zoning Ordinance.

Current uses of the site include cattle grazing and radio communications. Existing facilities on the site include:

- communications radio facilities (pole mounted antenna, transmitters, and receivers; a block building, trailer, pad mounted transformer);
- a 50 foot wide easement for the Northwest Natural Gas Company pipeline;
- anemometers;
- an ungraded, native surface jeep trail.

A map illustrating the Project location is included in Figure S.1.

1.2.2 Proposed Site Development

On the lands leased from Columbia Aluminum, FloWind and CARES propose to construct the Project as follows:

- install concrete pier foundations for each wind turbine;

- install 91 model AWT-26 wind turbines using 43 meter (140 feet) high guyed tubular towers on the pier foundations;
- construct a new 115/24-kV substation on the Project site;
- construct a 149 m^2 x 4 meter high (1600 $feet^2$ x 14 feet high) steel operations and maintenance building;
- install approximately 25 pad mount transformers at various locations along the turbine access roads;
- install approximately 4.0 km (13,000 feet) of underground communication and transmission lines from each turbine to a pad mount transformer.
- install approximately 5.6 km (3.5 miles) of 24 kV wood pole transmission lines to deliver electricity from the pad mount transformers to the Project substation;
- install approximately 3.2 km (2.0 miles) of 115 kV wood pole transmission lines to deliver electricity from the Project substation to the PUD's 115 kV Goldendale line;
- interconnect with the BPA transmission system through the Goldendale line and Goldendale substation owned by the Public Utility District No. 1 of Klickitat County (PUD);
- reconstruct, upgrade, and maintain approximately 8.0 km (5.0 miles) of existing native surfaced roads;
- construct and maintain approximately 6.4 km (4 miles) of new graveled roads along the turbine strings;
- install meteorological towers guyed with rebar anchors at various locations on the Project site (these may be moved and removed throughout the life of the Project);

As proposed, the 91 wind turbines would be arranged in 11 distinct rows, known as strings. The strings would range in length from approximately 183 to 915 meters (600 to 3000 feet). Development within each turbine string would include the turbine structures and foundations, controls, small pad mounted transformers, underground and overhead transmission and communication lines, and access roads.

Table 1.1 summarizes the ground disturbance estimated to occur as a result of constructing the Project as proposed.

Table 1.1 Summary of Proposed Project Features and Disturbed Areas

Features	Area Temporarily Disturbed		Area Permanently Occupied	
	hectares	Acres	hectares	Acres
Turbine Strings Development[1]	20	50	5.4	13
Overhead Powerline	4	10	3.1	8
New Primary Access Road[2]	N/A	N/A	N/A	N/A
Substation	0.5	1	0.5	1
Upgraded Access Road	11	28	10	25
Maintenance Facility	0.4	1	0.4	1
Construction Staging Area	2	5	N/A	N/A
TOTAL (rounded to closest hectare/acre)	**38**	**95**	**19**	**48**

1 Estimates 100-foot disturbance corridor along turbine strings that includes turbines, towers, foundations, transformer pads, underground lines, new turbine string and individual turbine access roads. New roads are estimated to be 12 feet wide plus associated drainage ditches.

2 All primary access roads are existing and would upgraded; all new roads are included in the turbine string development amounts.

A map illustrating the proposed site development is included in Figure 1.1

1.2.3 Key Design/Operating Features

1.2.3.1 AWT-26 Turbine Characteristics

The AWT-26 turbines were developed by R. Lynette & Associates in collaboration with the U.S. Department of Energy and the National Renewable Energy Laboratory.

Operational characteristics are as follows:

- Begins operation at 5.4 m/s (12 mph) wind speed;
- Shuts down operation at wind speeds of 24.6 m/s (55 mph);
- Designed to withstand wind speeds of 55 m/s (123 mph);
- Capable of generating 225-275 kW of power.

Physical characteristics are as follows:

- downwind, horizontal axis, free yaw orientation;
- two bladed rotor, advanced airfoils, stall-regulated, teetered, fixed pitch;
- 26.2 meter (86 feet) rotor diameter.

The rotor blades are a composite of wood, epoxy, and carbon fibers and are coated with a fiberglass gel.

A color photograph of the AWT-26 is included in Figure 1.2.

PROPOSED COLUMBIA WIND FARM #1 – Klickitat County, Washington

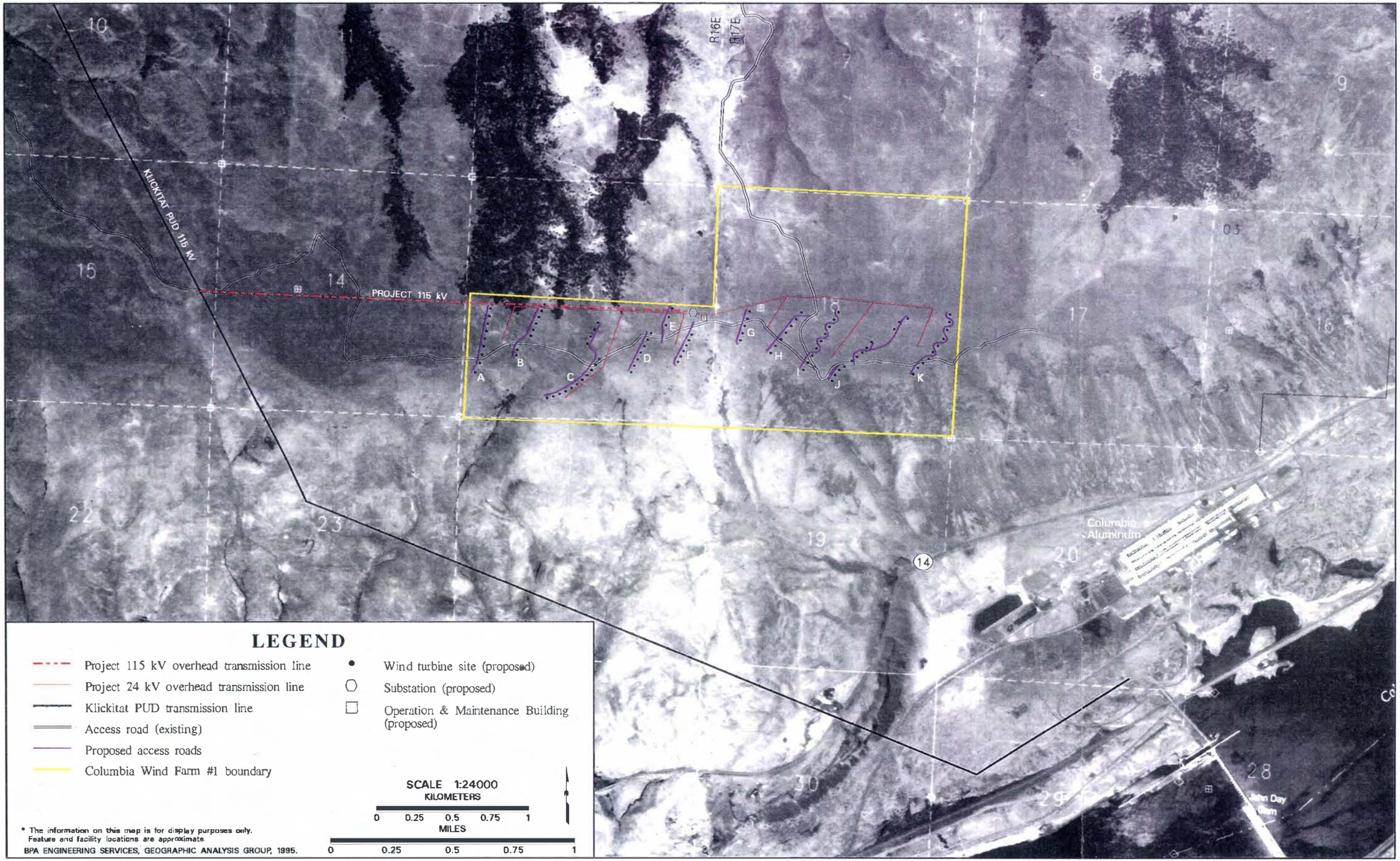


Figure 1.1 – Proposed Site Development

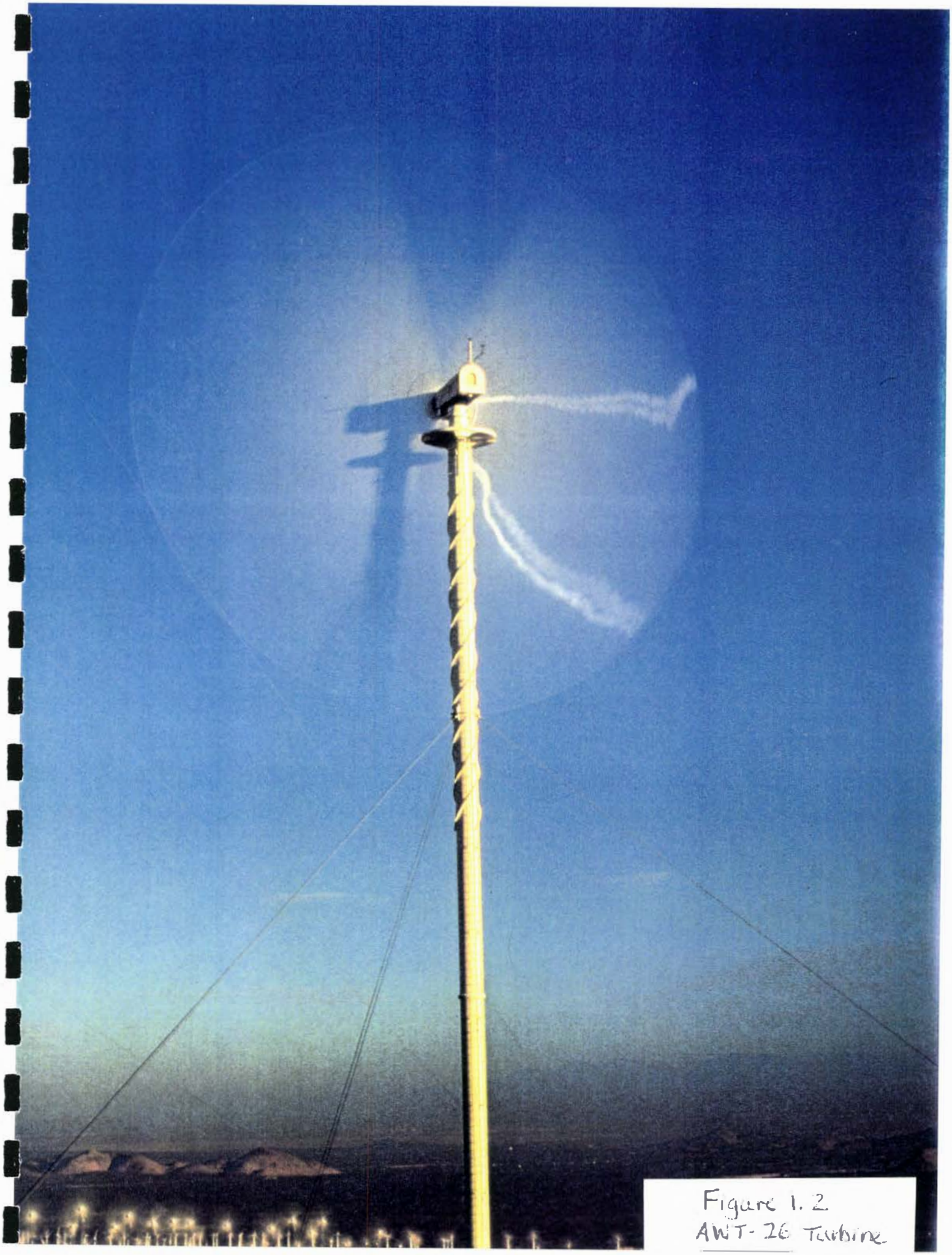


Figure 1.2
AWT-26 Turbine

1.2.3.2 Foundations and Towers

The turbines would be mounted on 1 meter (3 feet) diameter steel tubular towers approximately 43 meter (140 feet) in height. Total machine height to the top of the turbine blade would be approximately 56 meter (184 feet). The structure would be secured with 1.5 meter (5 foot) diameter concrete pier foundations for the 3 guy anchors and tower. The concrete would be cast in a hole and the area around the foundations would have gravel placed as needed. The depth of the foundations would be determined after completion of a subsurface analysis.

1.2.3.3 Underground Collection and Communication Lines and Transformers

Approximately 4.0 km (13,000 feet) of trenches would contain transmission and communication lines. The trenches would be approximately 1.2 meter (4 feet) deep and 0.6 meter (2 feet) wide, and would be backfilled with excavated material. In areas where excavated material does not meet specifications for backfill, off-site material would be used and unsuitable excavated material would be removed from the site for disposal.

The underground transmission line would feed electricity from each turbine through 480-volt power cables to the pad-mounted transformers, where the voltage would be stepped up to 24-kV. The 25 pad-mounted transformers would be set on a 4 meter x 4 meter (14 feet x 14 feet) reinforced concrete foundation. The electrical cabling would be housed in 76 mm (3 inch) PVC conduits.

The communication lines for monitoring and control of the Project would be placed in a single 51 mm (2 inch) PVC conduit. The microcomputer based monitor and control system would collect and process all turbine, wind, utility, and meteorological information. The systems central processing unit would be located inside the operation and maintenance building.

1.2.3.4 Overhead Transmission Lines

Power would be delivered from each transformer to the Project substation via overhead 24-kV transmission lines. The total length of the 24-kV transmission lines would be approximately 5.6 km (3.5 miles). This line would be constructed using wooden poles and typical tri-structure construction. The pole span would be no longer than 61 meter (200 feet).

Approximately 3.2 km (2.0 miles) of overhead 115-kV transmission line would be constructed from the Project substation to the PUD's existing 115-kV Goldendale transmission line. This line would be constructed using wooden H-frame structures with a maximum 122 meter (400 feet) span. The PUD's Goldendale line would

deliver the Project electricity to its Goldendale substation for integration into the BPA transmission system.

All transmission line poles would be constructed to meet accepted utility raptor protection standards as described in Section 1.1.6.1.

1.2.3.5 Substation

A centrally located on-site Project substation would be constructed to increase voltage of the Project electricity from 24-kV to 115-kV prior to interconnection with the PUD's Goldendale line. The entire substation would be fenced and the yard graveled. Substation equipment would be mounted on a concrete slab and electrical grounding material would be installed to completely ground the equipment. All controls would be housed in a block building.

1.2.3.6 Roads

Project development would require reconstruction and upgrading of the existing main access roads and construction of new access roads. The following summarizes the proposed construction and reconstruction activities.

Estimated current conditions of the existing access roads are:

- 8 km (5 miles) of total road length
- 3 meter (10 feet) wide driving surface
- native surfacing
- engineered drainage not provided

Proposed construction and upgrade activities to the main access roads:

- Widen the driving surface by 0.7 meter (2 feet) to 3.7 meter (12 feet)
- apply gravel surfacing
- construct 0.5 meter (1.5 feet) drainage ditches where appropriate
- construct drain dips and install culverts where appropriate

Proposed new road construction for access to turbine strings and individual turbines:

- 6.4 km (4 miles) of new construction
- 3 meter (10 feet) wide driving surface
- apply gravel surfacing
- construct 0.5 meter (1.5 feet) drainage ditches where appropriate
- construct drain dips or install culverts where appropriate

1.2.3.7 Construction Staging Areas

Up to 2 hectares (5 acres) would be required during construction for storing construction equipment and materials. An area adjacent to each turbine would also be used for foundation staging and assembly of each tower and turbine. The location of the staging area would be identified prior to construction, but after obtaining a Conditional Use Permit for the Project. Following construction, the temporary staging area would be restored and replanted with native vegetation.

1.2.3.8 Meteorological Towers

Pursuant to County building permits, temporary meteorological towers have been installed on the site to collect wind data for identifying exact locations of wind turbines and strings. The 24 to 30 meter (80 to 100 feet) meteorological towers are guyed with rebar anchors and do not require concrete foundations. A small number of meteorological towers are likely to be moved and removed throughout the life of the Project.

1.2.4 Project Construction

1.2.4.1 Construction Schedule

Construction of the Project would require an estimated 8 to 11 months. Construction activities are shown in Table 1.2.

Table 1.2 General Construction Schedule

Activity	Month										
	1	2	3	4	5	6	7	8	9	10	11
Civil Construction -- Clearing, Roads, Grading, and Storm Water	X	X	X								
Foundations			X	X							
Electrical and Communications Equipment Installation			X	X	X	X	X				
Turbine Installation			X	X	X	X	X				
Substation Construction			X	X	X	X	X				
Permanent Surface Water Controls/Cleanup								X			
Startup and Testing									X	X	X

1.2.4.2 Construction Equipment and Traffic

Table 1.3 summarizes the types of construction equipment required during Project construction.

Table 1.3 Construction Equipment and Traffic Estimates

Equipment Type	Purpose	Gross Vehicle Weight		Maximum Axle Loading		# of Vehicles	# of Trips To/From Site
		Metric Tonnes	Tons	Metric Tonnes	Tons		
D-7 Bulldozer	Road and foundation; pad construction	24.8	27.5	17.8	19.8*	2	4
Grader	Road and foundation; pad construction	18.4	20.4	15.3	17*	1	2
Backhoe/Pay Loader	General Use	6.8	7.5	10.6	11.8*	2	4
Water Trucks	Compaction, erosion, and dust control	19.2	21.4	11.6	12.8	3	6
Roller	Road and foundation; pad compaction	17	18.8	14.7	16.3	1	2
Trenching Machine	Underground Utilities	13.5	15	13.3	14.8*	1	2
Truckmount Driller	Pier Foundations	22.7	25	13.6	15	2	4
Concrete Mixer Trucks	Foundations	31.5	35	9.2	10.2	4	8
Mobile Cranes	Tower erection	72	80	12.2	13.5	2	4
Flatbed Trucks/Box Vans	Delivery of tower/blades/machinery	41.4	46	9.5	10.5	4	125
Dump Trucks	Gravel	24.6	27.3	9.5	10.5	40	1000
Pickups and Misc. Small Vehicles	General Use	N/A		N/A		3	6
Light Cars/Trucks	Employees	N/A		N/A		20	50/day

* Maximum axle load based on a flatbed truck hauling equipment to and from the construction site.

1.2.5 Project Operation

The Project would provide power throughout the year, but power generation would vary according to seasonal and diurnal wind conditions. Peak power production would occur from April through September. During the peak season, peak daily power production would occur from late afternoon through early evening.

Although the Project would operate primarily through an automatic electronic communications and control system, approximately four full-time workers would be employed on site to conduct maintenance and operations activities.

1.2.6 Mitigation Included in the Project Proposal

1.2.6.1 Bird Protection

As discussed in Section 2.5, wind power projects can create the potential for bird collisions with structures (turbine blades, towers, transmission poles) and electrocution. CARES and FloWind have proposed a number of measures to reduce the Project's potential to harm birds. These measures include:

- Reducing perching opportunities for raptors by using tubular rather than lattice towers.
- Reducing the potential for electrocution by designing the 24-kV and 115-kV transmission lines with raptor protection measures. Raptor protection measures will be designed in accordance with *Suggested Practices for Raptor Protection on Powerlines (Edison Electric Institute, 1975)* and may include:
  - Using wood, rather than metal, blades on crossarms.
  - Spacing energized wires at least 1.5 meter (5 feet) apart.
  - Providing insulated jumper wires.
  - Lowering the crossarm at least 1 meter (38 inches) below the top of the pole.
  - Providing protective equipment (lightening arrestors, power cutouts) on a secondary crossarm at least 1.2 meter (4 feet) below the crossarm that supports the transmission lines.
  - Covering all exposed terminals with wildlife boots or other insulating materials.

1.2.6.2 Safety Measures

As discussed in Section 2.13, the Project proposal includes a number of design features to minimize risks to public and employee health and safety. These features include:

- Installing turbines designed with a fail-safe redundant braking system to protect against loss of control due to excessive speed.
- Designing turbine towers and foundations to survive wind speeds of 55 m/s (123 mph) at 9 meter (30 feet).
- Enclosing gears and moving parts to contain sparks.
- Designing and installing all electrical equipment in compliance with national electrical safety codes and standards, including NEMA (National Electrical Manufacturers Association), ANSI (American National Standards Institute), and IEEE (Institute of Electrical and Electronics Engineers).

- Providing locks and high voltage warning labels on all control cabinets and transformer cabinets.
- Fencing and locking the Project substation and providing warning signs about the presence of high voltage equipment.
- Providing locked gates onto the Project site and signs warning of high voltage equipment and buried cable.
- Locating the overhead powerline at least 61 meter (200 feet) from the turbines so that cranes working on the turbines will be a safe distance from the powerlines.

1.2.6.3 Erosion and Sediment Control

Erosion control measures incorporated into the Project proposal include:

- Using and upgrading existing roads where feasible.
- Providing roads with ditches and culverts sized to accommodate the 100-year storm.
- Locating roads to reduce the amount of cut and fill (grading) required.
- Revegetating any disturbed areas that are not permanently occupied by Project features.

1.2.6.4 Aesthetics

Design measures included in the Project proposal to reduce potential aesthetic impacts include:

- Using non-reflective paints to reduce glare.
- Using neutral colored paint to blend with the background.
- Reducing the amount of road construction by using existing roads where feasible.
- Installing communication and transmission lines underground.
- Revegetating disturbed areas not permanently occupied by Project features.
- Locating turbines in strings to provide a more uniform-looking development.

1.3 Alternatives Considered but Eliminated from Detailed Study

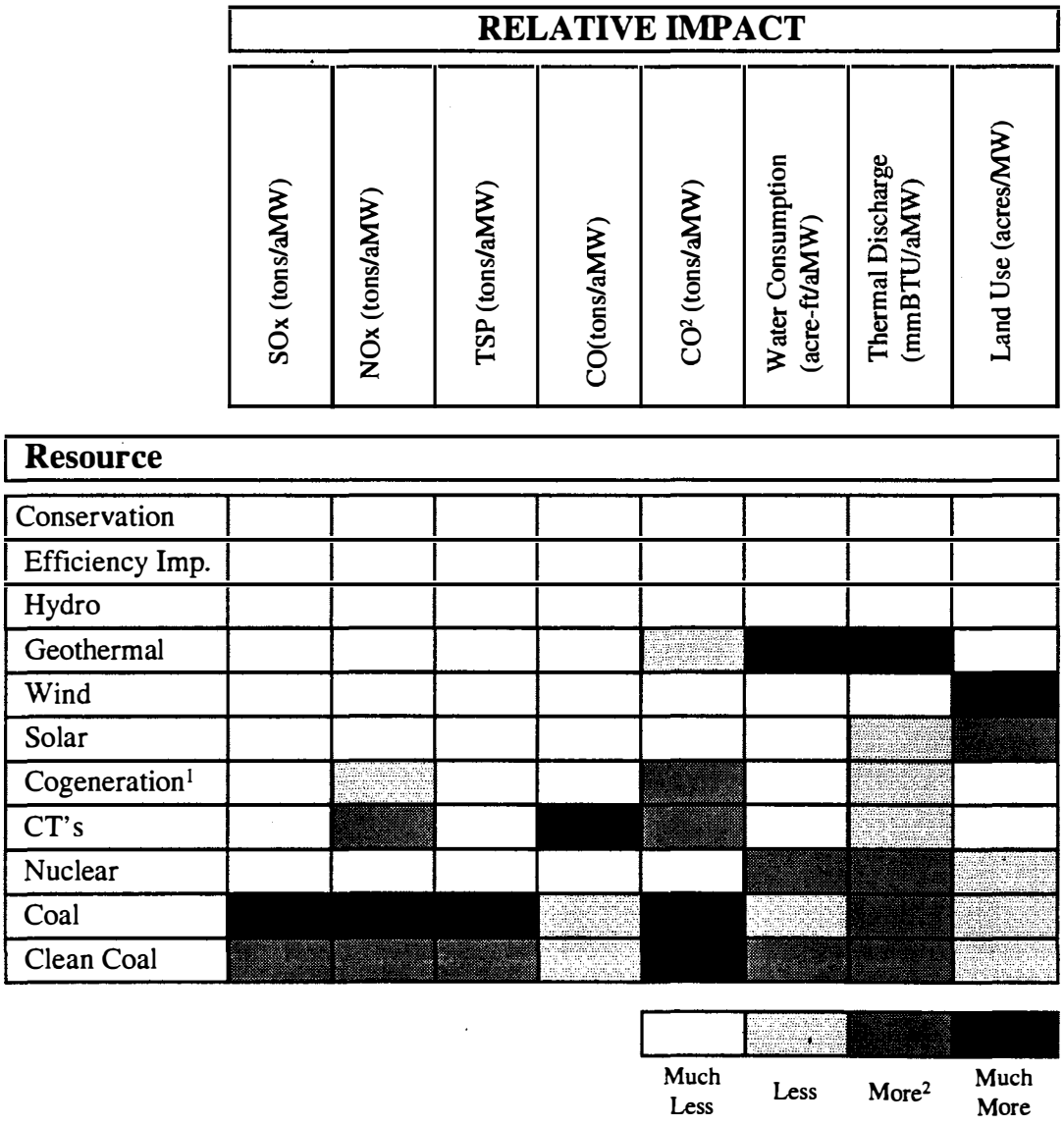
1.3.1 Alternative Energy Resources

BPA's RP EIS compared the environmental effects of various kinds of energy resources. The RP EIS evaluated the environmental trade-offs among generic resource types and the cumulative effects of adding various combinations of these resources to BPA's generating system. Figure 1.3 illustrates the relative environmental impacts typically associated with these available energy resources.

The analysis in the RP EIS supported BPA's April 22, 1993 Record of Decision (ROD) to acquire all cost-effective conservation and efficiency improvements, supplemented by a mix of renewable and thermal resources. The ROD also established that BPA would use demonstration projects to confirm the supply, cost, and reliability of renewable energy supplies.

The Project would implement BPA's decision to test wind energy in the region. Accordingly, it focuses on a specific wind energy demonstration project and does not duplicate the RP EIS's analysis of alternative resource types.

Estimated Environmental Impacts of Conservation and Generation Resource Options



[1] Natural gas fired cogeneration assumed

[2] "More" means a more negative impact

Source: Bonneville Power Administration
Final Resource Programs EIS, 1993.

Figure 1.3

1.3.2 Proposals Submitted in Response to the BPA RFP

Applicants who proposed resources for demonstration under the *RFP* solicitation developed each potentially qualifying action independently and submitted them to BPA separately. The *RFP* required applicants to submit specific environmental data with their proposals. This data furnished BPA with background information about potential impacts to natural resources, recreation resources, cultural and historical resources, aesthetics and noise, public lands, public health and safety, and consistency and compatibility with existing land uses and land use plans. BPA rated each proposal based on the evaluation of the environmental data. The environmental rating was incorporated into the demonstration value rating and, together with ratings for system cost and project feasibility, determined the overall project score.

Based on the overall project scores, the combination of the Columbia Wind Farm #1 and the Wyoming Windplant #1, located in Carbon County, Wyoming, offered the best demonstration value to BPA. BPA chose these two projects for further consideration in a negotiation group. A third proposal, Kenetech's Benton County Washington Windplant™ located in the Rattlesnake Hills area was identified as meriting potential consideration in the event negotiations for the other two proposals were unsuccessful. Kenetech has since abandoned the Benton County site, and the lead agencies determined it is not a reasonable or feasible alternative to the Project.

The four proposals not designated for the negotiation group were eliminated for the reasons identified in Table 1.4. CARES' and BPA's objective to test wind energy in the region precludes collective consideration of all potential actions. Implementing the proposed action will not foreclose future consideration of other potential BPA energy resource actions by this or other resource demonstration mechanisms. Table 1.4 is a brief summary of the six proposals along with a statement of why they were not selected for the negotiation group.

1.3.2.1 Off-Site Comparative Alternative

To meet the objectives of NEPA and SEPA to inform the public and agency decisionmakers regarding the environmental consequences of the proposed action, this EIS will include a discussion of the potential environmental consequences of the Benton County Washington Windplant™ project proposed under the BPA *RFP*. Although this project is not a reasonable alternative (see Section 1.3.2), the environmental information will be used to provide a comparative analysis with the potential environmental consequences from the Project.

BPA is prevented by law from owning any generating resources and uses a variety of approaches, such as competitive solicitations, to facilitate development of a project. Since experience has shown that competitive solicitations usually result in offers totaling many more proposals than needed to satisfy the request, BPA developed a

multi-stage evaluation process, documented in BPA's RP EIS. BPA prepares site specific environmental review of a proposed project prior to executing a PPA, but such review is limited to analysis of reasonable alternatives.

In 1991 under the BPA *RFP*, Kenetech Windpower, Inc. proposed to site a wind energy plant along the ridgeline of the Rattlesnake Hills, located on the Hanford Nuclear Reservation in Benton County, Washington. Although the Benton County Washington Windplant™ is not a reasonable alternative, the environmental data is presented here to provide a comparative analysis with the potential environmental consequences from the Project.

A portion of the Benton County Windplant site was located within the southernmost edge of the 650 square mile National Environmental Research Park at Hanford (the Park). Within the southernmost edge of the Park is the 120 square mile Arid Lands Ecology Reserve (Reserve), established in 1967 as an area to remain undeveloped shrub-steppe ecosystem. Development of the Rattlesnake Hills Windplant was proposed for portions of the shrub-steppe habitat in the Park, but outside of the Reserve, and for adjacent areas outside of the Park.

While no detailed environmental studies of the Rattlesnake Hills site were conducted, substantial data is available on the Park and Reserve.
Table 1.5 summarizes known environmental information and potential impacts of wind farm development in the Rattlesnake Hills area.

Table 1.4 Summary of Responses to BPA *RFP*

Project	Washington Windplant	Columbia Wind Farm #1	WVC Goodnoe Project	Saddle Mountain Wind Facility	Klickitat Wind Energy Project	Wyoming Windplant
Location	Benton County, WA (Rattlesnake Hills)	Klickitat County, WA (Juniper Pt)	Klickitat County, WA (Goodnoe Hills)	Grant County, WA	Klickitat County, WA (Columbia Hills)	Carbon County, WY (Foote Creek Rim)
Developer/ Utility	USW & CARES	FloWind & CARES	Windland & CARES	Zond & PGE	SeaWest & PGE	USW, PacifiCorp, EWEB, Idaho Power Co.
Proposed MW	14 MW to BPA (50 MW additional to IOU's)	25 MW	10 MW	28 MW	15 MW to BPA (25 MW additional to PGE)	50 MW to BPA (25 MW additional to owners)
Comments	Siting difficulties resulted in proposal moving to Columbia Hills	**Selected for negotiation group**	Lack of room for project expansion limited demonstration value	Lack of long term onsite wind data reduced project feasibility	System cost outside acceptable range	**Selected for negotiation group; BPA accepted only 25 MW**

Table 1.5 Estimated General Impacts of Wind Power Development at Benton County, Washington Site

Botanical Resources	In addition to several endangered and threatened plant species, the site contains ungrazed shrub-steppe habitat with undisturbed native plant communities such as Sagebrush-Steppe, Saltbush-Greasewood, and Wheatgrass/Bluegrass. Most of the development was proposed in shrub-steppe habitat and a few adjacent wheat fields. Shrub-steppe is considered a Priority Habitat under the Washington Department of Wildlife Priority Habitats and Species (PHS) Project. Along the ridge crest, species include: Eriogonum thymoides/Poa secunda association, Eriogonum thymoides, Phlox hoodii, Haplopappus stenophyllus, Balsamorhiza rosea, Lewisia rediviva, and Sandberg bluegrass. Late melting snow on the ridge allows other species, predominantly Lupinus spp. and Festuca idahoensis, to grow.
Wildlife	Species include elk, mule deer, cottontail rabbit, chukar, coyote, badger, bobcat, and other small mammals and reptiles. Listed species include pygmy rabbit, northern grasshopper mouse, night snake, and Woodhouse's toad.
Avian Resources	Hanford Reach is a known flyway for migrating birds and a migration corridor may exist on Rattlesnake Mountain. Special status birds known to inhabit, but not nest in, the Reserve for at least part of the year. These birds include bald eagles in winter, golden eagles, peregrine falcons, turkey vultures,, and sandhill cranes. The extent to which these species use Rattlesnake Ridge is unknown. Wintering raptors at the site include rough-legged hawks, northern harrier, and kestrel. Nesting raptors include sparrow hawk, Swainson's hawk, great horned owl, marsh hawk, burrowing owl, ferruginous hawk, and prairie falcon. Rattlesnake Mountain will be a key habitat area for population recovery efforts of an existing remnant sage grouse population.
Cultural Resources	Portions of the Reserve are traditional Native American hunting and food-gathering sites. The Hanford site was ceded to the Federal government by the Yakama and Umatilla Tribes in 1855 and is adjacent to lands ceded by the Nez Perce Indians. Rattlesnake Mountain may have religious and cultural significance to Native Americans. 148 archaeological sites identified at the broader Hanford site include Native American villages, campsites, hunting sites, cemeteries, and homestead and ranch remnants.
Land Use/Public Services	Eight communication towers used by numerous groups exist on Rattlesnake Ridge. Wind power development could conflict with land management objectives of the Research Park and Reserve.

Information available from the Rattlesnake Hills site, while limited, provides a basis for comparison with the Project site with regard to environmental features potentially affected by wind energy development. This comparison provides context for decisionmakers' and the public's understanding of the impacts associated with the Project site. Because more information has been developed on the Project site than is available regarding the Rattlesnake Hills location, the potential environmental features identified at the Project site may appear disproportionately greater.

Botanical Resources. Both sites contain botanical resources designated as priority habitats by the Washington Department of Fish and Wildlife. At both sites, placement of turbines would be expected, absent mitigation, to adversely affect the priority habitat plant communities. Due to the limited site design information that is available for the Rattlesnake Hills site, no comparison can be drawn about the total amount of affected priority habitat at the respective locations.

Non-Avian Wildlife. The Rattlesnake Hills and the Project site support similar kinds of animals. Each site is also known to be inhabited by several kinds of special status species, some of which are present (or likely present) on both sites, for example, night snake and woodhouse's toad. Other special status species appear to be present (or likely present) at only one of the sites, for example, the pygmy rabbit and northern grasshopper mouse at the Rattlesnake Hills location, and the other species listed in Table 2.8 of the Draft EIS at the Project site.

Avian Resources. More avian use data has been gathered for the Project site than is available for the Rattlesnake Hills site, but several similarities and differences can be identified between the two with respect to avian resources. The Project site does not appear to be a migratory bird flyway, while the Rattlesnake Hills location is near a known flyway along the Hanford Reach of the Columbia River, a difference that suggests that the latter location would pose a relatively higher potential for impacts to migratory birds. In addition, a remnant sage grouse population inhabits the Rattlesnake Hills site. It is hoped that the habitat there will play a key role in recovery of the sage grouse population. The Project site does not appear to include habitat critical to the recovery of such a similar population. With regard to other species, many of the same species are generally known to inhabit the areas surrounding both sites, including some special status species, but the available data do not support a species-by-species comparison.

Cultural Resources. Areas of the Rattlesnake Hills site are traditional Native American hunting and food-gathering areas. Development of the Rattlesnake Hills area for wind energy may have adversely affected these activities. The Project site, by comparison, has been under private ownership and access for such activities has been unavailable to Native Americans. Its development is accordingly not expected to diminish uses of this kind. Concerning culturally significant features that could be

adversely affected by wind energy development, the Rattlesnake Hills site includes Rattlesnake Mountain, which may have been significant to Native American culture and religion. No such specific features have been confirmed on the Project site, although consultation with the Yakama Nation continues, and Juniper Point may qualify for listing as a traditional cultural property.

Land Use. Wind energy development of the Rattlesnake Hills area was determined to conflict with the management policies of the Department of Energy, which provided for preserving the shrub steppe ecosystem in its undeveloped state. In addition, current land use includes eight communication towers used by a number of groups, a circumstance that would have at least complicated use of the site for wind energy. Although the Project site contains one such tower, no unmanageable conflict is expected with that facility and the proposed Project. The land use designations of the site, including zoning and comprehensive plan designation and policies, appear to be consistent with wind energy development.

1.4 No Action Alternative

The No Action Alternative would limit BPA's ability to diversify the long term power supply prospects in the region. If BPA does not purchase the energy output associated with this Project, then BPA would forego the opportunity to address regional barriers to cost effective wind development and gain hands-on experience with the operation and integration of commercial wind farms. Other than the wind energy demonstration project being considered in Wyoming, BPA is not likely to pursue another wind demonstration project given BPA's current financial situation. It is unlikely the Project would be implemented without a commitment from another party to acquire the energy output. If Klickitat County does not issue the permits required for construction and operation of the Project, it can not be constructed on the Project site. In either case, none of the environmental impacts or benefits associated with the Project would occur.

The lack of a suitable wind energy demonstration project in the region could lead to delayed implementation of BPA's and the Council's renewable energy development objectives and could prompt the increased development of other energy resource alternatives. Without the knowledge and experience gained through a demonstration project, proposed wind energy projects may continue to be too costly to qualify for selection through a competitive acquisition process. This would lead to proportionately greater development of competitively priced energy resources, most notably gas-fired combustion turbines. This EIS `incorporates by reference BPA's RP EIS to compare the environmental impacts of alternative generating resources which might be developed under the No Action alternative.

1.5 Other Actions

Although the proposed action would test and demonstrate the commercial viability of the wind energy resource in the region, it would not eliminate BPA's future need for a diverse power supply. Other resources that may be considered independent of the proposed action have been comparatively evaluated in BPA's RP EIS. Other resource types potentially available to meet future loads include:

- Conservation (commercial, residential, and industrial)
- Renewables (hydroelectric power, geothermal, and solar power)
- Cogeneration
- Combustion turbine (combined and single cycle)
- Nuclear
- Coal

As discussed in S.1, BPA develops a Resource Program every 2 years in response to the Council's power plan. The Resource Program examines alternatives composed of different combinations of energy resource types. In developing a Resource Program, BPA prepares load forecasts jointly with the Council. A range of forecasts are prepared to reflect uncertainties about future load growth. Next, a range of load resource balances is prepared by comparing the capability of the existing Federal system resources to the range of projected Federal system loads over the next 20 years. Concurrent with the process, BPA and the Council develop new resource supply forecasts to plan acquisitions of cost-effective resources as they are needed to meet load growth. Under this approach, resources other than the proposed action may be examined and evaluated in the future for their eligibility and ability to satisfy BPA's future needs.

1.6 Scoping Summary

The Klickitat County Planning Department and BPA conducted joint scoping for this EIS under SEPA and NEPA. The public scoping period for the project ran from January 24, 1995, through February 28, 1994. Public scoping meetings were held in White Salmon, Washington o February 15, 1994 and in Goldendale, Washington on February 16, 1994. Agency scoping meetings were held with state and federal wildlife agencies. An extended scoping period through July 22, 1994, was provided to the Yakama Indian Nation. Table 1.6 summarizes those oral and written scoping comments received on the Project that are appropriately addressed in this EIS. The sections where these scoping issues are addressed are also listed in Table 1.6.

Table 1.6 Scoping Summary

General Topic	Issue	EIS Section
Geology/Soils/ Hydrology	• Soil stability and erosion.	2.1.3, 2.1.4
	• Contamination from oil and grease leakage from turbines.	2.1.4, 2.3.3
	• Sensitive geologic areas.	2.1.3
Plants	• Impact of construction on shrub steppe/scrub desert habitat and flora such as Indian paintbrush, lupine, and ponderosa pine.	2.2.3
	• Possible introduction of noxious weeds.	2.2.3
Wildlife	• Effects on wildlife, especially deer populations.	2.6.4
	• Effects of lighting on nocturnal animals.	2.6.4, 2.13.2
	• Impacts to invertebrates.	2.6.4
	• Impacts to western gray squirrel and supporting habitats, and other special status wildlife.	2.6.4, 2.2.3
Avian Resources (Birds)	• A year long avian study of the Columbia Hills area should be conducted.	2.5.1
	• Impacts on migratory birds.	2.5.4
	• Effects on mortality rates of raptors.	2.5.4
	• Avian surveys and inventories should cover the Oregon side of Columbia River and tributaries within the home ranges of birds using the project site.	2.5.1
	• Impacts on seasonal occurrence, habitats, and use by peregrine falcon, bald eagle and other threatened or endangered bird species.	2.5.4
	• Habitat inventory.	2.5.3, 2.2.2
Cultural Resources	• A survey of the site should be conducted to identify potentially significant archaeological sites.	2.4.1
	• Access to areas important to the Yakama Indian Nation for traditional and spiritual uses should be considered.	2.4.1, 2.4.4
Aesthetics	• Mitigation should be considered to minimize visual impacts to Columbia Hills Estates tract and along ridgetops.	2.7.4
	• Unique cumulative impacts may result from different placement of turbines, rotational directions, and colors[1].	3.2.7
	• Visual impacts to Maryhill State Park.	2.7.4
Land Use (including Recreation and Socioeconomics)	• Effects on cattle from ingesting oil/grease from leaking turbines.	2.8.4
	• Appropriate setbacks to residential and other uses.	2.8.2, 2.9.2
	• Impacts on electric power rates. Jobs created by the local, temporary, and permanent Project.	2.8.4
	• Financial liability for abandonment.	2.8.4, 2.13.2
	• Impact on Goldendale Observatory.	2.8.4
	• Sightseers drawn to the area due to the Project.	2.8.2, 2.8.4, 2.7.4
	• Compatibility with the Columbia River Gorge National Scenic Area.	2.8.2, 2.7.2
Noise	• Noise impacts on existing or planned nearby residential properties.	2.9.3
	• Cumulative noise impacts to specific sensitive receptors.	3.3.9
	• Noise from construction activities.	2.9.3
Air Quality	• Dust from construction activities.	2.10.4

General Topic	Issue	EIS Section
Transportation	• Building of new roads, access to turbines, compatible use with agricultural equipment.	2.11.4
	• Damage to and effects of weight restrictions on Hoctor Road.	2.11.2, 2.11.4, 2.1.4
	• Erosion problems.	2.1.4
	• Traffic conflicts (agriculture/sightseer) on Hoctor Road.	2.11.4, 2.7.4
	• Lightly graveled on-site access roads may not be appropriate for winter use.	2.11.2, 2.11.4, 2.1.4
Public Services and Utilities	• County staff required for building inspections, monitoring.	2.12.3
	• Solid Waste generation and disposal.	
	• Firefighting needs and financial responsibility.	2.12.3
	• Impact on repeater station transmission on Juniper Point for emergency services.	2.12.3 2.12.3
	• Reduce cumulative impacts by jointly locating powerline routing/substations/roads.[1]	3.4
Health/Safety	• Wind will cause turbines to blow over.	2.13.4
Alternatives	• Alternatives analysis should include evaluation of gas turbines and their contribution to the greenhouse effect.	1.3.1

[1] A different wind power development project (Washington Windplant™ #1) is proposed by Kenetech on land adjacent to the Project. The cumulative impacts of these two wind power proposals are discussed in Chapter 3 of this EIS.

CHAPTER 2.0 -- Affected Environment, Environmental Consequences, and Mitigation Measures

2.1 EARTH AND GEOLOGY

2.1.1 Studies and Coordination

Primary sources of information for this section include the *Klickitat County Long Range Resources Plan* (November, 1983), unpublished soils information collected by the Natural Resources Conservation Service (NCRS, formerly the Soil Conservation Service) office in Goldendale, and various publications on the geology of Klickitat County and the Columbia Plateau. The NCRS was also consulted regarding soil characteristics on the Project site.

2.1.2 Regulations, Standards, and Guidelines

Klickitat County's *Comprehensive Plan* states that it is a County goal to "guide development to areas where soils and geology pose the fewest limitations to quality growth" (Klickitat County, 1977). In addition to this general policy goal, the State of Washington has adopted requirements under its *National Pollution Discharge Elimination System (NPDES) and State Waste Baseline General Permit for Stormwater Discharges Associated with Industrial Activities and Construction* (RCW 90-48, 90.52 and WAC 173-220). For construction activities that disturb more than 5 acres, General Permit requirements include development of a Stormwater Pollution Prevention Plan covering erosion and sediment control during Project construction. The Erosion and Sediment Control Plan (ESC Plan) must specify the stabilization and structural Best Management Practices (BMPs) that would be used to reduce soil loss from areas disturbed during construction. The ESC Plan must specify dates when major grading activities occur, dates when construction activities will temporarily or permanently cease on any portion of the Project site, and dates when stabilization measures will be implemented. In addition, the ESC Plan must include narrative descriptions of Best Management Practices (BMPs) as well as a set of site plans showing the location of the proposed stabilization and structural erosion and sediment control measures.

Stabilization and structural BMPs must be selected from the *Erosion and Sediment Control Handbook* (Goldman et al) and must meet the following requirements:

- All exposed and unworked soils must be stabilized by suitable and timely application of stabilization measures.

- Existing vegetation should be preserved wherever possible and areas that are not to be disturbed during construction must be marked in the field.

- Cut and fill slopes must be designed and constructed in a manner that minimizes erosion.

- Stabilization must be adequate to prevent erosion of outlets and adjacent streambanks.

- All BMPs must be inspected, maintained, and repaired as needed to assure continued performance. Inspections must occur at least once every seven days and within at least 24 hours after any storm event of more than 0.5 inches of rain in a 24-hour period.

- Provisions must be made to minimize the transport of mud from construction areas onto paved roads.

- Prior to discharge from the site, stormwater runoff must pass through a sediment pond, sediment trap, or other appropriate BMP. Sediment traps, perimeter dikes, barriers, and other BMPs must be constructed prior to site grading.

- Adjacent properties and waterways must be protected from sediment deposition and from downstream erosion due to increased stormwater runoff from the site.

- Temporary BMPs must be removed from the site within 30 days after the date when final soil stabilization is achieved.

Stabilization and structural BMPs typically include, but are not necessarily limited to: covering, seeding, or mulching exposed soils and stockpiles; providing vegetated buffer strips; protecting trees and mature vegetation; using temporary stormwater controls to divert water away from areas disturbed during construction; employing interceptor drainage swales and check dams on steeper, longer disturbed slopes or ditches in order to slow runoff velocity and direct flows toward sedimentation basins; employing sediment fences at the toes of disturbed slopes, at breaks in slopes, and along gullies; permanently restoring disturbed areas as soon as possible following disturbance and prior to the removal of temporary erosion controls; spraying construction roads and disturbed areas with water during dry periods to reduce the potential for dust and wind erosion; and providing sediment basins and traps.

2.1.3 Affected Environment

2.1.3.1 Regional Overview

The Project site is located near the western edge of the Columbia Plateau Physiographic province. Within Klickitat County, four major stratigraphic units (geologic layers) are evident:

- **The Ohanapecosh Formation.** This is the oldest stratigraphic unit in the County, possibly dating to the early Eocene period (up to about 58 million years ago) and consisting of a series of volcanic rock such as tuff, pumice, and ash, occasionally interbedded with basalt or other lavas. This formation is not evident at the surface near the Project site.

- **Columbia River Basalts.** This is the most extensive stratigraphic unit occurring in Klickitat County. Basalt is a hard, fine-grained rock formed from lava that flowed out of large fissures in the earth's crust. The basalts underlie most of the County in generally horizontal layers, except in areas where forces in the earth's crust have deformed and tilted the basalt flows. Columbia River Basalts form the distinctive dark brown to black rock cliffs occurring along portions of the Columbia River and other major river canyons in the County. Columbia River Basalts date from the Miocene period (up to about 25 million years ago).

- **Ellensberg Formation.** Sedimentary deposits of the Ellensberg Formation are interbedded with basalt flows. Ellensberg Formation deposits in the southeastern part of Klickitat County include unconsolidated silt, sand, and gravel deposits. This stratigraphic unit dates from 3 to 10 million years ago.

- **Simcoe Basalts and Cinder Cones.** This is the most recent stratigraphic unit evident in Klickitat County. Cinder cones and volcanic domes are evident throughout the Goldendale plateau.

The topography of the western portion of the Columbia Basin reflects volcanic activity, major east-west trending folds, and erosion caused by streams and rivers.

2.1.3.2 Site Geology and Topography

In the vicinity of the Project site, basalt outcroppings are common, with steep basalt cliffs occurring along the north shore of the Columbia River near John Day Dam. A large cinder cone occurs between the Project site and Goldendale, to the east of U.S. 97. This cinder cone is currently being mined for red rock.

The Project site extends along a portion of the ridge of the Columbia Hills. This ridge was formed from an upward fold (anticline) in the Columbia River Basalts. The Alder Ridge Anticline has been mapped as a distinctive geologic structure running from the eastern area of the site to the west of Luna Point. The Columbia Hills Anticline is mapped as a distinctive geologic feature to the east of Highway 97. However, it is likely that these two anticlines are part of the same geologic structure. The Swale Creek Syncline, a depressional fold in the Columbia River Basalts is mapped to the north of the two anticlines. (Brown, 1979).

The topography of the Project site ranges in elevation from about 670 meters (2,200 feet) MSL to about 950 meters (3,120 feet). Juniper Point, located in the center of the Project Site in Section 18, Township 3N Range 17E, is the highest elevation (954 meters, or 3,129 feet) in the immediate vicinity of the site. The Columbia River is approximately 700 to 800 meters (2,300 to 2,700 feet) lower than the crest of the Columbia Hills. Figure 2.1.1 shows Columbia Hills topography in the general vicinity of the Project site.

2.1.3.3 Geologic Hazards

No major faults have been mapped within or near the Project site, although some unidentified faulting may be associated with the basalt folds. Major earthquakes in the Columbia Plateau are relatively uncommon. Since 1893, only 64 seismic events measuring greater than 4.0 on the Richter Scale have been recorded. Seismic events in eastern Washington usually come in rapid, short intervals at depths of less than 2 miles (Ecology, 1979.)

Steep slopes exist within and near the Project site, primarily along the southern side of the crest of the Columbia Hills from Juniper Point to the southern Project boundary. The other geologic hazards that could potentially affect the site would be an ash fall from an eruption of one of the Cascade Range volcanoes. Mount St. Helens has experienced eight major eruptions in the last 13,000 years. The most recent eruption, which occurred in 1980, deposited ash in the Goldendale area.

2.1.3.4 Soils and Erosion Potential

A published soil survey for the area containing the Project site has not yet been developed. However, the NCRS has mapped much of the site onto aerial photographs and has developed Soil Interpretation Records for the mapped areas. Figure 2.1.2 is a generalized soils map of the Project site based on this unpublished NCRS data. Figure 2.1.2 groups several soil classifications into four categories generally reflecting the soils' susceptibility to erosion. These four categories include:

- **Silt Loams on Slopes Greater than 15 Percent.** These primarily include Slacker-Lickskillet soils in the western portion of the site, Goldendale and

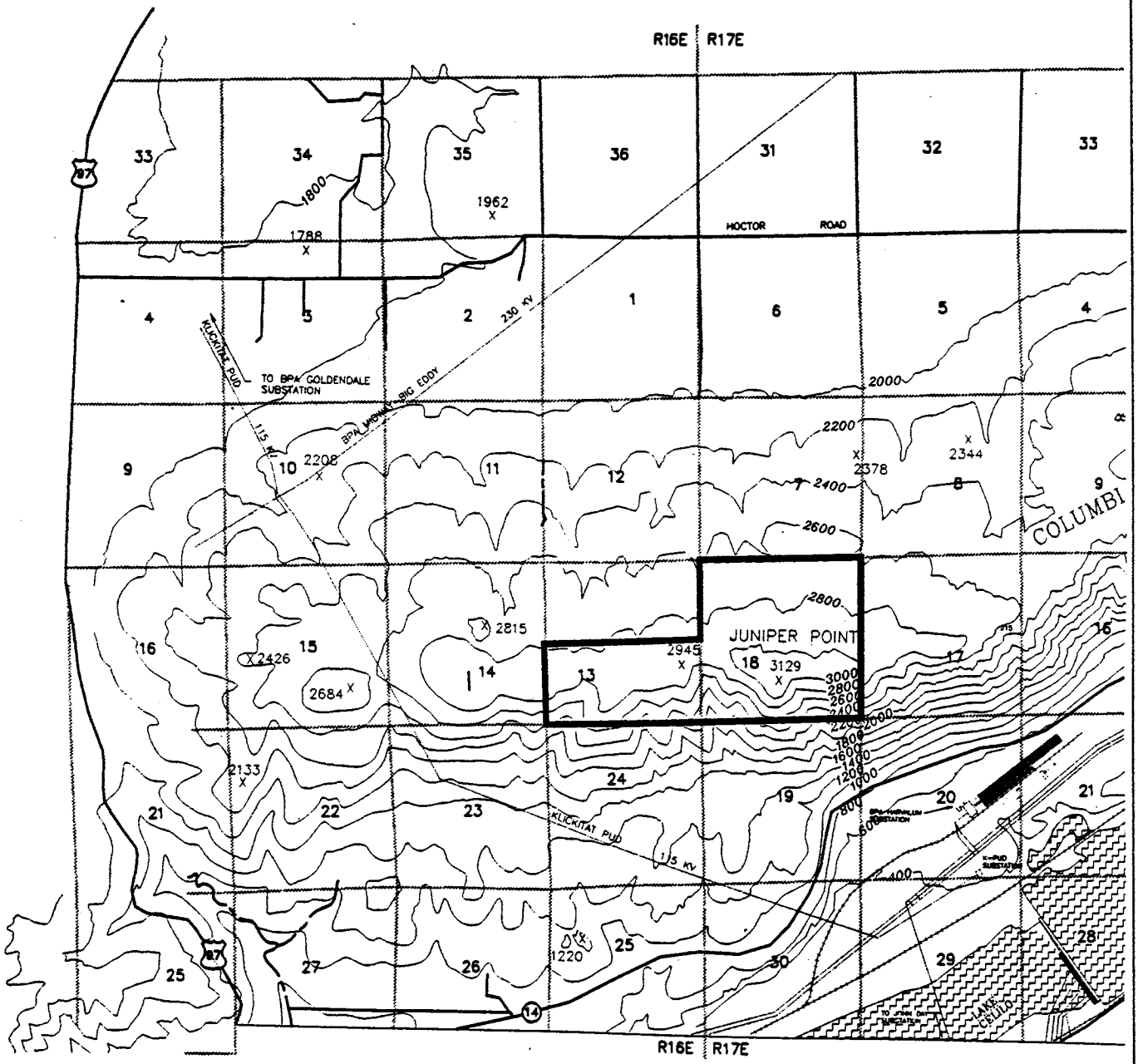


Figure 2.1.1 **Site Topography**

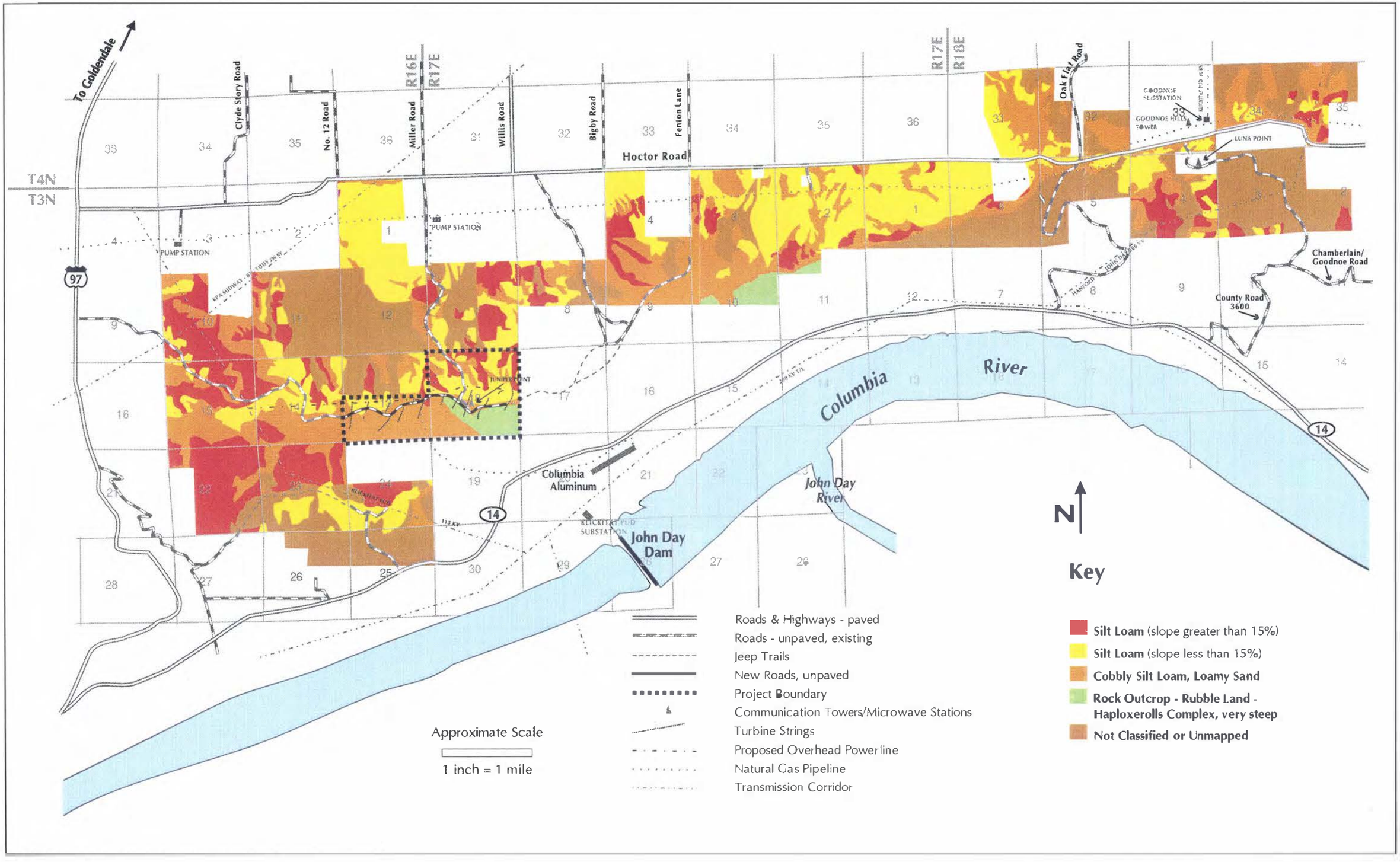


Figure 2.1.2 **Soils**

Lorena soils in the central portion of the site, and Slacker-Lickskillet or Asotin soils in the eastern portion of the site. These soils would be the most susceptible to erosion.

- **Silt Loams on Slopes Less Than 15 Percent.** These primarily include Lorena soils in the western portion of the site and Goldendale soils in the central and eastern portions of the site. Milder slopes would make these soils relatively less susceptible to erosion compared to silt loams on slopes greater than 15 percent.

- **Cobbly Silt Loams/Loamy Sands.** These primarily include Rockly and Rockly-Lorena soils. Due to the higher percentage of sand and cobble in these soils, they would be less susceptible to erosion than the silt loams.

- **Rock Outcrops/Haploxerolls Complex.** These would generally not be susceptible to erosion although in certain locations they may be susceptible to slides because of very steep slopes.

Table 2.1 summarizes characteristics of these major soils classifications. Silt-loam soils mapped on the site are generally susceptible to wind and water erosion because they include a large proportion of fine-grained soil particles. Slope length and gradient also contribute to an area's potential for erosion as do general land management and agricultural or grazing practices. The site lies outside of critical erosion areas mapped by the County (Long Range Resources Plan, 1983).

Because of the large proportion of fine particles in the silt-loam soils, they can be moisture sensitive and difficult to compact during wet or freezing weather. This also may limit the suitability of these soils as structural fill for roadway foundations.

Table 2.1 Soil Characteristics

	Principal Soil Classifications	Characteristics					Limitations To:	
		Slope Range %	Depth to Bedrock	Surface Layer Erosion Factor	Corrosivity		Local Roads and Streets	Road Fill
					Steel	Concrete		
Silt Loams > 15%	Goldendale	15-60	Greater than 60"	.43	Mod.	Mod.	Severe-low strength, slope	Poor-low strength, slope
	Lorena	15-65	20"-40"	.37	Mod.	Mod.	Severe-slope	Poor-depth to rock, slope
Silt Loams < 15%	Goldendale	2-15	Greater than 60"	.43	Mod.	Mod.	Severe-low strength	Poor- low strength
	Lorena	2-15	20-40"	.37	Mod.	Mod.	Moderate-depth to rock, shrink-swell, slope	Poor- depth to rock
Cobbly Silt Loam Loamy Sand	Rockly[1]	2-12	5-12"	.10	Low	Low	Severe-depth to rock	Poor-depth to rock
Haploxerolls Complex	Rock Outcrop Rubble Land Haploxerolls Complex	0-30	10-40"	.20	Mod.	Low	Severe- depth to rock, slope	Poor-depth to rock, slope

[1] Includes Rockly, Rockly-Lorena, and Lickskillet Cobbly Silt Loam.

2.1.4 Environmental Consequences

2.1.4.1 Proposed Action

Earthwork and Erosion

Construction activities would include clearing and grading associated with the development of new primary access roads, turbine strings (including secondary access roads), and the Project 115-kV transmission line. Trenching for utility and communication lines, substation construction, and construction of the Project maintenance facility would also disturb site soils. Temporary construction staging areas would disturb an additional 2 hectares (5 acres). Together, these activities are expected to temporarily disturb about 42 hectares (95 acres) during construction. Approximately 43 percent of this disturbance would occur on silt-loam soils, about 41 percent would occur on cobbly silts and loamy sands, and about 16 percent would occur in rocky areas.

As discussed in Section 2.1.3.4, silt loams are difficult to compact and may not be suitable for roadway foundations. Roads constructed on silt loam soils could be susceptible to rutting and sloughing unless they are constructed with adequate foundations. Gravel would be required for road foundations (subgrades) and surfacing. Assuming 12-inch road subgrades with 6-inch surfacing, the total amount of gravel required could range up to about 38,000 cubic yards, depending on whether or not existing roadways on the site were completely reconstructed.

Silt-loam soils also would be most susceptible to erosion from construction activities. Steeper and longer slopes would increase the potential for soil erosion, and gullies that form intermittent streams during periods of high runoff would also be relatively more susceptible to water erosion. The potential for water erosion would be greatest during late fall-winter rains and spring snowmelt. The potential for wind erosion would be greatest from mid-summer through fall when the area is driest.

Geologic Hazards

In addition to erosion, potential geologic hazards at the site include steep slopes, earthquakes, and an ashfall from a volcanic eruption. Most turbine strings (except for those in Section 13) would be at least partially constructed on slopes greater than 15 percent. The Project area falls within Seismic Zone 2B (Uniform Building Code, 1991). Any disruption to the Project from an ashfall would likely be short-term although some damage to equipment could result from the abrasiveness of the ash. Unstable slopes and the potential for localized slides pose the greatest potential geologic hazard at the site.

2.1.4.2 No Action

Potential impacts to earth resources, primarily those associated with erosion during Project construction, would be avoided if the agencies do not issue the required permits and approvals set forth in the *EIS Fact*. In addition, importing gravel and other earth materials for on-site road construction would not be required. However, impacts to earth resources associated with ongoing grazing use of the site would continue.

2.1.5 Mitigation Measures

In addition to the ESC Plan required under the NPDES General Permit and in addition to those measures incorporated into the Applicant's Proposed Action (see Section 1.1.6.3), the following additional mitigation measures, if implemented by the Applicant, would reduce the potential for erosion and other impacts to earth resources:

- Limit clearing and grading activities to the late spring through early fall period (typically May through October) in order to avoid grading during spring rains and snowmelt and late fall rains.

- Design road and turbine foundations and cut slopes in consultation with a professional geotechnical engineer to ensure that appropriate slope protection measures are incorporated into the design and that appropriate materials are used in road foundations.

- If detailed geotechnical investigations conducted during final Project design reveal any unstable areas that could not be adequately stabilized during construction or over the period of Project operation, avoid those areas during Project development.

- Design structural foundations and buildings in accordance with Uniform Building Code requirements for seismic zone 2B.

- Account for the effects of snowmelt in sizing drainage ditches and culverts.

- Use rock or other appropriate channel protection in steeper drainage ditches and channels.

- After construction, monitor the site for erosion on a regular basis, especially after large rainfall or snowmelt events, and take corrective action as necessary.

2.2 BOTANICAL RESOURCES

2.2.1 Studies and Coordination

This section describes the potential impacts to habitat and plant communities and summarizes the findings of the *Botanical Resources Technical Report for the Conservation and Renewable Energy System Columbia Wind Farm #1 EIS,* which is incorporated by reference into this EIS.

Botanical investigations of the Project site were conducted by Jones & Stokes Associates from April through July 1994. Pre-survey investigations were conducted to gain information regarding potential special-status plant species and vegetation communities that might exist on the project area. Table 2.2 lists special status species that were determined to potentially occur on the Project site. Field surveys were conducted to determine the presence of special-status plant species, map and describe potential vegetation communities, and document the presence of other species onsite, including culturally important species. Field surveys also were used to identify possible mitigation measures as a means to reduce potential Project impacts to botanical resources.

2.2.2 Affected Environment

Floristically, the Project site is located in the Columbia Basin Province dominated by shrub-steppe grassland vegetation (Franklin and Dyrness 1988). Completion of the presurvey and field investigations documented that the Project site is dominated by native bunchgrass communities (Figure 3.2). Vegetation communities which were observed on the Project site included the following:

- *Eriogonum douglasii/Poa secunda* (Douglas' buckwheat/Sandberg's bluegrass);
- *Festuca idahoensis/Agropyron spicatum* (Idaho fescue/bluebunch wheatgrass);
- *Quercus garryana/Pinus ponderosa* (Oregon white oak/ponderosa pine); and
- rangeland pasture.

Table 2.3 summarizes the key characteristics of the vegetation communities. Field surveys also determined that no special-status plant species were found on the study area.

Native grass and forb species are the dominant species present. Native bunchgrass such as Idaho fescue and Sandberg's bluegrass are the dominant species with other grasses such as bluebunch wheatgrass, needlegrass, and brushy squirrel tail present. Forbs and low shrubs such as Astragalus, lupine, yarrow, buckwheat species, daggerpod, desert parsley, showy phlox, longleaf phlox, pussytoes, Lithophrgma, and

Table 2.2 Special-Status Plant Species Identified during Presurvey Investigations

Plant Species	Status[a] USFWS/WNHP/TNC	Washington Distribution	Habitat Association
Astragalus arrectus Palouse milk-vetch	-/S/G2G3S1S2	Regionally endemic in Columbia Basin	Exposed rocky ridges, grassy hillsides, and open pine forests
Astragalus misellus var. *pauper* Barnaby-pauper milkvetch	-/S/G4T3S3	Regionally endemic in central and southern Washington	Exposed ridges and sagebrush zones
Collinsia sparsiflora var. *bruceae* Few-flowered collinsia	-/S/G4T4S1S2	Peripheral in its range in Klickitat County	Open grassy slopes and swales
Cryptantha rostellata Beaked cryptantha	-/S/G4S1	Peripheral in its range in southeastern and southwestern Washington	Dry open places
Draba douglasii var. *douglasii* Douglas' draba	-/S/G4T4S1	Peripheral in its range in Klickitat County	Exposed rocky and shallow soils of dry areas
Meconella oregana White meconella	C2/T/G2S1	Scattered in south-central and western Washington	Open oak groves with bunchgrasses such as Idaho fescue
Navarretia tagetina Marigold navarretia	-/T/G5S1S2	Klickitat County	Dry streambeds and gravelly washes near Columbia Gorge
Penstemon deustus var. *variabilis* Hot-rock penstemon	-/S/G5T2S1S2	Regionally endemic in Klickitat County	Dry foothills of lowlands and open grassy slopes
Ranunculus reconditus Obscure buttercup	C1/T/G2S1	Locally endemic in Klickitat County	Open meadows associated with phlox, desert parsley, and buckwheat

[a] Status Definitions:

USFWS = U.S. Fish and Wildlife Service

C1 = Category 1 candidate for federal listing. Category 1 includes species for which the USFWS has on file enough substantial information on biological vulnerability and threats to support proposals to list them.

C2 = Category 2 candidate for federal listing. Category 2 includes species for which the USFWS has some biological information indicating that listing may be appropriate but for which further biological research and field study are usually needed to clarify the most appropriate status. Category 2 species are not necessarily less rare, threatened, or endangered than Category 1 species or listed species; the distinction relates to the amount of data available and is therefore administrative, not biological.

S = Sensitive. A vascular plant taxon is labelled sensitive when it is vulnerable or declining and could become endangered or threatened in the state without active management or removal of threats.

TNC Rank. The ranking system developed by The Nature Conservancy facilitates a quick assessment of a taxon's global and state rarity. Each taxon is assigned both a global (G) and state (S) rank of 1 to 5. The rank is based on the number of known occurrences, quality of habitat, number of individuals, population and habitat trends, threats, etc. All state (S) ranks have been assigned by the Washington Natural Heritage Program. Global (G) ranks have been assigned by various state Natural Heritage Programs. The ranks are summarized as follows:

G = Indicator of global, i.e., rangewide, status
T = Indicator of status of infraspecific taxa, always used in conjunction with a global rank
S = Indicator of state status
1 = Critically imperiled because of extreme rarity or because it is particularly vulnerable to extinction or extirpation; typically 5 or fewer occurrences
2 = Imperiled because of rarity or because it is vulnerable to extinction or extirpation; typically 6 to 20 occurrences
3 = Either very rare and local throughout its range or found locally (even abundantly) in a restricted range; typically 21 to 100 occurrences
4 = Apparently secure; typically more than 100 occurrences
5 = Demonstrably widespread, abundant and secure

Table 2.3 Summary of Vegetation Community Characteristics

Vegetation Community	General Location	Approximate Area	% of Project Area	Common Plant Species
Douglas' buckwheat/ Sandberg's bluegrass	Primarily along ridge top on shallow soils	70 ha. (172 acres)	18	Sandberg's bluegrass, douglas' buckwheat, hood's phlox, threepart sagebrush, daggerpod, pussy-toes, nineleaf desert parsley, pestle parsnip, bitterroot, big-head clover, northern buckwheat, spring-gold
Idaho fescue/ Bluebunch wheatgrass	north-facing slopes on deeper soils	134 ha. (330 acres)	34	Idaho fescue, bluebunch wheatgrass, brushy squirrel tail, Thurber's needlegrass, northern buckwheat, western yarrow, pussytoes, balsamroot, Astragalus, upland larkspur, collinsia, velvet lupine, noneleaf desert parsley showy phlox, saxifrage, big-seed desert parsley, lungwort
Oregon white oak/ Ponderosa pine	Drainages on north-facing slope below ridge	2 ha. (6 acres)	< 1	Oregon white oak, Ponderosa pine, wax currant, common snowberry, western service berry, rose, bulbous bluegrass, Kentucky bluegrass, waterleaf, miner's lettuce
Rangeland pasture	north-facing grassy slope	69 ha. (172 acres)	17%	cheatgrass, annual fescue, bulbous bluegrass, intermediate wheatgrass, yarrow, Astragalus, lupine, northern buckwheat, rabbit brush
Mixed rangeland	south-facing steep rocky slopes	120 ha. (295 acres)	31%	unsurveyed native and nonnative grasses, scattered juniper

Table 2.4 Plant Species Observed on Project Site

Achillea millefolium
Agoseris spp.
Agropyron intermedium
Agropyron spicatum
Allium spp.
Amelanchier alnifolia
Amsinckia retrorsa
Antennaria dimorpha
Antennaria geyeri
Antennaria stenophylla
Apocynum androsaemifolium
Arenaria franklinii
Artemesia rigida
Astragalus purshii
Astragalus spp.
Balsamorhiza careyana
Brodiaea howellii
Bromus tectorum
Castilleja hispida
Chaenactis douglasii
Chrysothamnus nauseosus
Clarkia pulchella
Collinsia parviflora
Collomia grandiflora
Crocidium multicaule
Cryptantha spp.
Delphinium nutallianum
Draba verna
Dodecathion pulchellum
Erigeron spp.
Eriogonum compositum
Eriogonum caespitosum
Eriogonum douglasii
Eriogonum heracleoides
Eriophyllum lanatum
Erodium cicutarium
Erysimum spp.
Frasera albicaulis var. *columbiana*
Festuca bromioides
Fritillaria pudica
Galium aparine
Grindellia spp.
Hydrophyllum capitatum var. *thompsonii*
Juncus effusus
Juniperus occidentalis
Lithophragma parviflora
Lithophragma tenella var. *thompsonii*
Lithospermum ruderale
Lomatium macrocarpum
Lomatium nudicaule
Lomatium triternatum
Lewesia rediviva
Lotus spp.
Lupinus leucophyllus
Lupinus sericeus
Mertensia oblongifolia
Montia perfoliata
Myosurus minimus
Navarretia intertexta var. *propinqua*
Nemophila breviflora
Penstemon gairdneri
Phacelia humilis
Phleum pratense
Phoenicaulis cheiranthoides
Phlox hoodii
Phlox longifolia
Phlox speciosa
Pinus ponderosa
Plagiobothrys tenellus
Poa bulbuosa
Poa compressa
Poa sandbergii
Prunus virginiana
Quercus garryana
Ribes cereum
Rosa spp.
Sedum stenopetalum
Saxifraga integrifolia claytoniaefolia
Sisyrinchium douglasii
Sitanion hystrix
Stipa thurberiana
Symphoricarpos mollis
Thysanocarpus curvipes
Trifolium macrocephalum
Viola nuttallii
Vulpia spp.

stiff sagebrush are present. Other woody species sparsely distributed across the Project site include western juniper, western service berry, and ponderosa pine. Rabbit brush is scattered across the Project site and is commonly found in the rangeland pasture community. Oregon white oak occurs in the oak woodland shown on Figure 2.2.1. A list of the native and non-native plant species observed during field surveys is shown in Table 2.4.

The Douglas' buckwheat/Sandberg's bluegrass, Idaho fescue/bluebunch wheatgrass, and Oregon white oak/ponderosa pine communities mapped on the Project site would likely meet the Washington Natural Heritage Program's (WNHP) definition of a high-quality native, natural community. These communities are not regulated by state or federal laws, but they are considered priority habitats by the Washington Department of Fish and Wildlife and WNHP.

The Project site has been relatively undisturbed from development and heavy grazing pressure. The predominance of native plants, presence of a relatively undisturbed cryptogram crust on the soil surface, and the size of the communities meet the WNHP's criteria for a native, natural community. Because of the predominance of the ungrazed native bunchgrasses and the reduced extent of these communities in the Columbia Basin Province, the native bunchgrass communities represent a relatively large area of important vegetation communities, as defined by WNHP criteria.

2.2.3 Environmental Consequences

2.2.3.1 Proposed Action

This analysis includes impacts associated with the following project features: turbine strings and their appurtenant facilities, a 5.6 km (3.5 mile) 24-kV transmission line, a 3.2 km (2.0 mile) 115-kV transmission line, substation, operation and maintenance building, construction staging area, and access roads.

To determine the acreage of vegetation that will be affected, this analysis assumes that construction corridors are required to install the Project features. Construction corridors for Project features are as follows:

- 30 meter (100 feet) corridor for wind turbine string development (this corridor includes construction area for access roads and the turbines);
- 14 meter (45 feet) corridor for upgraded access road;
- 6 meter (20 feet) corridor for overhead transmission lines;
- 0.4 hectare (1 acre) substation;
- 2 hectare (5 acre) temporary staging area; and
- 0.4 hectare (1 acre) operation and maintenance building.

Direct impacts associated with vegetation removal can be characterized as temporary or permanent. Permanent impacts are associated with areas where vegetation will be

removed for permanent structures such as roads and ditches, buildings, and turbine pads. Temporary impacts are disturbance areas associated with activities required to build the Project, but would not result in a permanent structure. These activities include staging areas, trenches that are dug to install underground lines, and construction areas around permanent structures. Revegetation of these areas with native species would be done to reduce the area of soil disturbance. These temporary impacts may, however, be long-term impacts because of the difficulty in restoring the native bunchgrass systems to a natural condition.

Potential impacts within the construction corridors include the following direct impacts: vegetation disturbance or removal from Project construction and the initiation of development into relatively undisturbed native vegetation communities. Initiation of development would also divide the existing habitat into smaller units of the existing vegetation community.

Direct impacts from construction of the Project would result in the temporary disturbance of 38.3 hectares (94.7 acres) of vegetation and the permanent loss of 16.0 hectares (39.4 acres) of vegetation. Native bunchgrass communities dominated by Sandberg's bluegrass and Idaho fescue would be the primary vegetation communities affected (Table 2.5).

Table 2.5 Summary of Impact Area on Vegetation Communities

Vegetation Community Type	Area Temporarily Disturbed		Area Permanently Occupied*	
	hectares	acres	hectares	acres
Douglas' buckwheat/ Sandberg's bluegrass	17.3	42.8	9.7	24.3
Idaho fescue/bluebunch wheatgrass	14.8	36.6	7.7	19.3
Rangeland pasture	6.0	14.9	1.8	4.4
Oregon white oak/Ponderosa pine	0.2	0.4	0.2	0.4
Total (rounded to closest hectare/acre)	38	95	19.0	48

* Permanently occupied area within the transmission line corridors assumes power poles and cleared areas within oak/pine forest for transmission line maintenance activities.

Offsite impacts would include disturbance of native bunchgrass communities west of the Project site associated with the installation of approximately 1.7 km (1.1 miles) of 115kV transmission line. Temporary disturbance to vegetation, such as trampling, would occur from truck traffic during placement of poles and transmission lines. This

disturbance would be minimized be using low pressure, rubber tires on vehicles driving across the vegetation. Existing roads would also be used where possible to limit traffic on native vegetation. Placement of power poles would result in the permanent loss of less than 0.01 hectare (0.03 acre) of bunchgrass vegetation.

Plant species that would be affected by the Project would include those listed in Section 2.2.2. Native grasses and shrubs would be removed or disturbed with development of the Project. In addition to the loss of native plants that grow in these communities, the cryptogam crust on the soil surface would also be disturbed. Loss of the cryptogam crust could result in an increase in soil erosion and decreased soil nutrient and water retention.

In addition to direct impacts, indirect impacts to vegetation are likely to occur. Indirect impacts are associated with activities that would occur in the future. Ongoing activities that are required to maintain the site's function of producing wind power would likely result in trampling and degradation of native vegetation during maintenance of the site and facilities. This disturbance would create areas where invasive weeds could potentially grow and provide a continual source of weed seed in the Project area.

Removal or disturbance of 32.3 hectares (79.8 acres) of the Douglas' buckwheat - Sandberg's bluegrass, Idaho fescue - bluebunch wheatgrass, and Oregon white oak - ponderosa pine vegetation communities would be considered a moderately significant impact because of the following:

- These communities meet WNHP's criteria for native, natural communities and represent some of the higher quality native communities in the area. Other native bunchgrass communities have been documented by WNHP approximately 19.3 kilometers (12 miles) east northeast of the Project site. The existing relatively undisturbed condition of the native communities would be negatively modified.

- The extent of the existing native bunchgrass communities meeting WNHP's criteria for native, natural communities would be reduced in the area.

- The ability and time needed to restore grazed rangeland, that once supported native bunchgrass communities, and recover lost botanical resources on existing disturbed land would be considered a difficult and timely process. Cheatgrass dominates much of the grazed rangeland in the Columbia Basin Province and often increases with heavy grazing of native shrub-steppe communities, relinquishing ground very slowly after grazing has been reduced (Franklin and Dyrness 1988).

- Natural recovery times to reestablish the cryptogam crust component of the bunchgrass communities are long-term.

Loss of rangeland pasture would not be considered a significant impact because of the common occurrence of these vegetation communities in the region.

2.2.3.2 No Action

No environmental consequences would occur to botanical resources if the Project is not implemented. Ongoing grazing activities could contiue, potentially resulting in additional displacement of native shrub steppe habitats on the site.

2.2.4 Mitigation Measures

Mitigation measures that could be implemented to reduce the adverse impacts to botanical resources from implementing the proposed action include:

1. Locate construction staging areas in locations that minimize disturbance to native bunchgrass communities.
2. Require the preparation and use of a site access plan that limits construction, operation, and maintenance traffic to pre-identified locations. Utilize existing roads to the extent practical to minimize the amount of new road construction.
3. Prepare and implement a revegetation plan for areas temporarily disturbed during Project construction. The revegetation plan would specify means to reseed distrubed areas with native grasses and forbs and to salvage topsoil and bunchgrass plant material. The plan should be implemented immediately after the temporary impacts have occurred.
4. Limit the level of livestock use after the Project is operating until disturbed areas have been revegetated and reestablished..
5. Limit, to the extent possible, vehicle access during wet periods and the early growing season (generally from November through May) to minimize soil disturbance and damage to plants.
6. Restore rangeland habitat areas on the Project site with native, natural bunchgrass in coordination with agencies and restoration ecologists familiar with the bunchgrass vegetation communities.
7. Implement a weed monitoring plan after completion of construction.

2.3 HYDROLOGICAL RESOURCES (WETLANDS AND RIPARIAN AREAS)

2.3.1 Studies and Coordination

Jones & Stokes Associates conducted investigations of the Project site in April 1994. Background information, including aerial photography, was reviewed to determine expected hydrologic conditions and a field survey was conducted to map surface water resources and to determine site-specific conditions, potential environmental consequences, and appropriate mitigation measures. The findings are summarized here and fully documented in the *Hydrological Resources Technical Report for the CARES Columbia Wind Farm #1 EIS*, incorporated by reference into this EIS (Jones & Stokes, July 1994)

2.3.2 Affected Environment

The Project site is located on a ridgetop in the moderately dry climate of the Columbia River Basin in eastern Washington. Precipitation is approximately 30 centimeters (12 inches) each year (Franklin and Dyrness 1973) and occurs primarily in the winter and early spring. The northern half of Section 18 is steeper than the northern half of the Project site in Section 13. As a result, the drainage swales in Section 18 are deeper and the stream channels are narrower.

Hydrologic resources at the site include the headwaters of five seasonally flowing streams and four stock watering ponds which hold water for part of the year. Fourteen swales, five of which are associated with the onsite streams, were identified and evaluated and determined not to meet the Clean Water Act criteria of waters of the United States. One potential wetland was determined not to meet the criteria for jurisdictional wetlands. A map illustrating the locations of the hydrologic resources is included in Figure 2.3.1.

Streams on the site are typically narrow channels at the bottom of drainage swales which vary from 1 to 3 m (3 to 9 ft.) deep. Stream channel widths varied from 0.3 to 3 m (1 to 8 ft.) wide with an average width of 0.8 m (2.5 ft.). Channel depths varied from 5 to 15 centimeters (5 inches). The stream beds are typically composed of a loose mixture of sands and gravel. Channel banks were vegetated in most reaches but loose and eroding in occasional, smaller sections.

The fourteen swales drain into streams, either those identified on the site or others located downslope off the site. Swales were evaluated to determine the potential for contributing sediments to the streams as a result of erosion. Erosion observed on site, both in swales and streams, occurred primarily along steep banks and where

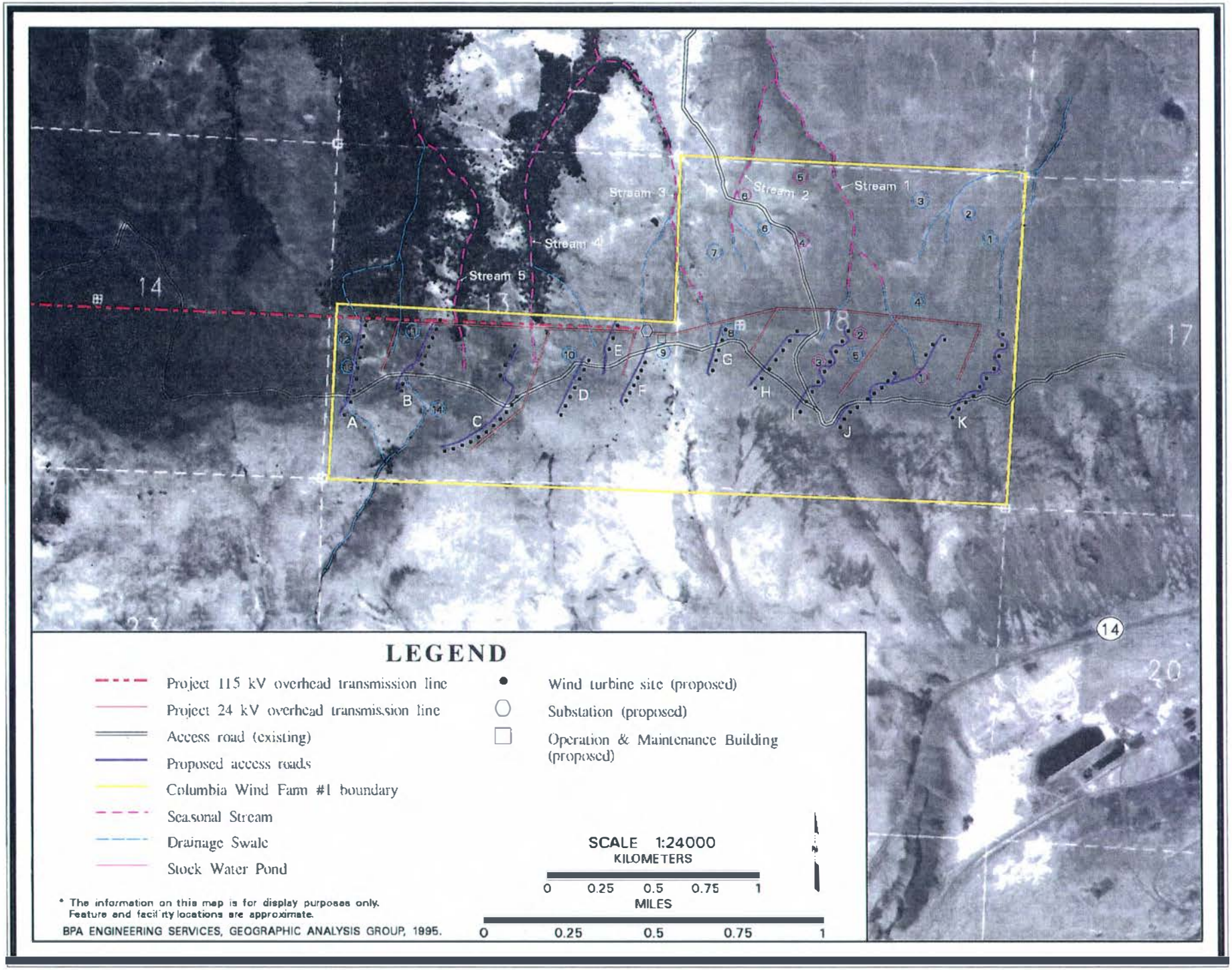


Figure 2.3.1 Hydrological Resources

cattle had trampled vegetation, destabilizing banks. Based on the field observations, erosion and sedimentation of streams are expected to be the primary potential impact to surface water resources on the Project site.

Six stock watering ponds were observed on the project site. No standing water was in two of the ponds and there was no evidence that either of these ponds store any water. Lines evident in the soil around the four ponds that contained water indicate that water levels decline fairly quickly in the spring. The ponds are likely to become dry by May.

2.3.3 Environmental Consequences

2.3.3.1 Proposed Action

Implementation of the proposed site development would result primarily in minor and temporary erosion and sedimentation impacts to streams and ponds from disturbance to the soil. Avoiding disturbance of stream channels and swales and implementation of construction best management practices (BMPs) to control erosion would minimize or eliminate these impacts. It is assumed that the staging area and the operations and maintenance building would not be located within or adjacent to any streams or swales.

Stream 2 could be directly impacted by widening of the existing 3.7 m (12 ft.) road to a 4.6 m (15 ft.) road which might require replacement of the existing culvert. This work could involve permitting under Section 404 of the Clean Water Act. Streams 4 and 5 might also be directly impacted by construction of the 24-kV and 115-kV transmission lines. Movement of equipment directly over streambanks and channels would result in moderate, short-term impacts.

Indirect impacts to streams could result from erosion in upslope swales. Erosion could potentially occur from construction of the transmission lines, which cross swales 4, 5, 8, 10, 11, and 12, and construction of roads, which are located adjacent to swales 8, 9, 12, 13, and 14, if soils within the swales are disturbed. Construction activities are proposed in the vicinity of the stock ponds 1, 2, 3, 4, and 6, which could be similarly effected by erosion and sedimentation.

One potential for long-term erosion is the Project substation which is proposed to be located in the upper end of swale 9 which drains into stream 3 downslope. Construction of the substation would temporarily disturb 0.5 ha (1 ac.) which would increase erosion within the disturbed portion of the swale. The substation would permanently occupy 0.5 ha (1 ac.) and would increase storm water runoff due to impervious or compacted soil surfaces which would, if unmitigated, likely increase erosion within the swale. Both temporary and permanent erosion impacts could potentially cause sedimentation of stream 3 downslope.

The proposed Project would not result in significant depletion or changes to recharge of the groundwater supply, and no significant environmental impacts are anticipated to groundwater due to operation of the Project. However, there is some chance that lubricating and hydraulic fluids could leak from the turbine nacelle during certain types of equipment failure.

2.3.3.2 No Action

Potential impacts to water resources, particularly from new or widened roads and construction of Project facilities, would be avoided if the agencies did not issue the required permits and approvals. Impacts to water resources associated with ongoing farming and grazing activities, including sediment discharge associated with erosion caused by agricultural activities, and any non-point source pollution resulting from livestock, would continue.

2.3.4 Mitigation Measures

In addition to erosion and sediment control measures that would be required under the NPDES General Permit, the following mitigation measures would minimize environmental consequences from the proposed development:

1. Limit movement of equipment across stream channels and swales where possible and implement measures to protect the integrity of stream channels.

2. Implement and maintain erosion and sedimentation control techniques adjacent to streams, swales, and stock ponds prior to any soil disturbance and throughout the construction period.

3. Revegetate all disturbed soils with native plants following completion of construction.

4. Relocate the Project substation outside of swale 9 or engineer erosion and sedimentation control methods to prevent erosion from impacting the downslope stream.

5. Locate the staging area and the operations and maintenance building away from any streams or swales.

6. Provide for lubrication and maintenance of construction equipment in contained areas and use liquid-absorbing booms, socks, pads, or loose absorbent materials in the event of minor spills of fuels, oils, lubricants, and other fluids.

7. Provide liquid-absorbing pads under turbines to contain or collect lubricant spills during turbine servicing.

8. Conduct regular inspections of turbine sites to detect any leakage of hydraulic or lubricating fluids and take appropriate action to contain leaks and clean up any material coming in contact with the environment.

2.4 CULTURAL AND HISTORICAL RESOURCES

2.4.1 Studies and Coordination

Archaeological and Historical Services (AHS) conducted a cultural resource inventory of the Project area. AHS documented their findings in a technical report, entitled *A Draft Cultural Resources Survey of the Proposed Columbia Wind Farm #1 Klickitat County, Washington.* The draft technical report is incorporated by reference into this EIS.

To obtain background information for the inventory, AHS conducted a search of records and site files, consulted with a representative of the Yakama Indian Nation (YIN) Cultural Resource Program staff, and coordinated with the Washington State Historic Preservation Officer (SHPO). Site specific fieldwork was conducted on August 30 - 31 and September 1 - 4, 1994 by two archaeologists from AHS and two archaeological technicians from the YIN. A map indicating the location of on-the-ground transects is included in Figure 2.4.1.

In addition to the AHS site specific cultural resource inventory, Historical Research Associates, Inc. (HRA) prepared a technical report entitled *Draft Cultural Resource Assessment of KENETECH Windpower Washington Windplant #1* (HRA, 1994). The HRA technical report is incorporated by reference into this EIS. The *Draft Cultural Resources Assessment* includes an overview of history and prehistory, Native American consultation, review of oral history interview tapes prepared by the YIN, and a cultural resource survey of Kenetech's proposed Washington Windplant™.

Both the office of Archaeology and Historic Preservation and the U.S. Forest Service expressed concerns about potential impacts to cultural resources during scoping for this EIS. Prior to field surveys, a detailed study plan was developed and reviewed by the State Office of Archaeology and Historic Preservation.

Consultation with Native American groups focused on the YIN. YIN staff has expressed concerns about Project impacts to a range of environmental resources including cultural sites, traditional cultural properties, habitat and native plants that have traditionally provided food and medicine, degradation of surface water quality and impacts to fish habitat, aesthetic impacts, and noise and air pollution. BPA and the County have corresponded and held meetings with YIN staff and members of the YIN Cultural Committee to discuss these concerns. In addition, YIN staff are conducting oral history interviews of tribal elders regarding traditional cultural use in the Columbia Hills area. Information gained to date from reviewing tapes of these oral history interviews is also summarized in this EIS.

Figure 2.4.1 Cultural Resource Survey Transects

2.4.2 Regulations, Standards, and Guidelines

Klickitat County has adopted a substantive SEPA policy to preserve important historic, cultural, and natural aspects of national heritage. In addition, several federal and state laws, regulations, and guidelines address the protection and management of cultural resources. Section 106 of the National Historic Preservation Act, as amended, directs that officials responsible for projects requiring federal permits take into account each project's effects on cultural resources that are eligible for listing in the National Register of Historic Places (NRHP). To be eligible for listing in the NRHP, a cultural property must have definable boundaries and meet one of four significance criteria. Specifically, as outlined in 36 CFR 60.4, "districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, material, workmanship, feeling, and association" are eligible for listing if they meet one of the following:

1. They are associated with *events* that have made a significant contribution to the broad patterns of history.

2. They are associated with the lives of *persons* significant in the past.

3. They embody the *distinctive characteristics* of a type, period, or method of construction or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction.

4. They have yielded, or may be likely to yield, *information* important in prehistory or history.

The Section 106 process is guided by regulations entitled *Protection of Historic Properties* (36 CFR Part 800) and starts with background research and field surveys to inventory cultural resources and to determine which ones are potentially eligible for listing using available information. Unless a site clearly contains only limited surface remains, its integrity has been compromised by previous disturbance, or some other disqualifying condition is obvious, archaeological sites are typically assumed to be potentially eligible pending additional study. If impacts to a potentially eligible site cannot be avoided, additional work is conducted to determine eligibility by digging test excavations to determine the nature of historical sites with important individuals, events, or architectural or engineering styles. Mitigation plans are then developed for eligible resources.

Traditional cultural properties, in addition to historic and archaeological properties, can also be eligible for listing. The National Park Service has prepared *Bulletin 38 - Guidelines for Evaluating and Documenting Traditional Cultural Properties* (Parker

and King, 1990). Traditional cultural properties include places that are important to the cultural practices, customs, or beliefs of a living community of people and that have been passed down over generations. Examples include locations associated with traditional beliefs of a Native American group about its origins or cultural history and places where Native American religious practitioners conduct traditional ceremonial activities.

The American Indian Religious Freedom Act of 1978 (AIRFA) provides guidance that could potentially affect development proposals. AIRFA directs federal agencies to consider the effects of their projects and programs on places and materials important to Indians' traditional religious practices. However, the law does not prevent the implementation of projects that might affect such practices.

The State Office of Archaeology and Historic Preservation includes the State Historic Preservation Officer (SHPO), who participates in federal and state cultural resource processes. The State's cultural resources review process generally follows that of the federal government. Other applicable Washington state regulations protect Indian graves and some other types of sites (RCW 27.44), and prohibit the disturbance of subsurface archaeological remains without a permit from the Office of Archaeology and Historic Preservation (RCW 27.53).

2.4.3 Affected Environment

Prehistory

Although the prehistory of the Project area is not well documented, it is likely similar to the prehisotry of the Mid-Columbia Region. It is generally believed that human occupation and use of the Mid-Columbia area dates to at least 10,500 years ago and has continued to the present time. The basic chronology of Mid-Columbia prehistory is summarized in Table 2.6.

Mid-Columbia archaeological sites have tended to include habitation sites, where remains indicate that multiple activities were carried out; resource procurement/processing sites, such as quarrying stone materials or roasting roots; and ritual sites that may include burials, rock art, or cairns (conical piles of rocks) (Galm et al, 1985). Most of the sites in the Mid-Columbia region have been recorded on irregular plains or high relief tablelands.

In Klickitat County, 70 habitation sites, 70 ritual sites, 1 resource procurement/processing location, and 42 combination sites had been identified by 1985 (Galm, 1985). More than 500 sites have been recorded in the county to date. Almost 70 percent of the sites in Klickitat County have been recorded in riverine environments.

Table 2.6 Chronological Sequence for the Mid-Columbia Region and the Columbia Plateau

Years Before Present	Description of Culture Historical Phases
250 - present	**Historic Period.** Introduction of Euroamerican technology and non-indigenous diseases lead to culture change. Diseases bring about population reduction. Euroamericans settle in the region.
2500 - 250	**Cayuse.** Population concentrated in large, nucleated winter villages of 50+ housepits. People dispersed to gather roots in the spring and to hunt in the fall and winter. This seasonal round became increasingly diverse and well organized over time. Trade with coastal groups was common.
4500 - 2500	**Frenchman Springs.** Introduction of semi-subterranean houses and more specialized camps for hunting, root collecting, and plant processing. Several styles of contracting-stemmed points predominate. Many have argued that the ethnographically-observed "Plateau Culture" had emerged by end of the phase.
8000 - 4500	**Vantage.** Inhabitants were highly mobile, opportunistic foragers adapted mainly to riverine environments (Chatters 1986; Galm et al. 1985). Increasing reliance on fish with less use of game. Sites are located along stream margins and projectile points are similar to those of the Windust Phase.
10,500 - 8000	**Windust.** Characterized by small, highly mobile bands of foragers/collectors who exploited plant and animal resources using a seasonal settlement system (Chatters 1986). Sites are generally small and exhibit low artifact densities. Large, shouldered or basal notched lanceolate projectile points are diagnostic (Rice 1972).
11,500 - 10,500	**Clovis.** Characterized by small, highly mobile bands of hunter/gatherers that exploited a wide range of subsistence resources, including bison and elk. Sites are usually small, exhibit low artifact densities, and are associated with early landforms, especially upland plateaus. Large lanceolate, fluted projectile points (Clovis points) are diagnostic.

Ethnography

Ethnographic bands that utilized the Columbia Hills spoke the Sahaptin language and may have included individual Sk!in, Wayampam, and Umatilla groups. These groups generally shared the same culture. In the vicinity of the Project site, villages were located along the Columbia River just west of Wishram, at Wishram, and at the mouth of Rock Creek, where a longhouse group is located today. The aboriginal settlement-subsistence system of these groups focused on the area's river systems because of the abundance of high-quality salmon and other fish resources, the protection for winter settlements, and the prehistoric importance of water transportation. Salmon and other fish provided from one-third to one-half of the diet and were the subject of the First Salmon Ceremony. Plant resources, the subject of seasonal thanksgiving feasts, provided a similar portion of the food supply and consisted primarily of roots and bulbs supplemented by berries, nuts, and greens.

These groups depended on stores of dried foods throughout the winter and hunted game animals for fresh meat. Spring activities include digging roots, gathering

greens, and harvesting salmon. Fishing was also an important summer activity, and women gathered and dried berries (Hunn, 1990). In the fall, groups gathered huckleberries in the Cascade Mountains and hunted deer and elk. The groups then returned to the rivers to harvest the fall Chinook salmon run which provided much of the winter supply. Thus, groups using the Columbia Hills visited a number of environmental settings during the year's subsistence activities; however, they maintained permanent winter settlements along protected tributaries to the Columbia and other rivers. Living in substantial structures, extended families used the winter months to make and repair tools and other items. Burials of various types were associated primarily with the winter settlements.

During late 1854 and 1855, Isaac Stevens, first governor of Washington Territory, negotiated several treaties with various tribal groups, including the Yakama tribe. The Yakama ceded large portions of their aboriginal territories in return for the establishment of a reservation -- land reserved for the exclusive use of Yakama tribal members. The Treaty reserves for the Yakama the right of taking fish at all usual and accustomed places along with the privilege of hunting, gathering roots and berries, and pasturing their stock on open and unclaimed land. The Project area is currently under private, non-Indian ownership, but is within the lands ceded by the Yakama in their treaty with the United States. A map illustrating the Yakama Reservation, ceded lands, and Project area is included in Figure 2.4.2.

Although tribal members often refrain from discussing sensitive and sacred cultural sites, such places are important to tribal cultural heritage. Yakama tribal members have described some of the important landforms in the Columbia Hills. Each point in the hills has an Indian name and special meaning. Indian groups traveled along the ridge, camped there, gathered plants for subsistence and medicinal use, made vision quests, and hunted deer and other large animals, small animals, and game birds. Burial sites may be located in the vicinity. Two traditional food plants harvested by the Yakama, bitterroot (*pyaxi*) and plants from the *Lomatium* family (*luks*), were observed by fieldworkers during the cultural resource inventory.

History

Early settlers in Klickitat County - many of whom migrated from the Oregon Territory in the 1860s and 1870s - settled near the Columbia River, Goldendale, and other places (Ballou, 1938). Many were attracted to a thin strip of pine growing on the ridge north of the Columbia River, which they cut and hauled to the river to fuel steamboats. Most of the earliest settlers raised livestock. Dryland wheat farming became a dominant industry in the county in the late 1800s. When the Columbia River and Northern Railroad constructed a line from Lyle to Goldendale in 1903, farmers could ship wheat from Goldendale to the Columbia River (Meinig 1968:284, 290, 344). Infrastructure associated with early dry-land wheat farming of the Columbia River plateau included large barns, grain warehouses, and bunkhouses and cookhouses for the seasonal harvest crew.

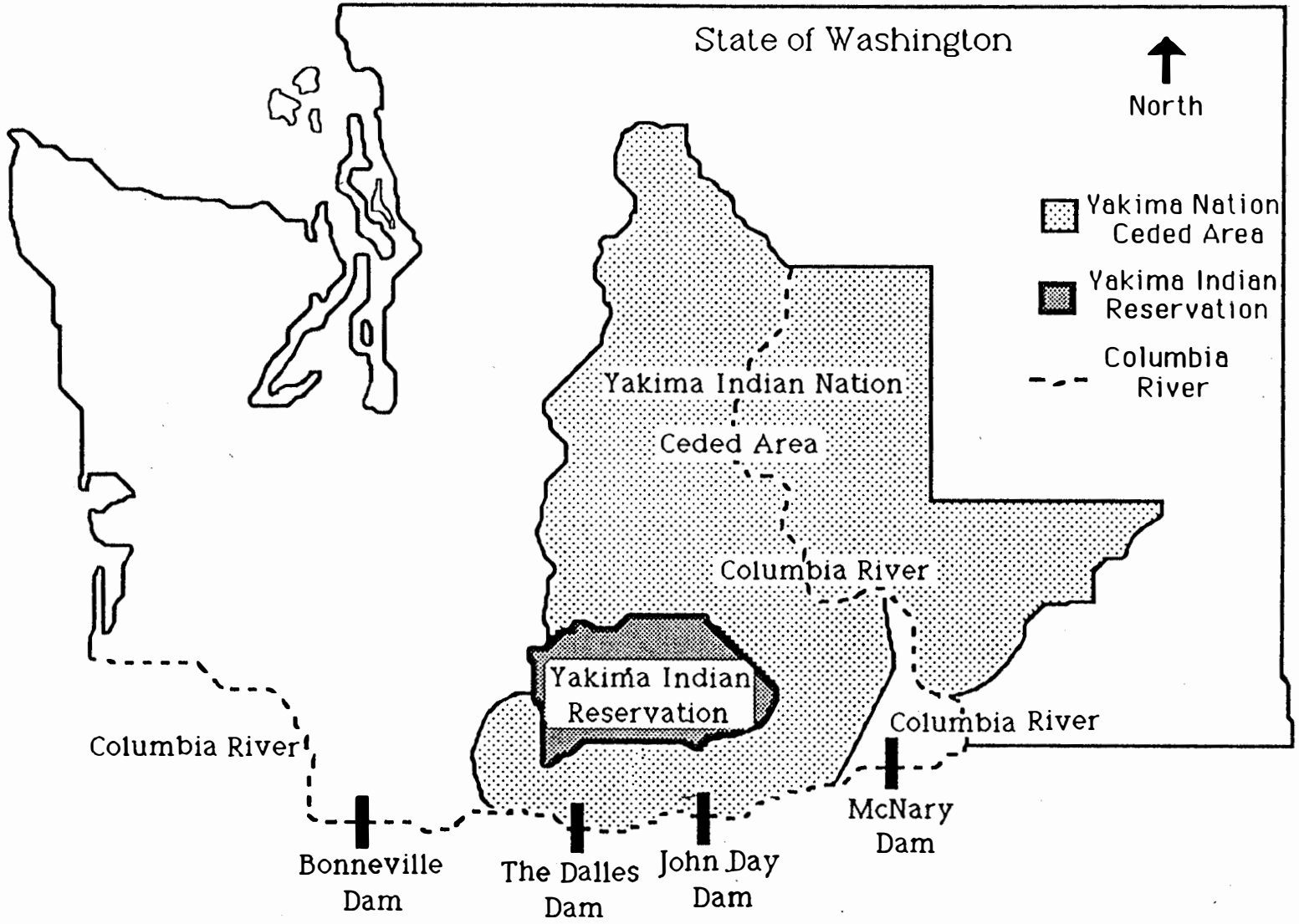


Figure 2.4.2 Yakama Ceded Lands

By the 1930's, agriculture within Klickitat County diversified, in part due to soil erosion and loss of soil fertility after decades of intensive wheat production. Agricultural products included wheat, irrigated alfalfa, cattle, hogs, and other livestock, cereal hay, poultry products, dairy products, and truck garden/fruit products. This move away from a reliance upon dry-land crops also resulted in development of deep-well irrigation in the central and eastern parts of the county. Additional changes included a trend toward fewer and larger farms with the emergence of gasoline and diesel-powered farm equipment in the 1930s.

The area where the Project is located was initially surveyed in the 1860's by the General Land Office (U.S. General Land Office Surveyor General 1861; 1868). A homestead patent for 65 ha (160 ac.) was obtained by John Atkinson on November 15, 1895 (Bureau of Land Management, no date). A cabin recorded on the Project site may be a remnant of this homestead, although this was not verified.

Traditional Cultural Properties

Traditional cultural properties, including cultural landscapes, may be listed in the National Register if they have defined boundaries and meet other requirements for listing. Klickitat County and BPA provided notification of the proposed Project to potentially affected Tribes and requested scoping comments. No scoping comments were received. However, BPA and the County provided an extended comment period to accomodate the needs of the YIN. The County and BPA have sought oral history information from the YIN to determine if any National Register-eligible traditional cultural properties might be present in the Columbia Hills area. (Such information includes site location, type of use, and its cultural importance.) As of January 11, 1995, YIN staff had conducted and taped oral history interviews with eight tribal elders who have ties to and knowledge of the Columbia Hills area. These interviews were conducted partially in English and partially in native language. Although translated transcriptions are not yet available, a portion of the tapes were reviewed as part of the studies conducted for this Project.

Information on the Columbia Hills area available from consultation with the YIN to date and review of oral history tapes indicates the area's ethnographic use included plant gathering and hunting, travel, and camping. Because of this use, YIN staff have indicated that burial sites may be located in the Columbia Hills area. Landforms in the Columbia Hills form part of the tribal landscape with importance to Yakama Indians. The Columbia Hills area includes habitat for eagles which are part of the native religion. YIN staff have indicated that Juniper Point is associated with legend and vision quest use in the past. They have also indicated that Skinpum Point, located west of the Project site and US-97, is a legend-associated area with traditional cultural value for ceremonial activities. The Yakama say that when a mythical flood killed almost all of the animals and people, Skinpum Point formed a small island where some animals and people could shelter. Elders have stated that

they believe spirits still reside in the Columbia Hills area. In addition, the Rock Creek Canyon, located east of the Columbia Hills, has religious value for the YIN. The original Rock Creek Village site is considered sacred by the YIN because it was associated with an Indian prophet. The long house at Rock Creek is currently used for religious practices.

Based on information gathered to date, Juniper Point might qualify for listing in the National Register of Historic Places as a traditional cultural property for its value as a legend site and a place where the Yakama collected juniper for medicinal uses.

Skinpum Point and Juniper Point do not appear to be linked by Yakama legend. Thus, information gathered to date does not suggest a distinct cultural landscape that would include the Project site and that would be eligible for listing in the National Register. The YIN, however, likely consider all of the aboriginal territory as a cultural landscape.

Views of Yakama Elders about the Project Area

Yakama Cultural Resources Program staff and elders believe they have a vested interest in the Project area. Some of them come from families that have been associated with the area since the beginning of time as counted by the Yakama, were born there, or have lived nearby for their entire lives. Yakama people who have traditional knowledge of the Columbia Hills area have driven through it with their children and grandchildren, pointing out places and teaching their culture. Yakama people cannot conduct activities in the Project area at present because it is in private ownership and fenced. They feel that the Project would not help this situation. The elders do not like the way the area is being used today, believing livestock grazing and other uses destroy the natural environment.

Yakama Cultural Resources Program staff and elders have stated a preference to avoid development because of the risk of environmental damage (for example, the destruction of the wild salmon runs) that has contributed to the loss of the subsistence lifestyle and for which they feel they have never been compensated. The Yakama are generally concerned about air, noise, and soil pollution. A specific concern is that the wind turbines may dry out the air, cause the native plants to wither and prevent them from reseeding the land. Yakama people are also concerned that the turbines will drive away wildlife including deer, rabbits, and birds. They wonder about potential impacts on allotments in the Columbia Hills vicinity; some Yakama tribal members own land in the Goodnoe Hills area. In addition, Yakama staff believe that the Project could affect the areas's aesthetics, and create noise and air pollution.

Yakama staff and elders see potential impacts from the proposed Project and question what value the project could bring to them. These concerns have led staff and some elders to state a preference that the project not be built, although the Tribal

Council has not yet sated its position. Although the concept of mitigation is not accepted by the yakama, they believe that they should be compensated for impacts on natural and cultural resources, including those incurred by past projects. There is a strong feeling that the project sould consider the views of the elders and the needs of the yakama people and that it should contribute toward righting past wrongs they have suffered. Tribal members are concerned about the enforceability of agreements with government agencies and private companies.

Ethnobotany

Botanical surveys (see Section 2.2) identified a number of plant species that were potentially used by Native Americans based on a list of plant species in the Hanford area provided by a YIN botanist. (Robson, 1994). The native plant species observed onsite were distributed throughout the Project site. These plant resources were likely gathered in the Columbia Hills prior to the land passing into private ownership. The property owner has indicated that they do not have arrangements or agreements with Native American individuals or groups to allow access to private lands for the gathering of plants.

Table 2.7 shows the plant species from the Hanford list that were observed during the botanical survey. Some of the species are non-native and would not have been used historically by Native Americans at this site.

Archaelogical and Historical Cultural Resources

Cultural resource surveys were conducted on approximately 324 ha (800 ac.) of the 395 ha (975 ac.) Project site. A pedestrian survey was conducted in 30 meter (100 ft.) wide transects in all areas of the Project except for the steep slopes on the south side of the ridge that were identified as undevelopable. The south facing slope in the south half of Section 13 was surveyed in transects that varied from about 30 to 70 m (100 to 230 ft.) to accommodate the terrain.

Cultural resources identified during the field survey were recorded either as sites or isolated artifacts (isolates), depending on whether more or fewer than 10 artifacts occurred per 10 m^2. Areas surrounding isolates were carefully inspected for the occurrence of additional specimens. Seventy five isolates and nine sites were recorded during the survey. The sites consist of six lithic scatters and procurement areas, a historic cabin, rock clusters, and rock cairns. Most of the isolates were flakes located near or within scatters of naturally occuring, eroding cryptocrystalline material.

Figure 2.4.3 shows the location of the nine sites located during the Cultural Resource survey.

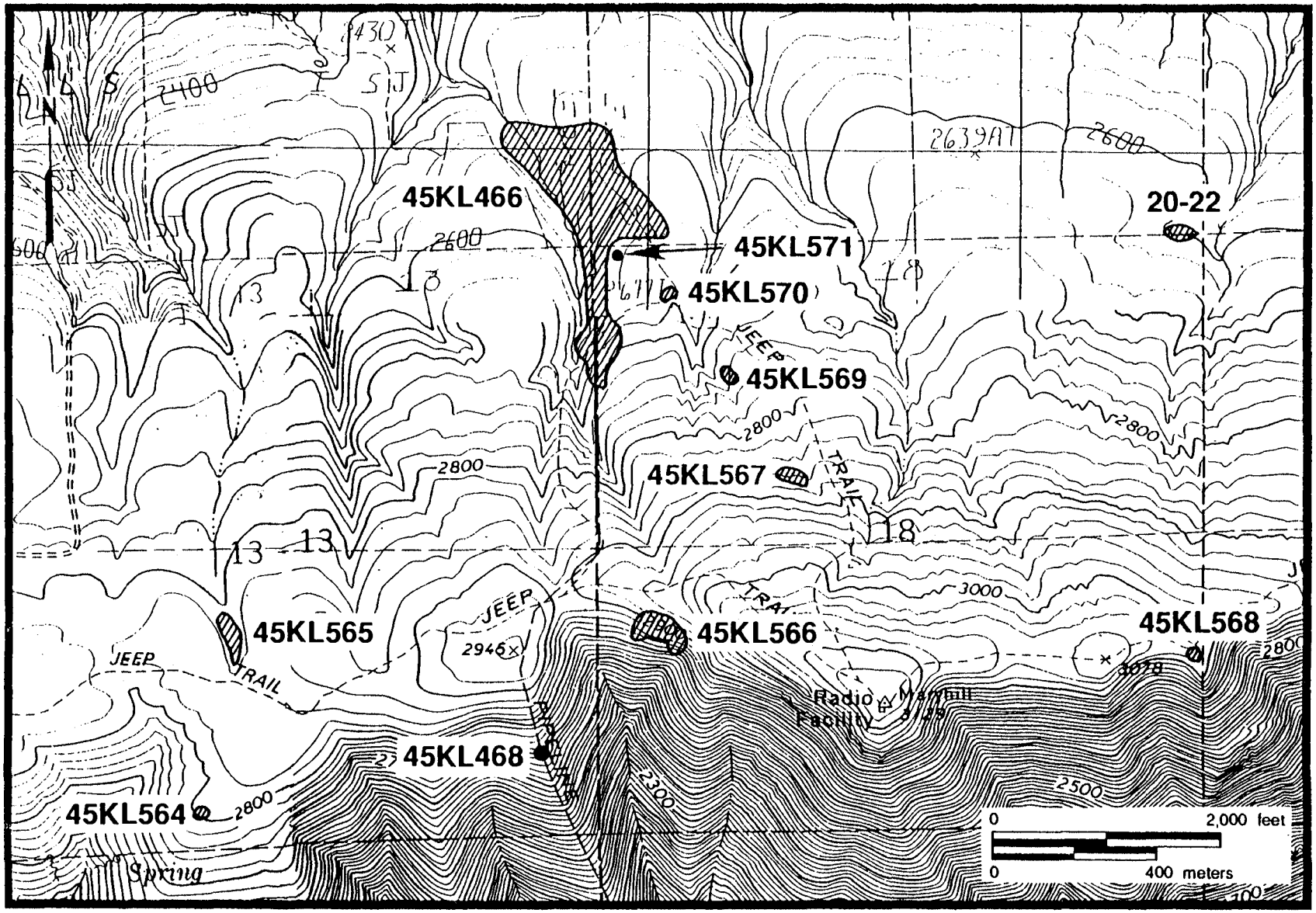


Figure 2.4.3 Cultural Resource Sites within Project Area

Table 2.7 Ethnobotanical Plants Observed on the Project Site

Linnean Name		
Achillea millefolium	*Erigeron spp.*	*Navarretia intertexta var. propinqua*
Agoseris spp.	*Eriogonum compositum*	*Nemophila breviflora*
Agropyron intermedium *	*Eriogonum caespitosum*	*Penstemon gairdneri*
Agropyron spicatum	*Eriogonum douglasii*	*Phacelia humilis*
Allium spp.	*Eriogonum heracleoides*	*Phleum pratense* *
Amelanchier alnifolia	*Eriophyllum lanatum*	*Phoenicaulis cheiranthoides*
Amsinckia retrorsa	*Erodium cicutarium* *	*Phlox hoodii*
Antennaria dimorpha	*Erysimum* spp.	*Phlox longifolia*
Antennaria geyeri	*Frasera albicaulis* var. *columbiana*	*Phlox speciosa*
Antennaria stenophylla	*Festuca bromioides*	*Pinus ponderosa*
Apocynum androsaemifolium	*Fritillaria pudica*	*Plagiobothrys tenellus*
Arenaria franklinii	*Galium aparine*	*Poa bulbuosa* *
Artemesia rigida	*Grindellia* spp.	*Poa compressa* *
Astragalus purshii	*Hydrophyllum capitatum* var. *thompsonii*	*Poa sandbergii*
Astragalus spp.	*Juncus effusus*	*Prunus virginiana*
Balsamorhiza careyana	*Juniperus occidentalis*	*Quercus garryana*
Brodiaea howellii	*Lithophragma parviflora*	*Ribes cereum*
Bromus tectorum *	*Lithophragma tenella* var. *thompsonii*	*Rosa* spp.
Castilleja hispida	*Lithospermum ruderale*	*Sedum stenopetalum*
Chaenactis douglasii	*Lomatium macrocarpum*	*Saxifraga integrifolia claytoniaefolia*
Chrysothamnus nauseosus	*Lomatium nudicaule*	*Sisyrinchium douglasii*
Clarkia pulchella	*Lomatium triternatum*	*Sitanion hystrix*
Collinsia parviflora	*Lewesia rediviva*	*Stipa thurberiana*
Collomia grandiflora	*Lotus* spp.	*Symphoricarpos mollis*
Crocidium multicaule	*Lupinus leucophyllus*	*Thysanocarpus curvipes*
Cryptantha spp.	*Lupinus sericeus*	*Trifolium macrocephalum*
Delphinium nutallianum	*Mertensia oblongifolia*	*Viola nuttallii*
Draba verna	*Montia perfoliata*	*Vulpia* spp.
Dodecathion pulchellum	*Myosurus minimus*	

* *Non-native species*

2.4.4 Environmental Consequences

2.4.4.1 Proposed Action

Implementation of the proposed action could result in impacts to cultural and historical resources from construction activities. Direct impacts could include soil disturbance from Project construction and indirect impacts could include soil erosion. The results of the Cultural Resource survey show the area has a relatively high potential for archaeological sites. The Project 115-kV transmission line location has not yet been surveyed for cultural resources and will need to be surveyed

prior to the start of construction. The 115-kv transmission line may be realigned to coincide with the existing road corridor.

Development of the Project as proposed would result in temporary and permanent disturbance to vegetation, including ethnobotanical plants, from construction and operation of the Project. Access to the Project site is not currently provided to Native Americans by the property owners, and Project development would not alter the status of access agreements. Therefore, the Project is not expected to adversely affect current availability of ethnobotanical plant resources to Native American groups.

As discussed in Section 2.4.3, Juniper Point might be eligible for listing as a traditional cultural property. Consulation with the YIN is ongoing regarding the eligibility of Juniper Point, and if so, measures would could be applied to avoid or minimize impacts. There is some potential that the occurrence of other traditional cultural properties could be revealed through this ongoing consultation process.

2.4.4.2 No Action

Potential impacts to cultural and historical resources from Project development would be avoided if the agencies do not issue the required permits and approvals. However, cultural and historical resources located on the site could potentially be disturbed by ongoing radio facility maintenance and grazing practices on these lands.

2.4.5 Mitigation Measures

Mitigation measures for National Register-eligible cultural properties include avoidance of impacts, minimization of impacts, and scientific data recovery for eligible properties. Avoidance is generally the preferred mitigation strategy because cultural properties are fragile and cannot be replaced. For archaeological deposits, avoidance is preferred over scientific data recovery because it is impractical to recover all possible data from such sites.

For the proposed action, the following mitigation measures would reduce or eliminate impacts from construction of the Project:

1. Flag and avoid potentially eligible sites and isolates located near any construction corridor.

2. Monitor construction activities to ensure that flagged cultural properties and other sensitive environmental resources are avoided.

3. Cease construction activities in the immediate vicinity of a site if any previously unidentified cultural resource properties are encountered during

construction. A qualified archaeologist should evaluate the site and consult with the State Office of Archaeology and Historic Preservation to identify appropriate mitigation measures.

4. Test any potentially eligible sites that prove to be unavoidable during final design, and determine their eligibility for listing in the National Register of Historic Places.

5. Design and implement scientific data recovery when testing confirms a site's National Register eligibility.

2.5 AVIAN RESOURCES

2.5.1 Studies and Coordination

This section addresses birds that could potentially be affected by the proposed Project and alternatives. Existing wind power facilities have experienced avian mortality due to collision with wind turbines, guy wires and overhead power lines, and electrocution (Biosystems Analysis, 1992). Those issues as well as concerns related to habitat loss, disruption of nest sites, changes in avian behavior, and impacts to special-status birds were identified during scoping as concerns for this Project.

Information in this section is summarized from *Avian Use of the Proposed KENETECH and CARES Wind Farm Sites in Klickitat County, Washington* (Jones and Stokes 1995), which presents the results of a year-long avian study conducted for this Project. The overall plan and design of the study was based on consultation with the USFWS, the WDFW, and the ODFW; a literature review; and information gained from preliminary site visits.

Because the study was conducted as part of a simultaneous study conducted for both the KENETECH and CARES projects, the primary study area surveyed included lands outside of the Project site. The survey area is described in detail in the Avian Technical Report included as Appendix D to this EIS.

The Project avian study incorporated four separate elements: (1) a winter raptor and waterfowl study; (2) spring migration and fall migration studies; (3) a raptor breeding study; and (4) a summer resident study. Specific survey dates were selected so that a survey would be made each week during the peak part of each seasonal period and every other week during the remainder of the season. A total of 85 person-days were spent observing bird use in the vicinity of the Project site and at a control area located near Horsethief Lake, about 21 km (13 miles) west of the site.

The primary methods used in gathering data for these studies were fixed-point observations and transect observations.[1] During the fixed-point observations, anytime a bird flew into the observation area counted as a sighting. If a single bird flew into, out of, and into an observation area, it counted as two sightings. If two birds flew into and out of an observation area at the same time, it counted as two sightings but only

[1] Fixed point surveys involve a surveyor taking observations from a fixed point (i.e., observation station) over a fixed period of time and at a fixed radius. This method provides standardized data that can be compared between stations, habitat types and seasons. This method allows statistical evaluation of data collected during the study period and also allows future statistical comparison of data collected during subsequent ongoing monitoring. Transect observations consist of a surveyor taking observations while traversing an identified path within the study area.

one observation. The total bird-minutes observed for each species were also recorded. Specific methods for each study included:

- **Winter Raptor and Waterfowl Study.** Winter Raptor study methods consisted of transects throughout the study area, observations of bald eagle winter roosts, observations of bald eagle daytime loafing and foraging behavior, and observations at regular intervals from a grid of 31 fixed point stations established within the Columbia Hills. Waterfowl study methods consisted of road transects following the Columbia River along the entire shoreline adjacent to the Columbia Hills. The winter raptor and waterfowl study was conducted in December 1993 through February 1994. Due to low visibility during December 1993, a supplemental study was conducted during December 1994.

- **Spring and Fall Avian Migration Studies.** Study periods were determined based on migration behavior published in the literature (Wahl and Paulson 1991; Jewett 1953; Heintzelman 1986). Migration study methods consisted of fixed point and transect observations performed throughout the primary study area shown on Figure 2.5.1. Transect observations were conducted enroute from one fixed point observation station to another.

- **Raptor Breeding.** Raptor nesting survey times were developed based on published breeding dates (Call, 1978) and on recommendations provided by the WDFW. Raptor breeding study methods consisted of fixed point observations from sites providing views of suspected nest sites; helicopter surveys for potential nest sites throughout an extended study area; and walking transects through potential nesting habitat. The extended study area for helicopter surveys for the golden eagle, bald eagle, and peregrine falcon included lands along the Columbia River and associated tributaries within 16 kilometers (10 miles) of potential turbine locations. This distance is the maximum home range for these species as reported by Call (1978) and was the study distance recommended by the WDFW.

- **Summer Resident Use.** Surveys were conducted during the summer to provide a greater level of detail about resident raptor and passerine use. The summer resident study incorporated transect surveys and fixed-point observations from the same points used for the spring and fall migration studies.

Data collected from fixed point stations in the spring and fall migration and summer resident studies were statistically analyzed to determine if variability in the number of observations could be correlated with a variety of environmental factors including: season, flight behavior and pattern, temperature, wind, cloud cover, flight direction, habitat traversed, altitude, and distribution across various geographical subareas or study units. Study units included five geographical areas containing similar

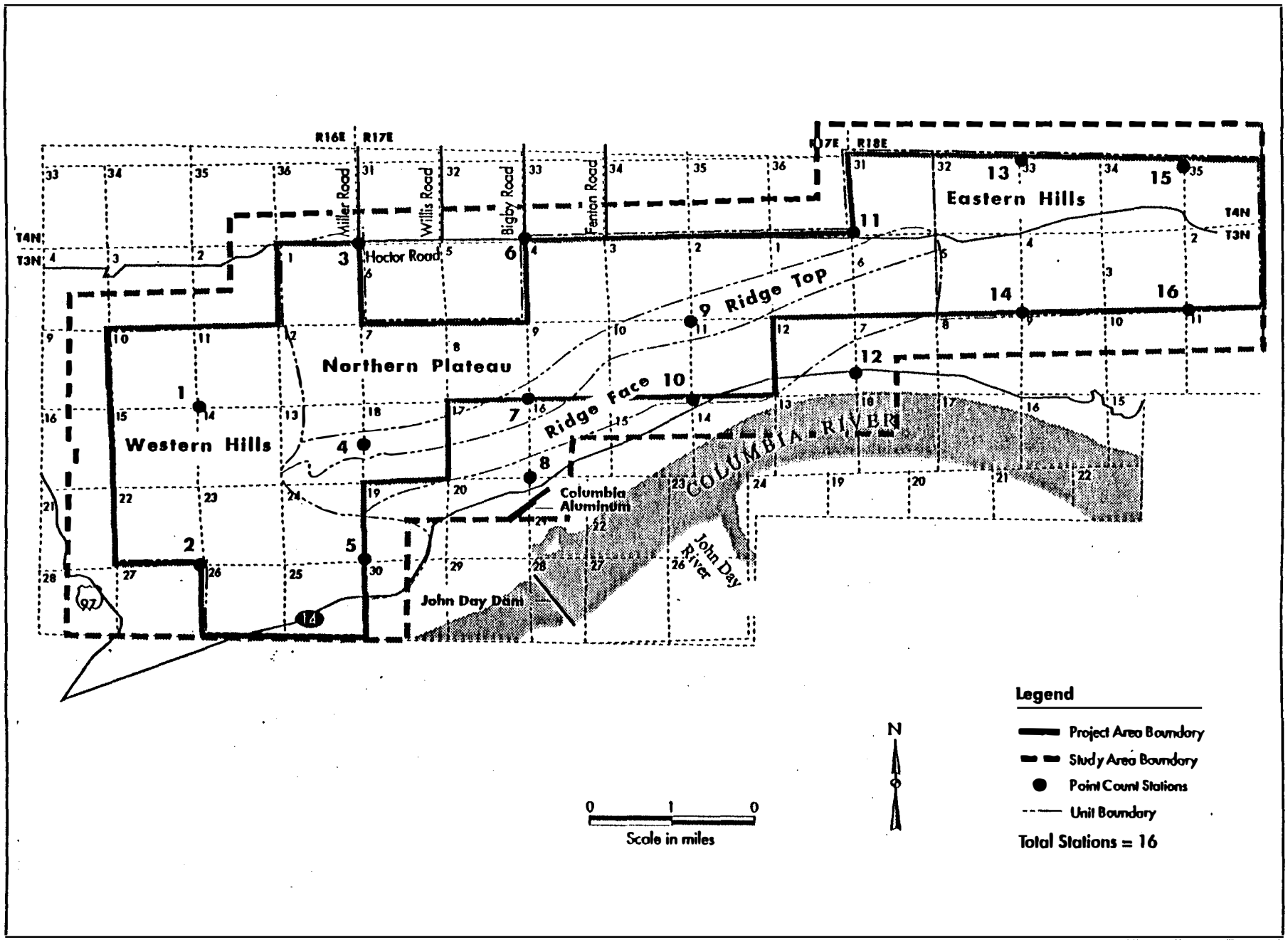


Figure 2.5.1 **Fixed Point Stations and Units Spring and Fall Locations**

topography, vegetation, land use, and other habitat features. Specific study units included:

- **Western hills.** This unit includes the steep, rounded hills located in the western quarter of the primary study area. The unit is almost entirely grassland, with some riparian habitat. The unit is situated immediately west of the project site and is not proposed for development of turbine sites as part of the Project.

- **Eastern hills.** This unit includes the steep, rounded hills located in the eastern corner of the primary study area. The unit contains mostly grassland, interspersed with a few parcels of cropland and some woodland area. This study unit is the farthest from the project site, being situated about 10 kilometers (6 miles) to the east, and is not proposed for development of turbine strings as part of the Project.

- **Ridge top.** This unit includes lands within 0.5 kilometer (0.3 mile) north of the Columbia Hills ridge crest, where the ridge begins to gently slope down to the north. This unit contains grassland along rolling topography connecting various high points along the ridge crest. These high points are separated by shallow gaps or saddles. This study unit crosses through the site and includes the area proposed for turbine development as part of the Project.

- **Northern Plateau.** This unit includes lands beginning 0.5 kilometer (0.3 mile) north of the ridge top study unit and extending to the northern limit of the study area. The unit contains grassland and oak/pine woodland in the southern portion and agricultural lands (mostly pasture) in the northern portion. This study unit includes the northern portion of the Project site and is not proposed for turbine site development as part of the Project.

- **Ridge face.** This unit includes the steep, south-facing slopes and cliffs of the ridge situated on the southern edge of the study area. The study unit, which parallels State Route 14 (SR-14), begins approximately 1 kilometer (0.6 mile) west of Juniper Point and continues about 13 kilometers (8 miles) east. This study unit includes the extreme southern portion of the Project site and is not proposed for turbine site development as part of the Project.

2.5.2 Regulations, Standards, and Guidelines

Klickitat County's Comprehensive Plan has established an overall goal of identifying and preserving wildlife.

As with the animal species discussed in Section 2.6 Wildlife Resources, avian species can be listed as threatened or endangered at the federal level and as threatened,

endangered, or otherwise sensitive at the state level. At the federal level, species listed as threatened and endangered are protected under the authority of the Endangered Species Act. Section 7 of the Endangered Species Act requires federal agencies to consult with the USFWS on actions leading to activities that may affect listed threatened or endangered species. Other federal laws include the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

In Washington, state management classifications include "sensitive" and "monitor" in addition to threatened and endangered. State-listed threatened or endangered species are not specifically protected by state statute or regulation, but are listed to assist with agency management efforts and decision making. Species may be listed at the state level because of rarity, vulnerability to disturbance, or other factors. Communal bald eagle roosts and nest sites are protected under WAC 232-12-292, the Washington State Bald Eagle Protection Rules.

2.5.3 Affected Environment

General

Consultation with resource agencies, literature review, and review of habitats in the Project vicinity identified 22 special-status bird species that could potentially be present on or near the Project site. **Table 2.8** lists the federal and state status of these species, as well as their habitat associations. One species - the peregrine falcon - is federally listed as endangered. The bald eagle is federally listed as threatened. Six other species (black tern, burrowing owl, western sage grouse, northern goshawk, long-billed curlew, and ferruginous hawk) are candidates for listing under the Endangered Species Act. Peregrine falcon and bald eagle are also listed as state-endangered and threatened, respectively. Sandhill crane is a state-listed endangered species, but is not federally listed.

Of the 22 special-status species that could potentially use or fly over the Project site, seven (western sage grouse, gray flycatcher, burrowing owl, grasshopper sparrow, bank swallow, black tern, and sage sparrow) were not observed in the study area nor were they listed as present by the WDFW Priority Habitats and Species data base. While these species may be present on the site or occasionally pass through the area, the site does not appear to provide important habitat areas for these species.

Osprey, long-billed curlew, loggerhead shrike, sandhill crane, northern goshawk, ferruginous hawk, ash-throated flycatcher, and Lewis' woodpecker were observed infrequently in the Project area:

- Osprey occur along the Columbia River and its tributaries and are closely associated with water bodies because they feed exclusively on fish.

- The long-billed curlew is primarily found in the Columbia Basin and may potentially use grasslands in the vicinity of the Project. No long-billed curlew were observed on the Project site, but two sightings were made within the study area: one in the Eastern Hills study unit and one in the Western Hills study unit. This suggests that the Project site receives only occasional use by this species.

- The loggerhead shrike is primarily found throughout the shrub-steppe areas of eastern Washington and Oregon, prefers open areas for foraging, and preys primarily upon insects and small birds and mammals. Loggerhead shrikes were not observed on the Project site, but three observations were made during Project surveys; two of these sightings were in the Eastern Hills study unit.

- One migratory flock of 50 sandhill cranes was observed during transect surveys, but none were observed during fixed-point station observations. Sandhill cranes were observed approximately 8 kilometers (5 miles) east of the Project site flying about 90 meters (300 feet) above the ground.

- Northern goshawk are primarily found in forested areas of Washington and Oregon, but could potentially migrate through the Project area.

- While the ferruginous hawk roosts and forages in habitat types similar to those in and around the vicinity of Project, it occurs infrequently near the Project site. Three sightings of these birds were made during spring through fall surveys, two in the spring and one in the fall. A single ferruginous hawk was observed during the winter study, in the ridge top study unit.

- While Lewis' woodpeckers are migratory, they were observed during the winter months, most frequently near the oak woodlands in the North Plateau.

- Ash-throated flycatcher were observed incidentally during the breeding survey.

The following discussions focus on federally threatened and endangered species, and on those special-status state species most frequently observed near the Project site.

Peregrine Falcon (Federal and State Endangered)

Peregrine falcons are found in areas with cliffs or other tall features (including tall trees and human-made structures) and near abundant sources of prey. Such features provide a good vantage point from which to locate prey. Peregrine falcons feed almost exclusively on birds, which are usually taken in the air. They prefer flocking birds when available, including waterfowl, rock dove, mourning dove, and shorebirds. During the nonbreeding season, peregrine falcons typically follow the movements of shorebirds and waterfowl and have been reported to move through eastern Washington

from late November through January (Ennor 1991). Peregrine falcons typically nest on steep cliffs or other areas where they can avoid predators (Ratcliffe 1993). Basalt cliffs along the Columbia River are suitable for peregrine falcon breeding (Anderson pers. comm. 1994). Peregrine falcons usually begin egg laying from around the third week in March to the first week in May, with hatching occurring any time from late April to mid-May. Young usually leave the nest in June.

The national decline in peregrine falcon populations has been attributed mostly to the use of DDT and other pesticides (USFWS 1982). Since DDT was banned, peregrine falcon numbers in Washington State have increased in part due to active reintroduction programs (WDFW 1991). Nonetheless, peregrine falcons have never been abundant in Washington or Oregon, and historical numbers have been estimated at 16 pairs for Washington and 30 pairs for Oregon (Platt and Enderson 1989). In Washington, naturally established nest areas have been documented on the Pacific Coast, San Juan Islands, and Columbia River Gorge. Oregon and Washington (from western Washington and through the Columbia Gorge to eastern Klickitat County) are also used by wintering peregrine falcons originating in Alaska and Canada.

The USFWS' recovery plan for the Pacific population of peregrine falcons identifies specific minimum numbers of breeding pairs within 21 management units. Recovery plan goals for the Columbia Gorge peregrine falcon Management Unit include a minimum of three breeding pairs. As of 1993, up to seven pairs were known to exist in this management unit. The Columbia Gorge management unit extends from the Portland area east to the point where the Columbia River heads north (USFWS 1982). Reintroduction activities implemented under the Recovery Plan have included releasing young birds in the Columbia River Gorge in Skamania County and placing young in an active prairie falcon nest located east of the Project site. Prior to field studies conducted for this EIS, the closest known pair of peregrine falcons to the Project site was located 25 km (15 miles) west of the Project site (Dames and Moore, 1993). The home range of nesting pairs is estimated to be 16 km (10 miles) (Call 1978).

Most of the Project site consists of steep grassy slopes rather than the steep cliff areas preferred by peregrine falcons. Nevertheless, because cliff habitat is present immediately south of the Project site, and these birds are typically wide ranging, they could occasionally fly over the site. In addition, peregrine falcons may forage on flocking birds as they travel between regularly used foraging areas.

Helicopter surveys revealed no peregrine nests within the 10-mile greater study area; however, a pair was sighted several times in the vicinity of Rock Creek, approximately 19.3 km (12 miles) east of the Project site. No peregrine falcons were observed during the winter study. Two sightings of peregrine falcon were made during the spring through fall fixed-point surveys. Both sightings were made in the northern plateau study unit, with both flying between 7.5 and 58 meters (between 25 and 150 feet)

above the ground. **Table 2.9** and **Table 2.10** summarize prey use and foraging methods used by the peregrine falcon.

Bald Eagle (Federal and State Threatened)

Wintering bald eagles typically spend over 90 percent of their daylight hours on perch sites, usually located in tall trees with strong lateral branches on the edge of stands that are closely associated with water (Watson et al. 1991). These perches provide a resting place as well as proximity to foraging opportunities. Wintering bald eagles in eastern Washington feed mainly on waterfowl, upland birds, and deer and livestock carrion, although fish are taken when available (Fielder 1982; Ichisaka et al. 1989; Fielder and Starkey 1987). Bald eagles typically spend the night and occasional periods of severe weather in regularly-used roosting areas and often roost in groups. The four primary characteristics of winter roosts are: clear visual access to surrounding terrain, a favorable microclimate, stout perches high above the ground, and isolation from excessive human disturbance (Hansen et al. 1980). Bald eagles may use different roost sites depending on weather conditions. Winter roost sites are often associated with foraging areas, although bald eagles will travel many miles between foraging areas and roosting areas (Stalmaster 1987).

Bald eagles declined to low levels due to pesticide poisoning, primarily from DDT. Since DDT was banned, bald eagle numbers have approached the recovery goals established by the USFWS (WDFW 1991). Habitat loss is currently the greatest threat to bald eagle populations in the Pacific Recovery Area (Rodrick and Milner 1991).

Most bald eagles that winter in Washington are associated with western Washington river systems. However, mid-winter surveys have regularly identified over 3,000 individual bald eagles in eastern Washington each year since 1982 (WDFW 1990). The upper and middle reaches of the Columbia River support the greatest number of wintering bald eagles in eastern Washington. Bald eagles can be seen year-round in Washington and regularly migrate to eastern Washington from Canada and Alaska for the winter (Fielder and Starkey 1987).

Klickitat County supports relatively few bald eagles. In 1990 about 1.2 percent of the total state count was found in Klickitat County (35 out of a total of 2,983) (WDFW 1990). This amounts to about 5 percent of the total count for eastern Washington counties (35 out of 642) (WDFW 1990).

Bald eagle use of the Columbia Hills is restricted to winter use only, and is limited to a small population of nonbreeding individuals who occupy the area along the Columbia River in the vicinity of the Project site from fall (end of October) through early spring (end of March). During the winter raptor study, three to 10 individual birds were observed at any one time. However, the winter survey was conducted over a relatively mild winter when overall bald eagle numbers in Washington were average. Because

bald eagle wintering populations can vary, it is estimated that up to 20 bald eagles could winter in the vicinity of the Project site during years of peak use assuming peak use is roughly twice average use. During supplemental surveys (4 days) conducted in December 1994, there were eight sightings of bald eagles.

Most eagles observed were perched along the river or flying along the ridge face and the Columbia River (see Figure 2.5.2). Flight behavior included gliding and soaring on updrafts along the ridge face, criss-crossing the face, and occasionally crossing the ridge crest to the north. On one occasion, bald eagles were observed flying within 50 meters (about 165 feet) above the ground. Active foraging behavior was not observed. No night or day roosts were located on the Project site; however, three regularly used day roosts were observed along the Columbia River over 6.5 kilometers (4 miles) east of the Project site and three night roosts were observed over 11 kilometers (7 miles) east of the Project site. In general, bald eagles using night roost sites located away from the Columbia River left the roosts near dawn and returned within a few hours of sunset. One specific route was observed being used by two adults (see Figure 2.5.3). Table 2.9 and Table 2.10 summarize prey use and foraging behavior employed by bald eagles.

Golden Eagle (State Candidate)

Golden eagles require large territories and nests are generally widespread. For example densities of golden eagles in the western states range from one pair per 34 km^2 (one pair per 13 mi^2) to one pair per 250 km^2 (96 mi^2) (Rodrick and Milner 1991). They favor steep-sloped open areas as their primary habitat, and were most often observed in the ridge face study unit. They were also regularly observed in the western hills and eastern hills, and occasionally observed in the remaining study units. They were observed most frequently during the summer.

Golden eagles primarily prey on medium-sized mammals such as rabbits but often prey upon small mammals and upland game birds, and occasionally snakes, lizards and carrion. They most often glide low along the contours of the ground while foraging for food, but also utilize a soar and search technique and sometimes hunt from a perch (Johnsgard 1990; Palmer 1988).

Golden eagles were observed in low to moderate levels in the study area. Thirty-seven sightings were made for a total of 90 minutes of use within the fixed-point observation areas. Based on repeated field observations, it was estimated that approximately four juveniles and three adults were utilizing the Project site. One active golden eagle nest was located in the vicinity of the Project site (see Figure 2.5.4). The nest site was approximately 2.9 kilometers (1.8 miles) from the nearest proposed Project turbine location. Another nest was located in the greater study area on Miller Island, 14.5 kilometers (9 miles) from the western edge of the site. Table 2.9 and Table 2.10 summarize prey use and foraging behavior of the golden eagle. In 1990, the golden

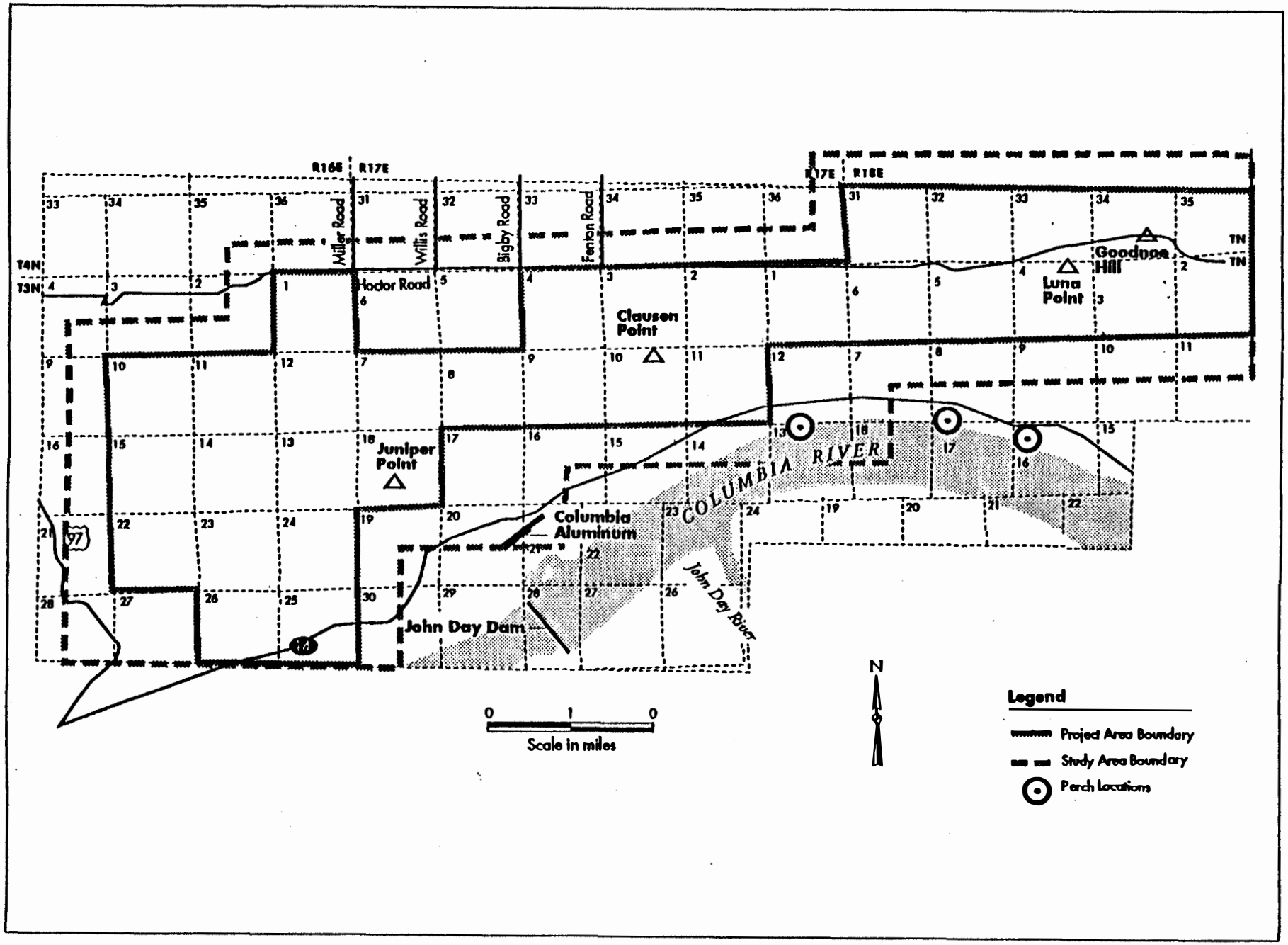


Figure 2.5.2 **Bald Eagle Daytime Perch Locations**

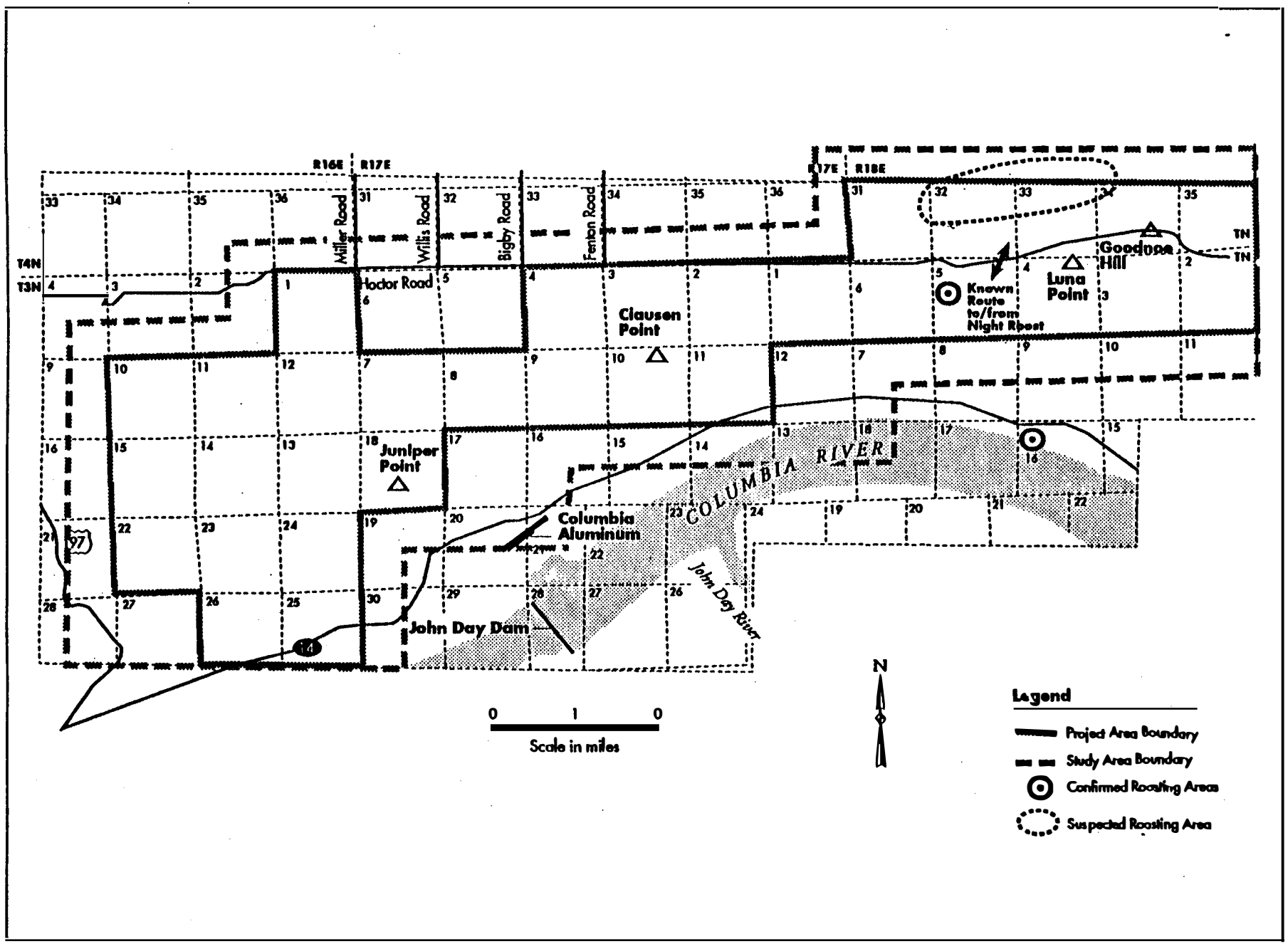


Figure 2.5.3 **Bald Eagle Night Roosts**

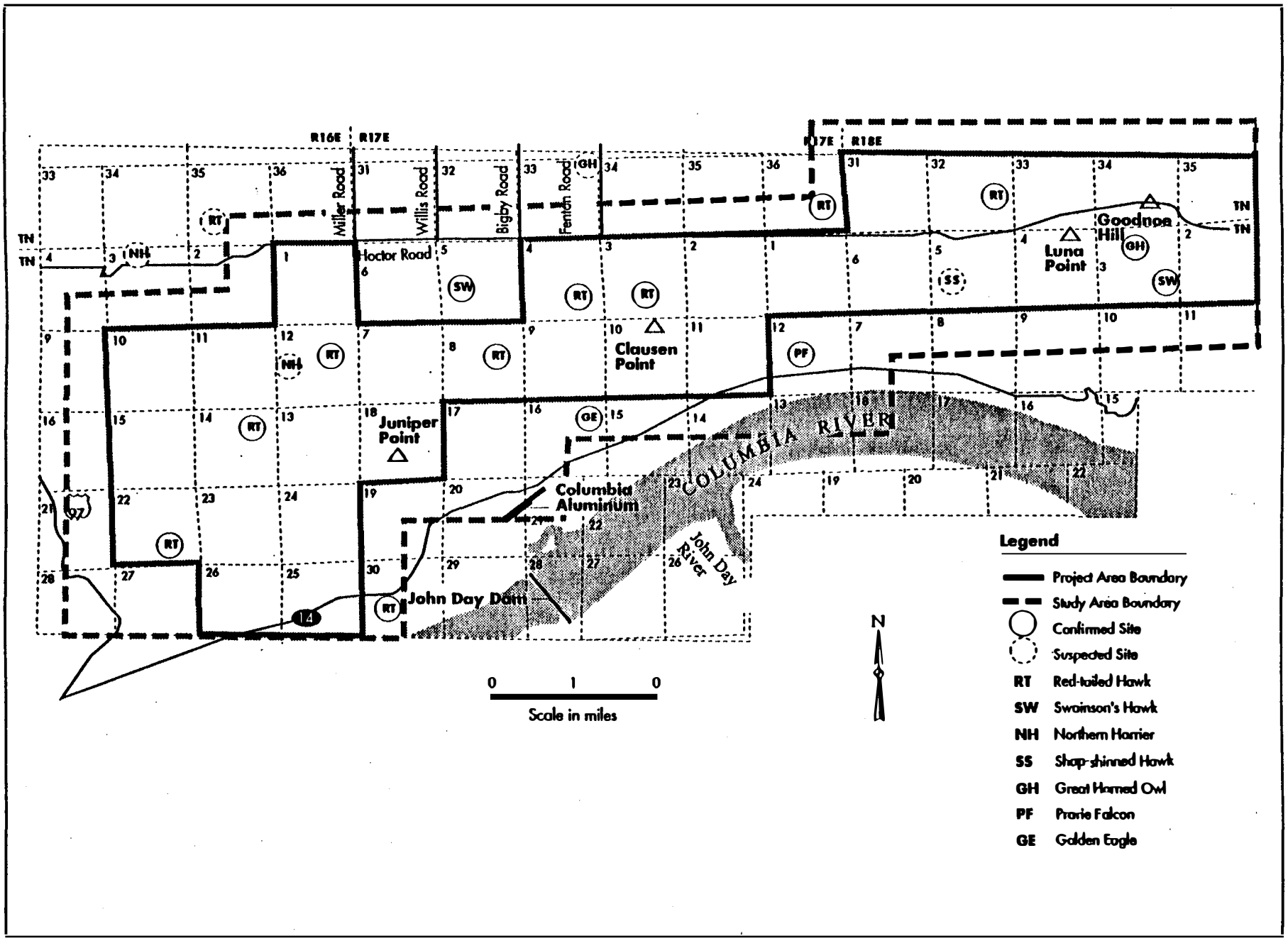


Figure 2.5.4 **Raptor Nesting Locations within the Primary Study Area**

eagle population in Washington was estimated at 80 breeding pairs (Rodrick and Milner, 1991).

Swainson's Hawk (State Candidate)

In Washington, 228 Swainson's hawk territories were documented between 1977 and 1986. Swainson's hawk winters in the vicinity of the Project site where their preferred habitat is cropland and grassland. Swainson's hawk primarily preys on ground squirrels in spring and grasshoppers in summer, and occasionally feeds upon medium-sized mammals, snakes, and lizards. It most often utilizes the soar and search method of foraging, but also forages from a perch or by flying close to the ground. No Swainson's hawks were observed on the Project site, but two Swainson's hawk nests were located in the primary study area: one near Hoctor Road, and another downslope from the Goodnoe Hills (see Figure 2.5.5). Eighteen sightings were made for a total of about 60 minutes of use within the fixed-point observation areas during the spring through fall point-count surveys. Table 2.9 and Table 2.10 summarize prey use and foraging behavior of the Swainson's hawk.

Prairie Falcon (State Monitor)

Prairie falcon primarily forage by flying close to the ground, but occasionally forage by gliding low along the contours of the land. Less often, they forage utilizing the soar and search, aerial pursuit, or perching methods. Prairie falcons commonly feed upon small mammals such as ground squirrels in non-winter months, particularly during breeding season. In winter, they are most likely to forage in areas containing sparse ground cover and in croplands, where horned larks, their primary winter prey, are most common. Other winter prey includes small- and medium-sized flocking birds.

One breeding pair was located 7 kilometers (4.3 miles) east of Project site just outside of primary study area. Three nests were observed within the extended study area. An estimated 52 breeding pairs of prairie falcon have been identified in Washington (Platt and Enderson 1984). The statewide estimated number of breeding pairs was 175 in 1989, and populations were judged to be stable (Platt and Enderson 1984). Prairie falcons were observed within all study units at relatively low numbers during spring through fall surveys; however, several observations were made along Hoctor Road in the north plateau study unit and along SR-14 within and south of the ridge face unit. Behavior observed included perching on utility poles and flying close to the ground. **Table 2.9** and **Table 2.10** summarize prey use and foraging behavior of the prairie falcon.

Turkey Vultures (State Monitor)

Turkey vultures can be found in the Project vicinity in the fall and spring, and are known to breed in the area. The turkey vulture's primary habitat is steep, open areas,

where it employs a slow, circling, soar and search technique while foraging. Turkey vultures feed almost exclusively on carrion. Turkey vultures are moderately common on the Project site. A total of 59 sightings were made for a total of 125 minutes during the spring through fall studies. Sightings were most often observed in the updrafts of the ridge face study unit. No nests were found on the site during the breeding survey, however, a communal nest was observed near Maryhill State Park, about 6.4 kilometers (4 miles) southwest of the site. **Table 2.9** and **Table 2.10** summarize prey use and foraging behavior of turkey vultures.

Western Bluebird (State Candidate)

The nesting season for the western bluebird typically begins in April. They were found to nest in oak/pine woodlands located north of the Project site. One hundred and one sightings during 16 observations were made during the spring migration period.

Other Raptors

Other raptors observed in the primary study area included American kestrel, Cooper's hawk, sharp-shinned hawk, and red-tailed hawk. Red-tailed hawk was the most frequently observed of all raptors (186 sightings) and is present year-round in the Project vicinity. This species prefers open area as their primary habitat, and are most commonly found in areas containing perches. Their primary prey is small mammals, although medium-sized mammals, snakes and lizards, and occasionally upland game birds, carrion and waterfowl are eaten.

Waterfowl

The Columbia River and associated tributaries south of the Project area provide the most suitable waterfowl habitat in the vicinity. While waterfowl use is most concentrated along the Columbia River, they can move great distances relatively easily and have been reported to take advantage of foraging opportunities located away from the river (Klickitat County, 1983). This behavior is most likely to occur during nonbreeding periods, especially during the fall and winter. During spring through fall surveys, 48 sightings were made during five observations. In late fall, large flocks of Canada geese and various species of ducks fly through the Columbia River corridor. During the winter study, road counts along the Columbia River immediately south of the study area observed waterfowl individual groups of up to 100 birds. Canada geese and American coots were the most frequently observed. Two transect surveys conducted in December 1994, along the Columbia River below the Project site to Rock Creek documented approximately 1,300 to 1,700 waterfowl along the river. During two weeks of observations in December 1994, no waterfowl were sighted in the Project area.

Non-listed Passerines and Other Birds

In addition to the bird species discussed above, several other bird species occur in the study area. Some species of medium- to large-sized birds are common throughout the study area, including common raven, black-billed magpie, western meadowlark, and northern flicker. In general, the north plateau study unit contains habitat for species associated with agricultural lands, including Brewer's blackbird, horned lark, killdeer, swallows, and European starling. Many of these birds are habitat generalists and use habitats in other study units as well. The eastern and western hills study units contain habitat for several species of sparrows, including savannah, grasshopper, and vesper sparrow. The ridge top study unit contains habitat for a variety of songbirds associated with open grassland and juniper savannah, including Townsend's solitaire, American robin, and several types of sparrows and other passerines. The ridge face study unit contains habitat suitable for nesting cliff swallows as well as canyon wrens and chukar. Chukar and California quail were also observed during field surveys.

Table 2.8 Special Status Species

Species	Federal Listing[1]	State Listing[1]	Observed on Project Site	Observed in Primary Study Area	Habitat Association
peregrine falcon	E	E	No	Yes	Cliffs, large concentrations of flocking birds
bald eagle	T	T	No	Yes	Water, ponderosa pine forest, rangeland
western sage grouse	C2	M	No	No[2]	Sagebrush
northern goshawk	C2	C	No	Yes	Mature forests
long-billed curlew	C2	M	No	Yes	Annual grasslands
ferruginous hawk	C3	T	No	Yes	Arid grasslands with level or rolling terrain
western burrowing owl	C2	C	No	No[2]	Sagebrush steppe, grasslands, pasture, roadsides with sparse level terrain
black tern	C2	Not listed	No	No[2]	Large bodies of water, primarily inland lakes
loggerhead shrike	Not listed	M	No	Yes	Shrubland for nesting, open areas for foraging
Lewis' woodpecker	Not listed	C	No	Yes	Oak and pine woodlands
Swainson's hawk	Not listed	C	No	Yes	Open areas, agricultural lands
western bluebird	Not listed	C	Yes	Yes	Clearings, old farms, fields, pastures, burned areas with snags
grasshopper sparrow	Not listed	M	No	No[2]	Grasslands
golden eagle	Not listed	C	Yes	Yes	Areas isolated from human disturbance, open grassland nests in cliffs or in large trees
prairie falcon	Not listed	M	Yes	Yes	Arid lands and open grasslands
sandhill crane	Not listed	E	No	Yes	Extensive open areas such as green fields, meadows, large marshes, and shallow ponds; nests in large shallow marshes
gray flycatcher	Not listed	M	No	No[2]	Dry coniferous forests
ash-throated flycatcher	Not listed	M	No	Yes	Open grasslands and riparian
turkey vulture	Not listed	M	Yes	Yes	Open usually arid areas, nests on cliffs
osprey	Not listed	M	No	Yes	Associated with fish-bearing waters, nests in trees
sage sparrow	Not listed	M	No	No[2]	Sagebrush steppe
bank swallow	Not listed	Undetermined in Oregon[1]	No	No[2]	Open ground or water, nests in recently cut banks near water

(1) E = endangered
T = threatened
C = candidate
M = monitor

(2) Not observed during Project surveys and not listed in Priority Habitats and Species data base.

Table 2.9 Typical Primary Types of Prey for Certain Raptors

Raptor Species	Prey									Comments
	Waterfowl	Upland Game Birds	Small Birds	Rabbits, Ground Squirrels, Other Medium-Sized Birds	Carrion	Snakes and Lizards	Medium-Sized Mammals	Small Mammals	Insects	
Peregrine falcon	1		2	1						
Bald eagle	2	1		3	2		2	3		
Golden eagle		2			3	3	1	2		
Red-tailed hawk	3	3			3	2	2	1		
Rough-legged hawk					3		3	1		
Northern harrier			2			3	3	1		May shift from small mammals to young passerine birds during the breeding season (Johnsgard 1990)
Swainson's hawk						3	3	1	2	Ground squirrels (spring) and grasshoppers (summer) are the most frequent prey
Merlin			2			2		1		
American kestrel			2					1	2	Starling, horned larks, deer mice, and various insects are the typical prey
Prairie falcon			2	2			1			Ground squirrels may be more important during breeding; flocks of small- and medium-sized birds may be more important during winter
Turkey vulture					1					
Sharp-shinned hawk	2	1						2		
Cooper's hawk	2	1						2		
Ferruginous hawk							1	2		
Great horned owl							1	2		
Western screech owl						2		1		

1 = Primary prey species.
2 = Secondary prey species.
3 = Occasional prey species.

Sources: Johnsgard 1990, Palmer 1988.

Table 2.10 Typical Foraging Behavior for Certain Raptors

Raptor Species	Foraging Behavior					Comments
	Aerial Pursuit	Soar and Search	Perching	Flapping Close to Ground	Contouring Close to Ground	
Bald eagle	3	3	1	2	2	
Peregrine falcon	1	2	2	3	—	
Golden eagle		2	3	3	1	Often fly low to ground or make low and fast final approach on prey (Johnsgard 1990)
Red-tailed hawk	3	2	1	3	2	
Northern harrier	2	3	3	1	2	
Rough-legged hawk		2	1	2	3	
Swainson's hawk	—	1	2	2	—	Rarely observed to fly low at high speed (Palmer 1993)
Merlin	2	2	1	—	—	
American kestrel	2	—	1	—	—	
Prairie falcon	3	3	3	1	2	
Turkey vulture	—	1	—	—	—	
Sharp-shinned hawk	2	—	1	2	—	Hunt mostly within woodlands
Cooper's hawk	2	—	1	2	—	Hunt mostly within woodlands
Ferruginous hawk	—	2	2	1	—	
Northern goshawk	2	—	1	—	—	
Great horned owl	—	—	1	2	—	
Western screech owl	—	—	1	—	—	

1 = Primary foraging method.
2 = Secondary foraging method.
3 = Occasional foraging method.
— = Rarely used foraging method.

Sources: Johnsgard 1990, Palmer 1988; field observations conducted for the Project avian study.

2.5.4 Environmental Consequences

2.5.4.1 Proposed Action

Potential impacts to raptors and other birds using the study area include collision with wind turbines, loss of habitat, disturbance to foraging and breeding behavior, collision with overhead power lines, and electrocution.

The Applicant's proposal includes measures to reduce the potential for avian mortality (see Section 1.1.6.1). The Applicant will implement raptor-protection measures on overhead power lines and poles, thereby minimizing the potential for electrocution. It has been suggested that lattice towers may contribute to the frequency of collisions because they provide perch sites (Onloff and Flannery 1992). The proposed Project would use tubular towers and eliminate this potential risk factor. Direct habitat loss would be limited in extent as discussed in the Section 2.2 Botanical Resources.

Project-related human activity could alter bird behavior during the construction phase of the project, and the post-construction density of turbines on the developed portion of the site may alter avian use. Most raptors would avoid active construction sites but would continue to use other areas. Construction of turbine strings and transmission lines would take place at least 320 meters (1,050 feet) from raptor nest sites, and no disturbance is expected. Post-construction activity would not significantly alter avian use because activities would be limited to work crews generally composed of less than 10 workers. Field studies conducted on the Project site indicated that birds fly within areas where wind turbines would be placed. These birds would have to alter flight paths to avoid turbines. This necessary alteration in flight could in turn reduce the foraging efficiency of raptors.

Overall, studies of other wind power projects have found that bird mortality associated with collisions varies from site to site and from year to year. Estimates of raptor mortality from collision with wind turbines in Solano County, California, range from 1.7 to 4.8 raptor strikes per 100 turbines, depending on the year. At Altamont Pass, raptor strikes vary from 2.3 to 5.8 per 100 turbines depending on the year (KENETECH Windpower 1994). Based solely on these ranges, raptor mortality from collision could range from about 2 to 6 per year at the proposed Project site.

Two factors that appear to influence overall raptor mortality are: (1) the size of resident populations and (2) the level of migration through the site. Unlike areas such as Altamont Pass, the proposed Project site does not appear to be a major flyway for migrating raptors based on the number of raptors observed during known migration periods. Based solely on the overall levels of raptor use of existing sites, the potential for raptor mortality at the proposed Project is expected to be somewhat lower than the level reported in Altamont, California. In addition, the density of turbines on the

Project site could reduce the frequency of avian mortality because the turbines would be more visible and the density might cause raptors to avoid the area (Biosystems Analysis 1992).

The following risk factors are considered in assessing the potential for collision impacts on individual species:

- The general abundance of individual species in the vicinity of the Project site, and distribution across different areas of the site including seasonal variations in use.

- Behavioral characteristics such as flight patterns and altitude, foraging behavior, and preferred prey.

Table 2.11 summarizes these risk factors for each species or species group. In addition to risk factors, the assessment of impacts also considers regional distribution and abundance of individual species and their federal and state status.

Federally Listed Threatened and Endangered Species

Peregrine Falcon. Because peregrine falcons do not regularly use the Project site, they would not be particularly susceptible to collision with wind turbines at the Project site. However, flight behavior exhibited during foraging could make them vulnerable should they travel through the developed site. Peregrine use of the Project site for foraging or roosting is infrequent and was not observed during field studies. The closest observation was made about 10 kilometers (6 miles) east of the Project site, and the pair of peregrine falcon frequently seen at Rock Creek is approximately 19.3 km (12 miles) east of the Project site.

The Project site is located on the eastern edge of the peregrine falcon's current range in the Columbia Gorge. Regionally in the Columbia River Gorge, there are up to seven pairs (not including the pair that was found to frequent Rock Creek). Thus, although the likelihood of collision is relatively low, if one of these peregrines were to strike a turbine, it would reduce the Columbia Gorge peregrine population but would not affect the viability of the overall population in the gorge.

Bald Eagles. No bald eagles were observed to fly within areas proposed for Project wind turbines, but bald eagles were observed to travel throughout the primary study area and are expected to occasionally use the Project site. Eagles travelling to night roosting areas were observed crossing an area about 11 kilometers (7 miles) east of the Project site, but no such crossings were observed on the Project site.

Although bald eagle foraging behavior (flying slowly and methodically) would not make this species particularly vulnerable to collisions with wind turbines, they were observed flying at critical altitudes in the primary study area and some mortality could occur. The site does not appear to be a particularly important bald eagle habitat in relation to other areas, and available evidence indicates that Klickitat County provides only a small percent of the wintering bald eagle habitat in eastern Washington. When viewed from this perspective, impacts to wintering bald eagle would be localized and would not likely affect overall eastern Washington population levels. Although bald eagle continues to be listed as a threatened species, it has greatly recovered from previously low population levels. Therefore, within a regional context, the Project's effects on bald eagles would not result in a significant decline in regional breeding or wintering populations.

Because the Project may adversely affect peregrine falcons and bald eagles, BPA initiated formal consulation under Section 7 of the Endangered Species Act with the U.S. Fish and Wildlife Service (US F&WS). The US F&WS is required to issue a Biological Opinion that will determine whether or not the Project is likely to jeopardize the continued existence of the listed species.

Other Special-status Species

Special-status species that would be most vulnerable to collisions with turbines due to the risk factors described in Table 2.11, include golden eagle, Swainson's hawk, and western bluebird. Although golden eagle most frequently use areas of the Project site that would not be developed with wind turbines, the foraging behavior of golden eagles makes them relatively susceptible to collisions with wind turbines. Golden eagle mortality at a project in Altamont Pass in California was the third-highest of all species (Biosystems Analysis 1992). Because golden eagles breed at low densities and only one active nest has been verified in the primary study area (two in the extended study area), any mortality that did occur could affect the local breeding population. In 1990, golden eagle populations in Washington were estimated at 80 breeding pairs (Rodrick and Milner 1991).

Because of its foraging habitat preferences and foraging flight behavior, Swainson's hawk would be vulnerable to collisions with turbines, but they were not observed to use the Project site and are therefore not at a significant risk.

Western bluebirds were observed to migrate through the site and also to breed on and near the site, and the Project could cause mortality and localized population impacts. However, as a passerine, western bluebirds are less likely to be vulnerable to collisions than are raptors (Biosystems Analysis 1992). Site observations were not at a level that would suggest that a significant portion of the County population moves through the Project site during migration. In addition, it would be highly unusual for these birds to follow such a defined migration route. Western bluebirds are believed to move

through the County in a relatively broad front, which includes the Project site. Bluebirds have been observed in other locations in Klickitat County such as Lyle, 38 km (23 miles) west of the Project site (Wahl and Paulson 1991).

Other Raptors. Other raptors that would be most vulnerable to collision include red-tailed hawk, rough-legged hawk, and American kestrel. These raptor species would be most vulnerable because they are relatively abundant on the site and because of their flight and foraging behaviors. Although the behavior, flight characteristics, and abundance of red-tailed hawks, rough-legged hawks, and American kestrel make them relatively vulnerable to collision, these species are regionally abundant. Thus, while Project development would likely result in mortality to these species and could reduce local populations (those using the Project site), they are not likely to significantly affect regional populations.

Waterfowl. Waterfowl mortality from collisions with wind turbines are expected to be infrequent and at a level that would not affect local wintering populations. Few flocks of waterfowl cross the Project site on a regular basis. In addition, very limited wetland habitat exists in or around the Project site to support breeding or wintering waterfowl. Croplands present near the Project site were not observed to be used as waterfowl foraging areas although this behavior has been reported.

Shorebirds, ducks, geese, and other waterbirds are prone to collision with utility wires and guy wires, primarily in low visibility conditions (Arend, 1970; Anderson, 1978; Avery et al., 1980; Brown et al., 1985; Fannes 1987). Because field studies determined that use of the Project site by such species is minor, the associated risk of collisions with overhead lines is also estimated to be minor.

Other Passerines. The Project would not result in a significant regional reduction in other passerine species. This conclusion is based on the expected low vulnerability of migratory passerines to collisions with wind turbines, and the results of studies indicating the Project site is not within a major regional migratory flyway.

Thus, while mortality of passerines and other birds from collision with Project wind turbines is expected to occur at proposed turbine locations; losses are not expected to be sufficient to affect regional breeding, wintering, or migrating populations.

2.5.4.2 No Action

Impacts to bird species from Project construction and operation would be avoided if the agencies do not issue the required permits and approvals.

2.5.5 Mitigation Measures

Collision with Wind Turbines

Although studies are currently being conducted to determine the underlying causes and circumstances of avian collisions with wind turbines, there are currently no known scientifically supportable measures to entirely prevent some incidental avian mortality. Post-construction monitoring of avian impacts may be considered by USFWS and BPA pursuant to the consultation process under Section 7 of the Endangered Species Act.

Electrocution

The following measures, when implemented, will reduce the level of potential electrocution mortality on the CARES project. Most of these measures were initially recommended by Olendorff et al. (1981) and have become standard practice for new utility construction where the potential for raptor electrocution is identified as a project impact.

- All jumper wires should be insulated (5 kV minimum rating and preferably 10 kV to 15 kV).
- All exposed terminals (e.g., pot heads, lightning arresters, and transformer bushings) should be covered by avian boots or other insulating materials.
- Nonconductive material (e.g., fiberglass and wood) should be used instead of the straight, aluminum-type combination arms on riser poles.
- All overhead power line construction should incorporate raptor protection for wood pole distribution lines.
- Energized wires should be placed a safe distance apart: 60 inches for a crossarm configuration and 55 inches for an armless configuration.
- No cutouts should be used on riser poles.
- Jumper leads should be oriented in a vertical configuration to discourage bird perching.
- Bonding of pole top devices mounted on nonconductive arms should be done with insulated wire.

Collision with Overhead Power Lines and Guy Wires

The following measures, if implemented, would reduce the potential for avian collision with utility lines.

- A minimum conductor wire size of 4/0 should be used to increase the visibility of the wire.

- Above-ground power line wires should not be sited near wetlands or other waterfowl feeding or resting habitat.

2.5.6 Significant Unavoidable Adverse Impacts

Year-long Project avian studies suggest the Project site is used by resident raptor populations and by migrating raptors and passerines such as the western bluebird. However, the Project site does not appear to be in a major migratory flyway. The Applicant has incorporated mitigation measures into its Proposed Action to reduce mortality from electrocution and from collision with transmission lines. However, incidental avian mortality from collisions with wind turbines would be unavoidable. The use of tubular rather than lattice towers would reduce potential attraction of the area to perching raptors, but use of the area cannot be ruled out.

Peregrine falcon, a federally listed endangered species, use the site infrequently. However, they are known to forage in upland areas of the Columbia Gorge similar to the Project site and collision with a wind turbine cannot be ruled out. If a peregrine falcon collision did occur, it would reduce the population of the peregrines in the Columbia Gorge Management Unit. Even in the event of a single peregrine collision, the Project is not expected to significantly affect the viability of the species in the Columbia Gorge Management Unit because the population is estimated at up to seven breeding pairs, which exceeds the management goal of three breeding pairs for the Management Unit.

Bald eagle, a federal threatened species, winter in the vicinity of the site and some mortality due to collision would be possible. Klickitat County provides only minor bald eagle wintering habitat relative to eastern Washington as a whole. Therefore, while the Project could result in the mortality of bald eagles, regional population levels are unlikely to be significantly affected by the Project.

Table 2.11 Collision Risk Factors for Key Special-Status Avian Species Present at the Project Site

Species and Status	Risk Factors	
	Behavioral Factors	Abundance and Distribution Factors Based on Field Studies
Peregrine falcon (Federal and State Endangered)	Most frequent foraging behaviors are aerial pursuit, soar and search, and perching. Not observed on the Project site and use is expected to be rare. Peregrines are known to forage in upland areas in the Columbia Gorge although they prefer cliff areas near bodies of water.	Low abundance during all seasons. No observations made on project site. Only two sightings made east of the Project site in the northern plateau study unit. The closest observation was made about 10 kilometers (6 miles) east of the Project site, and a pair of peregrine falcon was frequently seen at Rock Creek, located approximately 19.3 km (12 miles) east of the Project site. Sightings in study area are probably birds travelling between foraging areas. Species likely to spend most time near cliffs above the Columbia River, where they hunt waterfowl and other birds.
Bald eagle (Federal and State Threatened)	Assumed to fly within areas of site proposed for turbines, but vulnerability may be reduced by (1) slow, methodical behavior (2) keen eyesight, and (3) infrequency of diving.	Wintering only. Three to 10 individuals (different birds) observed in study area at any one time. Peak use may be up to about 20 individuals. Tended to be sighted in ridge face, ridge top, and eastern hills. Nighttime roost area identified north of site near Oak Flat Road and eagles observed flying between the Columbia River and this roost across the site. Carrion and chukar are potential food sources on Project site.
Golden eagle (State Candidate)	Often observed flying perpendicular to ridgetop within critical altitude. Contouring close to the ground was the most frequently observed foraging behavior. Often make low and fast final approach on prey.	37 sightings in primary study area. Greatest number of observations were south of areas proposed for wind turbines (ridge face study unit). Occasional but regular use of western hills, eastern hills, and ridgetop study units. A nest site is present 2.9 kilometers (1.8 miles) from the nearest proposed Project turbine location. Another nest is present on Miller Island, 14.5 kilometers (9 miles) from the western edge of the site.
Red-tailed hawk	Flies at critical altitude and often dives on prey from above. Forages in open habitats. Perching most common foraging behavior.	Most common large raptor on the Project site. 186 sightings made. No breeding pairs found on site, but 12 sites found in primary study area. Five nests observed within the extended study area.
Rough-legged hawk	Perching, soar and search, and flapping close to ground most frequently observed foraging. Also contouring close to ground.	Nearly as common as red-tailed hawks, but only in winter.

Species and Status	Risk Factors	
	Behavioral Factors	Abundance and Distribution Factors Based on Field Studies
Swainson's hawk (State Candidate)	Soar and search, perching, and flapping close to ground observed. Rarely observed to fly low (200 feet off the ground) at high speeds. Flies at critical altitude.	None observed on Project site, but two nest sites found within primary study area. Observations in eastern hills, ridgetop, and northern plateau.
Northern goshawk (Federal candidate)	Perching and aerial pursuit foraging behaviors.	One sighting outside of Project site.
Ferruginous hawk (Federal candidate)	Flies at critical altitude.	Study area is generally outside of this species range; 3 sightings made.
Northern harrier	Flies within areas proposed for wind turbines but typically flies below critical altitude. Flapping close to ground is the most frequently observed foraging behavior.	Common on site, although most frequent in the western hills and in the northern plateau study units, which would not be developed.
American kestrel	Perching and aerial pursuit most commonly observed foraging behaviors.	Common on site and throughout primary study area. 125 sightings made in primary study area.
Prairie falcon (State Monitor)	Flapping close to ground most frequently observed foraging behavior. All other behaviors also observed.	One breeding pair located 7 kilometers (4.3 miles) east of Project site just outside of primary study area. Three nests observed within the extended study area.
Turkey vulture (State monitor)	Vulnerability reduced due to slow, methodical flight; however, flies at critical altitude.	Moderately common in area (59 sightings made from fixed-point observations) and across all study units.
Sharp-shinned hawk	Flies within critical altitude. Perching and foraging close to ground most common foraging behaviors.	32 sightings made from fixed-point stations. Does not nest or forage in open habitats.
Note: "critical altitude" refers to vertical area occupied by wind turbines.		

2.6 WILDLIFE RESOURCES (Non-avian)

2.6.1 Studies and Coordination

This section addresses non-avian wildlife, including mammals, amphibians, and reptiles, that could potentially be affected by the proposed Project and alternatives. Special emphasis is placed on wildlife-related issues raised during scoping and on special status species and habitats. Because avian resources were a special concern with this Project, they are generally addressed in Section 2.5, Avian Resources.

Wildlife studies were conducted concurrently with year-long Project avian studies. Species and issues to be evaluated were determined through public scoping, through pre-survey literature review and file searches, and through consultation with the WDFW, the Oregon Department of Fish and Wildlife (ODFW), and the USFWS. Field biologists noted observations of target wildlife species while conducting point counts, transects, and other field investigations as part of the avian study conducted for this EIS (see Section 2.5). Habitat types located on the Project site were evaluated in conjunction with Project botanical studies (see Section 2.2). Species habitat requirements, regional distribution, and other ecological information were gathered from the literature and from consultation with resource agencies.

2.6.2 Regulations, Standards, and Guidelines

Klickitat County's Comprehensive Plan has established an overall goal of identifying and preserving wildlife. As with plants, animal species can be listed as threatened, endangered, or otherwise sensitive at either the federal or the state level. At the federal level, species listed as threatened or endangered are protected under the authority of the Endangered Species Act. In Washington, state-listed threatened or endangered animal species are not specifically protected by state statute or regulation, but are listed to assist with agency wildlife management efforts and decision making. Species may be listed at the state level because of rarity, vulnerability to disturbance, or other factors.

2.6.3 Affected Environment

2.6.3.1 General Habitats

Klickitat County is a transitional area supporting habitats and wildlife species from several regions. From west to east, the county shifts from the forested eastern slopes of the Cascade Mountains to the arid habitats of the lower Columbia basin. The county also includes the northernmost extension of habitats more common to Oregon and California, such as oak woodlands. The Columbia River acts as a partial barrier for some types of plants and animals.

Four primary habitat types present on the Project site are native shrub-steppe, rangeland, mixed rangeland, and oak and oak-pine woodlands. Plant habitats are mapped on Figure 2.2.1, Plant Communities/Habitat Map. The locations of these habitats are:

- native shrub-steppe grassland communities and juniper patches along the ridge top,
- rangeland, juniper patches, talus, and basalt outcrops along the steep southern face of the Columbia Hills (facing the Columbia River),
- cropland and pasture further north, and in the eastern portion of the site, and
- oak and oak/pine woodlands within shallow draws north of the ridge.

The WDFW has designated shrub-steppe, talus, cliff, juniper woodlands, and oak woodlands to be Priority Habitats. Taken together, the rangelands, cultivated fields and pastures, and Priority Habitats on the Project site provide a diverse array of habitats and associated species. The extent and composition of these areas is described below.

Native shrub-steppe is the most abundant type, making up 52 percent of the site or about 204 hectares (502 acres). The native shrub-steppe is composed of two communities, 134 hectares (330 acres) of Idaho fescue/bluebunch wheatgrass and 70 hectares (172 acres) of Douglas's buckwheat/Sandberg's bluegrass. The WDFW has designated shrub-steppe habitat as a Priority Habitat because of its rarity and ability to support a diversity of wildlife species, including some that depend on shrub-steppe as their primary habitat type.

The wildlife habitat value of the shrub-steppe habitats present on the site is moderate. While these communities provide good habitat for many types of native animals (e.g., deer, voles, and mice), they lack significant shrub cover. Shrub cover is known to be important to most types of wildlife species dependent on shrub-steppe habitats (Rodrick and Milner 1991), including pygmy rabbit, sagebrush vole, and several species of shrub-nesting birds (e.g., loggerhead shrike). Stiff sagebrush, a shrub, is scattered throughout these communities, but it generally measures less than 20 centimeters (8 inches) in height. This height is much less than the more typical stands of sagebrush that measure over a meter (3.3 feet) in height. These typical stands are the type known to provide habitat for shrub-steppe dependent species. Therefore, while the shrub-steppe habitats present onsite provide good wildlife habitat, they are of most value for their overall rarity and botanical significance, rather than for their value for shrub-steppe dependent wildlife.

Mixed rangeland makes up 31 percent of the site or about 120 hectares (295 acres). This area is located south of the area proposed for development and contains a mix of basalt outcrops, native shrub-stepped communities, non-native grasses, western juniper, and talus. The habitat value is relatively high for several reptile species that typically use rock areas (e.g., racer, western rattlesnake, and short-horned lizard).

Rangeland (i.e., grassland found to contain a high proportion of non-native grass and forbs) makes up about 17 percent (69 hectares or 172 acres) of the site. It is located along the northern border of the Project site and is heavily grazed, contains mostly non-native grasses and forbs, provides little or no water, and is low in structural diversity. It is regionally common and generally supports regionally common animal species.

The oak and oak-pine woodlands make up less than 1 percent of the site (2.4 hectares or 6 acres). This community type is a Priority Habitat because of its ability to support a wide range of wildlife species, including the state threatened western gray squirrel.

2.6.3.2 Common Non-Avian Wildlife Species

Table 2.12 lists common species that are supported by the habitat types located on the Project site. Common animals present on the Project site include shrews, deer mouse, northern pocket gopher, Great Basin pocket mouse, voles, raccoon, weasels, striped skunk, badger, red fox, coyote, bobcat, and Columbian black-tailed deer. Some species are closely associated with particular habitat types. Porcupine primarily use oak/pine woodland, yellow-bellied marmot primarily use basalt outcrops and rocky areas south of the Project site, Columbian ground squirrel primarily use cultivated lands and rangelands on the northern portion and north of the Project site, and Nuttall's cottontail primarily use shrubby thickets and rocky areas present in draws south of the Project site (Maser et al. 1984 and Thomas 1979).

Several common species of reptiles are found in the area, including short-horned lizard, western fence lizard, racer, gopher snake, western terrestrial garter snake, and western rattlesnake. These species use most habitats present on the Project site, but use talus and rocky areas most frequently (Nussbaum et al. 1983).

The scarcity of water makes the Project site generally unsuitable for amphibians, although a stock pond present in the northern portion of the site provides suitable breeding habitat for Pacific chorus frog (*Hyla regilla*), long-toed salamander (*Ambystoma macrodactylum*), and Great Basin spadefoot (*Scaphiopus intermontanus*). As part of the field surveys conducted for this EIS during spring 1994, Great Basin spadefoot were located in talus along SR-14 south of the Project site and in grazed rangeland along the ridgetop east of the Project site.

Table 2.12 Species on the Project Site

Common Name	Scientific Name	Habitat
MAMMALS		
shrews	(*Sorex* spp.)	General use across Project site
deer mouse	*Peromyscus maniculatus*	General use across Project site
northern pocket gopher	*Thomomys talpoides*	General use across Project site
Great Basin pocket mouse	*Perognathus parvus*	General use across Project site
voles	*Microtis* spp.)	General use across Project site
raccoon	*Procyon lotor*	General use across Project site
weasels	*Mustela* spp.)	General use across Project site
striped skunk	*Mephitis mephitis*	General use across Project site
badger	*Taxidea taxus*	General use across Project site
red fox	*Vulpes fulva*	General use across Project site
coyote	*Canis latrans*	General use across Project site
bobcat	*Lynx rufus*	General use across Project site
Columbian black-tailed deer	*Odocoileus hemionus columbianus*	General use across Project site
porcupine	*Erethizon dorsatum*	oak/pine woodlands
yellow-bellied marmot	*Marmota flaviventris*	basalt outcrops and rocky areas on the ridge face
Columbian ground squirrel	*Citellus columbianus*	cultivated lands and rangelands
Nuttall's cottontail	*Sylvilagus nuttallii*	shrubby thickets and rocky areas (Maser et al., 1984 and Thomas 1979)
REPTILES		
short-horned lizard	*Phrynosoma douglassi*	These species use most habitats present on the Project site, but use talus and rocky areas most frequently (Nussbaum et al. 1983)
western fence lizard	*Sceloporus occidentalis*	These species use most habitats present on the Project site, but use talus and rocky areas most frequently (Nussbaum et al. 1983)
racer	*Coluber constrictor*	These species use most habitats present on the Project site, but use talus and rocky areas most frequently (Nussbaum et al. 1983)
gopher snake	*Pituophis melanoleucus*	These species use most habitats present on the Project site, but use talus and rocky areas most frequently (Nussbaum et al. 1983)
western terrestrial garter snake	*Thamnophis elegans*	These species use most habitats present on the Project site, but use talus and rocky areas most frequently (Nussbaum et al. 1983)
western rattlesnake	*Crotalus viridis*	These species use most habitats present on the Project site, but use talus and rocky areas most frequently (Nussbaum et al. 1983)

2.6.3.3 Special Status Non-Avian Species

The USFWS has not listed any non-avian animal species as being federally threatened or endangered species within the vicinity of the Project site (Frederick pers. comm.). As shown in Table 2.13, three federal candidate species are potentially found onsite or in nearby habitats. Two of the federal candidates are bats, which roost in caves or crevices in cliff areas. The third federal candidate species, the northern sagebrush lizard, may use all habitats on the Project site but would typically use talus and rocky areas most frequently.

Several non-avian species listed at the state level by Oregon or Washington are present within the vicinity of the proposed Project (Marshall 1992, Rodrick and Milner 1991, Dugger pers. comm., and Cary pers. comm.). Table 2.13 summarizes the nine Washington state-listed species assumed to be located on the Project site based on habitat associations, WDFW records, and/or direct observation made during studies conducted for this EIS. One of these species, the western gray squirrel, is listed as a state-threatened species. Another species, the juniper hairstreak is a candidate for listing. The other seven species have been given a "monitor" designation.

The state-listed species located on the Project site are common elsewhere in the western United States, but are uncommon in Washington. For example, the western grey squirrel is threatened in Washington, but is designated as a game animal in Oregon, where it is hunted (ODFW 1994). The county and the Project site includes some habitats and species that are more common in Oregon, Idaho, and California (e.g., oak woodlands and juniper). Threats to state-listed species, therefore, are for populations on the regional edge of their range, and populations as a whole may not be threatened or declining. On the other hand, the federal candidate species (e.g., fringed myotis, small-footed myotis, and northern sagebrush lizard) are suspected to be in decline throughout their range.

Other special status species were evaluated for this EIS but likely do not use the Project site. Pygmy rabbit (*Brachylagus idahoensis*), a state threatened species, were determined to be absent because no typical habitat is present onsite. The species requires tall, dense sagebrush steppe with deep, loosely compacted soils (WDFW 1994). California mountain kingsnake (*Lampropeltis zonata*) was determined to be absent based upon the lack of: (1) any sightings near the site and (2) suitable habitat. California mountain kingsnake are known to be present in more forested habitats present in the western portion of Klickitat County (McAllister pers. comm.). Townsend's big-eared bat (*lecotus townendii townsendii*) and fringed myotis (*Myotis thysanodes*) use caves for breeding, resting during the day, or hibernating during the winter (Barbour and Davis 1969, Nagorsen and Brigham 1993). Project site surveys, which included searches of cliffs by helicopter, determined that no caves were present on or near the Project site. Yuma myotis *(myotis yumanensis)* is a federal candidate

closely associated with water, which is scarce on the Project site (Nagorsen and Brigham, 1993).

Table 2.13 State-Listed Species Confirmed or Likely Present on the Project Site

Species	Status	Potential for Using Site	Status On Site	Habitat Association
western gray squirrel (*Sciurus griseus*)	state threatened	confirmed year-round resident	present in oak/pine woodlands	closely associated with oak/pine woodlands (Rodrick and Milner 1993)
juniper hairstreak (*Mitoura siva*)	state candidate	high: within species range and suitable habitat present; known to be present near Maryhill	present in juniper woodlands	juniper woodlands (Tilden and Smith 1986)
fringed myotis (*Myotis thysanodes*)	federal candidate	moderate: may forage but is unlikely to roost since caves and rock crevices are not present	assumed present	colonial bat that roosts in caves and that may also roost in rock crevices (Nargorsen and Brigham 1973) such as those present south of the site
small-footed myotis (*Myotis ciliolabum*)	federal candidate	moderate: may forage and roost on site	assumed present	cliffs and rocky outcrops in arid regions. Roosts in a variety of areas including cliffs, crevices, and openings, boulders, vertical banks, talus slopes, under rocks, and on the ground (Nagorsen and Brigham 1993).
northern sagebrush lizard (*Sceloporus graciosus*)	federal candidate	moderate: may use most habitat on site but would tend to frequent talus slopes and rocky areas	assumed present	cliffs and rocky outcrops (Nussbaum et al. 1983)
Ord's kangaroo rat (*Dipodomys ordii*)	state monitor	moderate: soils generally too rocky and shallow, but may be present in some areas	assumed present in small numbers and patchy distribution	open sandy or soft soil areas with sparse vegetation cover (Larrison 1976); sagebrush scrub in open sandy areas (Ingles 1965)
sharp-tailed snake (*Contia tenuis*)	state monitor	moderate: not reported in the area, but may be present based on habitat	assumed present in riparian and riparian-associated talus	arid, rocky areas (McAllister pers. communication); found in moist rotting logs or stable riparian talus slopes, often near streams or in other damp habitats (Nussbaum et al. 1983)
night snake (*Hypsiglena torquata*)	state monitor	moderate: one record north of Goldendale near Bloodgood Creek	present in cliff and talus	found in vicinity of rock outcrops in arid regions (Nussbaum et al. 1983)
ringneck snake (*Diadophis punctatus*)	state monitor	moderate: known from locations west of site, but suitable habitat is present	assumed present in oak/pine and oak woodlands	oak/pine woodlands; also in open, grassy or brushy areas and in relatively open, rocky canyons (Nussbaum et al. 1983)
southern alligator lizard (*Elgaria multicarinata*)	state monitor	high: within species range and suitable habitat present	assumed present in oak/pine and oak woodlands	oak grassland and edges of pine forest (Nussbaum et al. 1983)
Woodhouse's toad (*Bufo woodhousei*)	state monitor	moderate: within species range, but permanent water lacking on most of site	assumed present near permanent water present in central portion of site	several types of habitats in arid regions, typically found close to permanent bodies of water (Nussbaum et al. 1983, McAllister et al. 1993)
pallid bat (*antrozous*)	state monitor	moderate: not reported in area but suitable habitat is present	assumed present roosting in cliff areas south of the site; foraging throughout the site	cliffs (roosting); open grasslands and shrub-steppe foraging (Nagorsen and Brigham, 1993)

Other Source Not Noted: Rodrick and Milner 1991, WDFW Priority Habitats and Species Data Base.

2.6.3.4 Recreational Species

The WDFW also recognizes species that are important as game animals or that otherwise have a high public appeal. Upland game birds and Columbian black-tailed deer are two types of species classified as recreationally important. Furbearers, another type of recreationally important species, were absent from the Project site.

Upland Game Birds

Upland game birds identified during site surveys included chukar (*Alectoris chukar*), Merriam's turkey (*Meleagris gallopavo*), ring-necked pheasant (*Phasianus colchicus*), gray partridge (*Perdix perdix*), and California quail (*Callipepla californica*). Chukar were observed most frequently along the Columbia Hills ridge top and ridge face. Gray partridge were observed near cultivated lands. Ring-necked pheasant were observed most often in thickets near cultivated lands and in riparian draws. Merriam's turkey were not seen, but are assumed to use the oak woodlands present in the southern portion of the Project.

Columbian Black-Tailed Deer

Columbian black-tailed deer are relatively common on the Project site and vicinity. Several wintering areas have been identified north of the Project site (WDFW, PHS data base). During field surveys conducted in December 1993 and January and February 1994, Columbian black-tailed deer were observed in groups of 5 to 15 on the Project site. Outside of the site, they were observed using Conservation Reserve Program (CRP) lands, rangelands, and croplands to feed during the day. Oak woodlands north of the Project site were observed to be used extensively by these deer, as evidenced by droppings and well-used deer trails. Deer are likely to use the oak and juniper woodlands for hiding and thermal cover, and to use the south-facing slopes of the Columbia Hills ridge for foraging. The south-facing slopes are most likely to be important during the periods of snow cover, because of the typically lower accumulations and duration of snow fall on these slopes (Loveless 1964). During hot summer months, trees and north-facing slopes may be important areas where deer can escape direct sunshine during hot periods.

Other Species

Mink *(Mustela vison)* and white-tailed jackrabbit *(Lepus townsendi)* are game animals that WDFW has identified as recreationally important species. Mink are closely associated with water (Chapman and Fieldhamer 1982). Because water is scarce on the site, mink are not likely to be present in any significant numbers. Habitat is suitable for white-tailed jackrabbit, although none were seen during the avian field surveys and they are generally scarce in Washington except for in the Okanogan Valley (Larrison 1976). Therefore, white-tailed jackrabbit are potentially present, but in small numbers. Waterfowl are also identified as recreationally important species and are discussed in Section 2.5, Avian.

2.6.4 Environmental Consequences

2.6.4.1 Proposed Action

Impacts to non-avian wildlife include temporary disturbance during construction, loss of habitat due to permanent Project features, and potential effects on wildlife behavior resulting from Project operation.

Habitat Loss

As discussed in Section 2.2, Botanical, about 38 hectares (95 acres) of vegetation would be disturbed during construction. About 19 hectares (48 acres) would be permanently occupied by Project features representing about 5 percent of the total site area.

Temporary disturbance of Priority Habitats would include about 0.2 hectares (0.4 acres) of oak and oak/pine woodland and 32 hectares (79 acres) of shrub-steppe habitat. This represents a 7 percent reduction in oak and oak pine woodland and a 16 percent reduction in shrub-steppe habitat compared to what currently exists on the site. Some restoration of disturbed shrub-steppe habitat could occur after Project construction. These habitats are declining regionally and the loss resulting from development of the proposed Project would contribute somewhat to this regional decline.

Temporary disturbance of non-Priority Habitats would include about 6 hectares (15 acres) of rangeland. This habitat type is heavily grazed and is common in eastern Washington. While many small mammals and other wildlife use rangeland, the habitat does not contain certain features considered important to wildlife such as vegetative structure and diversity.

Common Non-Avian Wildlife Species

The direct removal of habitat would cause an eventual reduction in wildlife abundance in the area. The construction of 91 wind turbines in 11 rows would significantly alter the habitat conditions on the 395-hectare (975-acre) site. Although common species would be the most affected in terms of numbers of individuals, the effect would be localized. Animal response to human activity differs among species, between seasons, and among individuals within the same species. Most common wildlife, such as the small mammal species on the Project site, are tolerant of human disturbance and would remain on the Project site in areas not directly affected by construction. The presence of humans during construction would cause some wildlife to avoid the Project site. Some common species may be vulnerable to disturbance during certain parts of their lifecycle. Bobcat generally avoid areas of high human activity and would likely avoid portions of the Project site during construction, especially if construction coincides with the breeding season when females are taking care of young.

Mortality resulting from traffic during construction and operation would not significantly affect population levels of wildlife species on the Project site because: (1) construction vehicles would typically travel at speeds where most wildlife would be able to avoid collisions, (2) mammals and reptiles are most susceptible at night when Project-related traffic would be minimal (Federal Highway Administration, 1975), and (3) following construction, Project operation would generate only minor traffic volumes (see Section 2.11, Transportation).

Lighting would be confined to security lights near the Project substation. The turbine towers would not be lighted (see Section 1.1, Proposed Action). This level of lighting would be very localized and would not significantly alter wildlife behavior on the Project site. Existing fencing, which currently surrounds most quarter sections, would remain. Project fencing would be limited to security fencing at road access points and around the Project substation. This would not significantly alter animal access or movements on the Project site.

Special Status Species

The projected loss of less than 0.2 hectares (0.4 acres) of oak and oak/pine woodlands would cause a minor reduction in habitat for western gray squirrel, which is a state threatened species. In addition, construction activities within 122 meters (400 feet) of western gray squirrel nests could disrupt western gray squirrel breeding (Dugger pers. comm., 1994).

Populations of juniper hairstreak, a butterfly that is a candidate for state-listing as threatened or endangered, would not be affected by habitat removal. The species is closely associated with juniper woodlands, which would be avoided by Project development. Juniper hairstreak, if present in the area, could collide with turbines.

Habitat loss for the northern sagebrush lizard, a federal candidate, would be relatively minor because they tend to favor talus and rocky outcrops, which would be largely avoided. Habitat loss for state-listed reptile and amphibian species would also be minor. Ring-neck snake and southern alligator lizard are associated with the edges and interiors of oak and oak/pine woodlands, which would be mostly avoided. Night snake and sharp-tailed snake are found in rocky areas. Although these areas are prevalent south of the Project site, only a few rocky areas near the top of the ridge occur on the site. Woodhouse's toads are most likely present near wetlands and springs, which would not be affected by the Project.

The pallid bat, fringed myotis, and small-footed myotis are known to roost in rock crevices and may roost within the limited rocky areas on the Project site and on cliffs south of the Project site. In addition, the small-footed myotis exhibits more generalized roosting behavior and could roost in the oak grove present at the southern portion and south of the site. Direct habitat loss for these bats would be negligible

because few rocky areas and no cliff habitat would be disturbed. However, because these bats forage in flight, they could collide with turbines. In addition, the presence of the wind turbines could cause bats to avoid some areas of the site and would, therefore, reduce the overall suitability of the area as habitat for these bats. Similar impacts would be expected for the more common species of bat present in the area, including big brown bat (*Eptesicus fuscus*) and little brown myotis (*Myotis lucifugus*).

Recreationally-Important Species

The Project would reduce habitat for upland game birds on the site. While chukar and grey partridge are likely to still use the site, the overall value would be reduced because of the loss of vegetative cover. When considered in the context of the large amount of habitat available in the Project vicinity and elsewhere in Klickitat County, the amount of habitat removed for these species would be minor.

Similarly, the direct loss of habitat used by Columbian black-tailed deer would be nominal in relation to the availability of these habitats on the Project site and in the county. Much winter habitat is available outside of the Project. Impacts to deer would be related to increased human activity rather than the loss of vegetation. The potential for adverse impacts to Columbian black-tailed deer would be greatest during construction. Work crews traveling through the Project site during winter could disturb deer and prompt them to flee, causing expenditure of energy during a time when deer are more vulnerable to starvation and exposure. Winter habitat is available outside of the Project site. Specifically, the WDFW has identified extensive areas of deer winter range north of the Project site (WDFW, PHS data base). Therefore, while deer currently use the Project site during winter, the amount of area that would be disturbed is minor. If construction activity were to coincide with a severe winter, when deer would be most vulnerable to stress caused by human disturbance, construction could cause local increases in winter deer mortality because deer might avoid the south-facing slopes on the Project site. These slopes offer more protection during severe winters. However, any increase in deer morality would be short-term, and could be reduced if construction activities were to halt or be curtailed during extended periods of snow or harsh weather. Because of the density of turbine placement proposed, deer may continue to avoid that area after project construction.

2.6.4.2 No Action

Impacts to non-avian wildlife caused by Project construction and operation would be avoided if the agencies do not issue the required permits and approvals. However, ongoing agricultural and grazing activities would continue.

2.6.5 Mitigation Measures

Mitigation for plant communities and habitats discussed in the Section 2.2, Botanical Resources would also help partially offset impacts to wildlife. Additional mitigation

for non-avian wildlife would primarily relate to measures to reduce impacts to the western gray squirrel. Based on consultation with the WDFW (Dugger pers. comm.), these measures include:

- Where feasible given the topography, Project boundaries, and safety considerations, adjust road and powerline routes to avoid Oregon white oak habitat.

- Retain all vegetation and restrict entry within a 23-meter (75-foot) radius of any western gray squirrel nests.

- Retain at least 50 percent canopy cover in oak woodlands within a 120-meter (400-foot) radius of known nest trees. To the extent these species are available, retain conifers (pine) for 25 percent of the remaining canopy cover.

- Avoid construction activity within 90 meters (300 feet) of any known western gray squirrel nest between May 15 and September 30.

2.7 VISUAL QUALITY AND AESTHETICS

2.7.1 Studies and Coordination

This section discusses visual impacts that may result from construction and operation of the Project. Photosimulations from five viewpoints are included to illustrate how certain representative views would change with development of the proposed Project. The five viewpoints were selected based on concerns raised during scoping and on the current land use of the viewpoint locations.

The issue of aesthetics is subjective, since the degree of impact depends on viewers' responses to changes in the landscape as well as the changes themselves. Specifically, the activity a person is engaged in, the physical location of the viewer, the length of time the view is visible, local land use policies, and individual values can all influence what an individual experiences as aesthetically pleasing or displeasing.

The approach used for this visual assessment is adapted from the Federal Highway Administration's (FHWA's) visual impact asssessment system (Federal Highway Administration 1983) in combination with other established federal assessment systems.

Data for this visual assessment were gathered from existing Klickitat County policy documents, USGS 7.5-minute topographic quad maps, a digital elevation model produced from 7.5-minute topographic quad maps, aerial photographs taken August 29, 1993, and two site visits, one on July 31, 1994 to analyze and determine appropriate viewpoints and one on November 1, 1994 to collect photographs of existing site conditions.

2.7.2 Regulations, Standards, and Guidelines

2.7.2.1 State and Local

The area's visual quality is recognized as an important resource at the state and local level. State Route 14 and U.S. Highway 97 in Washington state are designated as scenic and recreational highways. Interstate 84 will be a candidate for Oregon state scenic byway status.

As discussed in Section 2.8, there are no regulations in Klickitat County that specifically address the aesthetic impacts of wind power development. Nonetheless, the County's Comprehensive Plan set a goal of "preserving open space for its community-shaping, recreational, and ecological value." The County's zoning

ordinance establishes two secondary or overlay zones related to aesthetics: 1) a Scenic Design Area overlay, and 2) a View Protection District (VP) overlay. The Project site is not located within either of these secondary zones.

2.7.2.2 Columbia River Gorge National Scenic Area

The proposed Project site lies outside the Columbia River Gorge National Scenic Area (Scenic Area) as shown in Figure 2.7.1. and land use policies contained in the Management Plan for the Scenic Area do not apply to this Project. However, the Project site is visible from a portion of the Scenic Area, and this EIS assesses likely changes in views from within the Scenic Area that may result from development of the proposed Project.

2.7.3 Affected Environment

2.7.3.1 Visual Resources

Regional visual resources

Describing the visual character of the region provides a context and frame of reference for assessing the visual quality of the project site. The landscape of this region is highly scenic and both rural and natural in character. Its scenic quality is derived from its rugged and rolling terrain consisting of open range and agricultural lands in combination with views of distinctive mountains like Mt. Hood, Mt. St. Helens, Mt. Adams, and Mt. Rainier. The Columbia River Gorge snakes through the region providing highly scenic views of the steep hillsides and rock outcroppings that line the edge of the river.

State Route 14 in Washington and I-84 in Oregon are the primary sources of significant views of the Columbia River Gorge area. Above the river gorge, US-97 in Washington and U.S. Highways 197 and 97 in Oregon provide the primary views of rolling range lands, agricultural lands and distant mountains. Various other state and county roads, recreation areas, historic and scenic sites, and small towns provide important views of the region. State Route 14 and Interstate 84 are highly used by recreationists and people traveling for pleasure; these groups generally have high concern and sensitivity for visual quality.

Few elements exist that detract from the region's natural and rural character. However, sensitivity levels toward these views vary with high sensitivity in the Columbia River Gorge and moderate sensitivity in the rolling range and agricultural areas.

Visual resources of the Project area and site

The Project site is located on a ridge top north of the Columbia River. The site is somewhat predominant in the local landscape because Juniper Point, the high point

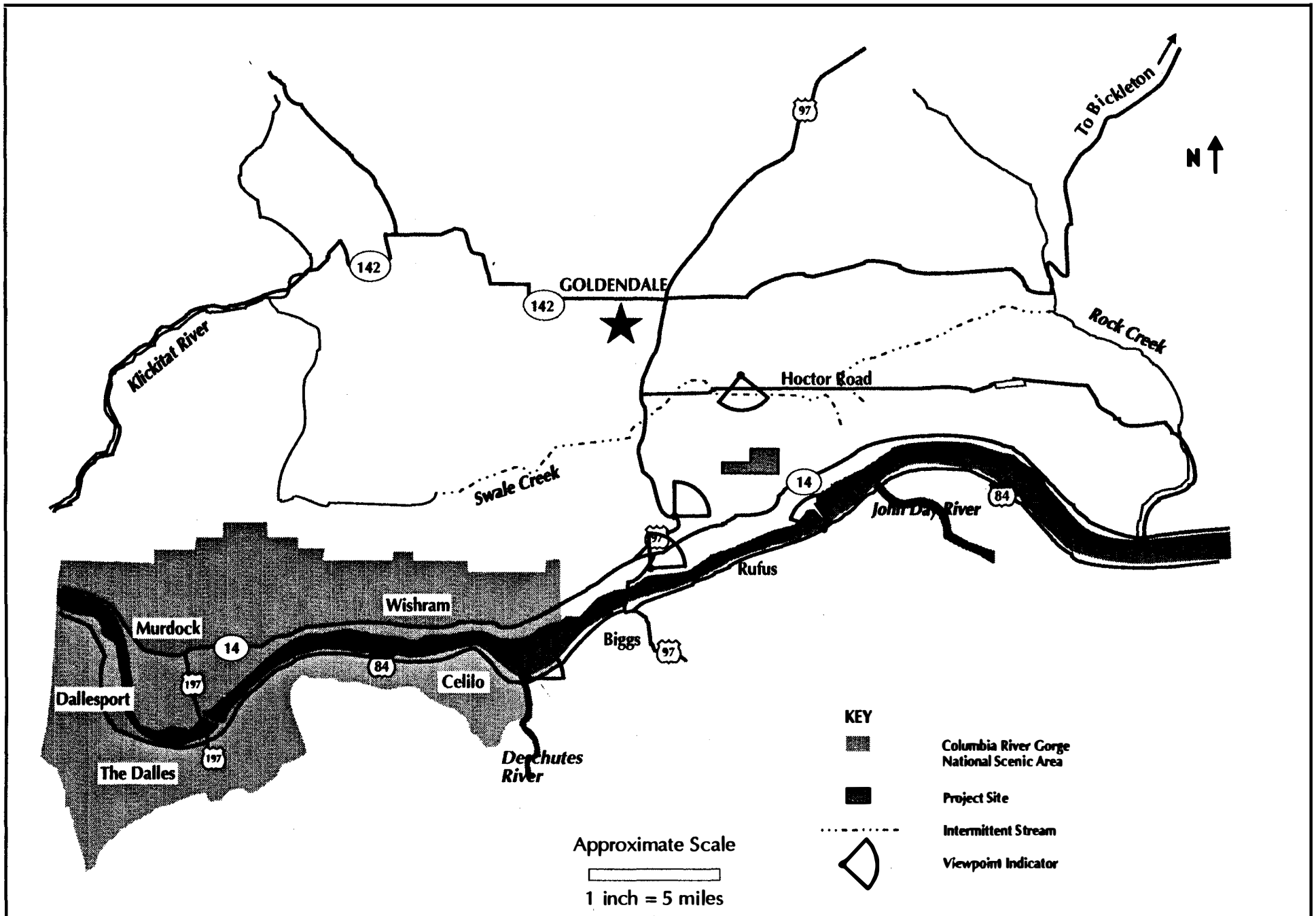


Figure 2.7.1 **Viewpoint Locations for CARES Project**

on the site, is approximately 91 to 122 meters (300 to 400 feet) higher than most of the surrounding hills. The northern half of the site consists of rolling rangeland, and the southern portion of the site consists of steep slopes that drop away in a southerly direction toward the river. The Project site is predominantly natural in character, consisting of open grasslands sparsely dotted with conical shaped junipers, ponderosa pine trees, and Oregon white oak trees. A few visual elements could be considered agricultural in character. These elements include barbed-wire fencing around the perimeter of the site, one fenceline crossing the interior of the site, signs of cattle grazing, and a few scattered manmade stock ponds. One small shed-like building and a radio/microwave tower are located on the site at Juniper Point. With the exception of an occasional 4-wheel drive vehicle or farm implement using an onsite jeep trail, the site is free of vehicular movement. There are no light or glare sources on the site.

Areas surrounding the site to the north, east, and west consist of predominantly agricultural land. These agricultural areas have rolling topography, rangeland vegetation, and commercial cropland interspersed with scattered wooded areas and grasslands. Scattered farm buildings and houses are visible in the landscape. The views are expansive and open. Large mountains are visible on the horizon from a number of locations.

The area to the south of the Project site consists of the Columbia River Gorge, and ranchland and rolling plateau above the river on the Oregon side. The river area consists of a wide expanse of flat water moving within steep hills and sharp bluffs along its edges. The river and its associated towns, bridges, and recreation areas provide distinctive views. The rolling plateau area above the river is very similiar in character to the agricultural and ranchland described in the preceeding paragraph.

Portions of the Project site can be viewed from five general areas:

- from within the Columbia River Gorge National Scenic Area,
- From the general vicinity of Maryhill Museum and Mayhill State Park,
- from SR-14 and I-84 east of the Scenic Area,
- from the Goldendale Valley and US-97, and
- from Hoctor Road.

Five viewpoints were selected for analysis which best represent these general areas in more detail (Figure 2.7.1). The existing visual resources and the impacts to these visual resources are described from each of the viewpoints.

Viewpoint 1 - The Columbia River Gorge National Scenic Area

On the north side of the Columbia River, within the Columbia River Gorge National Scenic Area (Scenic Area), only occasional glimpses of the Project site can be seen by those traveling east on SR-14 because twists and turns in the highway and intervening topographic features generally block the site from view. The site is not seen from the most eastern turnout with the Scenic Area along SR-14, nor can it be seen from the turnout marking Celilo Falls or from the town of Wishram. The closest glimpse of the site from SR-14 is about 0.8 kilometers (0.5 mile) west of the eastern boundary of the Scenic Area. The closest open view of the site is located about 1.6 kilometers (1 mile) west of the eastern Scenic Area boundary.

The Project site is visible from the eastern edge of the Scenic Area, 16 to 21 kilometers (10 to 13 miles) away and for approximately 5 kilometers (3 miles) of the drive. There are large numbers of viewers consisting primarily of people traveling along I-84 in Oregon (11,000 average daily traffic [Putnam pers. comm.]). A large number of these motorists are sightseeing, driving for pleasure, and enjoying the scenic area. This viewer group is considered highly sensitive to the visual environment.

The scene from Viewpoint 1, typical of views from the Scenic Area, consists of roadside vegetation and in some cases the Columbia River in the foreground, a series of steep bluffs in the middleground, and a number of rolling hills in the background. The Project site is visible as the terminus of a ridge of hills in the background zone of the view (Figure 2.7.2). The view is attractive but not highly memorable compared to other views along the Columbia River Gorge Scenic Area.

Viewpoint 2 - Vicinity of Maryhill Museum and Maryhill State Park

The general area including Maryhill Museum, Maryhill State Park, and the Stonehenge war memorial is located east of the Scenic Area and attract large numbers of visitors annually. Maryhill Museum is estimated to attract 86,000 visitors annually while Maryhill State Park atracted over 430,000 visitors in 1993. No data are available on visits to the "Stonehenge" memorial. Views of the western portion of the Project site and Juniper Point can be seen from portions of the grounds at Maryhill Museum and at Maryhill State Park. However, large trees obstruct the view in certain locations.

The most open and expansive view of the Project site is from the Stonehenge war memorial, approximately 5 kilometers (3 miles) from the site. The memorial is a scale-replica of England's Stonehenge built in 1930 to commemorate World War 1 veterans and attracts tourists. This viewer group is considered sensitive to the visual environment. However, the monument is sited so that the viewer's back is to the Project site during viewing.

The scene from the monument consists of the Stonehenge Memorial parking lot and store in the foreground, rolling hills in the middleground, and sky in the background.

Figure 2.7.2 Viewpoint 1 - Columbia River Gorge National Scenic Area

The site is visible in the middleground of the view (Figure 2.7.3). The view is attractive and highly memorable because of the unusual nature of the monument. It is a natural view, with the exception of large electrical transmission towers located in the middleground and the commercial nature of the concession stand in the foreground.

Viewpoint 3 - SR-14 and I-84 East of the Scenic Area

Portions of the Project site are visible from several locations along SR-14 and I-84 east of the Scenic Area. On the Washington side of the Columbia River, the western portion of the Project site can be viewed from a gas station located at the intersection of SR-14 and US-97. Further east, portions of the western area of the site are visible from several rural residences located west and east of John Day Dam. On the Oregon side of the Columbia River, extensive portions of the Project site are visible from the towns of Biggs and Rufus. Further east, protions of the central and eastern areas of the Project site can be viewed from Giles French Park at John Day Dam and from Lepage Park at the John Day River Recreational Area.

The Project site is visible to a high number of viewers from Giles French Park at John Day Dam (440,245 visits in 1994 [Pierson pers. comm.]) and the adjacent I-84 (12,000 average daily traffic [Putnam pers. comm.]. The viewer groups exposed to these views of the site include campers, boaters, windsurfers, and visitors to the dam. From I-84, between the John Day Dam and the river town of Biggs, Oregon viewer groups include commuters, tourists, and residents of the small Oregon towns of Biggs (unincorporated), Grant (unicorporated), and Rufus (1990 population - 295). The most sensitive viewer groups of those mentioned above include campers/recreationists, tourists, and residents living along the river with views of the site.

A viewpoint representative of views from the SR-14 and I-84 area can be found at the John Day Dam. The view consists of the Columbia River in the foreground, steep bluffs and rolling hills in the middleground, and sky in the background. The view is expansive and open in character. The site is located in the middleground of the view, 5 kilometers (3 miles) away, at the top of the rolling hilltops along the skyline. From this location the view is somewhat memorable because of the dramatic nature of the bluffs and hillsides in combination with views of the John Day Dam and the Columbia aluminum plant, located just out of the picture in Figure 2.7.4. The view is natural except for a number of encroaching manmade elements (e.g., electrical transmission towers, the aluminum plant, and the dam).

Viewpoint 4 - Hoctor Road

The Project site is visible to residential viewers and local traffic along Hoctor Road. This viewpoint was selected to represent worst-case residential views of the site. Other residential viewers live to the south of the site along Interstate 84 and State Route 14 and are better represented by the view shown in Viewpoint 3 (Figure

Figure 2.7.3 **Viewpoint 2 Vicinity of Maryhill Museum and Maryhill State Park from the Stonehenge Memorial**

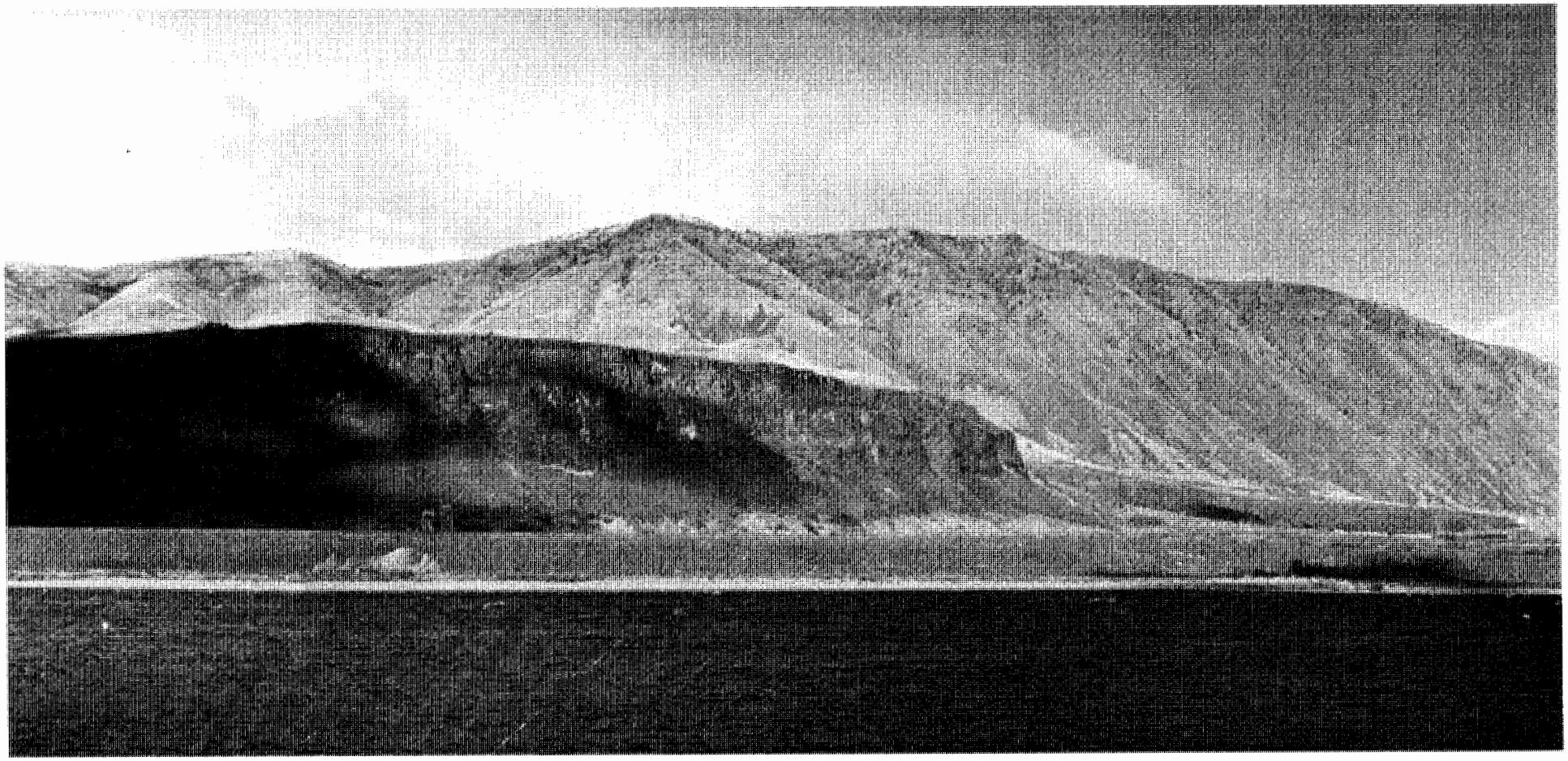


Figure 2.7.4 Viewpoint 3 Vicinity of SR-14 and I-84 from Giles French Park at John Day Dam

2.7.4). Residential viewers are considered highly sensitive to the visual environment because they spend many hours at home.

This viewpoint is typical of the scene along Hoctor Road, consisting of cropland and pastures in the foreground; a mixture of rangeland, grassland, cropland, and scattered woods in the middleground; and sky in the background. The view from this location is expansive. The Project site is visible on the horizon (Figure 2.7.5). The view is rural and pastoral but not highly memorable when compared to other views within the region.

Viewpoint 5 - Goldendale and US-97

Although portions of the crest of the Columbia Hills are visible from areas around Goldendale, much of the Project site is obscured from view travelling south of Goldendale on US-97 by topographic features, including two cinder cones formed by old volcanoes. A small portion of the northeast area of the Project site, where it is traversed by two high-voltage powerlines, would be visible from an existing viewpoint off US-97 just south of Hoctor Road. However, the orientation of the viewpoint and viewpoint marker is to the west toward the Cascade Mountain volcanoes that can be viewed across the Goldendale valley. A few rural residences are located south of Hoctor Road and east of US-97. Portions of the western area of the site are also visible from these residences. The most dramatic view of the Project site from US-97 is experienced by drivers travelling north on the steep portion of the roadway from SR-14 as the roadway makes a sweeping turn to the left and the lower portion of the Project site comes into view.

U.S. Highway 97 was selected for analysis because of the high number of people (4,400 average daily traffic [Blacketer pers.comm.]) that view the Project site from a relatively close 3 kilometers (2 miles) and easily accessible point within the Project viewshed. U.S. Highway 97 viewer groups' sensitivity varies greatly, ranging from low sensitivity for commuters to high sensitivity for tourists.

The scene from US-97 is shown as Viewpoint 5 and consists of the roadbed in the foreground, rolling hillsides and deep valleys in the middleground, and the sky in the background. The Project site is visible in the middleground along the horizon line at the top of the hills (Figure 2.7.6). The view is rural and pastoral but not highly memorable when compared to other views within the region. At other points along U.S. Highway 97 electric transmission towers are clearly visible.

2.7.4 Environmental Consequences

2.7.4.1 Proposed Action

Public Perceptions of Wind Project Aesthetics

Figure 2.7.5 Viewpoint 4 - Vicinity of Hoctor Road from the Intersection of Hoctor Road and Road No. 12

Figure 2.7.6 Viewpoint 5 - From U.S. Highway 97

As discussed in Section 2.7.1, aesthetic impacts are related to both changes in the landscape and the reactions of individuals experiencing those changes. Although commercial scale wind power projects are new to Washington State, several of these projects have been in place in Californial for several years. Research conducted on viewer reaction to those California projects indicates that nearly all viewers perceive large wind power projects as conspicuous, man-made features in the landscape. Those who advocate renewable energy resources or who receive a direct economic benefit tend to view wind power projects as visually interesting and positive symbols of appropriate technology and economic development while other viewers tend to view wind farm aesthetics in terms of visual clutter and as inappropriate changes to the natural landscape (Thayer, 1988).

In spite of this disparity in perception, viewers from California with both positive and negative reactions to wind power project aesthetics tended to hold similar views of design features that improved the overall appearance of the projects. Viewers tended to favor: 1) neutral colors; 2) turbines arranged in uniform orderly patterns; and 3) fewer, larger turbines. Inoperative trubines invoked strong negative reactions from viewers because they are viewed as evidence of unreliability (Thayer, 1988; Bosley and Bosley, 1990).

Impacts to Regional Visual Resources

The proposed Project would introduce a conspicuous and obviously man-made feature into the overall landscape of central Klickitat County. Although small single residential wind turbines exist in the region, there are no windfarms. For this reason, installation of the Project would affect the visual character of the region. The impact would be limited to creating a new visual element that would likely become a distinct "landmark" in the region. This new landmark would be most notable along I-84 in Oregon and U.S. Highways 14 and 97 in Washington. The regional impact of the Project would not be significant for the following reasons:

- existing visual conditions of the proposed project site are not unique to the region. For example, there would still be viewsheds of rangeland, agricultural land, and rolling hillsides left intact after Project development; and,

- although the site can be seen from the Scenic Area, it is seen at a great distance (approximately 16 kilometers [10 miles]) and for a very short time period. This would greatly reduce impacts to viewers within the Scenic Area.

Impacts to Visual Resources of the Project Area

The visual character of the Project site would change from that of a natural grassland and rangeland to that of an industrial windfarm site. The rolling terrain would be dotted with white wind turbines and the supporting access roads to those turbines. A 149-square meter (1,600-square foot) operations and maintenance building would be added to the landscape. Heavy equipment, in the form of cranes and other lifting

devices used to maintain the facility, would be housed onsite. It is expected that wind turbine parts (i.e., large rotors, oil used to lubricate the machines, and other maintenance equipment) would be visible onsite.

Construction activities associated with Project development would create temporary but visible aesthetic impacts because of activities associated with grading and road construction. Construction of switchbacked roads may be necessary to access a few turbine strings. Construction activities and equipment would generally be more visible at closer range; however, soil disturbances and road cuts would contrast with areas that remain vegetated, and these contrasting areas would be visible from a greater distance. Construction staging areas and material and equipment stockpiles could also create temporary aesthetic impacts.

The overall visual character of the Project site would change dramatically due to the intermingling of manmade elements into the natural vegetation on the site. Onsite views become mixed in character as wind turbines are placed into the rural rangeland setting.

Impacts to the visual resources of the project area are described in detail below from the five selected viewpoints. Panoramic photosimulation of the viewpoints are provided and the Project site is highlighted in a white box for clarity. Because photographs reduce the size of the actual perceived view, blow-up views of the project site have been provided to offset this minimizing affect.

Viewpoint 1 - The Columbia River Gorge National Scenic Area
The proposed Project would be visible in the background (Figures 2.7.7 and 2.7.8). Portions of approximately 20 wind turbines would be visible along the horizon. No perceivable changes to the view would occur. Impacts to views from this viewpoint are not considered significant.

Viewpoint 2 - Vicinity of Maryhill Museum and Maryhill State Park
The proposed Project would be visible in the middleground (Figures 2.7.9 and 2.7.10). Portions of approximately 26 wind turbines would be visible. Consistency of the landscape decreases slightly because of the addition of another manmade element. The view's rural and pastoral quality would be diminished due to the addition of wind turbines in the setting. According to current research, some viewer groups may place windfarms in the same category as other technologies that they consider to be unsightly intrusions on scenic or pastoral landscapes (Thayer 1988). However, because existing electrical transmission lines already exist within the view and because the Project site is to the back of the Stonehenge war memorial viewers, impacts to views from this area are not considered to be significant.

Viewpoint 3 - SR-14 and I-84 East of the Scenic ARea

The proposed Project would be visible in the middleground (Figures 2.7.11 and 2.7.12). Portions of approximately 43 wind turbines would be visible. The addition of wind turbines into the view would increase memorability of the landscape by adding a distinctive and unusual visual element. Current research indicates that some viewer groups may place windfarms in the same category as other technologies that they consider to be unsightly intrusions on scenic or pastoral landscapes (Thayer 1988). However, taken in the context of I-84 along one edge of the view, and numerous electric transmission towers visible along the river, impacts from the addition of wind turbines in the view are not considered significant.

Viewpoint 4 - Hoctor Road

The proposed Project would be visible in the middleground (Figures 2.7.13 and 2.7.14). Portions of approximately 63 wind turbines would be visible. The rural pastoral nature of the view would decrease due to the introduction of a new manmade object which is not agricultural in character. Memorability of the view would increase because of the distinctive and unusual visual character of the wind turbines. Some individual viewers may find these new views of the wind turbines objectionable and could be highly sensitive to changes in the viewshed. In the case of this Project, many residential viewers would benefit financially from the installation of the adjacent Kenetech Washington Windplant™ #1 project and would likely have a positive image of wind turbines. However, some viewer groups may be extremely sensitive to the change in the visual character from the area of Hoctor Road.

Viewpoint 5 - Goldendale and US-97

The proposed Project would be visible in the middleground (Figure 2.7.15 and 2.7.16). Portions of approximately 28 wind turbines would be visible. The open rural rangeland character of the view would be diminished while the memorability of the view would increase due to the addition of the distinctive and unusual character of the wind turbines. Taken in the context of other transmission line views within the viewshed of Highway 97 and the relatively short duration of the views of the project site, impacts to the visual environment from this viewpoint are not considered significant.

2.7.4.2 No Action

Under the no action alternative the visual resources of the Project area would be unchanged.

2.7.5 Mitigation Measures

The proposed Project incorporates a number of design characteristics which have been identified by current research to minimize visual impacts including: (1) use of similar types, sizes, and shapes of wind turbines, (2) placing wind turbines in orderly

rows respective of land contours, (3) evenly spacing turbines, (4) use of a consistent and neutral turbine color, and (5) use of moderately sized turbines (Thayer 1988).

Section 1.1.6 describes mitigation included in the Project proposal to reduce aesthetic impacts. The following mitigation measures would further reduce direct and indirect impacts resulting from the proposed Project:

- Return temporary construction roads and construction staging areas to preconstruction grades and restablishing native vegetation (See Botanical Resources Section 2.2).

- Store equipment and supplies in designated onsite storage areas or offsite only. Onsite storage areas should be screened from view by a 1.8 to 2.4-meter (6 to 8-foot) high fence. Fencing should be solid in character, of grey weathered wood, or painted an earthtone brown or grey to blend in with the surrounding terrain. Native trees and shrubs should be planted around fencing and maintained in a healthy condition. Damaged or unusable parts should be removed from the site or stored in screened storage areas.

- Immediately repair, replace, or remove inoperative turbines, because windfarm maintenance is critical to public acceptance of the project (Thayer 1988).

- Install underground transmission lines extending to and from the turbines (Thayer 1988).

- Prepare a decommissioning plan outlining the circumstances under which individual turbines will be removed from the site, methods used to restore areas previously containing turbines, and methods for decommissioning the overall Project and restoring the overall Project site.

- Coordinate with Washington, Oregon, and federal recreational facilities and areas, as well as Washington and Oregon State Highway Departments, to provide signs directing sightseers along I-84, SR-14, and US-97 to existing public facilities that provide safe viewing areas of the Project site.

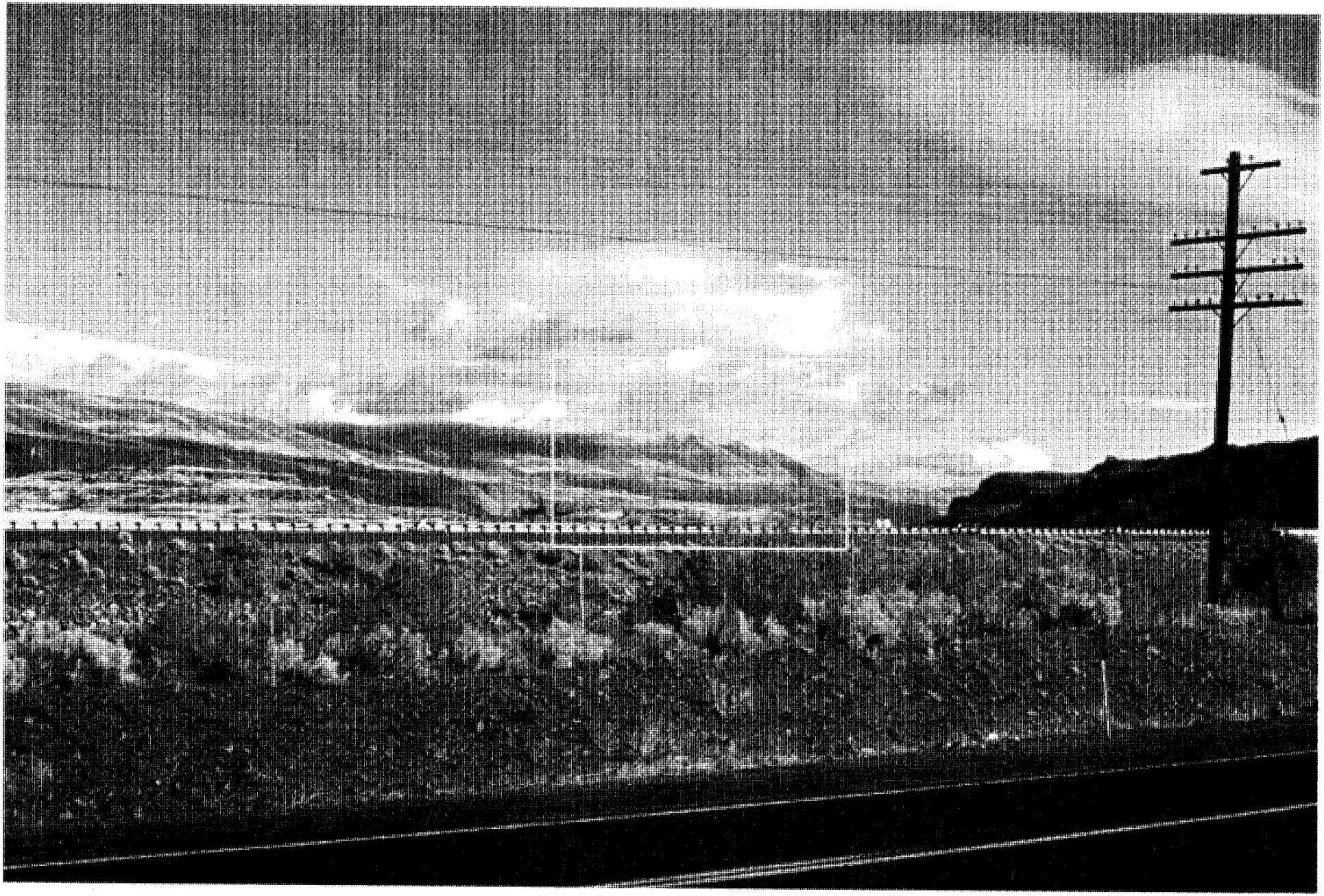


Figure 2.7.7 Visual Impacts to Viewpoint 1

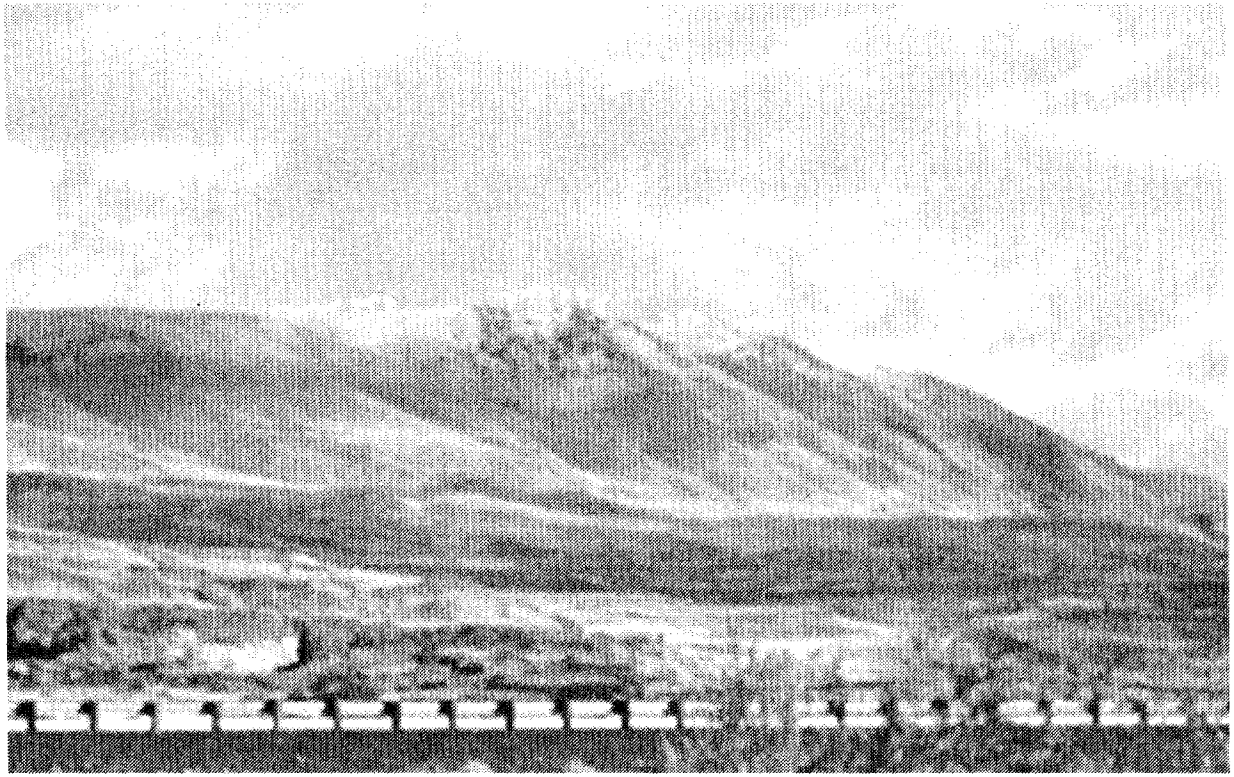


Figure 2.7.8 Enhanced Impacts to Viewpoint 1

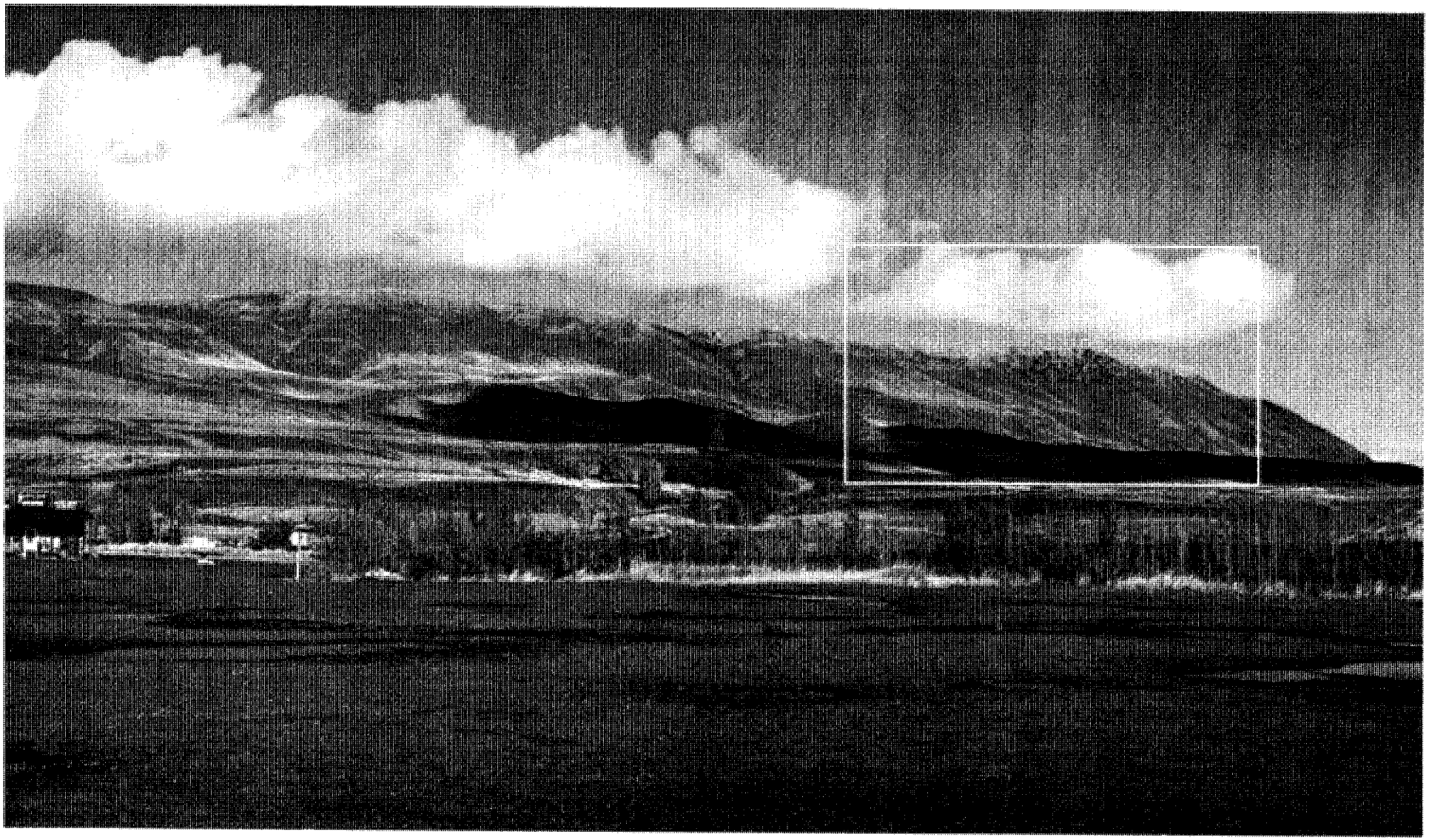


Figure 2.7.9 **Visual Impacts to Viewpoint 2**

Figure 2.7.10 Enhanced Impacts to Viewpoint 2

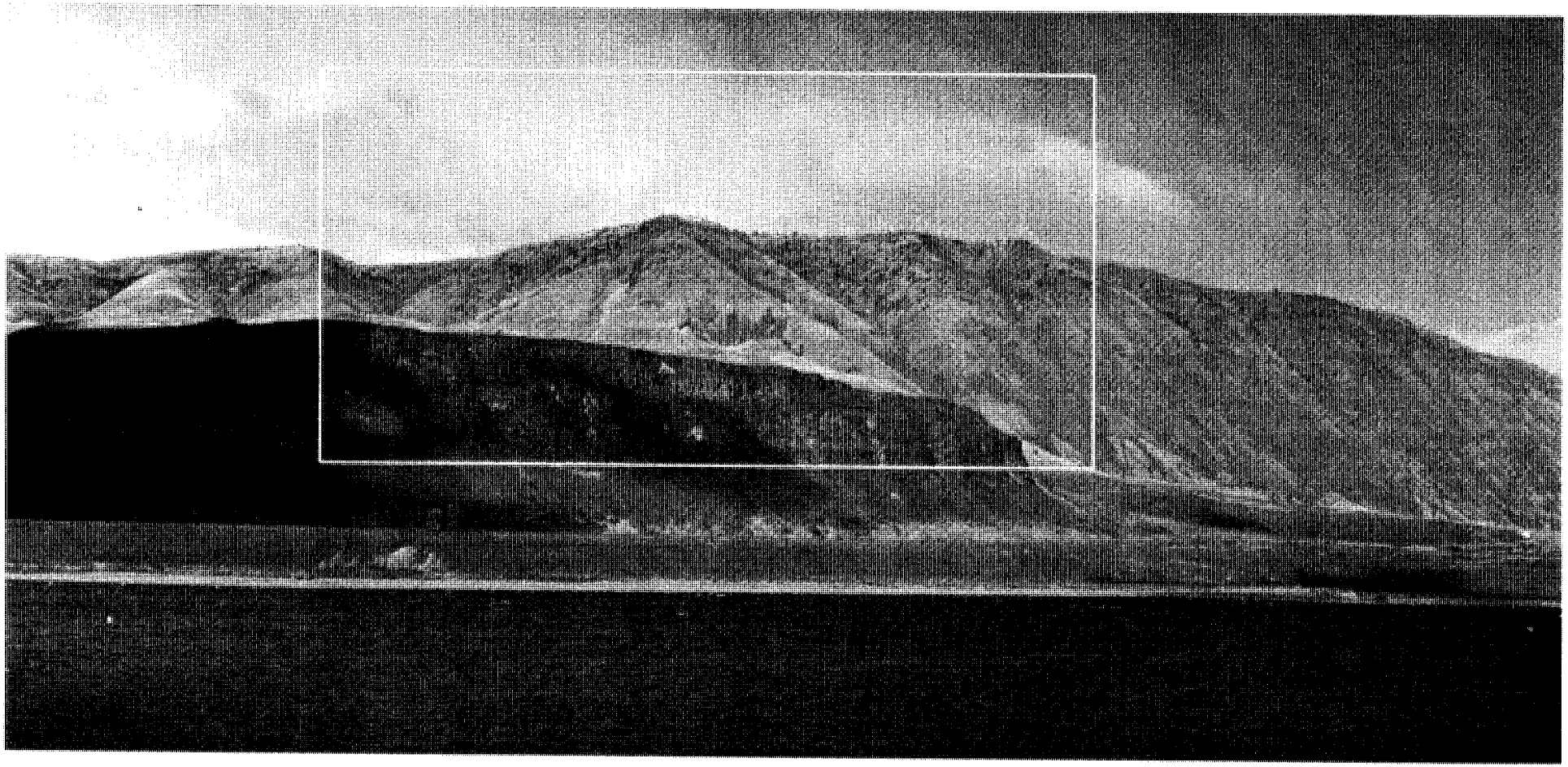


Figure 2.7.11 Visual Impacts to Viewpoint 3

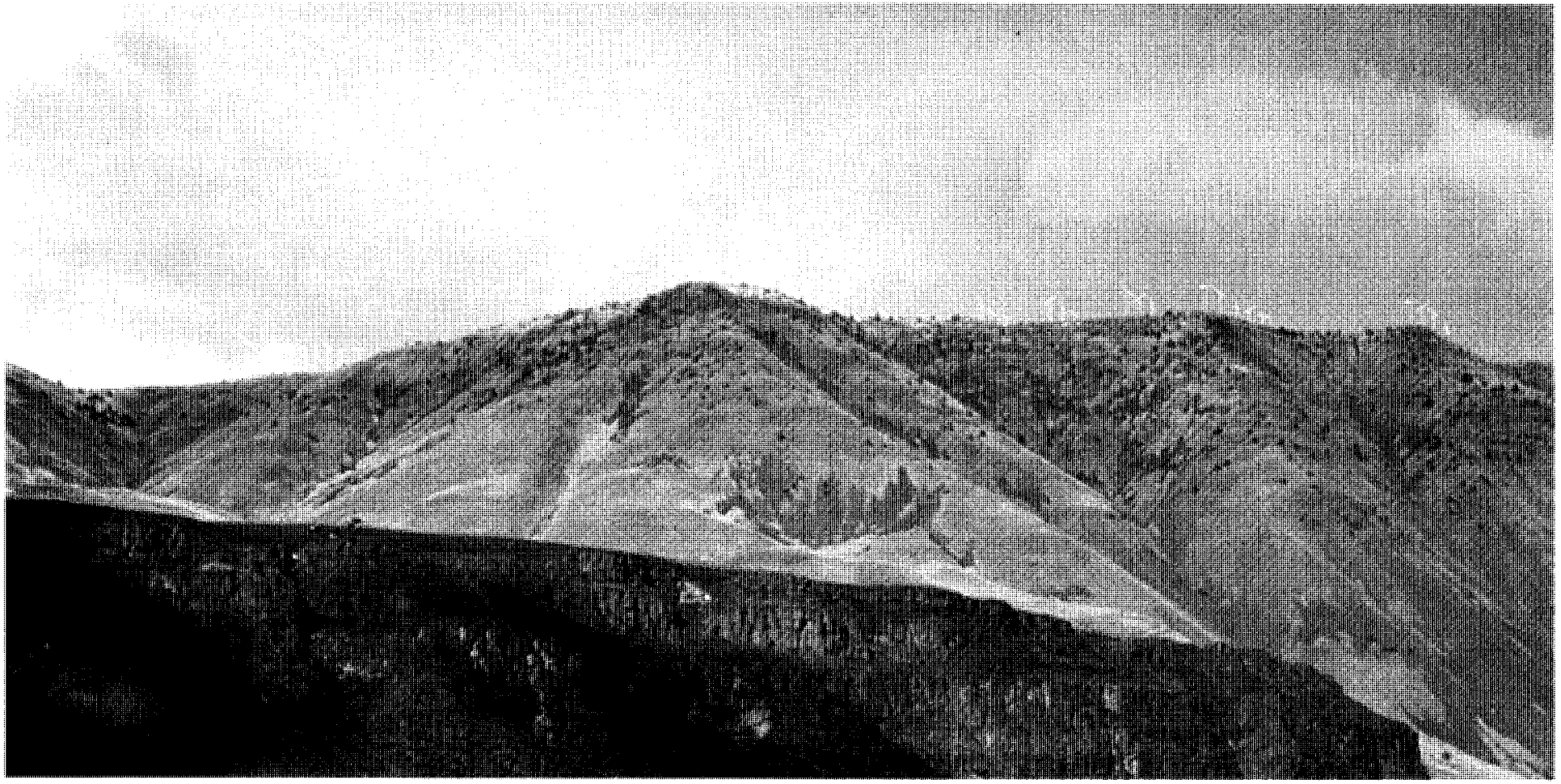


Figure 2.7.12 Enhanced Impacts to Viewpoint 3

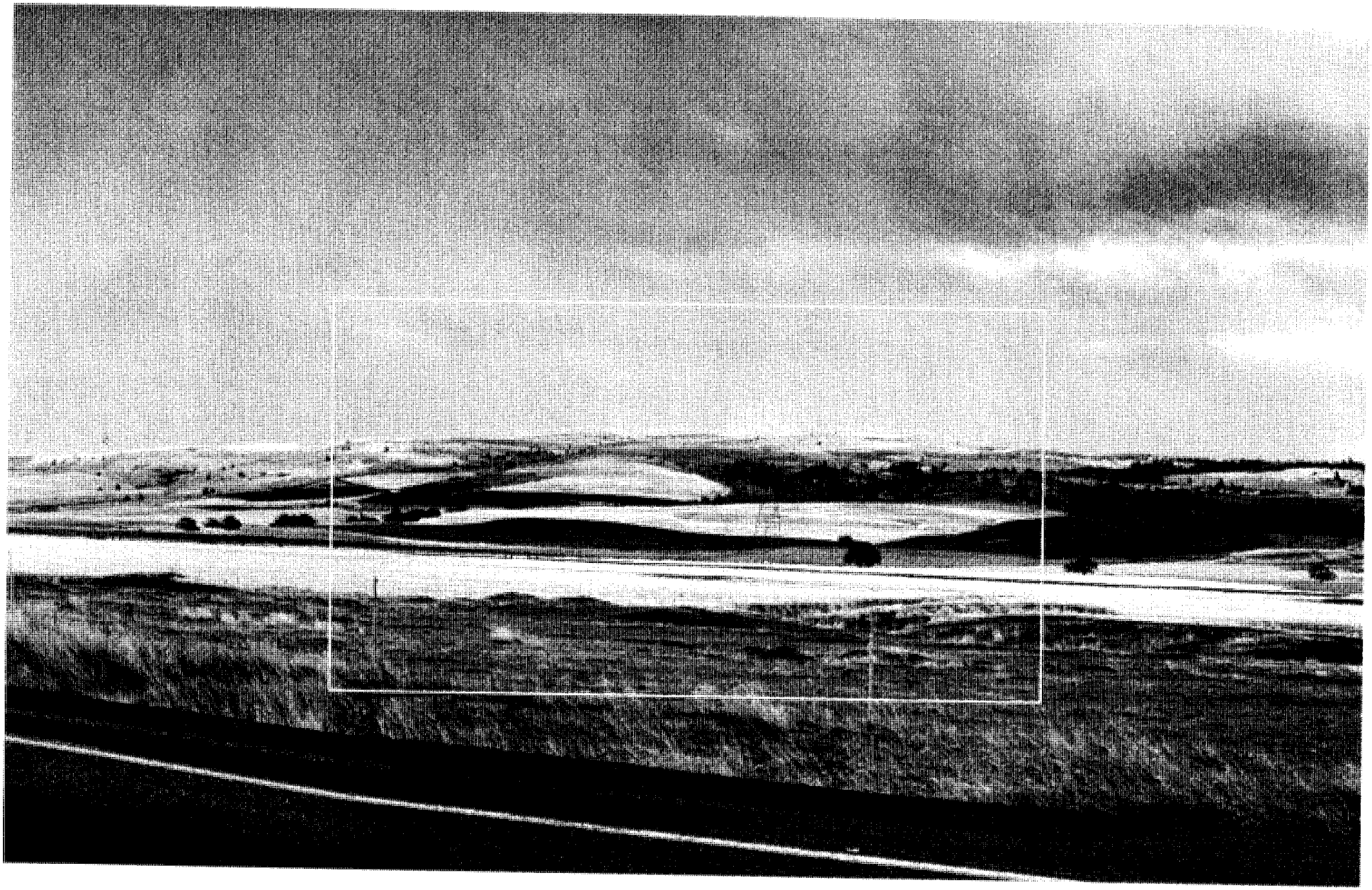


Figure 2.7.13 **Visual Impacts to Viewpoint 4**

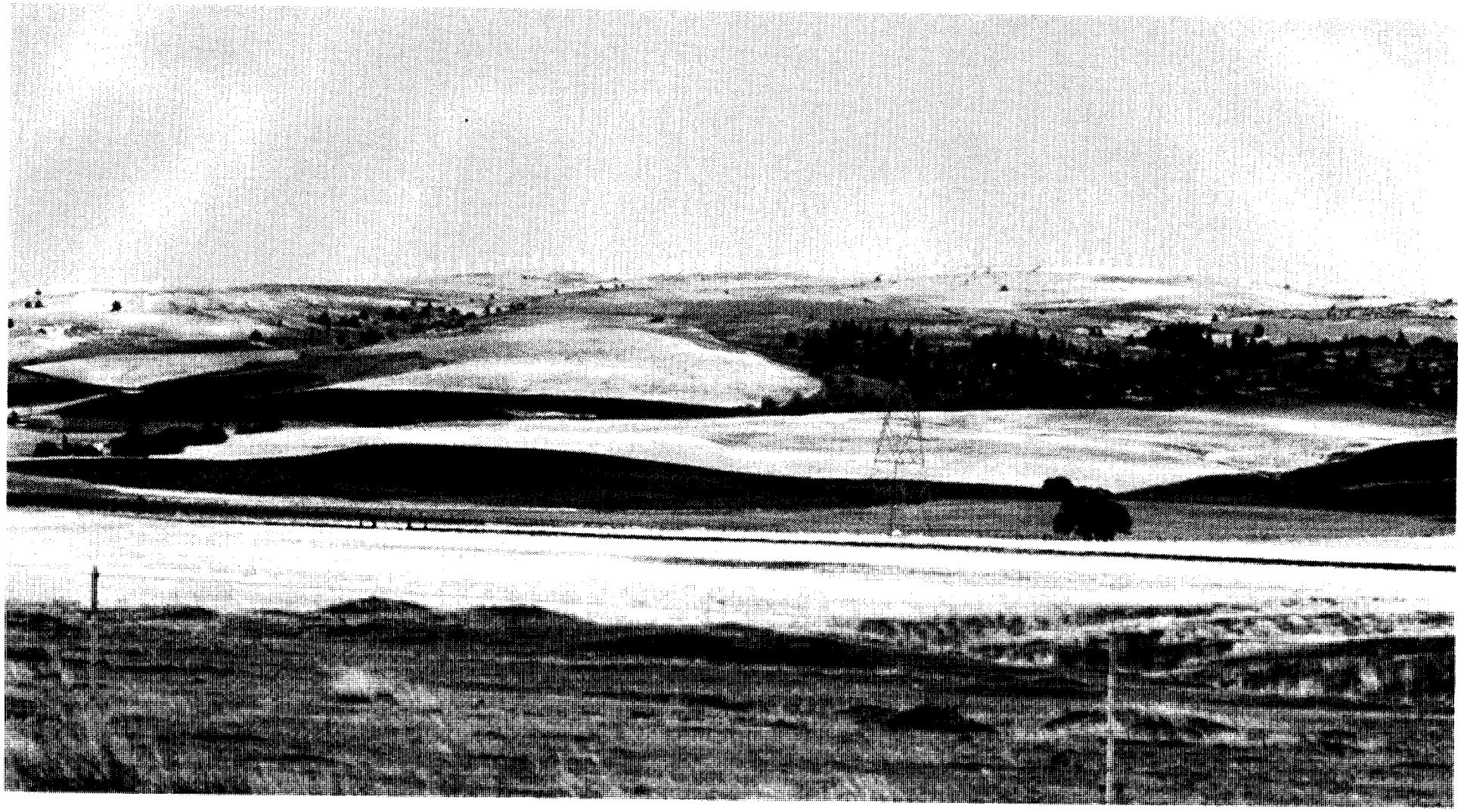


Figure 2.7.14 Enhanced Impacts to Viewpoint 4

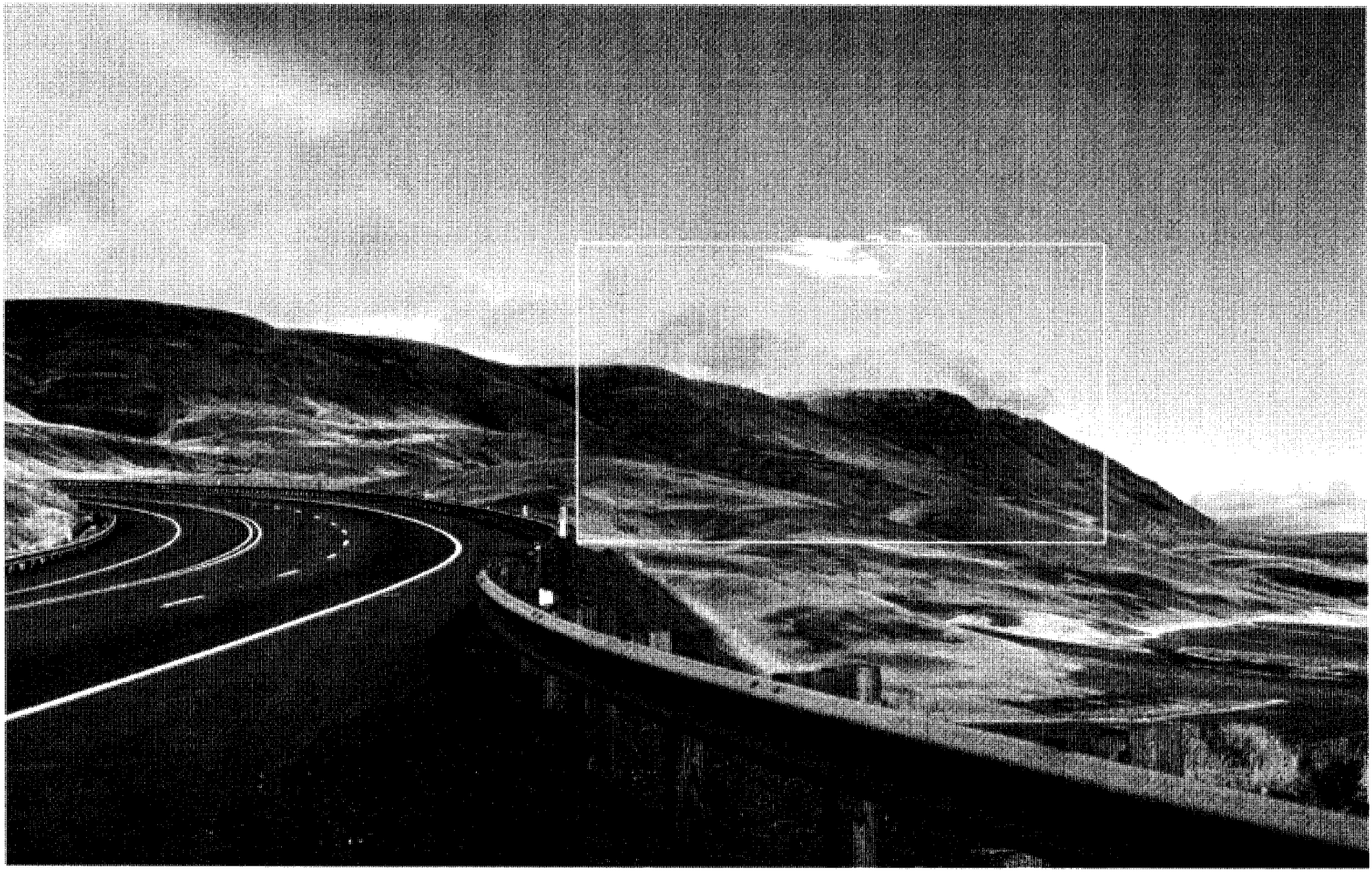


Figure 2.7.15 Visual Impacts to Viewpoint 5

Figure 2.7.16 Enhanced Impacts to Viewpoint 5

2.8 LAND USE, RECREATION, AND SOCIOECONOMICS

2.8.1 Studies and Coordination

The primary sources of information for this section are the amended Klickitat County Comprehensive Plan, adopted in 1979; the 1983 Klickitat County Long Range Resources Plan, the January 1994 Klickitat County Central Area Zoning Map; the amended Klickitat County Zoning Ordinance; the Klickitat County Illumination Ordinance; and interviews with the Klickitat County Planning Director.

2.8.2 Regulations, Standards, and Guidelines

Klickitat County has not adopted specific policies or zoning requirements that designate wind power development as a permitted use in specific areas of the County. Instead, the County evaluates individual wind power development proposals based on their ability to meet general land use goals and policies and on their compatibility with ongoing site and adjacent land uses. A Conditional Use Permit, setting forth specific conditions that would be required to assure compatibility, will be required for Columbia Windfarm #1. Pursuant to RCW 43.21C.060 and WAC 197-11-660, the County also exercises substantive authority under SEPA to condition or deny project proposals based on identified significant adverse environmental impacts disclosed in an EIS. The Klickitat County Environmental Ordinance specifies policies, codes, ordinances, resolutions, and plans that are the basis for exercising this authority under SEPA.

The following discussions summarize specific goals, policies, and standards outlined in Klickitat County's Comprehensive Plan and Zoning Ordinance. The Project site does not fall under the Washington State Shorelines Management Act or under the Klickitat County Shoreline Management Plan. Because the Project lies outside the Columbia River Gorge National Scenic Area, land use policies contained in the management plan for the scenic area do not apply to this Project.

2.8.2.1 Klickitat County Comprehensive Plan

The County's Comprehensive Plan, prepared in 1977 and amended in 1979, identifies goals to protect and enhance the County's natural resource and agricultural base and to strengthen and diversify the County's economy. Goals that are potentially applicable to development of Columbia Windfarm #1 include:

- Preserving the environmental quality of Klickitat County.

- Guiding development to areas where soils and geology pose the fewest limitations to quality growth.
- Maintaining high water quality by ensuring that adjacent land uses are compatible with water uses.
- Preserving the County's clean air and minimizing noise and odors.
- Maintaining and enhancing the County's natural resource base.
- Supporting and protecting agriculture.
- Strengthening and diversifying the County's economic base and promoting employment.
- Identifying and preserving wildlife.
- Encouraging tourism.
- Providing essential public services at the lowest possible cost.
- Promoting provision of utilities sufficient to protect the public health and welfare.
- Supporting adequate and effective police and fire services.
- Preserving open space for its community-shaping, recreational, and ecological value.
- Promoting regional awareness and cooperation.

These goals are supported by specific policies set forth in the Comprehensive Plan.

The County Comprehensive Plan also contains a General Land Use Map, updated in 1982, which also guides land use decisions in the County. The Project site and adjacent lands are located on lands designated as "Agriculture/Forest" (A/F) on the County's Land Use Map. The purpose and intent of the A/F land use designation is to "retain or conserve, insofar as practicable or desirable, prime agricultural and forest lands for the continued economic welfare of the farm and forest industry and residents of the County."

2.8.2.2 Klickitat County Zoning Ordinance

Primary Zoning Districts

The Klickitat County Zoning Ordinance, as amended June 1994, creates uniform districts in which compatible uses are allowed and sets forth standards and density controls for those districts.

Adjacent lands and land within the Project is zoned "Extensive Agriculture" (EA) (see Figure 2.8.1). The purpose of EA zoning is to "encourage the continued practice of farming on lands best suited for agriculture and to prevent or minimize conflicts between common agricultural practices and various non-farm uses." Uses that are permitted outright in EA zones include farming, farm dwellings and buildings, homes, and commercial or industrial activities directly serving agricultural operations. Eight categories of conditional uses are also allowed in EA zones. Wind power development would fall potentially under two of these categories: "utility facilities necessary for public service" and "other uses determined by the Board of Adjustment to be in keeping with the intent of this district." The County Zoning Ordinance also sets forth density standards (20- or 40-acre minimum lot sizes), standards limiting the size of signs and prohibiting flashing signs, and requirements that adequate off-street parking be provided for accessory or conditional uses. Any uses that were located in an EA zone at the time the zoning ordinance was adopted (April 30, 1979) are not to be treated as non-conforming uses.

Secondary or Overlay Zones

The Klickitat County Zoning Ordinance also establishes several secondary or overlay zones which may be superimposed over the primary zoning districts. These secondary zones include:

- Airport Approach Zone (AA)
- Aggregate Resource (AR)
- Flood Hazard Area (FA)
- Scenic Design Area (DA)
- View Protection District (VP)
- Illuminating Control District (IC)
- Cluster Development

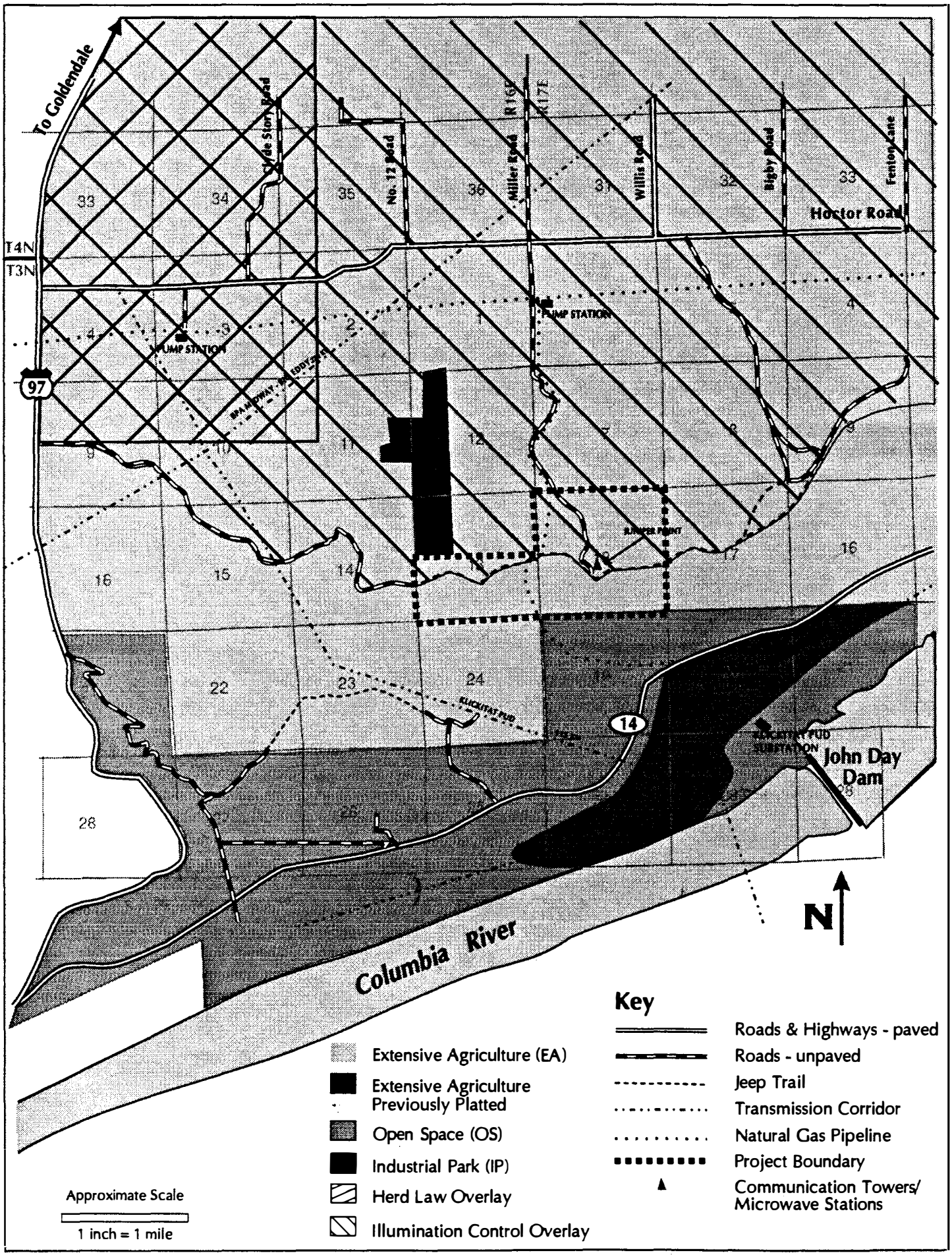


Figure 2.8.1 **Zoning Designations and Plats**

The Project site does not lie within any Airport Approach Zones, Aggregate Resource Areas, Flood Hazard Areas, Scenic Design Areas, View Protection, or Cluster Development Districts.

A portion of the site (roughly that portion of the site from the crest of the Columbia Hills north) is located within the Illumination Control District. The Illumination Control District is intended to prevent excessive lighting, glare, and reflection in areas adjacent to astronomical research facilities, such as the Goldendale observatory (see Figure 2.8.2). Within the designated Illumination Control District, Klickitat County requires that all outdoor lights, including light-directing refractors, must be shielded so that direct light emitted in a horizontal direction is minimized. The Illumination Control Ordinance also prohibits: the use of quartz or metal halide lamps for outdoor illumination; the use of outdoor flood or search lighting between midnight and sunrise except for emergency lighting required by public agencies; and illumination of outdoor public recreation facilities after midnight unless specific activity is in progress.

Under the authority of state law (RCW 16.24.010), Klickitat County has designated stock restricted areas where it is unlawful to permit livestock to run at large. Under state law, any area not designated as a stock restricted area is defined as a range where it is lawful to allow livestock to run at large. The Project site is not located in any Stock Restricted areas (see Figure 2.8.1).

2.8.3 Affected Environment

2.8.3.1 Population and Employment Trends

The Project site is located southeast of Goldendale, the County seat, which had an estimated population of 3,730 in 1993. In 1993, the estimated population of the entire county was 17,500. Approximately 34 percent of the population reside in Goldendale, White Salmon, and Bingen. The remainder of the population is widely dispersed and rural in character. The population density is 8.7 persons per square mile, with an average of 2.2 people per housing unit. These statistics place Klickitat County in the bottom 25 percent of Washington state counties ranked by population density.

Since 1990, the population of Klickitat County has increased by approximately 1.7 percent per year. Goldendale's population has increased at a lower rate of about one-half percent per year. Population growth in the County is largely the result of the birth rate being slightly higher than the death rate. However, a small net increase in in-migration to the County has occurred since 1990.

Employment in Klickitat County includes: government; manufacturing (primarily lumber, wood products, and aluminum); wholesale-retail trade; services; agriculture; transportation and utilities; mining/construction; and finance/insurance/real estate. Table 2.14 illustrates the distribution of jobs across these employment sectors.

Table 2.14 Klickitat County Employment

Sector	Average Full-Time Jobs
Government	1,560
Manufacturing	1,460
Wholesale/Retail	840
Services	600
Agriculture	4851,2
Transportation Utilities	300
Mining/Construction	180
Finance/Real Estate/Insurance	140

1 Peak monthly agricultural employment was 955 in July.
2 Does not include agricultural employees not covered by Employment Security.

In 1992, average annual agricultural employment accounted for about 9 percent of County jobs. During peak months, 0.16 percent (on an average) of the County's workforce was employed in agriculture. Since 1980, total employment in manufacturing has fallen by about eight percent. Employment in government, services, wholesale/retail trade, transportation/utilities, and finance/insurance/real estate has increased over the same period. The largest increases have been in wholesale/retail trade, where employment increased by 53 percent (4.4 percent per year) between 1980 and 1992, and services, where employment increased by 33 percent (2.8 percent per year) between 1980 and 1992.

2.8.3.2 Current Land Use and Trends

Project site lands are owned by Columbia Aluminum and are currently used for limited grazing and communications. Microwave and radio communications stations are located on Juniper Point, and a natural gas pipeline runs through the site. Residential density in the general vicinity of the site is very low and consists primarily of homes associated with existing farms and ranches surrounding the site.

2.8.3.3 Recreation

Recreation sites and resources in the general vicinity of the proposed Project are shown on Figure 2.8.2.
Table **2.15** summarizes activities offered at the locations and the number of visitors in 1993.

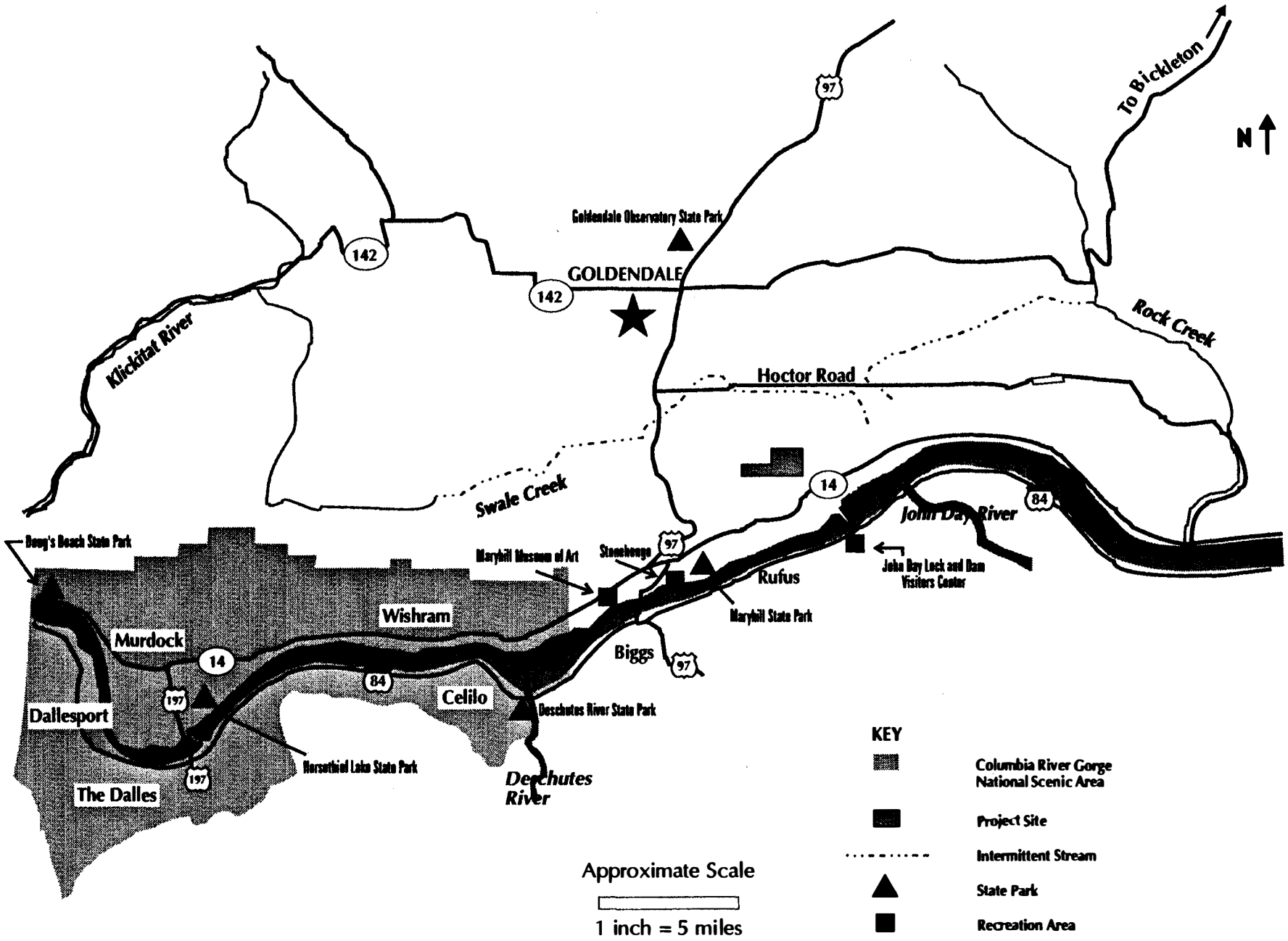


Figure 2.8.2 **Recreation Areas**

Table 2.15 Recreation Opportunities in Central Klickitat County

Name	Description	Hours	No. of visitors in 1993
Doug's Beach State Park (Washington)	Offers intermediate and advanced windsurfing. Located off Highway 14 near Lyle, Washington	Day use only	50,000 +
Horsethief Lake State Park (Washington)	Offers hiking, camping, picnicking, and other water activities.	Sept. 30 to April 1, 6:30 a.m. to dusk; Oct. 1-31, 8 a.m. to dusk; Closed Nov. to Mar. 31.	105,000 +
Deschutes River State Park (Oregon)	Offers hiking, camping, fishing and a variety of winter activities.	Office hours 8-4:30 p.m.	116,000 +
Maryhill Museum of Art (Washington State Musuem)	Contains permanent collections and special exhibitions.	9 a.m. to 5:30 p.m. March 15 to Nov. 15	86,000
Maryhill State Park (Washington)	Offers boating, swimming, fishing, camping, and windsurfing.	April 1 to Sept. 30, 6:30 a.m. to dusk; Oct. 1 to Mar. 31, 8 a.m. to dusk	430,000 +
Stonehenge	A replica of Stonehenge built by Sam Hill as a memorial to veterans of WWI.	All hours	No data available.
Goldendale Observatory State Park (Washington)	Offers tours, programs, and use of its 24-1/2-inch reflecting telescope to the general public and students of astronomy.	Oct. 1 to March 31, 1-5 p.m. 7-9 p.m. Saturday 1-5 p.m. Sunday; April 1 to Sept. 1, 2-5 p.m., 8-midnight, Wednesday to Sunday	30,000 +

2.8.4 Environmental Consequences

2.8.4.1 Proposed Action

Land Use

Development of the Project would add a system of wind turbines and associated facilities to existing land use (grazing, communications, and utility use). About five percent of site lands would be unavailable for agricultural use following Project development.

During construction, approximately 38 hectares (95 acres) of the site, excluding existing roads, would be disturbed including about 5 hectares (14 acres) of range, and 33 hectares (81 acres) of shrub-steppe habitat. Additional land area may be temporarily restricted from livestock grazing because of the need to restrict the overall limits of construction and avoid conflicts between livestock and construction equipment. These effects would be temporary except that soil disturbance could create a longer-term potential for shrub steppe areas to become dominated by invasive weeds.

Following construction, permanent Project features (excluding existing access roads) would occupy about 19 hectares (48 acres) or less than five percent of the overall site area. A portion of the overhead Project powerline would extend off-site to the west and connect to the existing Klickitat PUD 115 kV transmission line. The Project proposal would not alter existing fencing around the site except at gates to access roads, which would be locked. In addition, maximum turbine heights would fall below the 200-foot requirement for lighting established by the FAA. No other evening lighting sources from the Project have been identified. Therefore, Project operation would not result in lighting impacts to the Goldendale observatory or conflict with County requirements in its Illumination Control overlay zone.

Although only five percent of the Project site would be occupied by Project features, turbines would require guy wires, and thereby could create some potential for livestock injury. Adverse land use impacts could also result from any maintenance materials or individual decommissioned turbines stored on site. An on-site maintenance facility heated by propane is proposed. Both waste and portable sanitary facilities would be provided at the site building. Mitigation, in the form of a decommissioning plan, is suggested in Section 2.7, Aesthetics.

Socieoeconomics

During construction, population and employment impacts of the project would be related to hiring of construction workers and purchase of goods and services in Goldendale during the construction period for each phase. Average construction employment is anticipated to be approximately 20 workers compared with average full-time employment in the County of approximately 5,600. Goods and services purchased in the Project area will be limited primarily to gravel, concrete, equipment rental, fuel, overnight accommodations, and meals. Nearly all of the major pieces of equipment such as turbines, support structures, transmission line components, and transformers will be brought to the Project site from out of the County.

During operation, employment will include five full-time staff in Klickitat County. Goods and services purchased locally during operation would be miscellaneous supplies, and maintenance equipment. Increased personal income, payment of real estate and sales taxes, and payments to Columbia Aluminum would also result.

Recreation

The Project site is not used for recreation although limited hunting during certain times of the year may occur. Hunting is generally allowed only by permission of the property owner and, therefore, access is limited.

The Goldendale-Central Klickitat County area offers many recreational opportunities for tourists. The Project could attract tourists or others passing through the Goldendale area. Although because the Project would primarily be visible from Hoctor Road, it would likely not attract large numbers of visitors. Unauthorized access would be discouraged by several factors, including: the size, steepness, and general inaccessibility of the site; locked gates at access points; and the presence of on-site workers during Project operation.

Compatibility with Zoning and Land Use Policies

Table 2.16 summarizes Project compatibility with land use goals and objectives established in the County's Comprehensive Plan. With mitigation recommended in other sections of this EIS, the proposed Project would generally be compatible with those goals. As shown in Figure 2.8.1, the site is located adjacent to other lands zoned Extensive Agriculture, including lands platted for residential development prior to adoption of the County zoning ordinance.

Table 2.16 Compatibility with Comprehensive Plan Goals and Objectives

Goals	Discussion
Goal: To preserve the environmental quality of Klickitat County.	
• The capability of the land, water, and air to sustain human activities should be a determining factor in making land use decisions. Land capability maps should be prepared and referred to when decisions on land subdivisions, development, or zoning must be made.	Project not expected to significantly conflict with the limited grazing that currently occurs on the site.
• Buildings should be located on sites that minimize the need for cutting, grading, or the removal of native vegetation. – Land surface modifications should be compatible with natural features and processes. – As much natural vegetation as possible, especially large trees, should be preserved as development occurs.	By following ridgelines and using existing roads to the maximum extent possible, cutting and grading would be minimized. Large trees would generally be maintained.
• Rural areas should be developed at low densities.	Project would not conflict with this objective.
Goal: To guide development of areas where soils and geology pose the fewest limitations to quality growth.	
• Generally, unsewered areas with severe soil limitations for development should not be developed at a density greater than one unit per five acres.	On-site septic disposal would not be required. Portable facilities would be required during construction and operation.
• Where severe soil limitations coincide with other limiting factors such as geologic instability or surface flooding, development should be discouraged.	Major soil limitation is erosion, which can be controlled through Best Management Practices under NPDES General Permit requirements.
• On-site geological engineering studies should be required before development is allowed in areas with potential slope instability or soil settling problems.	Geotechnical investigations to support design are recommended.
Goal: To maintain high water quality by insuring that adjacent land uses are compatible with water uses.	
• Shoreline and upland development should not impair fishing activities.	On-site intermittent streams not used for fishing. Erosion and sediment control measures required under NPDES General Permit.
• Proposed subdivisions and large site plans should include provisions to protect the natural drainage system. Where the natural system is not adequate, supplemental drainage facilities should be required.	Culverts across drainages and other controls to maintain site drainage patterns are recommended mitigation.
• The shorelines of the rivers and streams of Klickitat County are a specialized resource to be	Not applicable to this Project.

Goals	Discussion
protected and enhanced. The Shoreline Master Program for Klickitat County shall serve as the policy governing shoreline use.	
Goal: To preserve the County's clean air and minimize noise and odors.	
• Buffers between noise-generating and odor-generating uses and other uses should be provided through zoning and subdivision ordinances.	The closest turbine string would be within several hundred feet from the nearest area platted for residential use. Mitigation to keep noise levels consistent with state noise standards are identified as mitigation.
• Greenbelts between residential subdivisions and between communities should be preserved.	Most site vegetation would be maintained.
Goal: To maintain and enhance Klickitat County's natural resource base.	
• Conserve the natural resources required for agriculture, forestry, extractive mining, etc., in order to protect the basic economy of the County.	Project would minimally reduce the amount of land available for agriculture (five percent). Agreement with land owner provides financial benefit.
Goal: To support and protect agriculture.	
• A plan for preserving prime agricultural land should be developed and land use regulations enforced.	95% of Project land could remain in current use.
• Buffers should be provided between agricultural areas and residential areas,.....it is important that buffer strips not become neglected, weed-infested areas that will result in the infestation of grazing and cropland with potential danger to livestock and crops.	A restoration and weed management plan is identified as mitigation for the Project.
• Mechanisms should be developed to protect agriculture land still in production from suburban growth, costs such as development or improvement assessments, increased property taxes, or zoning limitations.	Not applicable. Land would remain in grazing use.
• Range land should be protected against encroachment by residential development.	Not applicable. Land would remain in grazing use.
Goal: To identify and preserve wildlife in Klickitat County.	
• A fish and wildlife habitat inventory and management plan should be developed.	A year-long avian/wildlife study has been conducted to determine the impacts to wildlife from the proposed Project.
• Significant habitats should be protected and managed.	Mitigation for impacts to habitat and native plant communities is recommended.
• All projects should be evaluated for their impact on fish, fowl, and mammals.	See sections 2.3 - 2.5 of this EIS.
• Full compliance with environmental protection laws should be required prior to issuing permits.	This EIS is being prepared in compliance with both NEPA and SEPA.
Goal: To strengthen and diversify Klickitat County's economic base and promote employment.	
• Economic development in Klickitat County should take place in a manner that will enhance regional economic goals.	Development of the proposed Project will provide a clean, efficient source of energy for the region and a small number of local jobs. It will also provide financial support to current property owner.
• Action programs to improve utilities and services for industrial parks whose development is under way should be supported.	Not applicable to this Project.
• The Overall Economic Development Plan shall be	Not applicable to this Project.

Goals	Discussion
an important tool for industrial development efforts.	
• The Overall Economic Development Plan (OEDP) Committee and the Rural Development Committee (RDC) shall be advisory on all economic development projects and issues.	Not applicable to this Project.
Goal: To provide an efficient transportation network in Klickitat County.	
• Maintenance and improvement of existing roads should have priority over creation of new roads.	Existing roads on the site would be improved and new roads would be constructed only as needed.
• Land use decisions should consider their impact on adjacent roads. Similarly, road improvements should be consistent with proposed land use densities.	Road impacts would occur during construction. Mitigation measures are indentified in Section 2.11.
• Development should, as much as possible, pay for itself.	Permit fees would be required for Project development.
• Development patterns should be consistent with availability of services and utilities as well as with land capability and neighborhood goals.	Significant public service demands are not expected. See Section 2.12 on public services and utilities.
Goal: To promote provision of utilities sufficient to protect the public health and welfare.	
• Utilities should be placed underground whenever possible.	Communication lines would be placed underground and power/collection lines would be placed underground where feasible.
• Consolidation of power transmission lines with other utility corridors and transportation rights-of-way should be encouraged.	The Project's transmission line would interconnect with the Klickitat PUD's 115-kV Goldendale line west of the site.
• Power substations should be screened with mature plantings or be designed to blend visually with their surroundings.	See land use mitigation in this section.
• Proposed power-generation facilities should study socioeconomic impacts upon the County.	Being prepared by CARES.
• A "utilities coordination council" should be created to insure coordination of planning and development of utilities and prevent costly construction delays.	Not applicable to this Project.
• Energy conservation and production should be encouraged in Klickitat County.	The proposed development would generate new energy production in the County using a renewable resource.
Goal: To support adequate and effective police and fire services to all residents and land owners.	
• All proposed development should be reviewed for adequacy of access and circulation by emergency law enforcement and fire vehicles and adequacy of water provision for fire.	Review is included in this EIS. Water trucks on site during construction and other mitigation is recommended (see Public Health and Safety and Energy and Utilities).
Goal: To coordinate land use and comprehensive health planning.	
• Land use projects should be evaluated with impact on community health in mind.	The proposed Project would not have any significant impacts on public health.
Goal: To preserve open space for its community-shaping, recreational, and ecological value.	
• As much land as possible should be left in its natural condition.	All remaining Project land, in excess of 95% of the total area under easement, continues to be available for grazing and other existing use. Some native plant communities and priority habitats would be disturbed and displaced.
• Clustered development should be encouraged and	Not applicable.

Goals	Discussion
greenbelts between communities and neighborhoods should be preserved.	
• Standards for open space preservation should be specified in all (subdivision) plans.	Not applicable.
• Utility rights-of-way on publicly owned land should be reserved for future use as part of a trail system.	Not applicable.
Goal: To promote regional awareness and cooperation.	
• The regional interest should be given full consideration when conflicts arise between jurisdictions.	Traditional cultural use of the area, which is in ceded Yakama Indian Nation lands is discussed in Section 2.4.

2.8.4.2 No Action

Existing grazing, communications, and utility land use at the site would continue if the agencies did not issue the required permits and approvals. Economic benefit of the Project, including construction and permanent employment and tax payments, would not be obtained under the No Action Alternative.

2.8.5 Mitigation Measures

Mitigation for impacts to other elements of the environment are discussed in other sections of this EIS. These measures would also reduce potential land use conflicts. For example revegetation and weed control mitigation measures are identified in Section 2.3. Section 2.7, Aesthetics, identifies measures related to on-site storage, decommissioning of facilities, and providing for safe viewing by sightseers. Section 2.9 identifies mitigation for noise impacts. Section 2.12 identifies mitigation related to public services, including measures to address vandalism and unauthorized entry. In addition, requiring landscaping and fencing around the Project substation to screen it from veiw would reduce impacts from development of the substation. Additional mitigation could include:

- Screening the Project substation.
- Providing visible flagging on guy wires to prevent conflicts with agricultural activities.

2.9 NOISE

2.9.1 Studies and Coordination

This section addresses noise impacts that could result from construction and operation of the Project. Estimates of noise impacts are based on published information on noise characteristics typically associated with construction activities and on site-specific modeling of noise resulting from Project operation.

2.9.2 Affected Environment

There are few noise sources in the vicinity of the Project. Distant noise sources include traffic traveling on U.S. Highway 97 west of the site and on SR 14 which runs east/west south of the site and north of the Columbia River. Noise from Interstate 84 which runs east/west along the south side of the Columbia River in Oregon can occasionally be heard from some locations on the site. Intermittent man-made noise sources include trains, off-road vehicles, farm equipment, and vehicles traveling on Hoctor Road.

Existing background noise levels in the Project area were not measured. However, because the area surrounding the Project is rural and sparsely populated, background noise levels at locations distant from traveled roadways under calm wind conditions are likely to be between 40 and 50 A-weighted decibels (dBA). The A-weighted decibel scale is a composite scale that approximates the way the human ear responds to noise levels. Noise levels in the 40 to 50 dBA range are similar to those experienced in libraries or residential living rooms and are characterized as quiet. Noise levels at locations closer to roadways such as Hoctor Road are likely to be between 50 and 60 dBA. However, as discussed, traffic noise is a distant or intermittent noise source and does not dominate. Field observations indicate that wind is the dominant noise source in the Project area and drowns out most background noises.

The applicable noise standards in Klickitat County are the noise limitation criteria established under the Washington Administrative Code (Chapter 173-60 WAC). These criteria , shown in Table 2.17, specify noise limits that restrict both the level and duration of noise measured at any given point within a receiving property. The maximum permissible environmental noise levels depend on the Environmental Designation for Noise Abatement (EDNA) of the property containing the noise source and the land use of the property receiving that noise.

Table 2.17 Maximum Permissible Sound Levels by Receiving Property

EDNA of Noise Source	EDNA of Receiving Property			
	Class A (dBA)			
	Day	Night*	Class B (dBA)	Class C (dBA)
Class A	55	45	57	60
Class B	57	47	60	65
Class C	60	50	65	70

* As shown here, between the nighttime hours of 10:00 p.m. and 7:00 a.m. the noise limitations are reduced by 10 dBA below the daytime limitations for Class A land uses.

Sources: Chapter 173-62 WAC

Land uses are categorized as follows:

- Class A includes lands where people reside and sleep. This includes residential areas, parks, camps, and health and correctional facilities.

- Class B includes lands not used for human habitation, where protection is required against noise interference with speech, including commercial and retail areas; theaters, stadiums, and fairgrounds; and facilities for educational, religious, and government use.

- Class C includes lands used for economic activities where higher noise levels are normally anticipated than are experienced in other areas, including industrial and agricultural areas.

EDNA's for Class A receiving properties are reduced from daytime limitations by 10 dBA between the nighttime hours of 10:00 p.m. and 7:00 a.m. At any hour of the day or night, the applicable noise limitation for any receiving property may be exceeded in any 1-hour period by no more than:

- 5 dBA for a total of 15 minutes,
- 10 dBA for a total of 5 minutes, and
- 15 dBA for a total of 1.5 minutes.

Sounds created by motor vehicles, regulated by Chapter 173-62 WAC, and sounds resulting from construction activity at temporary construction sites are exempt from all provisions of 173-60 WAC. Noise from activities, including truck operations, within the Project is subject to provisions contained in Chapter 173-60 WAC.

2.9.3 Environmental Consequences

2.9.3.1 Proposed Action

Construction

The primary source of construction noise would be the operation of heavy equipment and support vehicles. Peak construction-period noise would generally be about 93 dBA at 15 meters (50 feet) from the construction site. Locations within 457 meters (1,500 feet) of a construction area would experience periods when noise levels exceeded 60 dBA. Locations within 183 meters (600 feet) of a construction site would experience periods when noise levels exceeded 70 dBA. These noise levels would not be continuous throughout the day and would generally be restricted to daytime, weekday hours.

The closest potential residential receptor to the proposed Project site is an undeveloped 5-acre residential parcel located in the west-central portion of Section 13, Township 3 North, Range 16 East. This receptor identified as Receptor 16 in Table 2.18, is approximately 168 meters (550 feet) north of the nearest proposed turbine location. People in the area would likely hear construction activities; however, as stated in Section 2.9.2, construction noise would be short-term and is exempt from regulation under WAC 173-60. There is no residential structure on this parcel at the present time.

Noise from Wind Turbine Operation

CARES is proposing to operate 91 AWT-26 wind turbines on the Project site. The turbine blades would rotate at approximately 57 revolutions per minute (RPM). Measured noise levels for turbines similar to the AWT-26 turbines are approximately 71 dBA at 124 feet downwind of the turbine (Flowind 1994). The 71 dBA noise level is a conservative estimate (i.e., is higher than would actually occur) because the estimate is based on: (1) a turbine type having less insulation in the nacelle, and (2) a 24 meter (80-foot) rather than a 43 meter (140-foot) tower (i.e., closer to the recepter), as would be used for the AWT-26 turbine (Hoffman pers. com.).

Noise levels estimated at the 16 identified receptors are shown in Table 2.18. The greatest noise level (57 dBA) would occur at Receptor 16, the undeveloped 5-acre property. Noise from turbine operations would likely be heard above existing background noise at Receptor 16. However, if the wind turbines were operated between 10:00 p.m. and 7:00 a.m., the 50 dBA threshold may be exceeded and a noise standard violation could occur.

Noise levels were also modeled at 15 other residential properties more distant from the Project site. Properties are located along Hoctor Road north of the Project site, near U.S. Highway 97 west of the site, and near SR 14 south of the Project site. The closest residence to the CARES project site is approximately 3,050 meters (10,000 feet) north and is located south of Hoctor Road between Miller and Willis Roads. Modeled noise

levels for these distant residential properties ranged from 16 to 39 dBA. Modeled noise levels at these 15 receivers are equal to or lower than background levels and below the EDNA criteria shown in Table 2.17. Therefore, Project operation would not cause a significant noise impact at these locations.

Table 2.18 Estimated Project Related Noise Levels

Receptor	Noise Level (dBA)
1. Along I-97 just south of Davies Pass	32
2. Along SR 14 west of Columbia Aluminum	39
3. Along SR 14 east of John Day River	38
4. Along SR 14 east of the Hanford-John Day 500 kV Transmission line	20
5. Along Hoctor Rd. SW of intersection with Clyde Story Rd.	34
6. Along Hoctor Rd. SW of intersection with No. 12 Rd.	36
7. Along Hoctor Rd. SE of intersection with Miller Rd.	37
8. Along Hoctor Rd. SW of intersection with Willis Rd.	37
9. Along Hoctor Rd. NE of intersection with Willis Rd.	35
10. Along Hoctor Rd. SW of intersection with Fenton Lane	31
11. South of Hoctor Rd. between Fenton Lane and Oak Flat Rd.	28
12. South of Hoctor Rd. between Fenton Lane and Oak Flat Rd. east of Receptor 11	24
13. Along Hoctor Rd. approximately 2.3 km (1.4 miles) west of Oak Flat Rd. east of Receptor 12	20
14. North of Hoctor Rd. approximately 1.4 km (0.9 miles) west of Oak Flat Rd.	16
15. .Along County Rd. 3600 at intersection with Chamberlain/Goodnoe Rd.	16
16. Walker property located south of Hoctor Rd. along No. 12 Rd.	57

2.9.3.2 No Action

Under this alternative, impacts on noise levels resulting from construction, operation, and maintenance of the Project would not occur. Noise would continue to be generated by traffic on highways and Hoctor Road, trains, off-road vehicles, and farm equipment.

2.9.4 Mitigation Measures

The gearbox design proposed as part of the Project would reduce noise generated during turbine operation from noise levels modelled for this environmental review.

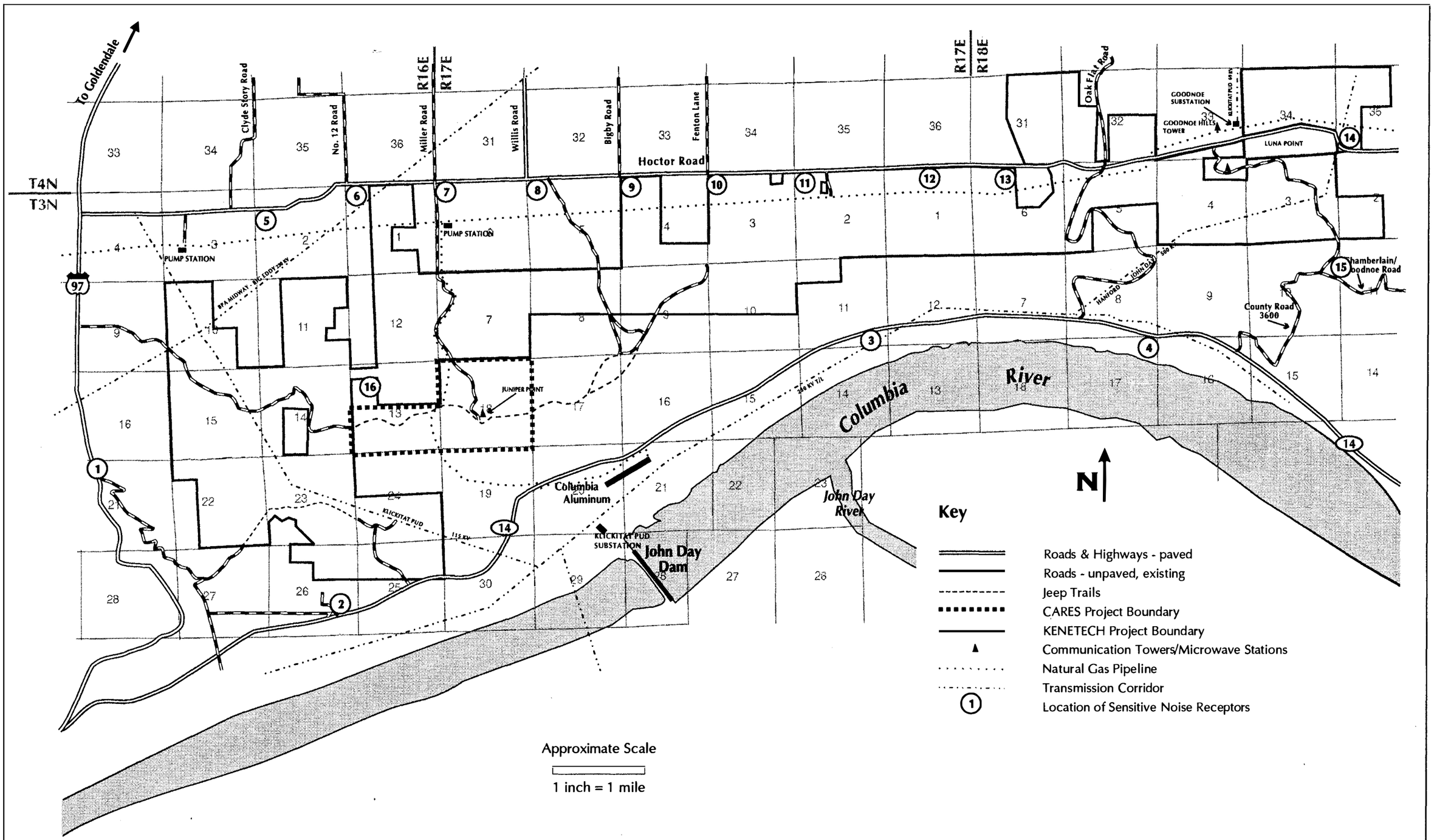


Figure 2.9.1 **Noise Receptor Locations**

In addition to measures incorporated into the Project design, the following measures, if implemented by the Applicant, would reduce noise levels and assure that noise standards of WAC 173-60 would not be exceeded:

- Maintain sound levels at the Project boundary that are under the maximum levels for adjacent receiving properties based on the receiving properties' environmental designation for noise abatement (EDNA) at WAC 173-62 subject to the temporary exceedances allowed in state regulations.
- In the event of a coomplaint to the County that noise standards may be exceeded due to Project turbines, require the Applicant to provide appropriate sound level measurements on the comoplaintant's property.
- Reduce noise levels during construction by employing the following types of measures:
  - Turn off idling equipment.
  - Select the quietest effective setting for back-up alarms.
  - Confine construction activities to daytime hours in proximity to homes.

2.10 AIR QUALITY

2.10.1 Studies and Coordination

This section describes air quality impacts associated with construction and operation of the Project. Washington Department of Ecology (WDOE) staff have indicated that air quality modeling is not necessary for this DEIS. Currently, there are insufficient site-specific air quality data available; therefore, it would be difficult to estimate pollutant concentrations using computer modeling or other analytic techniques (Swackhamer pers. com.). As a result, a qualitative discussion of existing air quality conditions and potential impacts is provided.

2.10.2 Regulations, Standards, and Guidelines

Air quality is generally evaluated in terms of pollutant concentration in the atmosphere. Table 2.11 shows the National Ambient Air Quality Standards (NAAQSs) established by the U.S. Environmental Protection Agency (EPA) and the state standards set by the WDOE. Unless the state adopts stricter standards, EPA standards apply. In some cases, however, standards set by the State of Washington are stricter than the NAAQSs. The NAAQSs identify primary and secondary standards for criteria air pollutants. Primary standards are intended to protect public health with an adequate margin of safety. Secondary standards are established to protect the public welfare from any known or anticipated effects associated with these pollutants. Areas exceeding the NAAQSs are designated as nonattainment for each pollutant for which there is a violation.

2.10.3 Affected Environment

Air quality in Klickitat County is regulated by WDOE. Currently, the air quality attainment status of Klickitat County is not classified because air quality is not monitored. The primary source of air emissions in Klickitat County are industrial facilities. Wind blown dust is prevalent in non-irrigated agricultural areas because soils are composed of fine grain loess material (see Section 2.1 of this DEIS). Wood stove smoke also contributes to countywide air emissions (Billings pers. comm.).

Of the pollutants shown in Table 2.19, particulate (dust) emissions are the most significant form of air contaminants in the area and are the pollutant type most likely to be generated by activities associated with the Project. The particulates of concern are those less than 10 microns in diameter and are referred to as PM10.

For the purpose of this analysis, PM10 will be referred as fugitive dust and is most often generated by wind blowing over bare or disturbed soil surfaces. Because site

preparation activities associated with Project construction would require vegetation removal and soil disturbance, potential air quality impacts caused by fugitive dust emissions are addressed in the following sections.

Table 2.19 National and State Ambient Air Quality Standards

Pollutant	National (EPA) Primary[a]	National (EPA) Secondary[a]	Washington State
Total Suspended Particulates			
Annual geometric mean	No standard	No standard	60 mg/m^3
24-hour average	No standard	No standard	150 mg/m^3
Lead (Pb)			
Quarterly average	1.5 mg/m^3	1.5 mg/m^3	1.5 mg/m^3
Particulate Matter (PM_{10})			
Annual arithmetic mean	50 mg/m^3	50 mg/m^3	50 mg/m^3
24-hour average	150 mg/m^3	150 mg/m^3	150 mg/m^3
Sulfur Dioxide (SO_2)			
Annual average	0.03 ppm	No standard	0.02 ppm
24-hour average	0.14 ppm	No standard	0.10 ppm
3-hour average	No standard	0.50 ppm	No standard
1-hour average	No standard	No standard	0.40 ppm[b]
Carbon Monoxide (CO)			
8-hour average	9 ppm	9 ppm	9 ppm
1-hour average	35 ppm	35 ppm	35 ppm
Ozone (O_3)			
1-hour average[c]	0.12 ppm	0.12 ppm	0.12 ppm
Nitrogen Dioxide (NO_2)			
Annual average	0.05 ppm	0.05 ppm	0.05 ppm

Note: Annual standards never to be exceeded. Short-term standards not to be exceeded more than once per year unless noted.

[a] Primary standards are set to protect public health. Secondary standards are based on other factors (e.g., protection of crops and materials, advoidance of nuisance conditions).

[b] 0.25 ppm not to be exceeded more than two times in 7 consecutive days.

[c] Not to be exceeded on more than 1 day per calendar year as determined under the conditions indicated in Chapter 173-475 WAC.

ppm = parts per million
PM_{10} = particles 10 or less microns in size
mg/m^3 = micrograms per cubic meter

Source: Washington Department of Ecology 1991.

2.10.4 Environmental Consequences

2.10.4.1 Proposed Action

Wind Generated Particulates

Fugitive dust would be the main source of air emissions associated with wind farm construction and operation. Soil would be prone to wind erosion when the vegetative cover was removed or when the soil was disturbed during Project construction.

The amount of PM_{10} generated per day during construction was conservatively estimated assuming 2.2 hectares (5 acres) were disturbed daily and the soil contained a 55% PM_{10} constituent. Approximately 113 kilograms (303 pounds) of PM_{10} would be generated daily under the above scenario. Assuming a total of 42 ha (95 ac.) were disturbed during construction, approximately 2.3 metric tons (2.54 short tons) of PM_{10} would be generated. Roads would be watered to control dust generation from unpaved road surfaces during construction.

After construction, portions of the site would be restored leaving approximately 19 hectares (48 acres) of the site permanantly occupied with Project facilities. The primary sources of fugitive dust would be loose soil located along road sides, in the road bed, and in disturbed areas around tower platforms.

Traffic Generated Particulates

Truck and heavy equipment traffic on dirt and gravel roads located on the site would produce fugitive dust during dry weather. As discussed in Section 1.1, site roads would consist of 8 kilometers (5 miles) of primary access roads, and 6 kilometers (4 miles) of secondary roads along the turbine strings. During construction, there would be approximately 20 heavy truck, 40 light truck, and 20 passenger car trips each day to and from the site (FloWind 1994). Several maintenance vehicles would operate throughout the Project site on a daily basis during operation. The roads would be watered to control dust generation from unpaved road surfaces during construction.

Air Quality Permit Compliance

The Project would not need to be registered with WDOE because it does not meet the applicable criteria. Because the Project would not require registration, it would be exempt from New Source Review requirements contained in WAC 173-400-110.

2.10.4.2 No Action

Under this alternative, impacts on air quality from construction, operation, and maintenance of the Project would not occur. Dust would continue to be generated from farming equipment and activities, vehicle travel on dirt roads, other construction activities, and other sources.

2.10.5 Mitigation Measures

Mitigation measures to control erosion (see Section 1.1.6.3) would also reduce fugitive dust emmisions. The following list of mitigation measures, to control fugitive dust emissions from unpaved roads during project construction and operation, were taken from *Control of Fugitive Dust Sources, U.S. EPA 450/3-88-008, 1988*:

- Cover unpaved dirt roads with gravel or slag,
- Vegetate low volume roads and disturbed areas,
- Apply water or chemical dust suppressants to unpaved road surfaces and disturbed areas; and,
- Construct temporary wind fences around construction sites.

2.11 TRANSPORTATION

2.11.1 Studies and Coordination

This section discusses potential transportation impacts that would occur during CARES Project construction and operation, including increased traffic, impacts to local roadways due to heavy construction vehicles, and traffic safety. Information used in this section includes traffic count data developed by the Washington State Department of Transportation (WashDOT), the Oregon Department of Transportation (ODOT), and the Klickitat County Department of Public Services.

2.11.2 Regulations, Standards, and Guidelines

Klickitat County classifies roads according to their purpose, the volume of traffic they carry, and their geometric design features. Design standards for rural County roads are summarized in Table 2.20. County roads are subject to weight limits during thaws because of the potential for heavy vehicles to damage the road beds. When weight restrictions are in effect, the maximum loads are 3000 pounds per tire for conventional tires, 11 inches and over in width and for 1200 X 22.5-sized tubeless tires. Under these restrictions, a dump truck with a 4-wheel rear axle would have a maximum allowable axle loading of 5.4 tonnes (6 tons). Vehicles which exceed weight limits would be prohibited from using County roads during thaws.

2.11.3 Affected Environment

2.11.3.1 Existing Public Road System

U.S. Highway 97 (US-97), Washington State Route 14 (SR-14) and Interstate 84 (I-84) form the regional transportation network serving the Goldendale area and the Project site. Access to the site would be provided off of Hoctor Road. Hoctor Road runs north of the site and serves the local residences and farms in the area. A network of other paved and gravel roads serve the site area and adjacent properties. The following discussions describe the roadway system in more detail.

- **US-97** is the main regional north/south route running from Yakima south to Goldendale and south from Goldendale into Oregon. US-97 is classified as a two-lane Principal Arterial. Near Goldendale, pavement conditions are excellent and wide shoulders are provided.

- **SR-14** runs east-west from Vancouver, Washington to I-82 at McNary Dam. SR-14 intersects US-97 approximately eight miles south of Goldendale. SR-14 provides for travel between the cities, towns, and industries along the Washington side of the Columbia River. SR-14 is classified as a two-lane Rural Principal Arterial by WashDOT.

- **I-84** is a four-lane interstate highway running from Portland, Oregon, into Idaho. I-84 serves as the primary travel route for trucks, cars, and other vehicles along the Columbia River. It intersects US-97 just south of the Sam Hill Memorial Bridge, about 10 miles south of Goldendale.

- **Hoctor Road** is a two-lane rural County road that runs north of the Project site, extending from US-97 east to Rock Creek Road. Hoctor Road is classified as a Minor Collector Arterial by the Klickitat County Department of Public Services. Hoctor Road is subject to weight limits during freeze/thaw periods.

The County has been upgrading and repairing Hoctor Road over the past several years. Two sections, which are currently in poor condition, are programmed for repairs during the 1995 construction period (May through September). These two areas include a 0.8-mile section immediately east of Highway 97 and a 2.0-mile section extending from No. 12 Road to Willis Road. The reconstruction of these two sections is anticipated to take three to four months during which time delays and/or rerouting of traffic around the construction area will be required (Klickitat County Department of Public Services, 1994).

2.11.3.2 Traffic Volumes

Table 2.21 shows 1993 average daily traffic (ADT) volumes for key roadways in the general vicinity of the Project site. Traffic volumes along SR-14 and US-97 in Washington are based on traffic counts conducted by WashDOT in 1993. Traffic volumes on I-84 and US-97 in Oregon are based on traffic counts conducted by ODOT in 1992. Volumes were escalated to 1993 using the straight-line annual growth rate that occurred between 1990 and 1992. Traffic volumes along Hoctor Road are based on 1994 ADT counts by the Klickitat County Roads Division. 1994 volumes on Hoctor Road were assumed to be roughly equal to 1993 volumes.

WashDOT operates a weigh station on US-97 just north of Goldendale. Counts conducted at this weigh station in 1993 indicated that traffic volumes along US-97 in the Goldendale area include approximately 26 percent heavy vehicles.

Traffic volumes on roadways can vary considerably from month to month reflecting the effects of tourism in the summer and poor weather in the winter. Based on data from the WashDOT weigh station on US-97 north of Goldendale, peak summer traffic (July and August) is about 15 percent above the annual average while winter traffic (January) is about 35 percent below the annual average.

Table 2.20 Design Standards - Rural Klickitat County Roads

CLASSIFICATION		MAJOR ARTERIAL		SECONDARY & COLLECTOR ARTERIAL		LOCAL ACCESS		CUL-DE-SAC		
		max.	min. R^1	max. D^0	min. R^1	max. D^0	min. R^1	max. D^0	min. R^1	
General Purpose		To link major destinations within the County and to provide the principal tie between rural areas and the state and federal highway system.		To collect and distribute traffic from groups of residents and link the traffic with County arterials and state and federal highways.		To provide access to individual residences and property, and to link these with the County arterial and collection network.		"Dead-end" roads which provide access to individual residences and property and to link these with the County arterial and collection network.		
Curvature	Flat Rolling Mountainous	8.5 13.5 25.0	694 427 231	8.5 13.5 25.0	694 427 731	8.5 13.5 25.0	694 427 231	8.5 13.5 25.0	694 427 231	1. May be steeper for short distances. 2. All bridge curbs to meet State standards. Sidewalks to be determined on an individual basis. 3. For guardrail installation, width of shoulder to be an additional two feet.
Min. Stopping Sight Distance (ft.)	Flat Rolling Mountainous	350 275 200		350 275 200		350 275 200		350 275 200		
Maximum Grade[1] (%)	Flat Rolling Mountainous	6 8 11		6 8 11		6 8 11		6 8 11		
New Bridges[2]	Width (curb to curb (ft) Design Load (AASHO) Vertical Clearance (ft)	26 H-20 14.5		20 H-20 14.5		26 H-20 14.5		20 H-20 14.5		
Min. Pavement Width (ft.) Roadway Width [3] (ft. Number of Lanes Right-of-Way Width (ft) Maximum Length (ft) Turn-around radius (min. R/W) (ft) Turn-around radius (Roadway) (ft)		20 28 2 80		20 28 2 60		 24 2 60		 24 2 60 2,500' 60' 40'		

Table 2.21 Existing Average Daily Traffic (ADT) Volumes in Project Vicinity

Location	Existing (1993)
US-97 north of Hoctor Road	3300
US-97 south of Hoctor Road	4500
I-84 west of US-97	11475
I-84 east of US-97	10000
SR-14 west of US-97	1500
SR-14 east of US-97	1700
SR-14 east of Stonehenge Drive	1400
SR-14 near Roosevelt	962
Hoctor Road just east of US-97	202
Hoctor Road west of Willis Road	120

1 ADT = average daily traffic. One vehicle making a round-trip along a stretch of roadway results in two ADT.

2.11.3.3 Site Access and On-Site Roads

Existing access to the Project site is provided from the north, off of Hoctor Road at the Miller Road intersection. Private roads on the site are gravel farm roads and jeep trails. These roads vary widely in terms of condition and regular maintenance provided. The roads are used to move farm vehicles, implements, supplies, and products; and to access a communications station on Juniper Point.

2.11.4 Environmental Consequences

2.11.4.1 Proposed Action

Local transportation would be affected by both construction and operation of the proposed Project. However, impacts during operation would be minimal since fewer than 15 trips (ADT) per day would be associated with routine operation. Construction activity would create the greatest impact due to increased traffic and delivery of heavy equipment and construction materials to the site.

Construction Trip Generation

Project construction would result in both heavy and light vehicles accessing the site and would generate the average traffic volumes shown in Table 2.22. This table is based on average daily trips (ADT) with one vehicle making a round trip along a stretch of highway is equivalent to two ADT. During peak construction periods, project traffic could be about two times higher than the average.

Table 2.22 Estimated Project Trip Generation

Vehicle Type	Construction ADT (average)
Passenger Cars/Light Trucks[1]	60
Heavy Trucks[1]	20
Other Heavy Equipment	< 1 [2]

1 Estimates of ADT values for Passenger Cars/Light Trucks and Heavy Trucks supplied by the Flowind Corporation.

2 Heavy equipment would be brought in infrequently so that on certain days the traffic would be higher. For example, if all equipment and vehicles associated with grading and road construction (except gravel trucks) arrived on the same day, up to an additional nine heavy vehicle trips would result.

Construction Traffic Volume Impacts

There are three principle roads serving the project site: SR-14, US-97, and Hoctor Road. Only one access point (off of Hoctor Road at the Miller Road intersection) is proposed. Average daily traffic volume impacts during construction in ADT are shown in Table 2.23. Daily traffic volumes on US-97 would increase by approximately two percent during construction. The largest impact would occur on Hoctor Road where volumes would increase by approximately 64 percent on average.

Table 2.23 Traffic Volume Impacts

Location	ADT			Percent Increase
	Project 1995 (Without Project)	Construction Traffic	Total	
US-97, south of Hoctor Road	4,700	81	4,781	2
Hoctor Road, east of US-97	208	81	289	39
Hoctor Road, west of Willis Road	126	81	207	64

1. Approximately 65% of the daily trips related to construction activity will be heavy vehicles.

2. The table represents average traffic volumes through the construction period.

Impacts to Roadway Conditions

Hoctor Road was constructed over compacted native soils without an engineered subgrade. These soils contain a large proportion of fine particles causing the soil to be moisture-sensitive and difficult to compact under certain conditions. These soil conditions make the road susceptible to damage caused by failure of the subgrade to support vehicle loads resulting in lateral displacement of subgrade material. If this condition occurs, potholes, cracking, and structural failure of the road surface result. The severity of damage is related to traffic volume, vehicle axle weight, and whether or not the subgrade is undergoing freezing or thawing. This damage may not be evident until several years following the excessive traffic loading. The Project construction traffic could result in or aggravate this type of damage to Hoctor Road.

Schedule Conflict

Currently, Klickitat County has scheduled repairs to two sections of Hoctor Road just east of US-97. Periodic road closure and/or one-way traffic through the affected areas are anticipated. This could adversely affect the Project construction schedule since access to the site is at the Miller Road intersection, which is located between No. 12 Road and Willis Road, one section of Hoctor Road scheduled for repair.

Traffic Safety Conflicts

Due to the increase in traffic during Project construction, vehicles entering and leaving the Project site could pose a conflict to cross-flow traffic as Project vehicles (light and heavy) turn on or off Hoctor Road. Traffic conflicts on Hoctor Road could result from interference with slow-moving farm equipment entering and exiting properties along the road. At the intersection of Hoctor Road and US-97, potential conflicts could exist between traffic on US-97 and heavy construction vehicles making turns on to or off of Hoctor Road. However, sight distances appear to be adequate at this location.

2.11.4.2 No Action

Potential impacts to traffic volumes and roads used to access the Project site would be avoided if the agencies do not issue the required permits and approvals set forth in the *EIS Fact Sheet.*

2.11.5 Mitigation Measures

The following mitigation measures would reduce transportation-related impacts:

- Scheduling Project construction activities to avoid use of Hoctor Road during likely periods of freeze/thaw cycles.

- Coordinating routing of Project construction traffic and travel times with the Klickitat County Department of Public Services to reduce conflicts with

construction work on Hoctor Road scheduled for the spring and summer of 1995.

- Employing traffic safety precautions such as traffic control flaggers and signs warning of construction activity and merging traffic.

- Conducting a detailed assessment of the Hoctor Road roadway condition prior to commencement of construction. Following completion of construction, conducting a similar assessment to determine the amount of road damage caused by construction vehicles and to allocate the appropriate costs to the Applicant.

It should be noted that while the County could postpone repairs to Hoctor Road until 1996, Hoctor Road's current condition may not be suitable for the projected volumes of heavy vehicle traffic associated with the proposed Project. During certain construction periods, use of Hoctor Road could be eliminated by routing construction traffic to the site from an access point located off of US-97. This would require crossing the Kenetech project site along an existing gravel road and accessing the Project from the western site boundary. The feasibility of this alternative routing would need to be investigated, including the availability of easements, transportation conflicts with Kenetech, and road surface adequacy.

2.12 PUBLIC SERVICES AND UTILITIES

2.12.1 Studies and Coordination

This section addresses impacts on public services and utilities resulting from the development of the Project. Specific issues include fire fighting services, medical aid, police, electrical utilities, water supply, sewer, natural gas pipelines, solid waste, and communication facilities. Most reference information in this section comes from personal communications with representatives of local public service agencies and utilities. They include the Klickitat County Rural Fire District #7; the Klickitat County Sheriff's Department; the Klickitat County Public Utility District; the Klickitat County Department of Public Services; the U.S. Army Corps of Engineers; and various operators of radio, television, microwave, and other communication facilities located in the general vicinity of the Project site.

2.12.2 Affected Environment

2.12.2.1 Public Services

Fire and Medical Aid

The Klickitat County Rural Fire District #7 (District #7) provides fire suppression and medical aid service to approximately 5,000 people residing within District #7's 273-square-mile service area. The District manages 10 fire stations, employs three full-time staff, has 180 on-call volunteers, and owns and operates approximately 40 fire trucks. In 1993, District #7 answered a total of 300 calls, 100 of which were calls for fire service. Approximately 20 of the requests for fire service came from calls in the general vicinity of the proposed Project. Most of these fires were generated by sparks from the railroad track running parallel to and south of Highway 14. These fires rarely cross to the north of Highway 14. (Roberta Hoctor, pers. communication, 1994.)

Fire service to the Project site would be provided from the Maryhill, Bob Lee (near Juniper Point), Hoctorville, and/or Pleasant Valley fire stations. Additional support could be provided by the Roosevelt Fire Department if necessary. The estimated response time to the Project site is approximately 10 minutes or less.

Klickitat Valley Hospital is located in Goldendale, approximately 10 miles northwest of the Project site. This 30-bed hospital has a 24-hour emergency room and 4-bed intensive care unit.

Police Service

The Klickitat County Sheriff's Department (the Department) provides service to approximately 11,500 people residing in unincorporated Klickitat County. The

Department employs 16 commissioned officers, including one sheriff, two lieutenants, two sergeants, 10 deputies, and 30 reserve officers. In 1993, the Department responded to 4,931 calls for service. Police service to the CARES Project site would be provided from the Department's office in Goldendale. One lieutenant, one sergeant, and five deputies are assigned to that office.

2.12.2.2 Communication Services

Communication systems are located at Juniper Point on the CARES Project site and include microwave, television, radio, and navigation systems as listed in Table 2.24. Additional communications facilities are located at Luna Point and Haystock Butte; however, the CARES Project would not create the potential for interference with communications signals from these locations.

Microwave signals are transmitted in either a direct "line of sight" path, from the transmitter to the receiving station, or in an omnidirectional manner in which the signal radiates in all directions. The path of the microwave signal is dependent on its frequency and the type and location of the receiver. Interference to both modes of microwave signal transmission could potentially occur due to disruptions caused by physical obstructions, electrostatic effects, or electromagnetic forces.

Television, radio, and navigation communications are generally transmitted at lower frequencies than microwave signals, and are broadcast in a radial manner (360°). Multiple communication signals at different frequencies can be transmitted from and received at the same location. Primary causes of interference to television, audio, and navigation communications are electrostatic effects or electromagnetic forces.

To support police, medical and fire dispatching, Klickitat County operates a main repeater station on Juniper Point. The repeater station relays messages, using an omnidirectional microwave signal, to emergency and support vehicles and other communication stations throughout the County.

Communication facilities and signals are also associated with nearby dam and shipping vessel operations on the Columbia River. Government users associated with river or John Day Dam operations include the National Marine Fisheries Service (NMFS), the U.S. Army Corps of Engineers (Corps) and the Bonneville Power Administration (BPA). These agencies primarily transmit and receive signals from John Day Dam, but BPA also utilizes communications systems located at the Harvalum Substation. Vessels utilizing the river employ electronic navigation and radio communication systems. Approximately 7 to 27 vessels equipped with these systems pass the site each day. (Jim Williams, pers. communication, 1994.)

Table 2.24 Communication Systems on Juniper Point

Owner/Operator	Type	Description/ Direction
Klickitat County Rural Fire District # 7	Microwave Repeater	UHF, 2.3 GHz to Goldendale omnidirectional
Klickitat Valley Hospital	2 Radio Repeaters	UHF repeater, VHF transmission, omnidirectional
Mid Columbia Medical Center	Radio Repeater	VHF, 75 Mhz, omnidirectional
Klickitat County Sheriff's Department	2 Radio Repeaters	VHF, omnidirectional and UHF, link to Goldendale
Klickitat County Roads Division	Radio Repeater	VHF, omnidirectional
Klickitat County Public Utility District	Microwave Repeater and Radio Repeater	VHA and microwave to Goldendale, omnidirectional
Intertribe Fisheries Department	Radio Repeater	VHF, omnidirectional
Wheeler Communication	2 Radio Repeaters	UHF, omnidirectional
Immigration Department	2 Radio Repeater possibly	VHF, omnidirectional
Department of Natural Resources	2 Radio Repeaters, possibly	VHF, omnidirectional
Army Corps of Engineers	Radio Repeaters	VHF, omnidirectional
Columbia Aluminum	Radio Repeater	UHF, omnidirectional
Not Known	Ham Repeater	140 MHz
BATS Towing	2 Radio Repeaters	VHF link to Biggs and UHF base to Pasco
Don Coats	Radio Repeater	UHF, omnidirectional

2.12.2.3 Utilities

There are no existing utility corridors at the Project site. Three-phase electrical power is available near the Project site from a 12.5-kV overhead distribution line that runs along Hoctor Road. Electrical power is provided by the Klickitat County Public Utility District. A natural gas pipeline runs across the site in a north-south direction, passing through the center of the site.

Potable water use by residents south of Hoctor Road in the general vicinity of the Project site is provided by individual domestic wells. There is currently no sewer system serving the Project site, and none is expected to be required for the Project.

Solid waste collection in the general vicinity of the Project site is provided by a private collection company. In addition, a transfer station is located in Goldendale. Disposal service is provided by the Regional Disposal Company which operates three transfer stations and the Roosevelt Regional Landfill in the eastern part of the County.

2.12.3 Environmental Consequences

2.12.3.1 Proposed Action

Public Services

During Project construction, the installation of the turbines and turbine towers would require welding, which can generate sparks and temporarily increase the potential for fires on the Project site, especially during dry weather. An average of approximately 35, and a peak of approximately 70, workers would be required for Project construction. Careless smoking could also temporarily increase the potential for fires in the area. The relatively high-risk nature of heavy construction and the number of construction workers involved may temporarily increase the likelihood of medical service being required at the Project site. Construction activities could also occur in the vicinity of the existing natural gas pipeline that runs through a portion of the site.

Approximately five full-time staff would be required for Project operation. Operations staff would maintain and repair equipment and also monitor Project operation and site conditions. Project operation could somewhat increase the chance of fire from human causes or from mechanical or electrical equipment failure. In addition, any welding during ongoing equipment maintenance and repair could also increase the chance of fire at turbine locations. Because of the small number of operations staff, Project operation is not expected to create a significant new demand for medical services. However, Project security measures could delay access to the site in any emergency situations that did occur.

Section 2.8 discusses recreational impacts including the potential for the Project to attract unauthorized visitors. Any increase in number of unauthorized visitors to the site would create the potential for increased demand for police services to the site.

By County Ordinance, the Klickitat County Department of Public Services issues permits and provides site inspections for buildings and structures in accordance with administrative requirements established in the Uniform Building Code, 1991 Edition. Chapter 3 of the Code sets requirements for permit application inspections and fees. Through its building permit process, the County will conduct plan reviews and inspection of certain construction activities including concrete reinforcing bar placement, structural welds, and bolting systems.

Communication Systems

Individual turbines would be as close as about 65 meters (200 feet) from communication facilities on Juniper Point. This is beyond the distance where electrostatic or electromagnetic field interference would typically be expected; however, there is a slight probability that some electrostatic or electromagnetic interference could occur, depending on the operating mode and condition of the turbines.

The potential for interference with communication systems also exists where turbines or other Project structures are located in the pathway of microwave signals from the transmitter to the receiver. Obstruction of microwave signals by turbine blades or towers could result in interrupting or weakening of these signals. This effect would depend on the specific location and height of turbine structures, the frequency of signal, and the location of the receiver. However, interference with directional microwave signals could potentially occur wherever the path of a directional signal intersects a turbine string. Table 2.25 lists communication stations where this potential for impacts exists. Actual impacts would depend on the path and elevation of directional microwave signals and on the precise location and elevation of turbines.

Table 2.25 Potentially Affected Communication Systems

Owner/Operator	Type
Klickitat County Rural Fire District #7	Microwave Repeater
Klickitat County Sheriff's Department	Radio Repeater
Klickitat County Public Utility District	Microwave Repeater and Radio Repeater
BATS Towing	Radio Repeater

Utilities

The Project site is not expected to require routine water, electrical, or sewer service. Water tanks and portable sanitary facilities would be used at the on-site operations building. The building would be heated with propane. Peak demand for water at the site would result from firefighting activities. However, as much as 12,000 gallons over a 1-hour period could be provided by Fire District #7 tanker trucks (Roberta Hoctor, pers. communication, 1994).

It is not anticipated that a significant amount of construction-related debris would be generated over the construction period. Any construction debris that is generated could be disposed of at the Roosevelt Regional landfill. Workers could create the potential for littering during Project construction. Because only five workers would be required for Project operation, they would create relatively small potential for generating litter. Although the Project could attract unauthorized visitors, the presence of on-site operations staff would discourage any unauthorized visitors. During Project operation, impacts could also result from broken or decommissioned equipment being stored on site.

2.12.3.2 No Action

Potential impacts to public services and utilities would be avoided if the agencies do not issue the required permits and approvals. Existing demands for public services and utilities would continue.

2.12.4 Mitigation Measures

The following measures would reduce or eliminate impacts to local public services and utilities due to the construction and operation of the Project:

- During Project construction and all Project welding operations, require the presence of a readily accessible water truck and chemical fire suppression materials to allow immediate fire response.
- Minimize or restrict high fire-risk activities during periods of high fire danger.
- Provide Project staff with cellular phones to enable timely communication with the Fire Department and other emergency services.
- Prohibit construction and operating personnel from smoking on the Project area except within designated areas.
- Equip all emergency departments and vehicles with access to electronic gates.

- Provide fire extinguishers and shovels on vehicles and equipment used during construction.

- Field locate and flag the existing natural gas pipeline and avoiding construction in its immediate vicinity, if possible. Where avoidance is not feasible, use hand excavation methods.

- Precisely determine the location and frequency of potentially impacted communications transmitters and receivers when siting individual turbines in turbine strings to guard against potential signal line-of-sight interference.

- Remove all turbine structures and associated equipment that are permanently taken out of operation, and restore lands in accordance with a decommissioning plan approved by the County.

- Monitor the site for evidence of unauthorized use and provide additional security as appropriate.

- Monitor operation of communications facilities and take corrective action as necessary.

2.13 HEALTH AND SAFETY RISKS

2.13.1 Studies and Coordination

This section discusses potential health and safety risks associated with the construction and operation of Columbia Windfarm #1. Potential health and safety risks include those that could be experienced by the general public as well as construction and operations workers at the facility. The primary sources of information for this section are published information and interviews with individuals having experience with construction safety and the types of health and safety risks associated with wind turbines and electrical power generation and transmission.

2.13.2 Regulations, Standards, and Guidelines

A variety of federal and Washington State safety regulations and guidelines would apply to Project design and construction. Federal safety regulations are issued under the authority of the Occupational Safety and Health Act (OSHA); state safety regulations are issued under the Washington Industrial Safety and Health Act (WISHA). In addition, the National Electrical Manufacturers Association (NEMA), and Institute of Electrical and Electronics Engineers (IEEE) issue standards for the design of electrical equipment and controls. The Uniform Building Code (UBC) sets standards for fire, life, and structural safety aspects of all buildings and related structures.

The Federal Aviation Administration (FAA) establishes requirements for towers and other tall structures that could potentially interfere with aircraft safety. The FAA generally regulates structures 200 feet or taller and requires that they be lighted for aircraft safety (Lambert, personal communication, 1994).

2.13.3 Affected Environment

The Project site currently includes an underground natural gas pipeline.

2.13.4 Environmental Consequences

2.13.4.1 Proposed Action

Potential health and safety risks associated with the construction and operation of the Project include the potential for worker injury; the potential for electrical shock and fires; general worker safety; and the potential effects of electromagnetic fields. In all cases, two conditions must exist to constitute a health or safety risk: a potential health

hazard (such as proximity to high-voltage powerlines) and individual exposure to the hazard for a sufficiently long time to result in a health effect.

Construction-Related Risks

Potential health and safety risks affecting workers during Project construction include: exposure to fugitive dust generated during construction; the risk of electric shock from working with and in the vicinity of electrical equipment and powerlines; fire hazards related to welding, careless smoking, and other construction activities; and injury associated with the use of heavy equipment and installation of elevated structures. Construction activities could also result in potential health and safety risks to any unauthorized visitors to the site during construction; however, it is expected that unauthorized visitors would be discouraged by the number of construction workers on the site.

Operation-Related Risks

Potential impacts to health and safety during operation of the Project include: the potential for electric shock from working in the vicinity of high-voltage electrical equipment and powerlines; the potential for injury related to operation and maintenance of elevated structures that are accessed via ladders or cranes; the potential for injury from collision with guy wires; and the potential for fire resulting from maintenance welding. Project operation staff workers on the site would discourage unauthorized use of the site. Nevertheless, persistent individuals could likely gain unauthorized access to some of the Project site and facilities.

Air Traffic Safety

Turbine towers would be tall, and the maximum height of the overall turbine structure (including blades) would be 56 m (184 feet). Thirty-seven meter to 43 meter (120 to 140-foot) towers should pose no threat to low-flying aircraft. This height falls below the 61 m (200-foot) limit where structures fall under FAA regulation, therefore lighting would not be required. If it is determined that any military training flight routes are near the Project site, the FAA will notify the responsible military branch and request that they adjust their routes to avoid the site.

Electromagnetic Fields

Electric and magnetic fields (EMF) occur across a broad electromagnetic spectrum. EMF results from both natural phenomena and human activity such as communications equipment, appliances, and the generation, transmission, and local distribution of electricity. Much of the body of national and international research regarding EMF and public health risks remains contradictory or inconclusive. To date, the scientific and medical communities have not been able to form a consistent conclusion as to whether or not there are any adverse health effects from EMF at the frequencies typically associated with electric power systems.

The strength of electric and magnetic fields attenuates rapidly as the distance from the source increases. For overhead powerlines, the magnetic field strength is based on the square of the distance from the line to the point of interest. For example, if the magnetic field from an overhead powerline is 20 mG at the centerline and 16 mG at 10 feet from the centerline, at 20 feet from the centerline the magnetic field falls to 4 mG. For electrical equipment such as substations, the magnetic field strength is based on the cube of the distance and results in even more rapid decrease in field strength. For example, if the magnetic field at a substation transformer is 4.5 mG and 4.4 mG 2 feet from the transformer, at 4 feet, the drop in field strength would be eight-fold, resulting in a field strength of 3.7 mG.

During Project operation, the overhead powerlines and substation will produce EMF in the immediate vicinity of these facilities. However, the nearest residences to the overhead powerlines or the proposed substation would be more than one and a half miles away, far removed from any potential electric or magnetic field effects. In addition, the proposed powerlines are not anticipated to raise the level of EMF present to produce levels that would represent an uncommon exposure to the public. Thus, the incremental increase in EMF due to the Project facilities, over and above that from other area powerlines, is not expected to be significant.

2.13.4.2 No Action

Health and safety risks associated with construction and operation of the Project would be avoided if the agencies do not issue the required permits and approvals. Health and safety risks associated with existing use of the site, including operation of on-site communication facilities, would continue.

2.13.5 Mitigation Measures

The following measures would reduce health and safety risks if implemented by the Applicant:

- Maintain existing fencing and access gates around the Project site.
- Equip the main access gates with locks and provide fencing and locks around the substation, as well as warning signs posted near high-voltage equipment.
- Develop and maintain an on-site health and safety plan, informing employees and others on site what to do in case of emergencies, including the locations of fire extinguishers and nearby hospitals, important telephone numbers, and first aid techniques.
- Minimize accidental injury during construction and operations by:

- Offering specific job related training to employees, including CPR, first aid, tower climbing, rescue techniques, and safety equipment inspection.

- Requiring each worker to be familiar with site safety;

- Assigning safety officers to each shift to monitor construction activities and methods;

- Ensuring that workers on each shift are certified in first-aid;

- Ensuring a well-stocked first-aid supply kit is accessible on site at all times and that each worker knows its location;

- Conducting periodic safety meetings for construction and maintenance staff.

- Follow the precautions to minimize fire hazards outlined in Section 2.12.

CHAPTER 3.0 -- Cumulative Impacts

3.1 Introduction

Klickitat County has received two Conditional Use Permit applications for wind power projects in the Columbia Hills area southeast of Goldendale, Washington. The first project -- the 115-MW Washington Windplant #1 -- is proposed by KENETECH Windpower, Inc. Electrical power generated by Washington Windplant #1 (the KENETECH Project) would be transmitted over the Bonneville Power Administration's (BPA) transmission system to utilities purchasing the KENETECH Project's output. The second project -- Columbia Wind Farm #1 -- is proposed by Conservation and Renewable Energy Systems (CARES), a consortium of eight Washington public utility districts. Columbia Wind Farm #1 (the CARES Project) would be developed as a wind energy demonstration project sponsored by the Bonneville Power Administration (BPA).

This part of the EIS addresses the expected cumulative impacts that would result from construction and operation of the KENETECH and CARES Projects. (The relative location of the two projects and principal project features are shown on Figure 3.1.)

3.2 Summary Project Descriptions

3.2.1 Washington Windplant #1 (KENETECH Project)

The KENETECH Project would be located on 5,110 hectares (12,630 acres) of privately-owned land extending approximately 22.5 km (14 miles) along the crest of the Columbia Hills. KENETECH Windpower, Inc., has entered into wind power easement agreements with site landowners. The site is primarily zoned Extensive Agriculture; however, a small portion of the site is zoned Open Space. The site is currently used for livestock grazing and cultivated cropland.

Development of the KENETECH Project would ultimately entail installation of approximately 345 wind turbines. The proposed 33-MVS turbines are designed and manufactured by KENETECH Windpower, Inc. These three-bladed turbines employ a variable speed, horizontal axis, upwind design where the wind hits the turbine rotor prior to hitting the turbine tower. The turbines would be supported by tubular towers measuring 24 to 36.6 meters (80 to 120 feet); guy wires would not be required for tubular tower support. With the rotor blades, the turbine structures would range up to about 74.5 meters in height (up to about 184 feet).

Turbines would be arranged in 39 distinct rows (turbine strings). Turbine strings would also include secondary access road accessing individual turbines. The KENETECH Project would also include the following features:

- Underground power collection and communication lines.

- 24.6 kilometers (15.3 miles) of overhead 34.5-kV powerline.
- Transformers.
- An electrical substation to step up voltage from 34.5 kV to 115 kV.
- 19.3 km (12.1 miles) of new primary access road connecting various areas of the site.
- 6.0 km (3.6 miles) of upgraded road.
- A temporary construction staging area.

The operations/maintenance facility for the KENETECH Project would be located off site.

The KENETECH Project would be developed in two or more phases with each phase requiring between eight and 11 months for construction. Table 3.1 summarizes the estimated amount of land that would be disturbed during construction and the amount of land that would be permanently occupied by Project features. Up to 155 hectares (382 acres) or about three percent of the site would be disturbed during construction. Project features would permanently occupy about 79 hectares (193 acres), or about 1.5 percent of the site.

Table 3.1 Summary of Kenetech Project Features

Features	Area Temporarily Disturbed		Area Permanently Occupied	
	Hectares	Acres	Hectares	Acres
Turbine String and New Secondary Access Road[1]	98	243	33	82
Powerline	17	42	14	34
New Primary Access Road[2]	27	66	24	58
Substation	<1	1	<1	1
Upgraded Access Road	8	20	7	18
Construction Staging Area	4	10	0	0
TOTAL (rounded to closest hectare/acre)	155	382	79	193

1 Assumes 30-meter (100-foot) disturbance corridor along turbine strings except where steep terrain dictates the use of road switchbacks. Secondary roads along turbine strings are about 4 meters (12 feet) wide plus associated drainage ditches.

2 Assumes area required for an approximately 5-meter (16-foot) primary road and associated drainage ditches.

Peak power production would occur from April through September. During the peak season, peak daily power production would occur from the late afternoon through early evening. During operations, the KENETECH Project would employ approximately 9 full-time workers. Although the KENETECH Project would be operated remotely, maintenance employees would tour and inspect the Project site daily.

3.2.2 Columbia Wind Farm #1 (CARES Project)

The CARES Project would be located in the southern half of Section 13, Township 3N, Range 16E and Section 18, Township 3N, Range 17E on a site that includes Juniper Point, one of the predominant features of the Columbia Hills. The 395-hectare (975-acre) site is owned by

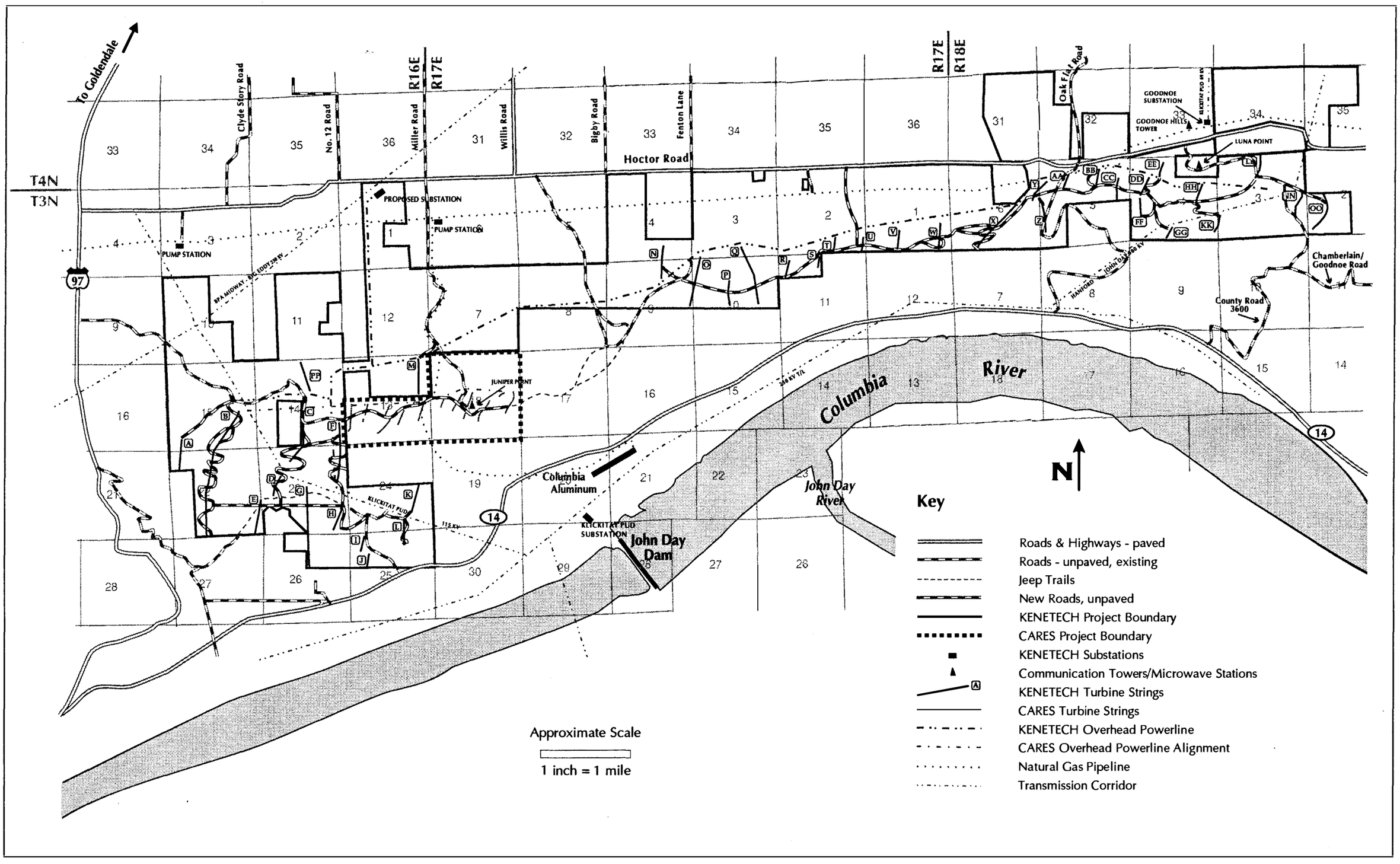


Figure 3.1 **CARES Project and KENETECH Project Sites**

Columbia Aluminum and is currently used for limited livestock grazing. In addition, a microwave and radio communications facility is located at the top of Juniper Point.

The 25-MW CARES Project would include installation of 91 AWT-26 wind turbines developed in collaboration with the U.S. Department of Energy and the National Renewable Energy Laboratory by R. Lynette & Associates. The two-bladed turbines employ a horizontal-axis, downwind design where the wind hits the turbine tower prior to hitting the rotor blades. Tubular towers measuring approximately 43 meters (140 feet) tall and 0.9 meter (3 feet) in diameter are proposed. Towers would be supported by guy wires. With the rotor blades, the turbine structures would range in height from about 30 to 56 meters (98 to 184 feet) above the ground.

Turbines would be arranged in 11 turbine strings generally oriented southwest to northeast. Turbine strings would include secondary roads accessing individual turbines. The CARES Project would also include the following features:

- Underground power collection lines.
- 5.6 kilometers (3.5 miles) of overhead 24-kV wood pole transmission line.
- Transformers.
- An electrical substation to step up voltage from 24 to 115-kV.
- 3.2 kilometers (2.0 miles) of overhead 115-kV wood pole transmission line.
- An upgraded access road along the existing jeep trail running east-west through the site.
- An operations/maintenance building.
- A temporary construction staging area.

As proposed, the 115-kV CARES Project powerline would extend off-site to the west and cross a portion of the KENETECH Project site prior to interconnecting with an existing 115-kV Klickitat County PUD transmission line. However, agreements with landowners to allow this crossing have not been entered into.

Table 3.2 summarizes the estimated amount of land that would be disturbed during construction of the CARES Project and the amount of land that would be permanently occupied by Project features. Up to 42 hectares (95 acres) or about 10 percent of the site would be disturbed during construction. Project features would permanently occupy about 19 hectares (48 acres) or about 5.0 percent of the site.

Table 3.2 Summary of CARES Project Features

Features	Area Temporarily Disturbed		Area Permanently Occupied	
	Hectares	Acres	Hectares	Acres
Turbine Strings Development[1]	20	50	5.4	13
Overhead Powerline	4	10	3.1	8
New Primary Access Road[2]	N/A	N/A	N/A	N/A
Substation	0.5	1	0.5	1
Upgraded Access Road	11	28	10	25
Maintenance Facility	0.4	1	0.4	1
Construction Staging Area	2	5	N/A	N/A
TOTAL (rounded to closest hectare/acre)	**38**	**95**	**19**	**48**

1 Assumes 100-foot disturbance corridor along turbine strings that includes turbines, towers, foundations, transformer pads, underground lines, new turbine string and individual turbine access roads. New roads are assumed to be 12 feet wide plus associated drainage ditches.

2 All primary access roads are existing and to be upgraded; all new roads are included in the turbine string development amounts.

During operations, the CARES Project would employ approximately five workers who would be housed in a small on-site operations building. The building would be fueled by propane. Bottled water and portable sanitary facilities would be included at the facility.

3.3 Cumulative Impacts

3.3.1 Earth

Both the KENETECH and CARES Projects would be located in the Columbia Hills area of Klickitat County. The Columbia Hills were formed from folds in the Columbia River Basalts, a hard, fine-grained rock formed from lava that flowed out of fissures in the earth's crust up to about 25 million years ago. Steep basalt cliffs are located south of the two Project sites, along the north shore of the Columbia River near John Day dam. No major faults have been mapped in the Columbia Hills, although some unidentified faulting may be associated with the basalt folds.

The KENETECH project site generally follows the ridge of the Columbia Hills; elevations range from about 305 meters (1,000 feet) mean sea level (MSL) to about 880 meters (2,890 feet) MSL. Slopes on the KENETECH site range from 5 to 100 percent; turbine strings would be developed on slopes ranging from 5 to 50 percent. Based on unpublished Soil Interpretation Records (SCS, 1994) the KENETECH Project site contains four general soil groupings: 1) silt-loams on slopes less than 15 percent; 2) silt-loams on slopes greater than 15 percent; 3) cobbly silt loams/loamy sands; 4) and rock outcrops/haploxerolls complex (talus slopes). Some of the KENETECH Project site has not been mapped by the Soil Conservation Service. Portions of the KENETECH site are located in critical erosion areas in Klickitat County's Long Range Resources Plan (Klickitat County, 1983).

Elevations on the CARES Project site range from about 680 meters MSL (2,240 feet) to about 954 meters MSL (3129 feet) at the top of Juniper Point. Slopes on the CARES Project site range from 5 percent at the top of the ridge crest to 100 percent on the south side of the ridge crest. Turbine strings would be located on slopes ranging from 5 to 15 percent. Soils on the CARES site include silt loams, cobbly silt loams and loamy sands, and rock outcrops/talus slopes. However, the CARES Project site lies outside of critical erosion areas mapped by Klickitat County (Klickitat County, 1983).

Cumulative impacts to earth resources from the simultaneous construction of the KENETECH and CARES Projects would include increased potential for erosion. Construction activities for the CARES Project and Phase 1 of the KENETECH Project are expected to occur over the same general time frame. Silt loam soils are fine-grained and susceptible to both wind and water erosion. Silt loam soils with slopes greater than 15 percent would be the most susceptible to erosion. Table 3.3 summarizes soil disturbance during construction that would result from each Project as well as the combined soil disturbance that would result from both Projects. Together, these Projects would disturb approximately 183 hectares (452 acres) of soil. Because they would share a common access point off of Hoctor Road at its intersection with Miller Road, the cumulative amount of soil disturbance would be about 4.4 hectares (11 acres) less than if the estimated disturbances associated with each Project were added together.

Table 3.3 Cumulative Soil Disturbances

Soil Type	Kenetech		CARES		Cumulative[1]	
	Hectares	Acres	Hectares	Acres	Hectares	Acres
Silt Loam (slope >15%)	37	92	2	5	39	97
Silt Loam (slope <15%)[1]	28	69	14	35	42	104
Cobbly Silt Loam, Loamy Sand	36	88	16	39	52	127
Rock Outcrop	3	8	6	15	9	23
Non-Classified, Unmapped[1]	51	126	0.4	1	52	127
TOTAL	**155**	**382**	**38**	**95**	**193**	**466**

1 The existing access road at the Hoctor Road and Miller Road intersection will be upgraded for access to CARES site and would be upgraded to access KENETECH turbine string M. Therefore, the cumulative impact is not strictly additive.

Mitigation identified for each of the two individual projects would also mitigate these cumulative impacts.

3.3.2 Water

The Columbia Hills are located in a semi-arid region of Klickitat County receiving about 15 inches of annual rainfall north of the ridge crest. Most of this rainfall occurs from late fall through early spring. The 100-year storm results in approximately 3.5 inches of precipitation

over a 24-hour period. The Columbia Hills includes three major drainages: Swale Creek, Rock Creek, and direct drainage to the Columbia River. Runoff north of the crest of the Columbia Hills and to the west of Bigby Road drains to Swale Creek, a tributary of the Klickitat River. Runoff north of the crest of the Columbia Hills and to the east of Bigby Road drains to Luna Gulch and then to Rock Creek. Runoff from the KENETECH Project site drains to the Swale Creek Basin, the Rock Creek Basin, and directly to the Columbia River. Most runoff from the CARES Project site drains to the Swale Creek basin; runoff south of the ridge crest drains directly to the Columbia River. Drainage features on both sites include swales, intermittent streams, and stock watering ponds; however, none of the stockponds would qualify as jurisdictional wetlands.

The primary cumulative impact to water resources would be a potential to increase sediment loading to the Swale Creek basin during the simultaneous construction of the CARES Project and Phase 1 of the KENETECH Project. Mitigation identified for each of the two individual projects would also mitigate these cumulative impacts.

3.3.3 Plants

Much of the Columbia Hills has historically been heavily grazed. As a result, much of the area has been invaded by non-native weed species such as cheatgrass and includes less than 50 percent native plant cover. Nonetheless, portions of the Columbia Hills contain a number of priority habitats as defined by WDFW and high-quality native plant communities as defined by WDNR-Natural Heritage Program. Priority habitats include: shrub-steppe; oak woodland; and juniper savannah. Oak woodland is also considered a high-quality native plant community. Native plant communities in shrub-steppe areas include communities dominated by bunchgrasses, primarily bluebunch wheatgrass-Sandberg's bluegrass and bluebunch wheatgrass-Idaho fescue, and communities including a buckwheat shrub layer, primarily Douglas buckwheat/Sandberg's bluegrass. The buckwheat communities occur on shallow, rocky soils scattered along the crest of the Columbia Hills.

The KENETECH Project site extends over 5,110 hectares (12,630 acres) and includes: 3,150 hectares (7,870 acres) of rangeland; 910 hectares (2,280 acres) of land under cultivation; 77 hectares (195 acres) of juniper and scattered juniper woodland; 17 hectares (40 acres) of riparian habitat; 1,000 hectares (1,300 acres) of oak/oak-pine and scattered oak/oak-pine woodland; and 375 acres (945 acres) of shrub steppe habitat. About 70 percent of the shrub-steppe habitat is dominated by bunchgrass communities. The CARES Project site occupies 395 hectares (975 acres) and includes: 101 hectares (249 acres) of rangeland; 80 hectares (198 acres) of juniper and scattered juniper woodland; 0 hectares (0 acres) of riparian habitat; 26 hectares (6.4 acres) of oak/oak-pine and scattered oak/oak-pine woodland; and 211 hectares (522 acres) of shrub steppe habitat. About 65 percent of the shrub-steppe habitat is dominated by bunchgrass communities. Native shrub-steppe vegetation on the CARES site is relatively undisturbed due to the limited grazing that has occurred historically on the site.

Neither project is expected to result in impacts to state or federal threatened or endangered plant species since no threatened or endangered species were located during botanical surveys. In addition, wetlands are not expected to be affected by construction or operation of either Project. The primary cumulative impact to plant communities that would result from simultaneous construction and operation of the KENETECH and CARES projects would be cumulative impacts to the western habitat complex that extends over portions of both sites (see Figure 3.2). This habitat complex includes both shrub-steppe and oak communities and covers over 690 hectares (1,700 acres).

Table 3.4 summarizes direct impacts to the western habitat complex. Direct impacts from construction of both projects would include disturbance of about six percent of overall existing vegetation in this complex, including 3 hectares (6 acres) of oak/oak pine and 40 hectares (101 acres) of shrub-steppe. Indirect impacts would include splitting the habitat complex into smaller units and increasing the potential for invasive weeds. Development on the CARES Project site would be more concentrated than development on the KENETECH Project site and would primarily involve disturbance to shrub-steppe communities, primarily Douglas' buckwheat/Sandberg's bluegrass. The CARES powerline would create an additional corridor through the shrub-steppe habitat located on the KENETECH site. Splitting the habitat complex into smaller units combined with increased human activity in this area would lower the habitat's value for wildlife.

Table 3.4 Direct Impacts to Western Habitat Complex

	KENETECH		CARES		Total		
	Hectares	Acres	Hectares	Acres	Hectares	Acres	% of Community in Western Habitat Complex (Both Sites)
Buckwheat[1]	3	8	17	43	20	51	17
Bunchgrass[1]	5	13	15	37	20	50	6
Oak/Oak Pine	2	5	<1	<1	3	6	1
Totals	10	26	33	81	43	107	6

[1] Shrub-steppe habitats.

In addition, soil disturbances, especially in the Douglas' buckwheat/Sandberg's bluegrass communities, would create the potential for invasive weeds to become established in this area. The Douglas' buckwheat/Sandberg's bluegrass communities would initially be most susceptible to invasive weeds, and successful methods for restoring this plant community are not known. Once disturbed, the Douglas' buckwheat/Sandberg's bluegrass communities would, therefore, typically be displaced by invasive weeds. Without controls, these weeds will tend to successfully compete with adjacent native vegetation. Thus, overtime and without mitigation, the overall habitat quality of this area would be reduced, and shrub-steppe areas would become more like the grazed rangeland that is prevalent in most areas of the Columbia Hills. The value of invasive weeds for livestock grazing is generally less than the value of

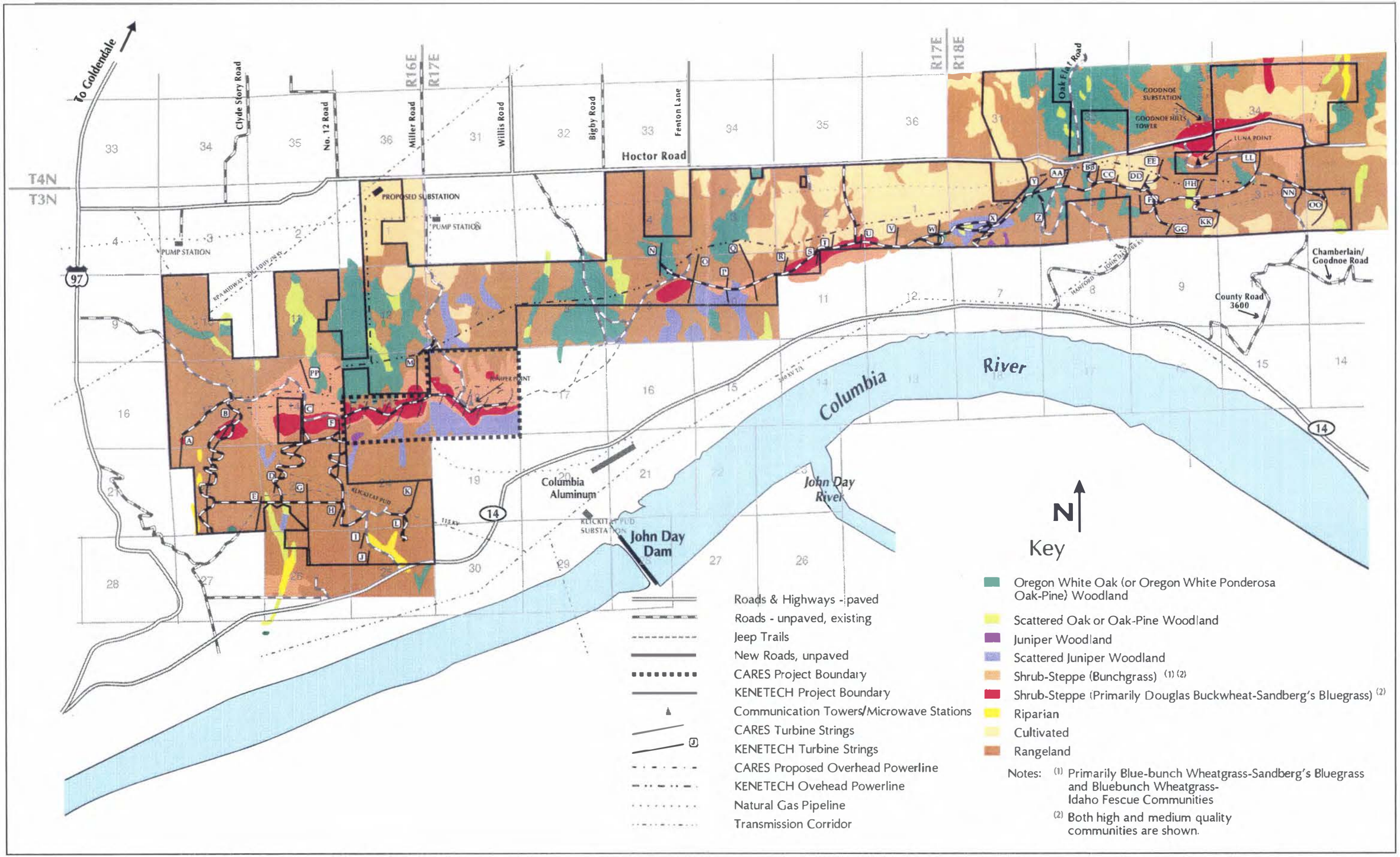


Figure 3.2 Cumulative Impacts to Western Habitat Complex

native grasses. Mitigation identified for each of the two projects would also mitigate cumulative impacts. Additional mitigation for cumulative impacts is discussed in Section 3.4.

3.3.4 Wildlife Resources (Non-Avian)

Common, non-avian wildlife that are likely to be present on both Project sites and in the Columbia Hills in general include a variety of small to large mammals such as shrews, mice, raccoons, weasel, badger, red fox, coyote, bobcat, and Columbian back-tailed deer. Common reptiles, including garter and rattle snakes, racer, and common lizards, use most habitat types found in the Columbia Hills, but are most likely found in talus and rock areas such as those found on the southern half of the CARES site.

Mitigation identified for each of the two projects separately would also reduce cumulative impacts. Mitigation to further reduce cumulative habitat impacts is discussed in Section 3.4.

Special-status species also use habitats found in the Columbia Hills. Oak and oak-pine woodlands, which provide habitat for the state-threatened western gray squirrel, are primarily found on the KENETECH site, while cliffs and talus slopes, which provide primary habitat for a variety of reptiles on the Washington "monitor" list, are primarily located on the southern portion of the CARES site. Both sites include juniper, which provides habitat for the juniper hairstreak, a butterfly that is a candidate for state listing. The CARES Project site and, to a lesser extent, the KENETECH Project site include rock outcrops and talus areas which provide habitat for the western gage lizard, a federal candidate. Nearby cliffs may provide roosting habitat for bats, including some species that are federal candidates.

The primary cumulative impacts to wildlife associated with development of the two projects would be the direct loss of habitat and indirect impacts which would occur in the vicinity of the western habitat complex located on the site. When considered separately, either project would leave relatively large portions of the complex undisturbed. When considered cumulatively, however, almost all areas of this habitat complex would receive some disturbance and would, therefore, be less valuable to wildlife. Indirect impacts would include: a general reduction in overall habitat quality caused by splitting the habitat complex into smaller fragments; a higher potential for invasive weeds to become dominant; higher numbers and more concentrated man-made development; and increased human activity.

3.3.5 Birds

Year-long studies of avian use in the Columbia Hills indicate that the area supports a number of resident bird populations, but is not a major migratory corridor for raptors and other birds. Of the 22 special status bird species that were evaluated, eight were determined to be most important with respect to potential impacts either because of the numbers of birds using the area or because of their protected status as federally threatened or endangered species. These eight special status species include:

- Peregrine falcon (federal and state endangered)
- Bald eagle (federal and state threatened)
- Golden eagle (state candidate)
- Swainson's hawk (state candidate)
- Prairie falcon (state monitor)
- Turkey vulture (state monitor)
- Lewis' woodpecker (state candidate)
- Western bluebird (state candidate)

Two sightings of peregrine falcon were made in the eastern portion of the KENETECH site, in an area where turbine strings are not proposed. Peregrine falcons were never observed flying over the CARES site. A pair of peregrine falcons were observed frequenting the Rock Creek area, approximately 8 km (5 miles) east of the eastern edge of the KENETECH Project site and 19.3 km (12 miles) from the CARES site. However, no peregrine nests were identified within 16 km (10 miles) of the Columbia Hills study area. Peregrine falcons have a home range of up to 16 km (10 miles) from their nesting areas. Because waterfowl are a preferred prey for peregrine falcon and high cliffs are a preferred habitat type, they would be more likely to forage near the Columbia River than in the habitats found on the eastern portion of the KENETECH site. However, they could cross the site between foraging areas and are known to forage in upland areas north of the river (Anderson, pers. communication, 1994).

Between three and 10 individual wintering bald eagles were observed flying over the Columbia Hills area at altitudes that would potentially put them at risk of colliding with wind turbines. Three wintering bald eagle day roosts were located, near the Columbia River, east of the CARES site. Three night roosts were also observed. At dusk and dawn, bald eagles were most frequently observed flying over the eastern portion of the KENETECH site, in the vicinity of turbine strings Z, Y, AA, BB, and CC on their way to and from night roosts located in Luna Gulch, north of the KENETECH site. Between two and four eagles were found to roost at the Luna Gulch location. The direct flight paths between known day and night roosts do not cross over the CARES site, and no bald eagles were observed crossing that site during field studies. It is likely, however, that bald eagles occasionally fly over the CARES site.

Resident golden eagles were observed using all areas of the KENETECH and CARES sites, but used the south ridge face of the Columbia Hills most frequently. They also occasionally were observed flying along the ridge top, where turbines are proposed for both projects. Thirty-seven sightings of golden eagle were made during field studies. One active golden eagle nest was located in the Columbia Hills, approximately 3.2 km (2 miles) from the nearest turbine strings proposed on the CARES site and approximately 1.6 km (1 mile) from the nearest turbine strings proposed on the KENETECH site. Another nest was found on Miller Island, approximately 14.5 km (9 miles) south the CARES site.

Eighteen sightings of Swainson's hawk were made during the spring through fall studies; none were observed during winter studies because this species does not overwinter in the area. All sightings of Swainson's hawk were made in the eastern hills, ridge top, and northern plateau study units, primarily in the eastern hills area of the KENETECH site. Two active nest sites were located in the vicinity of the Columbia Hills. One nest was located downslope of Goodnoe Hills within 0.4 km (0.25 miles) of the nearest proposed KENETECH turbine string location. The second nest was located near Hoctor Road approximately 1.6 km (1 mile) from proposed turbine string locations on the KENETECH site and about 2.4 km (1.5 miles) from proposed turbine string locations on the CARES Project site. Swainson's hawk nest and forages in open habitats.

Seventeen sightings of prairie falcon were made during the spring through fall studies. They were also occasionally observed during the winter studies. Most prairie falcon activity was observed in the typical nesting, roosting, and foraging habitat along the cliffs of the Columbia River. During the winter study, prairie falcon were also observed along Hoctor Road. One prairie falcon nest was located south of the CARES site, on cliffs above SR-14. Another nest has been reported by the Washington Department of Fish and Wildlife to be located upslope of the Columbia Aluminum facility.

Fifty-nine sightings of turkey vultures were made during the spring through fall studies. Turkey vultures were not observed during winter studies because they leave the area during that period. Observations of turkey vultures were primarily made in the south-facing ridge face although they were occasionally observed in all study units. A communal nest was observed near Maryhill State Park.

Lewis woodpeckers were observed to be relatively common near oak woodlands in the Columbia Hills and were typically observed flying below the altitude where they would vulnerable to collision with wind turbine blades. Western bluebirds were observed to migrate through the Columbia Hills and to breed on or near the project sites. One hundred and one sightings of western bluebirds were made during 16 observations in the spring through fall studies.

Other raptors, including American kestrel (125 sightings), red-tailed hawk (186 sightings), northern harrier (45 sightings) and sharp-shinned hawk (32 sightings) were observed in the area relatively frequently. Over 6,000 unidentified passerines were observed. Flocks of waterfowl were observed along the Columbia River; however, field studies suggest the project areas are not an important migratory corridor for waterfowl although agricultural lands receive some waterfowl foraging use.

Cumulative impacts to birds resulting from operation of the KENETECH and CARES projects would include an increased potential for collision with turbine blades due to the greater number of turbines that would be installed in the Columbia Hills and their wider distribution across the area. In addition, the CARES Project would introduce another potential risk factor -

collision with guy wires - because the turbines proposed for the CARES project require guy wires for support. Both projects propose to incorporate design measure to minimize the potential for raptor electrocution into their powerline and powerpole designs.

The cumulative potential for peregrine falcons to collide with wind turbines associated with both projects would be low and would be similar to the potential created by the KENETECH Project alone for three reasons. First, peregrines were infrequently observed (two sightings) in the Columbia Hills. Second, peregrine falcons were only observed flying over the eastern portion of the KENETECH site. Finally, Rock Creek, where a pair of peregrines was observed more frequently, is located over 19.3 km (12 miles) from the CARES site while the home range of peregrines is typically about 16 km (10 miles).

The cumulative potential for bald eagles to collide with wind turbines associated with both projects would also be similar to but higher than the potential created by the KENETECH Project alone since bald eagles were most frequently observed to cross the Columbia Hills in the eastern portion of the KENETECH site and because known day and night roosts are located east of the CARES site. Bald eagle were not observed crossing the CARES site during field studies.

The cumulative risk of collision for other raptor species, which were observed in both Project sites, would generally be proportional to the increased number of turbines when the two projects are considered cumulatively. Based on estimates from other wind projects of annual raptor mortality from collision, cumulative raptor mortality could range from 1.7 to 5.8 birds per 100 turbines or from 8 to 25 birds per year. Mitigation incorporated into the design of the two projects would generally mitigate cumulative impacts.

3.3.6 Cultural Resources

Background research and cultural resource fieldwork identified a total of 144 cultural resource properties on the KENETECH and CARES project sites. Twenty-two of the properties are sites, while the remaining properties are isolates or cairns. Nineteen of the cultural sites on the KENETECH Project site and eight of cultural sites on the CARES Project site are eligible or potentially eligible for the National Register of Historic Places under Criterion D because they may be likely to yield information important to history or prehistory. These sites could potentially be adversely impacted by the proposed projects. Six cairns could also be potentially affected.

It appears that nine of the 11 cultural resource sites located on the KENETECH Project site could be avoided through minor adjustments to features locations within turbine strings. Cairns could also be avoided. Consultation with the Yakama Indian Nation indicates that Juniper Point, on the CARES site, might qualify for listing as a traditional cultural property. Ongoing consultation will attempt to achieve an agreement with the Yakama Indian Nation and State Historic Preservation Office regarding the eligibility of Juniper Point for listing on

the national Register of Historic Places, impacts from construction and operation of the CARES and KENETECH Projects, and measures to avoid or minimize such impacts. Consultation to date has revealed no other potentially eligible cultural properties on the Project sites. However, landforms in the Columbia Hills form part of the tribal landscape with importance to Yakama Indians, and past traditional use by Native Americans indicates that burial sites may be located in this area. Cairns could potentially be burial markers.

The transmission line corridor extending from the western boundary of the CARES site into the KENETECH site has not yet been surveyed for cultural resources. This feature of the CARES Project creates the potential for additional impacts to unidentified cultural properties on the KENETECH site.

3.3.7 Aesthetics

Cumulative aesthetic impacts would result at locations where both Projects would be simultaneously visible. Generally, the western area of the KENETECH site would also be seen from areas where the CARES site would also be visible. Cumulative aesthetic impacts are not expected from viewing locations near the eastern portion of the KENETECH site, such as the eastern end of Hoctor Road or along I-84 and SR-14 east of the John Day River. Both projects would employ tubular-type towers that would appear similar in the landscape, thereby avoiding cumulative impacts associated with tubular and lattice-type towers being located in close proximity to one another. Potential cumulative aesthetic impacts that would be associated with the development of the two projects include:

- Short-term impacts resulting from construction activities that would be occurring simultaneously and that would be visible from off-site locations.
- A greater number of turbines on the landscape.
- Different arrangements and densities of turbines.
- Different blade configurations that would be apparent when turbines were not operating. (KENETECH turbines feature a three-blade rotor while CARES Project turbines feature a two-bladed rotor).

The following discussions summarize expected cumulative aesthetic impacts from five potential viewing areas: 1) within the Columbia River Gorge National Scenic Area; 2) from the general vicinity of Maryhill Museum and Maryhill State Park; 3) from SR-14 and I-84 east of the Scenic Area; 4) from the Goldendale Valley and along SR-97; and 5) from Hoctor Road. In addition, photosimulations from three viewpoints are included to illustrate how views from these locations would change with development of the two projects. The locations of these viewing areas and viewpoints are shown on Figure 3.3.

Columbia River Gorge National Scenic Area

From all potential viewing locations within the Scenic Area, only the western portion of the KENETECH site would be visible, and Juniper Point would be the most predominant landform in the Columbia Hills. On the north side of the Columbia River, within the Scenic Area, only occasional glimpses of the Project sites can be seen by those traveling east along SR-14 because twists and turns in the highway and intervening topographic features generally block the sites from view.

On the southern side of the Columbia River, clear views of the Project sites from within the Scenic Area occur more frequently. A long (approximately 5 km (3-mile)), clear view of the Project sites occurs for drivers traveling east on I-84 near the Deschutes River. At this location, both projects would be visible in the background view. The arrangement of KENETECH Project turbines would create a series of long white lines running down the distant hillside. CARES Project turbines would create a more horizontal line at the crest near Juniper Point. Together, elements of the two projects would occupy a greater area of the distant view. At this distance, individual turbines may be visible; however, viewers would not likely be able to distinguish the three-bladed from the two-bladed models.

Vicinity of Maryhill Museum and Maryhill State Park

The general area including Maryhill Museum, Maryhill State Park, and the "Stonehenge" war memorial is located east of the Scenic Area and attracts a large number of visitors annually. Views of the western portion of the KENETECH site and the CARES site including Juniper Point can be seen from the grounds at Maryhill Museum and from Maryhill State Park; however, large trees obstruct the view in certain locations.

The most open and expansive view of the two project sites in this general area is from the "Stonehenge" memorial. From this viewpoint, the rolling hills of the western portion of the KENETECH site and the steeper south slope areas of the CARES site are clearly visible and dominant in the middleground view. High-voltage transmission towers are visible at the base of the middleground view; however, there is little encroachment on the remainder of the middle ground view. Figure 3.4 illustrates the view from "Stonehenge" with the two projects in place. From this viewpoint, KENETECH Project turbines would be visible in vertical rows running down the hillside that dominates the middleground of the view. CARES Project turbines would be visible in a more horizontal pattern near the crest of the Columbia Hills further to the east in the vicinity of Juniper Point. Thus, together, the two projects would occupy a greater area of the middleground view. Individual turbines would be visible, and viewers may be able to distinguish the two-bladed CARES Project turbines from the three-bladed KENETECH turbines when turbines were not operating. Roads would also be visible on the KENETECH site. Overall from this location, the projects would be more distinct from one another compared to views from a greater distance such as those from within the Scenic Area.

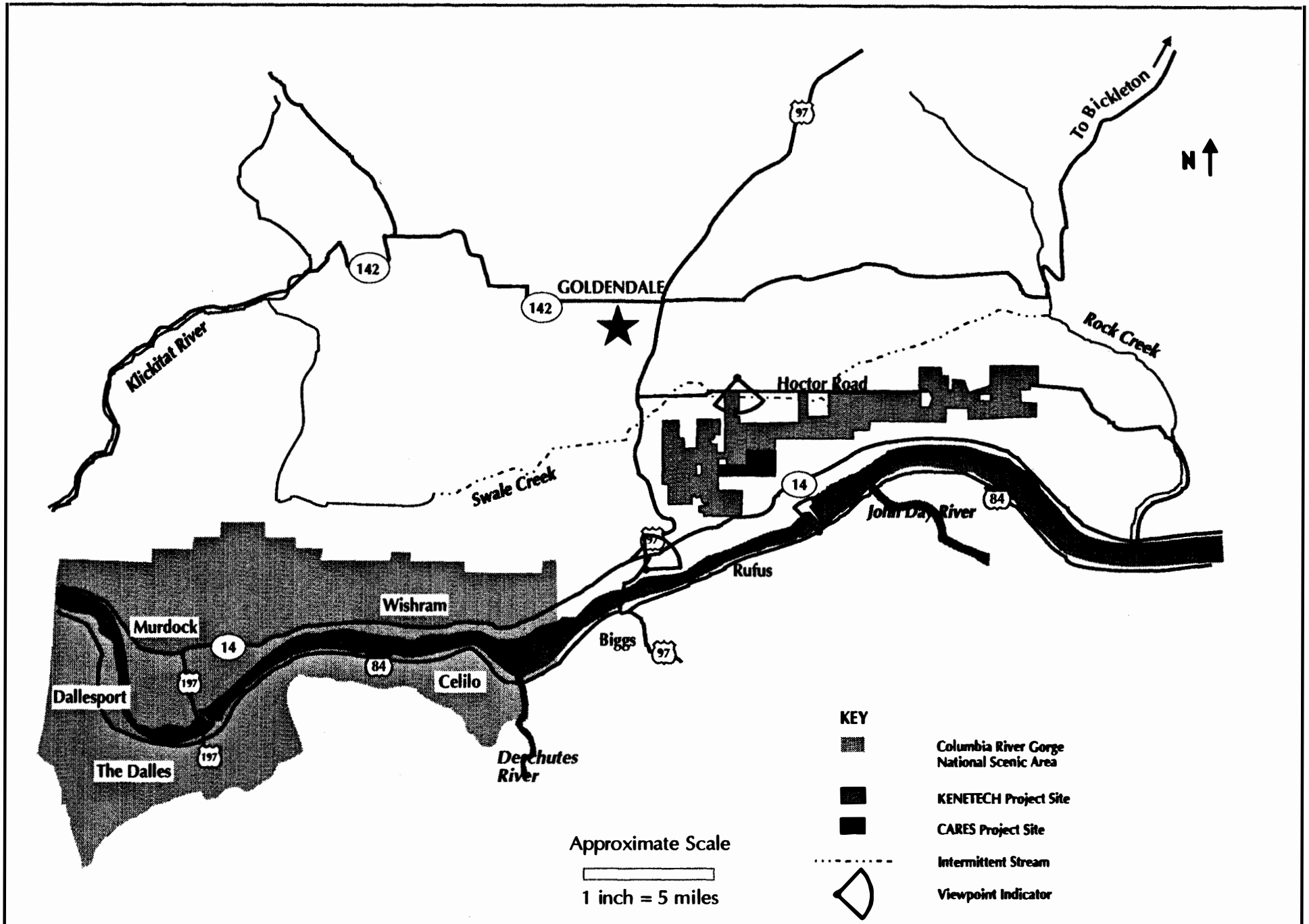


Figure 3.3 **Viewpoint Locations for Cumulative Impacts**

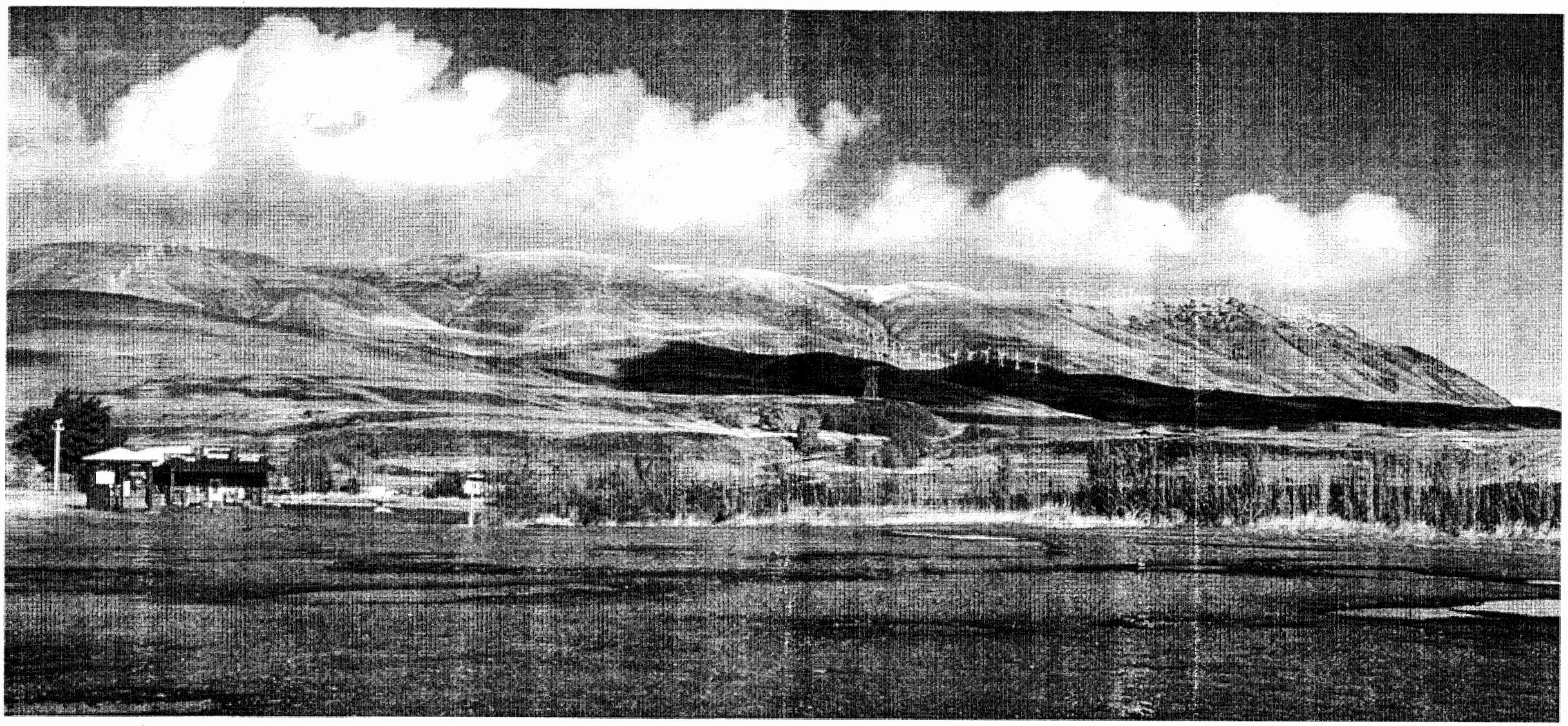


Figure 3.4 View of KENETECH and CARES sites from "Stonehenge" (with Projects)

Figure 3.5 KENETECH and CARES sites from Giles French Park at John Day Dam (with Projects)

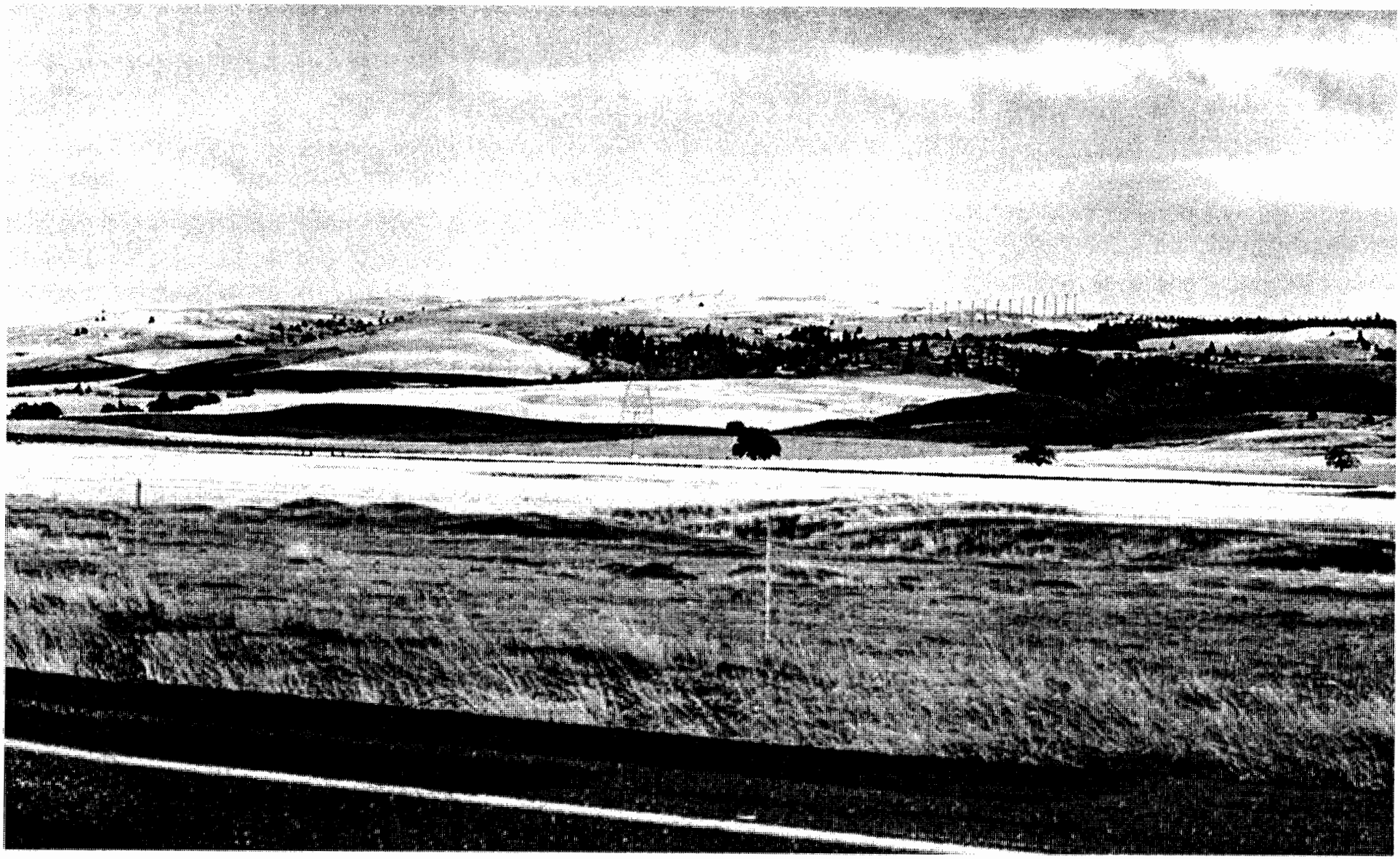


Figure 3.6 View of KENETECH and CARES sites from the Intersection of Hoctor Road and No. 12 Road (with Projects)

SR-14 and I-84 East of the Scenic Area

Outside of the Scenic Area, the western area of the KENETECH Project site and portions of the CARES site would be visible from a number of locations. Along I-84 in Oregon, long views of these areas would occur between the eastern boundary of the scenic area and the town of Rufus. Views from the towns of Biggs and Rufus being generally similar to the view from "Stonehenge."

Further east along I-84, portions of the central area of the KENETECH Project site and portions of the CARES site would be visible. Figure 3.5 is an example of a view from this area taken from Giles French Park at John Day Dam. This photosimulation is oriented to the northeast and includes portions of the Columbia Hills located east of Juniper Point. The Columbia River forms the foreground view; the Columbia Hills form the middleground view and recede into the distance further east. Columbia Aluminum, high-voltage transmission towers, and portions of SR-14 are visible in the foreground view. A large, orange and white high-voltage tower adjacent to John Day Dam is located on the right edge of the photograph. More distant and further east, portions of KENETECH project turbine strings that cross the crest of the Columbia Hills would also be visible. From this viewpoint, the visual patterns created by the arrangement of turbines on the landscape would be similar for the two projects. Although individual turbines would be visible, viewers may not be able to distinguish the two-bladed CARES Project turbines from the three-bladed KENETECH turbines from this location. Relative to views from the Oregon side of the Columbia River, visual changes would be more obvious when viewed from some locations along SR-14 and would be less obvious from other locations along SR-14 where the viewing angle is obscured.

Goldendale and US-97

Although the crest of the Columbia Hills is visible from some areas near Goldendale, much of the sites would be obscured from view for viewers traveling south from Goldendale on SR-97 by topographic features, including two cinder cones formed from old volcanoes. From US-97, both projects would be most easily seen by drivers traveling north on the steep portion of that roadway that climbs from SR-14 just as the roadway makes a sweeping turn to the left. At this point, the lower portion of the western KENETECH Project site and portions of the CARES site come into view. Views from this location would be similar to those from "Stonehenge" but would be at a closer range and have a more eastern orientation. From this vantage, however, the sites would only be visible for a short period of time because of the winding character and deep road cuts associated with this portion of US-97.

Hoctor Road

The northern portion of the KENETECH and CARES site would be visible from many locations and rural residences along Hoctor Road although both projects could be viewed simultaneously only from the western end of this roadway. Figure 3.6 is from a viewpoint located at the intersection of Hoctor Road and No. 12 Road. This view currently consists of roadside vegetation, barb-wire fencing, and relatively flat cropland and pasture in the foreground view. Rolling hills consisting of rangeland and scattered woodlands form the middleground view, and sky forms the background view. The view from this location is expansive from east to west, and most travelers along Hoctor Road would drive by this location. From this viewpoint, turbines from both projects would be visible in the middleground view along the crest of the hill (see Figure 3.6). CARES Project turbines would be located in the eastern portion of the view; KENETECH Project turbines would be located in the western portion of the view. Turbine strings from the two projects would create similar patterns on the landscape from this viewpoint location. At this distance (2 to 3 miles), viewers may not be able to distinguish the three-bladed KENETECH turbines from the two-bladed CARES project turbines.

3.3.8 Land Use, Recreation, and Socioeconomics

The CARES Project site and most of the KENETECH Project site would be located on land zoned Extensive Agriculture (EA). The purpose of the EA zone is to "encourage the continued practice of farming on lands best suited for agriculture and to prevent or minimize conflicts between common agricultural practices and non-farm uses." The KENETECH Project site is owned by a number of private landowners and is primarily used for livestock grazing, although some cultivation occurs in the northern portion of the site. The CARES Project site is owned by Columbia Aluminum. Grazing activity on the CARES site is generally less intensive than on the KENETECH site, and none of the CARES site is currently cultivated. A number of utility corridors currently cross the KENETECH site, including high-voltage transmission lines and natural gas pipelines. A radio and microwave communication station is located at Juniper Point of the CARES site. The CARES site is also crossed by a natural gas pipeline.

Provided that appropriate precautions are taken to minimize noise impacts, construction disturbance, and the potential for discarded or nonfunctioning equipment to be stockpiled on site; and provided that aggressive actions are taken to control erosion, revegetate disturbed areas, and provide for the long-term control of invasive weeds; neither project would substantially affect the area's potential to support agricultural uses, including grazing. Less than 1.5 percent of the KENETECH Project site would be occupied by Project features; approximately five percent of the CARES Project site would be occupied by Project features. In addition, the CARES Project would create an additional transmission corridor across the KENETECH site. Both projects would create a limited number of permanent local jobs, provide construction employment, provide royalty or lease payments to landowners, and contribute to the local economy through increased purchases of goods and services. The effect

of local job creation would be relatively small since together the two projects would require 15 or fewer full-time workers during operation.

3.3.9 Noise

Three types of cumulative noise impacts could potentially result from simultaneous operation of the KENETECH and CARES Projects:

- A greater number of residential receivers in the Columbia Hills area could experience higher than background noise levels.

- Receivers could experience noise levels with the two projects together that would exceed the highest impact created by either Project.

- Some receivers that would not experience noise levels exceeding standards with either Project, could experience noise levels that exceed the 60-dBA daytime noise standard or the 50-dBA nighttime noise standard when noise levels from the two Projects are combined.

Predicted noise levels at 16 receptor locations throughout the Columbia Hills are shown in Table 3.5. This table illustrates noise levels resulting from each Project as well as noise levels resulting from the combined effects of both Projects. Noise levels of the two projects are not additive because the decibel scale is logarithmic.

Relative to the CARES Project alone, which would only cause an impact of 50 dBA or greater at only one location, the two projects together would cause an impact of 50 dBA or greater at eight receptor locations. This is primarily due to the influence of the KENETECH Project, which would by itself cause impacts of 50 dBA or greater at the same eight locations. Combined impacts of the two projects would not cause any additional receptors to exceed the 50 dBA or 60 dBA noise standards.

Together, the two projects would cause slightly elevated noise levels at Receptors 5 through 9 and at receptor 16 relative to the greatest noise levels created by the projects considered separately. Receptors 9 through 15 are located along Hoctor Road between Clyde Story and Bigby roads. The cumulative effect of the two projects would add 1 to 2 decibels to noise impacts that would result at these locations from the KENETECH Project alone. The greatest impact from either project, and the greatest cumulative impact would occur at Receptor 16, which is on property that was platted for residential use prior to enactment of the Klickitat County zoning ordinance. There is currently no residence constructed at this location and road access, drinking water, and wastewater (septic) service would be required in order to build and occupy a residence on this property. Therefore it is not certain whether this receiver would qualify as a residential property for purposes of its environmental designation for noise abatement. At Receptor 16 cumulative noise impacts would approach, but be somewhat lower

than, the 60 dBA daytime noise standard. It should be noted, however, that noise modeling for the KENETECH Project includes "worst-case" assumptions about the number of turbines in each turbine string and, therefore, both the predicted impacts from the KENETECH Project and predicted cumulative impacts may, therefore, somewhat overestimate the actual noise levels that would be experienced at some locations.

Mitigation for the two projects separately would also help mitigate cumulative impacts. Compliance with noise standards will be the responsibility of the Applicants and turbine operations will be subject to noise abatement through County enforcement actions, typically initiated through complaints.

Table 3.5 Cumulative Construction Noise Levels During Operation

Receptor	KENETECH (dBA)	CARES (dBA)	Cumulative (dBA)
1.	50	32	50
2.	55	39	55
3.	49	38	49
4.	45	20	45
5.	42	34	43[1]
6.	40	36	41[1]
7.	38	37	41[1]
8.	40	37	42[1]
9.	41	35	42[1]
10.	56	31	56
11.	54	28	54
12.	50	24	50
13.	53	20	53
14.	55	16	55
15.	52	16	52
16.	55	57	59[1]

[1] Receptors where cumulative noise impacts exceed the greatest noise impact created by one of the two Projects.

3.3.10 Air Quality

The primary cumulative impact to air quality from the development of the CARES and Phase 1 KENETECH projects will be the increased area-wide levels of fugitive dust due to the essentially simultaneous construction of the two projects. Together about 182 hectares (452 acres) would be disturbed, resulting in about 10.7 metric tons of fugitive dust not taking into account mitigation. This impact would be short-term in nature. The increase in overall dust generation in the area due to the operation of the two projects would be minimal because the majority of the areas disturbed would be restored after construction. Mitigation identified to reduce air quality impacts for the two projects individually would also reduce cumulative air quality impacts.

3.3.11 Traffic/Transportation

Cumulative transportation impacts would primarily result from use of Hoctor Road during simultaneous construction of the two projects. For the KENETECH Project, construction access would be provided at: three locations from Hoctor Road (at the Miller Road intersection, Oak Flat Road intersection, and about 1.5 miles east of the Oak Flat Road intersection); one location from US-97 in Section 9, T3N R16E; and one location from SR-14 in Section 25, T3N R16E (see Figure 3.1). An additional access from Hoctor Road to the central portion of the KENETECH site (near turbine strings T and U) would also be constructed in Section 2, T3N R17E. Construction access for the CARES Project is proposed to be from Hoctor Road at its intersection with Miller Road (see Figure 3.1).

Table 3.6 illustrates expected traffic volumes on Hoctor Road, US-97, and SR-14 with and without the two projects. Cumulative construction traffic along Hoctor Road would exacerbate impacts that would occur if either project were being constructed. Specifically, the traffic on Hoctor Road from both projects would interfere with the County's plans to repair the two western sections of Hoctor Road (a 0.8-mile stretch immediately east of US-97 and a 2.0-mile stretch from No. 12 Road to Willis Road) during the summer of 1995. During this time, site access would be more difficult for the two projects, which could potentially affect the projects' construction schedules. In addition, the increased concentration of heavy traffic during construction of the two projects would also accelerate or increase structural damage to Hoctor Road, which was constructed over compacted native soils without an engineered subgrade. These native soils are moisture-sensitive, making the road bed susceptible to failure from heavy loads that cause lateral displacement of the subgrade material.

Table 3.6 Cumulative Impacts from Heavy Construction Vehicle Traffic

	Projected	KENETECH			CARES			Total		
	1995	Const.	Total	% Incr.	Const.	Total	% Incr.	Const.	Total	% Incr.
US-97	4,700	141	4,841	3	20	4,720	0.4	161	4,861	3
SR-14	1,466	29	1,495	2	20	1,486	1.4	49	1,515	3
Hoctor Road	208	92	300	44	20	228	10	112	320	54

3.3.12 Public Services and Utilities

The Kenetech and CARES projects would receive public services from the same agencies, including the Klickitat County Fire District No. 7 for fire service, and the Klickitat County Sheriff's Department for police and emergency medical service. Neither project would require potable water or sewage service. The CARES project would require electric service.

Cumulative impacts to public services could result during the simultaneous construction of the Kenetech and CARES projects. Proportionally-higher demand for fire, police, and emergency medical service due to the combined construction activities could result. During operation, cumulative demand for fire, police, and emergency medical service would be much less than during construction because of reduced staffing levels and site activities. Because operation of the CARES Project would include full-time on-site staffing, it may somewhat reduce the potential for trespass and vandalism on adjacent portions of the KENETECH site.

The Kenetech and CARES projects could create cumulative impacts to communication systems located on Juniper Point if turbines or other project structures are located in the pathway of directional microwave signals. Obstruction of microwave signals by turbine blades or towers could interrupt or weaken these signals. Actual impacts would depend on the path and elevation of the microwave signals and the precise location and elevation of turbines. Mitigation identified to reduce impacts of the two projects individually would also reduce cumulative impacts.

3.3.13 Health and Safety Risks

Potential health and safety risks associated with the construction and operation of the KENETECH and CARES projects include the potential for worker injury during construction, the potential for electric shock and fires during Project construction and operation, general worker safety during Project operation and maintenance, and the potential effects of electromagnetic fields. These risks are expected to be low for either project and would also be low for the two projects considered cumulatively. The potential for fire and electrocution pose the greatest risks; however, these risks are greatly reduced by employing appropriate design, construction, and operating practices. Mitigation identified to reduce impacts of the two projects individually would also reduce cumulative impacts.

3.4 Mitigation for Cumulative Impacts

Mitigation identified to mitigate impacts of the KENETECH and CARES Projects individually would also help mitigate cumulative impacts. In addition, the following measures, targeted specifically at cumulative impacts could be employed:

- To the extent feasible, given safety considerations and the status of easements, realign the CARES Project powerline where it is proposed to cross the KENETECH site to follow the existing road alignment or the KENETECH powerline alignment.

- Jointly coordinate construction activities between the two projects and with the Klickitat County Department of Public Services to reduce traffic conflicts with scheduled repairs on Hoctor Road.

- Investigate the feasibility of jointly using the KENETECH access from US-97 during construction in order to provide an alternative access to the CARES site that avoids use of Hoctor Road during scheduled county road improvements.

- Coordinate the paint colors for the two projects' turbines.

- Coordinate revegetation plans and activities and long-term efforts to control invasive weeds where the two project sites adjoin.

CHAPTER 4.0 -- Glossary and Acronyms

GLOSSARY

Aboriginal settlements are the dwellings of original inhabitants of an area.

Aggregate is gravel and crushed stone used for mixing foundations and surfacing roads.

Anaerobic is a condition in which oxygen is lacking.

Archeological site is a site containing an archaeological resource that is any material remains of human life or activities that are at least 100 years of age, and that are of archaeological interest.

Attenuate means to reduce the force, value, or amount.

Avian of, relating to, or typical of birds.

Backfill is earth used for refilling a trench or an excavation.

Bedding is a condition where planes divide sedimentary rocks of the same or different physical characteristics.

Best Management Practices (BMPs - general definition) means schedules of activities; prohibitions of practices; maintenance procedures; other physical, structural, and/or managerial practices to prevent or reduce the pollution of waters of the State of Washington.

Bunchgrass is a densely tufted perennial grass with a compact cluster of stems, shoots, and leaves.

Cairn is a mound of stones.

CCS flakes are natural fragments of cryptocrystalline silicates.

Chroma is a measure of the intensity of the grayness of the soil color. A chroma of 1, occurring with or without mottles, or a chroma of 2, occurring with mottles, is considered to be low and an indicator of hydric soils.

Cinder cone is a cone composed of particles ejected from a volcano.

Collector arterial is a road that is designed to distribute traffic from groups of residences and link the traffic with county arterials and state and federal highways.

Conservation Reserve Program (CRP) is a national program designed to take small grain producing lands on highly erodible soils out of production to reduce erosion and degradation of those lands.

Construction staging area are tires with inflatable inner tubes.

Conventional tires are tires with inflatable inner tubes.

Corrosivity is the degree to which chemical processes, such as oxidation, gradually destroy metal alloys.

Critical Altitude as used in this EIS refers to the altitudes at which birds are most likely to have collisions with wind turbine blades [approximate range from 5 to 56 meters, (16 to 184 feet)].

Cryptogam crust is a surface crust on the ground that is composed of lichens and mosses and is a characteristic feature of bunchgrass and sagebrush communities in the Columbia Basin and other Great Basin deserts.

Cultural resource site for this EIS is defined as an area identified as containing more than 10 cultural artifacts per 10 m^2.

Cultural property is a definite location of past human activity, occupation, use, or traditional cultural practice identifiable through field survey, historical documentation, or oral history.

Culvert is a covered channel or a large-diameter pipe for transmitting surface water.

Daily Traffic Volume is the total amount of traffic that travels a given roadway in either direction over a 24-hour period.

dBA means an A-weighted decibel scale that measures sound levels and is weighted to frequencies perceived by humans.

Decibel is a measure of sound intensity, defined as 10 times the logarithm of the ratio of two sound pressures squared.

Dendritic means a branching or tree-like shape.

Detention means the temporary storage of stormwater to improve quality and/or reduce the mass flow rate of discharge.

Easement is a right, as a right-of-way, afforded a person to make limited use of another's real property.

Electromagnetic Spectrum is the total range of wavelengths or frequencies of electromagnetic radiation, extending from the longest (radio waves) to the shortest (cosmic rays).

Electromagnetic fields are forcefields associated with electric charge in motion and have both electric and magnetic components and contain a specific amount of electromagnetic energy.

Equivalent Sound level (L_{eq}) is the level of constant sound with the same sound energy as the actual fluctuating sound.

Erosion and Sediment Control BMP's means BMPs that are intended to prevent erosion and sedimentation, such as preserving natural vegetation, seeding, mulching and matting, plastic covering, filter fences, and sediment traps and ponds. Erosion and sediment control BMPs are synonymous with stabilization and structural BMPs.

Erosion means the wearing away of the land surface by running water, wind, ice, or other natural processes.

Erosion and Sediment Control Plan means a document that describes the potential for erosion and sedimentation problems, and explains and illustrates the measures that are to be taken to control those problems.

Ethnobotanical pertains to botanical resources that are considered an important part of indigenous cultures.

Ethnography is the study of the origin and the physical, social, and cultural development of indigenous societies.

Fill material is earth used for embankments or as backfill.

Final stabilization means the completion for all soil-disturbing activities at the site and the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures that will prevent erosion.

Foraging is the act of looking or searching for food.

Forb is any plant not having a woody stem and branches and that is not a grass or grasslike.

Fugitive dust is temporary dust usually created as a result of construction or agricultural activities.

Gradient is a slope expressed as a ratio of the horizontal to the vertical distance.

Grading is segregating a product into a number of adjoining categories that often form a spectrum of quality.

Groundwater means water in a saturated zone beneath the land surface.

Guy wire is a rope or wire securing a structure in a vertical position.

Habitat is the environment in which an organism or biological population usually lives or grows.

Habitat complex is a large area containing a variety of contiguous native plant communities.

Habituate means to develop a tolerance or psychological dependence through frequent use.

Headwaters are the upper reaches of streams that have less than a mean annual flow of 0.14 cubic meters (5 cubic feet) per second.

Hectare is a metric unit equal to 2.471 acres.

Herbaceous is plant without woody stem and branches such as grasses, grasslike plants, and forbs.

Hydric Soil is soil that is wet long enough to periodically produce anaerobic conditions, thereby influencing the growth of plants.

Impervious pertains to materials that fluids cannot pass through.

Inclusion is a vegetation community within a mapped unit that is not identified by the map unite name, e.g., the small Idaho fescue/bluebunch wheatgrass community occurring within the mapped Douglas' buckwheat/Sandberg's bluegrass community is an inclusion.

In-community-processes include those processes that foster natural sustainability and growth of a given plant community.

Isolates in this EIS are defined as isolated artifacts that do not meet the definition of a *Cultural Resource Site.*

Jumper wires are short lengths of conductor used to make a connection between two points or terminals in a circuit to provide a path around a break in a circuit.

Lightening arrestor is a protective device designed primarily for connection between a conductor of an electrical system and ground to limit the magnitude of transient over voltages on equipment.

Line of sight is the actual physical path a microwave beam takes to transmit its signal from one point to another.

Magnetic field is one of the elementary fields in nature; it is found in the vicinity of a magnetic body or current-carrying medium and, along with electric field, in a light wave.

Mean sea level (MSL) is the average sea surface level for all stages of the tide over a 19-year period, usually determined from hourly height readings from a fixed reference level.

Megahertz (MH) is a unit of frequency, equal to 1,000,000 hertz.

Meteorological towers are towers used to collect data on windspeed and direction.

Microwave repeater is a tower equipped with a receiver and transmitter for picking up, amplifying, and passing in either direction the signal sent over a microwave network.

Milligauss (mG) is a unit of magnetic flux density equal to one-thousandth of a gauss.

Mitigation includes avoiding an adverse impact by not taking a certain action or parts of an action; minimizing adverse impacts by limiting the degree of magnitude of the action and its implementation; rectifying an adverse impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating an adverse impact over time by preservation and maintenance operations during the life of the actions; and

compensating for adverse impacts by replacing or providing substitute resources or environments.

Mottles are spots or blotches of contrasting color within the soil matrix.

Nacelle is a fiberglass enclosure that houses the gearbox, generator, and hydraulic controls on a wind turbine.

National Pollutant Discharge Elimination System means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of the Federal Clean Water Act, for the discharge of pollutants to surface waters from point sources.

National Environmental Policy Act is a federal act passed in 1969 requiring the environmental review of most federal or federally approved projects and programs.

Noxious weeds are invasive plants that rapidly move in and take over native plant communities and are often dangerous for animals to ingest.

Omnidirectional means radiating or receiving equally well in all directions.

Overlay zone is a secondary land use zone that may be imposed over a land use primary zone.

Overstory refers to the vegetation that occupies the higher elevations in a large plant community, such as large oak trees.

Pad-mount transformers are small electrical devices set on a concrete foundation that convert or "step up/step down" the incoming voltage to a higher/lower outgoing voltage.

Particulates are fine solid particles that remain individually dispersed in the atmosphere.

Passerines are perching birds and songbirds such as jays, blackbirds, sparrows, finches, and warblers.

Permeability is the capacity of a porous rock, soil, or sediment to transmit a fluid.

Pollutant Discharge is any dredged soil, solid waste, incinerator residue, filter backwash, sewage, sewer sludge, garbage, munitions, chemical waste, biological materials, radioactive materials, heat, rocks, sand, discarded equipment, or industrial, agricultural, or municipal waste discharged into water.

Population density is the number of people located in a given area.

Potable water is water considered safe for human consumption.

Primary zoning district is a district set forth by standards which control density and create uniform districts with compatible uses.

Principal arterial is a road designed to meet appropriate state and federal design standards and is intended to move traffic safely and efficiently to and from major destinations in a given location.

Priority habitat is a designation given by the Washington Department of Fish and Game to habitats that provide unique or significant value to wildlife species.

Radio repeater is a repeater that acts as an intermediate station in transmitting radio communications signals or radio programs from one fixed station to another; serves to extend the reliable range of the originating station.

Raptors are birds of prey, such as hawks or owls.

Recreational species are those species that can be legally hunted when in season by those with the proper permits.

Repeater station is a station containing one or more repeaters.

Right-of-Way width is the width needed to properly construct a roadway; usually exceeds the actual width of paved road.

Roost site is a place where birds go the rest or sleep.

Sediment means the fragmented material that originates from the weathering and erosion of rock or unconsolidated deposits, and is transported by, suspended in, or deposited by water.

Seismic event is an earthquake.

Significant impact is an impact that has reasonable likelihood of more than a moderate adverse impact on environmental quality (WAC 197-11-794).

Silt loam are moderately erodible soils that consist largely of clay and silt.

Special-status plant species include species from the following categories:

- plants listed or proposed for listing as threatened or endangered under the federal Endangered Species Act (50 CFR 17.12 [listed plants] and various notices in the Federal Register [proposed species]);

- plants that are Category 1 or 2 candidates for possible future listing as threatened or endangered under the federal Endangered Species Act (55 Federal Register 6184, February 21, 1990);

- plants listed as endangered, threatened, or sensitive WNHP.

Special status species are classified either under state or federal laws or programs as endangered, threatened, proposed, candidate, sensitive, or monitor status.

Stabilization means the application of appropriate BMPs to prevent the erosion of soils, such as temporary and permanent seeding, vegetative covers, mulching and matting, plastic covering, and sodding (see also the definition of Erosion and Sediment Control BMPs).

Stormwater is a water that falls as precipitation and drains from the land surface.

Subgrade is the existing natural soil layer upon which imported soil component layers, such as topsoil or road foundation materials, are placed during the construction of a given project.

Substation is an assembly of equipment in an electric power system through which electric energy is passed for transmission, transformation, distribution, or switching.

Swales are slight or shallow depressions amidst generally level land.

Switchbacks are a zigzag arrangement of road by which vehicles can reach a higher or lower level by the succession of easy grades.

Turbine string is a continuous line of individual wind turbines.

Ultra High Frequency (UHF) is the band of frequencies from 300 to 3000 megahertz in the radio spectrum, corresponding to wavelengths of 10 centimeters to 1 meter.

Understory refers to the vegetation beneath taller, shading vegetative cover and occupying ground level or lower elevation areas.

Vascular plant: Those plants with vascular systems to conduct water and food throughout the plant; does not include fungi and mosses.

Vegetation community: An assemblage of plants that form a distinctive system with its own composition, structure, and functions.

Very High Frequency (VHF) is the band of frequencies from 30 to 300 megahertz in the radio spectrum, corresponding to wavelengths of 1 meter to 10 meters.

Visual Resources are visual features of the landscape, the character of those features, and the sensitivity of those features to change.

Waters of the State includes those waters in the State of Washington as defined as "waters of the United States" in 40 CFR Subpart 122.2 and as defined in Chapter 90.48 RCW which include lakes, rivers, ponds, streams (including intermittent streams), inland waters, underground waters, salt waters, and all other surface waters and water courses within the jurisdiction of the State of Washington.

Wetlands are areas inundated or saturated by water at a frequency or duration sufficient to support a prevalence of plants commonly known as hydrophytic vegetation, and animals typically adapted for life in saturated conditions.

Wind erosion causes detachment, transportation, and deposition of loose topsoil or sand by the action of wind.

ACRONYMS

AWT	Advanced Wind Turbines
BMP	Best Management Practice
BPA	Bonneville Power Administration
CARES	Conservation and Renewable Energy System
CDA	Construction Development Agreement
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
EMF	Electromagnetic Fields
EPA	Environmental Protection Agency
ESA	Endangered Species Acts
ESC Plan	Erosion and Sediment Control Plan
EWEB	Eugene Water and Electric Board
kph	kilometers per hour
kV	Kilovolt
mG	Milligauss
MW	Megawatt
MOA	Memorandum of Agreement
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service (formerly SCS)
ODFW	Oregon Department of Fish and Wildlife
PGE	Portland General Electric
PM_{10}	Particulate matter less than 10 microns
PPA	Power Purchase Agreemnt
PUD	Public Utility District
PVC	Polyvinyl Chloride
RCW	Revised Code of Washington
SCS	Soil Conservation Service
SEPA	State Environmental Policy Act
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USW	U.S. Windpower (now known as Kenetech, Inc.)
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WNHP	Washington Natural Heritage Program
$\mu G/m^3$	Micrograms per cubic meter
YIN	Yakama Indian Nation

CHAPTER 5.0 -- References

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Chapter 6 - Distribution List

6.1. DEIS Recipients

The following recipients have been sent copies of the DEIS. In addition certain recipients were sent copies of separately bound technical reports as indicated by:

[1] Sent copy of Appendix B-Columbia Wind Farm #1 Botanical Resources Field Survey
[2] Sent copy of Appendix D-Avian Use of Proposed KENETECH and CARES Windfarm Sites in Klickitat County, Washington
[3] Sent copy of Appendix C-Cultural Resources Survey of the proposed CARES Columbia Wind Farm #1.

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Appendix A

Columbia Wind Farm #1
Checklist of Environmental Consultation, Review, and Permit Requirements

A. Environmental Consultation, Review, and Permit Requirements

This section addresses federal statutes, implementing regulations, and executive orders potentially applicable to the Proposed Action (the Columbia Wind Farm #1). In each case, the text provides a brief synopsis of the relevant aspects of the law or order and a summary of Proposed Action compliance with these requirements. Consultation is summarized in Table A.1.

A.1 National Environmental Policy Act

This EIS was prepared pursuant to regulations implementing the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.), which requires federal agencies to assess the impacts their actions may have on the environment. Decisions will be based on understanding of the environmental consequences and actions will be taken to protect, restore, and enhance the environment.

This joint NEPA/SEPA EIS was prepared in compliance with NEPA guidelines and Washington State SEPA rules (Chapter 197-11 WAC). The federal (BPA) and state (Klickitat County Planning Department) lead agencies held public scoping meetings and invited comments on the scope of the EIS. An EIS Implementation Plan was prepared and published by BPA in compliance with Department of Energy NEPA Regulations. Public comments received on the Draft EIS will be addressed in the Final EIS. The EIS and the overall processes by which it was developed comply with NEPA's requirement for documentation and public involvement.

A.2 Endangered and Threatened Species and Critical Habitat

The Endangered Species Act (ESA) of 1973 (16 U.S.C. 1536), 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 upon which they depend. Section (7a) requires federal agencies to ensure that the actions they authorize, fund or carry out do not jeopardize endangered or threatened species or their critical habitats. Section 7(c) of the ESA and the federal regulations on endangered species coordination (50 CFR section 402.12) require that federal agencies prepare biological

assessments of the potential effects of major construction actions on listed or proposed endangered species and critical habitats.

Technical studies to support the Columbia Wind Farm #1 EIS included a botanical resource survey, wildlife assessment, and a year-long study of birds in the Project vicinity. The botanical resources survey concluded there were no federally threatened or endangered species located on the Project site. The USFWS identified three non-avian animal species that are candidates for listing as threatened. The avian resources study identified one federally endangered species, one federally threatened species, and three candidates for federal listing in the Project vicinity. Impacts to special-status plant, animal, and bird species are discussed in the EIS.

A.3 Fish and Wildlife Conservation

The Fish and Wildlife Conservation Act of 1980 (16 U.S.C. 2901 et seq.)encourages federal agencies to conserve and to promote conservation of nongame fish and wildlife species and their habitats. The EIS lead agencies are responding to this policy through full consideration of fish and wildlife needs in developing alternatives and in comprehensive analysis of fish and wildlife impacts and identification of potential mitigation measures.

The Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act) (16 U.S.C. 839 et seq.) established the Pacific Northwest Electric Power and Conservation Planning Council (Council) to develop a Regional Electric Power and Conservation Plan (Plan). In implementing its mandate to assure an adequate, efficient, economical, and reliable power supply, a federal agency must give due consideration to the protection, mitigation, and enhancement of the region's fish and wildlife resources. Any action a federal agency takes, including acquisition of major resources (i.e., resources with a planned capability greater than 50 average megawatts acquired for more than five years) must be consistent with the Plan, including its fish and wildlife components, unless an exemption is granted by an Act of Congress. The Project would implement an objective of Northwest Power Act to encourage the development of renewable resources in the Pacific Northwest. It would also implement an objective of the Council's 1991 Power Plan to determine the cost and availability of new cost-effective resources, such as wind energy, through research and demonstration programs.

A.4 Heritage Conservation

The National Historic Preservation Act. A number of federal laws and regulations have been put into effect to protect the nation's historical, cultural, and prehistoric resources. A federal agency must consider whether its actions may have an effect on a property listed on the National Registry of Natural Landmarks, a property listed as a National Historic Landmark, a property listed on the World Heritage List, a property

listed on a statewide or local lists, or the ceremonial rites or access to religious sites of Native Americans.

A cultural resources survey was conducted to locate cultural resource properties and sites. Seventy-five isolates and nine sites were recorded during the survey. All of the sites could be avoided. The State Historic Preservation Office will be consulted to determine if the sites are eligible under Criterion D of the National Register of Eligibility.

Traditional Cultural Properties

The Native American Graves Protection and Repatriation Act (NAGPRA) addresses the recovery, treatment, and repatriation of Native American and Native Hawaiian human remains and cultural items (associated funerary objects, unassociated funerary objects, sacred objects, and objects of cultural patrimony). No graves have been identified on the site, although past Native American use and the presence of cairns suggest the potential for graves.

The American Indian Religious Freedom Act (AIRFA)of 1978 was a joint resolution of Congress establishing a policy that the United States will protect and preserve American Indians' rights of freedom of belief, expression, and exercise of traditional religions. Courts have interpreted AIRFA to mean that public officials must consider the American Indians' interests in traditional religious practices before undertaking actions that might harm those interests. Consideration of these issues is addressed in Section 2.4 of this EIS.

A.5 State, Areawide, Local Plan, and Program Consistency

The CEQ regulations for implementing NEPA (40 CFR 1506.2) require agencies to consider the consistency of a proposed action with approved state and local plans and laws. In accordance with Executive order 12372, this EIS will be circulated to the appropriate state clearinghouses to satisfy review and consultation requirements.

A.6 Wetlands Protection

Executive Order 11990 (Protection of Wetlands) and DOE regulations implementing the Executive Order (10 CFR Part 1022) require federal agencies to minimize the destruction, loss, or degradation of wetlands; and to preserve and enhance the natural and beneficial values of wetlands when undertaking federal activities or programs. If a wetland will be affected, a finding must be made that there is no practicable alternative to affecting that wetland and that all practicable measures have been taken to minimize harm. No wetlands would be impacted by the Project.

A.7 Farmland Protection

The Farmland Protection Policy Act (7 U.S.C. 4201 et seq.) requires federal agencies to identify and take into account the adverse effects of their programs on the preservation of farmlands. This Act does not apply to the proposed Project because it does not meet the criteria for selection set forth in 7 CFR 658.3.

A.8 Global Warming

A discussion of possible global warming effects from thermal generating projects has been incorporated by reference from BPA's Resource Programs Final EIS and presented in this EIS for comparison purposes.

A.9 Pollution Control at Federal Facilities

The Clean Air Act (CAA) establishes a comprehensive program for improving and maintaining air quality throughout the United States. The goals of the CAA are achieved through permitting of stationary sources, restricting the emission of toxic and other pollutants from stationary and mobile sources, and establishing National Ambient Air Quality Standards (NAAQS). Building the Columbia Wind Farm #1 would result in a temporary increase in fugitive dust emissions related to construction activities. The emission should not exceed national standards. Operation of the Columbia Wind Farm #1 would have no significant adverse impacts on air quality.

The Clean Water Act (CWA) sets national goals and policies to eliminate discharge of water pollutants into navigable waters, to regulate discharge of toxic pollutants, and to prohibit discharge of pollutants from point sources without permits. The primary instrument for implementing the act is the National Pollutant Discharge Elimination System (NPDES) permit. The NPDES permit would be required for discharging stormwater from the Columbia Wind Farm #1. The mitigation measures to reduce impacts related to stormwater runoff are discussed in Section 2.1 of this EIS.

The Noise Control Act of 1972 as amended (42 U.S.C. 4901, et seq.) sets forth a broad goal of protecting all people from "noise that jeopardizes their health or welfare." It places principal authority for regulating noise control with the states and local communities. Noise related to the Columbia Wind Farm #1 would not violate day or evening standards, but may potentially exceed nighttime noise standards in some locations. Mitigation is suggested in Section 2.9 of the EIS.

A.10 Watershed Protection and Flood Protection Act

The purpose of the Watershed Protection and Flood protection Act is to protect watersheds from erosion, floodwater, and sediment damages. It provides assistance programs to local organizations to conduct investigations and surveys, prepare plans and estimates, develop soil and water conservation practices, and install improvement works for protection of watersheds. An Erosion and Sediment Control Plan would be required under the NPDES General Permit for this Project.

A.11 Other Acts and Regulations

The following policies, acts, and regulations were determined not to apply to the implementation of the Columbia Wind Farm #1:

The Fish and Wildlife Coordination Act
The National Wildlife Refuge System Administration Act
The Migratory Waterfowl Act
The Marine protection, Research and Sanctuaries
The Archeological Resources Protection Act
Coastal Zone Management Act Consistency
Floodplain Management
The Farmland Protection Policy Act
Permits for Structures in Navigable Waters
Permits for Rights-of-Way of Public Land
Energy Conservation at Federal Facilities: 42 U.S.C. 8241 et seq.
The Wild and Scenic River Act
The Columbia River Gorge National Scenic Area Act
The Water Resources Development Act
The Federal Water Project Recreation Act
The Land and Water Conservation Act
Safe Drinking Water Act
Comprehensive Environmental Response and Liability Act
Resource Conservation and Recovery Act
The Federal Insecticide, Fungicide, and Rodenticide Act
The Toxic Substances Control Act

Table A. 1 Summary of Consultation

Requirement	Applicability	Remarks
National Environmental Policy	Yes	This Draft EIS evaluates alternatives and significant impacts and identifies mitigation measures to reduce or avoid impacts.
Endangered and Threatened Species	Yes	USFWS provided lists of threatened and endangered species potentially present in the project vicinity and provided input on the avian study plan. Formal Section 7 consultation under the Endangered Species Act was initiated with submittal of a Biological Assessment to the USFWS.
Fish and Wildlife Conservation	Yes	Consultation integrated into review process for this EIS. State wildlife agencies consulted during preparation of study plans.
Heritage Conservation	Yes	Sectio 106 consultation will be initiated with review of draft cultural resources report by the Washington State Historic Preservation Office.
Land Use Plan Consistency	Yes	Consultation integrated into review process for this EIS. Project appears to be consistent provided mitigation is implemented. Plan consistency will be a critical element of the County's conditional use permit requirement, and is within the County's jurisdiction.
Coastal Zone Management	No	Project not in coastal area.
Floodplain Management	No	Project not in floodplain.
Wetlands	No	None that would be impacted by the project identified through environmental review and botanical field studies.
Farmlands	Yes	EIS assesses compatibility with farm and range lands. Less than 5% of site lands would be permanently occupied by project features. Agricultural uses would continue on remaining lands.
Recreation Resources	Yes	No adverse impacts associated with project.
Global Warming	Yes	No adverse impacts associated with Project.
Permit for Structures in Navigable Waterways	No	No obstacles to be constructed.
Permit for Discharges into Waters of the U.S.	Yes	US Army Corps Section 404 nationwide permits required for crossings of intermittent streams.
Public and Indian lands Right-of-Way permit	No	Project would be constructed on private lands.
Energy Conservation at Federal Facilities	No	No federal facilities involved.
Pollution Control at Federal Facilities	No	No federal facilities involved.
Watershed protection and Flood Protection Act	Yes	Erosion and Sediment Control Plan required under Washington State NPDES General Permit.