EXHIBIT S

HISTORIC, CULTURAL, AND ARCHAEOLOGICAL RESOURCES

OAR 345-021-0010(1)(s)

TABLE OF CONTENTS

S.1 INTRODUCTION

OAR 345-021-0010(1)(s) *Information about historic, cultural, and archaeological resources providing evidence to support a finding by the Council as required by OAR 345-022-0090, including:*

Response: This exhibit describes impacts related to the Biglow Canyon Wind Farm Facility (the Facility) on historic, cultural, and archaeological resources in the vicinity.

S.2 RESOURCES LISTED, OR ELIGIBLE FOR LISTING, ON THE NATIONAL REGISTRY OF HISTORIC PLACES

(A) Historic and cultural resources within the analysis area that have been listed, or would likely be eligible for listing, on the National Register of Historic Places;

Response: "Historic properties" are cultural resources that have been listed on, or are likely to be listed on, the NRHP. No "historic properties" in the area of the Biglow Canyon Wind Farm Facility (Facility) are currently listed on the National Register of Historic Places (NRHP).

The Council's Historic, Cultural, and Archaeological Resources Standard, OAR 345-022-0090, states:

To issue a site certificate, the Council must find that the construction, operation, and retirement of the facility, taking into account mitigation, is not likely to result in significant adverse impacts to:

(1) Historic, cultural, or archaeological resources that have been listed on, or would likely be listed on, the National Register of Historic Places;

(2) For a facility on private land, archaeological objects, as defined in ORS 358.905(1)(a), or archaeological sites, as defined in ORS 358.905(1)(c); and

(3) For a facility on public land, archaeological sites, as defined in ORS 358.905(1)(c).

Three historic sites and one historic archaeological site were discovered and recorded with the Oregon State Historic Preservation Office (OR SHPO):

- Homestead A (BCW-1) is a wheat farm and cattle ranch operation associated with an occupied residence. The residence, a heavily altered and remodeled Victorian farmhouse, has lost its architectural integrity. Although its current owners, Norman and Marilyn Fridley, believe it is one of the earliest homesteads in the vicinity, the original owners/settlers are not known to be associated with events that have made a significant contribution to the broad patterns of our history (36 CFR 60.4, criterion "a"), nor is the farm associated with the lives of persons significant in our past (criterion "b"). Lack of architectural integrity for the main residence and the barns and outbuildings preclude this property from embodying the distinctive characteristics of a type, period, or method of construction. The buildings are not the work of a master, nor do they possess high artistic values or represent a significant

and distinguishable entity whose components might lack individual distinction (criterion "c").

- Homestead B (BCW-2) is an abandoned Victorian farmhouse with associated outbuildings and cached older farm equipment. According to Norman and Marilyn Fridley (current residents of Homestead A), the house was constructed by George Fridley in 1891 or 1892. The residence is in very poor condition and its doors and windows are missing and/or are open to the elements; it has lost its architectural integrity and its present condition is beyond repair or rehabilitation. Although it too is one of the earliest homesteads in the vicinity, its original owners/settlers are not known to be associated with events that have made a significant contribution to the broad patterns of our history (criterion "a"), nor is the homestead associated with the lives of persons significant in our past (criterion "b"). It clearly lacks integrity and is not eligible under criterion "c."

- The historic building (BCW-3) is an isolated vernacular garage building presently used for storage of a non-functioning automobile. It is probably associated with the rural residence across the highway (out of the proposed Facility area. With some windows missing and/or boarded up, it is still in fair overall physical condition and it still retains its integrity of design. Little is known about this building, but it is architecturally undistinguished (criterion "c") and it is not known to be associated with events that have made a significant contribution to the broad patterns of our history (criterion "a"), nor is it associated with the lives of persons significant in our past (criterion "b").

- The archaeological site (BCW-4) is a small historic period surface dump feature. This site is small, lacks appreciable depth, and (it or its artifact contents) cannot be clearly associated with any particular person in the historic record. It represents a single disposal event and lacks any direct contextual association with any nearby homesteads. Its recordation has substantially captured much of its historic archaeological information. Although its full data recovery could yield some additional information, it is unlikely that this additional information (or the information already yielded through its recording) is important in history (criterion "d").

Attachment S-1, the Cultural Resources Survey Report, includes mapped locations of recorded sites, and provides details of the methodology and findings of the investigations.

S.3 ARCHAEOLOGICAL OBJECTS ON PRIVATE LANDS WITHIN THE ANALYSIS AREA

(B) For private lands, archaeological objects, as defined in ORS 358.905(1)(a), and archaeological sites, as defined in ORS 358.905(1)(c), within the analysis area;

Response: Archaeological site (BCW-4) is believed to be ineligible for listing in the NRHP.

S.4 ARCHAEOLOGICAL SITES ON PUBLIC LANDS WITHIN THE ANALYSIS AREA

(C) For public lands, archaeological sites, as defined in ORS 358.905(1)(c), within the analysis area;

Response: There are no public lands in the Biglow Canyon Wind Farm Facility area.

S.5 SIGNIFICANT POTENTIAL IMPACTS OF CONSTRUCTION, OPERATION, AND RETIREMENT OF THE FACILITY ON HISTORIC, CULTURAL, AND ARCHAEOLOGICAL RESOURCES

(D) The significant potential impacts, if any, of the construction, operation, and retirement of the proposed facility on the resources described in paragraphs (A), (B), and (C) and a plan for protection of those resources that includes at least the following:

S.5.1 Methodology

(i) A description of any discovery measures, such as surveys, inventories, and limited subsurface testing work, recommended by the State Historic Preservation Officer and the National Park Service of the U.S. Department of Interior for the purpose of locating, identifying, and assessing the significance of resources listed in paragraphs (A), (B), and (C);

Response: An intensive cultural resources field inventory was conducted to check for the presence/absence of historic properties and for cultural resources that otherwise might not meet the threshold of significance necessary to qualify them as historic properties.

The study methods employed here followed applicable NEPA regulations and were consistent with U.S. Secretary of Interior Standards for cultural resource survey and documentation under Section 106 of the National Historic Preservation Act. Turbine string linears were surveyed as 150-meter (~500-foot) corridors, with 30-meter (~100-foot) transect intervals. Transmission line corridors were surveyed with 75-meter (~250-foot) transect intervals. Transportation corridors were surveyed in 60-meter (~200-foot) transect intervals. Staging areas, and operations and maintenance (O&M) facilities were investigated with buffers of approximately 25 percent to provide for altered placement. Surveys were conducted and sites were recorded via hand-held Trimble GPS devices.

Human occupation of the Columbia Plateau is generally thought to have occurred for at least the last 11,000 years. Most evidence for prehistoric cultures is derived from lowland sites located near streams. Archaeological evidence in upland areas, such as the Facility vicinity, has not been extensively documented or explored. Upland areas are considered to be of lower archaeological sensitivity because they are often removed from permanent, resource-bearing water sources, and are generally thought to lack the wider array of natural resources normally found in lowland and/or riverine settings. Upland areas have not yet yielded evidence of prehistoric seasonal, semi-permanent, or permanent settlements.

The Columbia River Gorge traditionally was used by several cultural groups: the Wishram, White Salmon, and Cascades groups (Eastern Chinookan linguistic group) and the Yakama and Klickitat groups (Echeesh-Keen linguistic group) (Griffin and

Churchill, 2001). These groups used the Columbia River and its tributaries. Loose territorial boundaries, usually based on geography, were established. Subsistence centered on a seasonal round of resource availability (Griffin and Churchill, 2001). Upland and inland resources were used seasonally, and permanent or semi-permanent villages were located along streams and other permanent water sources. The specific Facility area was used by the Tenino, and perhaps the Umatilla (Ray et al., 1938). Berreman (1937) placed the boundary between the Umatilla and the Tenino at Arlington.

The proto-historic period represents the introduction of non-aboriginal cultures into the area. It is believed that this initial contact began between 1600 and 1750. It was during this period that epidemics were introduced resulting in heavy mortality among native populations.

Accounts of Euro-American exploration by Lewis and Clark, the Northwest Fur Company, and the Hudson's Bay Company described the indigenous cultural groups that settled along the Columbia River. Accounts of the settlements of the Wishram, White Salmon, Cascades, Yakama, and Klickitat by these early explorers confirm the land use pattern described by ethnographic informants. The implication of this use pattern for archaeological identification of cultural resources is that physical evidence of cultural activity in upland and inland areas is scant, if it exists at all. Instead, most archaeological evidence for ethnographic and ethno-historic activity is expected to be found in lowland areas along major rivers and streams.

The earliest Euro-American residents of Sherman County entered the area in the 1860s. Ranching and livestock were the main economic activities of the area. In the 1880s, driven by the promise of government land patents, homesteaders began to arrive in the county, and it was soon transformed from a ranching to a farming community. Two standing structures in the Facility area are thought to date to the 1890s.

S.5.2 Survey and Inventory Results

(ii) The results of surveys, inventories, and subsurface testing work recommended by the state and federal agencies listed in subparagraph (i), together with an explanation by the applicant of any variations from the survey, inventory, or testing recommended;

Response: The results of the August 2005 cultural resources survey, including the inventory forms and electronic database entries, prepared for the newly recorded cultural resources, are documented in the Cultural Resources Survey Report (Attachment S-1). This report has been submitted to the OR SHPO for review and comment on October 1, 2005. Any subsequent revised version of this report will also be submitted to the OR SHPO for entry into their cultural resource database and library.

Homestead "A," described in S.2, might undergo direct physical impacts from Facility construction. However, because the property is not an eligible resource, impacts by definition will not be significant. All other cultural resources will be avoided during construction, operation, and retirement of the proposed Facility. Although none of the cultural resources are believed to be "historic properties" (i.e., eligible for listing on the NRHP), the locations of all Biglow Canyon Wind Farm facilities (with the exception of

Homestead "A") are designed to avoid construction, operation, and retirement impacts upon these cultural resources.

A Cultural Resource Management Plan (CRMP) has been developed by the Applicant in coordination with the Oregon SHPO. The CRMP, included in Attachment S-1, the Cultural Resources Survey Report, includes specific protocols and procedures for protecting these cultural resources, as well as any additional sites accidentally discovered during construction.

In the event that the Facility is changed, or expanded beyond the areas recently surveyed for cultural resources, the Applicant will commission additional cultural resources surveying and design all new or additional facilities to avoid impacts on cultural resources.

S.5.3 Measures Designed to Prevent Destruction of Historic, Cultural, and Archaeological Resources

(iii) A list of measures to prevent destruction of the resources identified during surveys, inventories, and subsurface testing referred to in subparagraph (i) or discovered during construction; and

All of the cultural resources will be avoided during construction, operation, and retirement of the proposed facilities. Although none of the cultural resources are believed to be "historic properties," the locations of all Biglow Canyon Wind Farm facilities are designed to avoid the impacts of construction, operation, and retirement upon these cultural resources. As already mentioned, a CRMP is included in the Cultural Resources Survey Report (Attachment S-1). The CRMP includes specific protocols and procedures (measures) to protect these cultural resources, as well as any resources that might be accidentally discovered during construction.

Archaeological sites and historic homesteads will be temporarily flagged in the field and on Facility construction maps before and during construction. Archaeological construction monitors will be present during construction in selected locations to prevent accidental damage to these cultural resources.

In the event that the Facility is changed, or expanded beyond the areas recently surveyed for cultural resources, the Applicant will commission additional cultural resources surveying and design all new or additional facilities to avoid impacts to cultural resources.

S.5.4 Permit Application

(iv) A completed copy of any permit applications submitted pursuant to ORS 358.920. Notwithstanding OAR 345-021-0000(4), the applicant shall include copies of the permit applications as part of the site certificate application. If the same information required by subparagraphs (i) through (iii) above is contained in the permit applications, then the applicant may provide cross-references to the relevant sections of the permit applications in substitution.

No permit applications have been submitted to the OR SHPO pursuant to ORS 358.920 because no subsurface testing on public or private land was conducted (recorded sites and general site location and history do not warrant subsurface testing). In the event that heretofore undiscovered archaeological sites are inadvertently disturbed during construction, construction work will cease and the Applicant will direct its archaeologist to apply for necessary archaeological excavation permits from the SHPO. This requirement will be included in the CRMP.

S.6 PROPOSED MONITORING PROGRAM

(E) The applicant's proposed monitoring program, if any, for impacts to historic, cultural, and archaeological resources during construction, operation and retirement of the proposed facility;

During construction in selected locations near recorded cultural resources, onsite archaeological monitors will be present, if necessary, to ensure that no accidental damage to known cultural resources occurs. The CRMP addresses long-term management of the known/recorded resources and includes a section on accidental discovery of cultural resources. This section provides a detailed plan of protocols and procedures (measures) to be followed if cultural resources are accidentally discovered during construction or operation of the facilities.

S.7 CONCLUSION

The foregoing evidence demonstrates that the Council's standard for historic, cultural, and archaeological resource protection has been met because no historic properties in the proposed Facility area have been listed on the NRHP and because the CRMP provides for the protection of any resources accidentally discovered during construction of the Facility.

S.8 REFERENCES

Berreman, Joel V. 1937. Tribal Distribution in Oregon. American Anthropological Association, Memoir no. 47.

Griffin, Dennis, and Thomas Churchill. 2001. *Traditional Cultural Properties for the Lake Chelan and Rocky Reach Projects.* Report prepared for Chelan County Public Utility District No. 1, Wenatchee, Washington.

Ray, Verne F., et al. 1938. Tribal Distribution in Eastern Oregon and Adjacent Areas. American Anthropologist 40:384-415.

BCW APP Doc 2

ATTACHMENT S-1

Cultural Resources Survey Report

Findings +
Prehistoric__ Historic_4_Isolate__
Sherman County
Township 3N, Range 17E Sections 35,36
R. 18E, Sec's 31, 32
T. 2N, R. 17E, Sec's, 1,4, 9-15, 21, 28, 33-36
R. 18E, Sec's 5-9, 14-18, 19-24, 25, 31
USGS Quinton, Oreg.-Wash, 7.5, 1971
USGS Rufus, Oreg-Wash, 7.5', 1971
USGS Wasco, Oreg, 7.5', 1971 (photo revised 1987)
USGS Klondike, Oreg, 7.5', 1971
Project Acres: 899
Acres Surveyed: 899
Cultural Resources Survey
Field Notes Location:_CH2M Hill (Portland)

Cultural Resources Survey

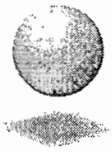
for

Biglow Canyon Wind Farm Facility

Sherman County, Oregon

Prepared for

Orion Energy, LLC
1611 Telegraph Ave, Suite 1515
Oakland, Ca. 94612
By



CH2MHILL

825 NE Multnomah
Portland, Oregon 97232

September 30, 2005

Figures

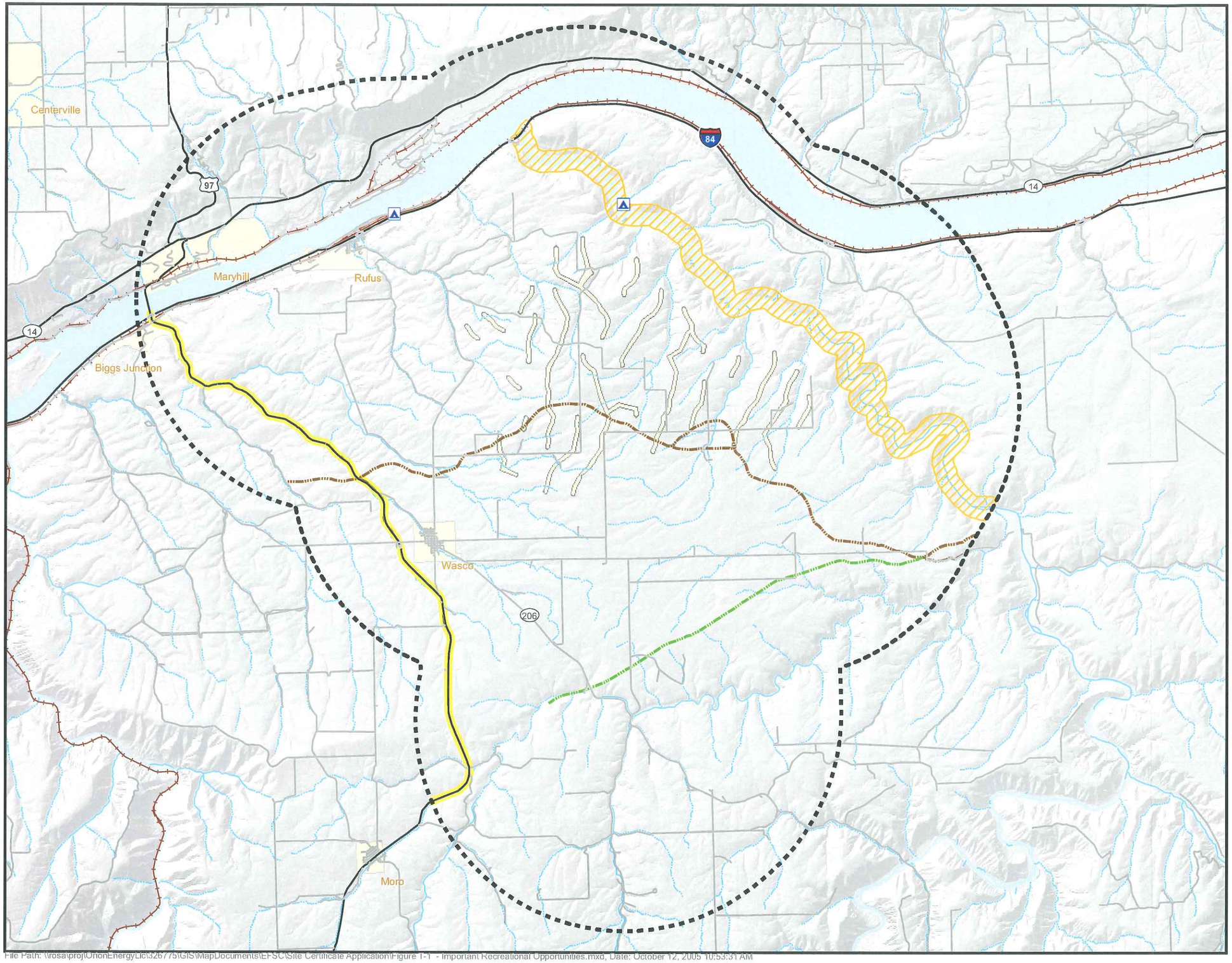


Figure T-1

Important Recreational Opportunities

Biglow Canyon Wind Farm

ORION ENERGY LLC

Legend

- Highway
- Major Road
- Railroads
- Rivers/Lakes
- 5-mile Recreation Analysis Area
- Proposed Turbine Corridors

Important Recreational Opportunities

- Public Campground
- Journey Through Time Scenic Byway (US 97)
- Oregon Trail (Approx.)
- Barlow Road Cutoff Trail
- John Day River Corridor

N
W E
S

0 1 2 3 4

Miles

CH2MHILL

File Path: \\rosa\proj\OrionEnergyLlc\326775\GIS\MapDocuments\EFSC\Site Certificate Application\Figure T-1 - Important Recreational Opportunities.mxd, Date: October 12, 2005 10:53:31 AM

EXHIBIT T

RECREATIONAL FACILITIES AND OPPORTUNITIES

OAR 345-021-0010(1)(t)

TABLE OF CONTENTS

T.1 INTRODUCTION

OAR 345-021-0010(1)(t) *Information about the impacts the proposed facility would have on important recreational opportunities in the analysis area, providing evidence to support a finding by the Council as required by OAR 345-022-0100, including:*

Response: OAR 345-022-0100(1) requires that site certificate applications for proposed energy facilities address important recreational opportunities, and that "the Council must find that the design, construction, and operation of a facility, taking into account mitigation, are not likely to result in significant adverse impact to important recreational opportunities in the analysis area as described in the project order."

This exhibit addresses impacts the proposed Biglow Canyon Wind Farm Facility (Facility) will have on important recreational opportunities in the analysis area. This exhibit is organized according to the requirements in OAR 345-021-0010(1)(t) and provides evidence to support a finding by the Council as required by OAR 345-022-0100.

T.2 IMPORTANT RECREATIONAL OPPORTUNITIES AND FACILITIES IN THE ANALYSIS AREA

OAR-345-021-0010(1)(t)(A) *A description of any important recreational opportunities in the analysis area considering the criteria in OAR 345-022-0100;*

Response: The analysis area for potential impacts on recreational opportunities includes the Facility site and 5 miles from the site boundary, as shown in Figure T-1. Accordingly, the following discussion considers potential recreational opportunities on the Facility site itself and also within the broader analysis area.

There are no county, state, or federal designated recreation lands or any designated recreational facilities on the Facility site. In general, recreational activities in the vicinity include camping, hiking, upland bird and big game hunting, rafting, boating, fishing, sightseeing, nature and wildlife photography, and bicycling.

Within 5 miles of the site boundary are two public campgrounds—one near the John Day River and the other near the Columbia River (DeLorme, 2001). Water-based recreation activities, such as fishing and boating, occur on the John Day River.

OAR 345-022-0100 prescribes criteria used to evaluate a recreation facility's relative importance: any special designation or management, degree of demand, outstanding or unusual qualities, availability or rareness, and irreplaceability or irretrievability of the opportunity. Based on these criteria, there are no important recreational facilities or opportunities within the site boundary. However, three potentially important opportunities have been identified in the analysis area:

- John Day River (approximately river mile 0 to 26)
- Journey Through Time Scenic Byway (US 97) (approximately milepost 4 to 12.5)
- Historic Oregon Trail alignment, including the Barlow Road Cutoff Trail alignment

Descriptions of these three recreational opportunities follow.

T.2.1 John Day River

The John Day River system includes more than 500 river miles and is one of the longest free-flowing river systems in the continental United States (U.S. BLM, 2001). The main stem between approximately river miles 0 and 20 runs through the analysis area. This segment, a designated Federal Wild and Scenic River (WSR), is classified as Recreational. The primary recreational uses on the segment of the river within the analysis area include fishing, boating, and bird hunting (Mottl, H., pers. comm.). Outstanding remarkable values include scenery, recreation, fish, wildlife, geology, paleontology, and archaeology (U.S. BLM, 2001). Botanical and ecological values are also deemed significant (U.S. BLM, 2001). The segment is also designated as a State Scenic Waterway pursuant to the Oregon State Scenic Waterways Act administered by the Oregon Parks and Recreation Department. The Oregon Department of Fish and Wildlife administers the John Day Wildlife Refuge located upstream of the confluence of the John Day and Columbia rivers (located within the analysis area). The primary purpose of the refuge is to protect wintering and nesting waterfowl (Mottl, H., pers. comm..). Further, the Army Corps of Engineers administers the John Day Arm of the Columbia Reservoir and Le Page Park, located from river mile 10 downstream to the Columbia.

T.2.2 Journey Through Time Scenic Byway

The Journey Through Time Scenic Byway is a designated Oregon State Scenic Byway. The byway runs south out of Biggs along US 97 through the analysis area to Shaniko, where it turns east, and eventually travels to Baker City. The "route celebrates an area of uncommonly rich history. The route is a story of fortunes made and lost, of Chinese laborers and their culture, of towns that boomed and busted, of timber, agriculture, and pioneer settlers" (Wetter, 1996).

Primary recreational uses include sightseeing and road touring. There are no developed scenic overlooks or waysides along the byway in the analysis area.

T.2.3 Historic Oregon Trail and Barlow Road Cutoff Trail Alignments

Although the trail alignments technically meet the criteria for being important recreational opportunities, agricultural practices and other development activities have destroyed nearly all evidence of the trails in the analysis area. No intact segments have been identified within the site boundary. The only accessible, intact segment within the analysis area that has been identified occurs near the McDonald Crossing, which is southeast of the analysis area.

Trail crossings at county and state roads are somewhat well signed within the analysis area, but many signs are dilapidated or missing. Further, the surrounding landscape is primarily private land cultivated for wheat, so the recreational opportunity is limited to visiting and viewing the approximate historic alignments from county roads.

T.3 SIGNIFICANT POTENTIAL ADVERSE IMPACTS TO THE OPPORTUNITIES IDENTIFIED

OAR 345-021-0010(1)(t)(B) *An assessment of significant potential adverse impacts to the opportunities identified in (A) including, but not limited to, potential impacts such as:*

(i) Direct or indirect loss of an opportunity as a result of construction or operation;

Response: A discussion of direct or indirect loss of opportunities for each of the identified important recreational opportunities follows.

T.3.1 John Day River

There will be no direct loss of opportunity. Indirect losses could result from impacts to visual resources, but these impacts are expected to be insignificant and are described in subsection T.3(vi) and in Exhibit R.

T.3.2 Journey Through Time Scenic Byway

There will be no direct loss of opportunity. Indirect losses could result from temporary traffic impacts. Expected to be negligible, these impacts are described in (iii). The proposed Facility is compatible with the goals stated in the Journey Through Time Management Plans: (1) create jobs, (2) maintain rural lifestyles, (3) protect important values (i.e., historical attractions and artifacts), and (4) build identity for the North Central Region (Wetter, 1996). See Exhibit U for a discussion of why the Facility is compatible with some of these goals, specifically job creation and economic benefits.

T.3.3 Historic Oregon Trail and Barlow Road Cutoff Trail Alignments

There will be no direct or indirect loss of opportunity as a result of Facility design, construction, or operation. The proposed Facility will be constructed on private property on which no intact trail segments have been identified. Furthermore, the Facility will not affect existing locations where the historic trail alignments cross county roads, nor will turbines be constructed over the historic alignments. Access roads will cross the historic alignments in a few locations, but will not affect intact segments because none exist at the proposed access road crossings.

(ii) Noise resulting from facility construction or operation;

Response: As detailed in Exhibit X, projected noise levels resulting from Facility construction and operation will meet requirements contained in Oregon Department of Environmental Quality rules.

Given projected noise levels, the distance between turbine locations and recreational opportunities, and the role of topography in attenuating noise effects, the noise resulting from Facility construction or operation will not affect recreational opportunities in the 5-mile analysis zone.

(iii) Increased traffic resulting from facility construction or operation;

Response: A detailed traffic analysis is presented in Exhibit U.

The primary transporter route will begin from either eastbound or westbound I-84, and continue south on US 97 (from Biggs, Oregon) to the community of Wasco. Construction traffic might also approach the site from the south on US 97. From Wasco, the primary transporter route will continue east and then southeast on ORE 206 before heading due east on either Klondike Road or Hilderbrand Lane. Vehicles then will progress north on North Klondike Road to various county roads to access individual turbine string roads. County roads include sections of Medler Lane, Emigrant Springs Road, Oehman Road, Biglow Road, Beacon Road, and Herin Lane.

State, county, and local roadways might be temporarily affected by traffic increases from construction vehicles accessing the site. Potential construction and operational impacts to traffic safety or maintenance on state highways from this Facility are anticipated to be inconsequential, as the state highway system (I-84, US 97, and ORE 206) was constructed to design, safety, and load-bearing standards. These roadways can accommodate vehicles at the legal load limit, thereby reducing the potential for significant traffic safety and maintenance impacts. County and local roadways might require improvement before construction can begin, and might need to be monitored during construction to ensure and protect the quality of the roadway after the Facility has been completed.

Local road improvements will enhance sections of the access routes to the John Day River, and thus have some positive impact on accessibility to the river. Visitor interest in the wind farm might also augment visits to existing recreational opportunities.

Increased traffic resulting from Facility construction and operation will remain at absolute levels that are low and will not detrimentally impact important recreational opportunities.

(iv) Water use during facility construction or operation;

Response: There will be no lasting impacts to water use. As discussed in Exhibit O, any impacts will be temporary, limited to the construction period. Specifically, water will be used during construction for concrete mixing, road compaction, and dust suppression. The construction contractor will be responsible for arranging for delivery of water to the site via water trucks from a source with an existing water right. The city of Wasco, Oregon (City) has agreed to provide the Applicant's contractors with municipal water for construction activities.

Water for dust suppression will have a positive effect on recreational opportunities by improving air quality and reducing haze. Other water uses during Facility construction and operation will not affect recreational opportunities.

(v) Wastewater resulting from facility construction or operation;

Response: There will be no wastewater impacts. As discussed in Exhibit V, the use of water for construction practices is not anticipated to generate runoff. Wastewater will not be discharged into wetlands or other adjacent resources. Sanitary effluent will be treated via the proposed septic tank and stormwater will infiltrate on site.

Wastewater resulting from Facility construction or operation will not affect recreational opportunities.

(vi) Visual impacts of facility structures, including cooling tower or other plumes, if any; and

Response: Exhibit R includes a discussion of potential impacts to visual resources as a result of the proposed Facility, and concludes that the Facility results in no significant visual impact to scenic or aesthetic areas.

(vii) Visual impacts from air emissions resulting from facility construction or operation, including, but not limited to, impacts on Class 1 visual resources as described in OAR 340-204-0050;

Response: The proposed Facility will not create air emissions, thus no impacts will occur.

T.4 MITIGATION MEASURES

OAR 345-021-0010(1)(t)(C) *A description of any measures the applicant proposes to avoid, reduce, or otherwise mitigate the significant adverse impacts identified in (B);*

Response: Measures to reduce visual impacts are discussed in Exhibit R. Because no significant impacts will occur to important recreational opportunities, no further measures are proposed to avoid, reduce, or otherwise mitigate Facility impacts. Potential impacts to other (nonimportant) recreational opportunities will be reduced through measures being taken for other purposes, including the use of existing roads where possible and the visual design of the turbine towers.

T.5 MAP OF ANALYSIS AREA

OAR 345-021-0010(1)(t)(D) *A map of the analysis area showing the locations of important recreational opportunities identified in (A); and*

Response: Figure T-1 shows the analysis area for recreational opportunities and facilities and important recreational facilities identified pursuant to OAR 345-021-0010(t)(A).

T.6 MONITORING PROGRAM

OAR 345-021-0010(1)(t)(E) *The applicant's proposed monitoring program, if any, for impacts to important recreational opportunities.*

Response: Because no significant impacts will occur to important recreational resources, no monitoring program is proposed.

T.7 CONCLUSION

The foregoing evidence demonstrates that the Council's recreation standard has been met, because there will be no significant adverse impacts on any identified important recreational opportunities within the analysis area. The Applicant has satisfied the requirements in OAR 345-021-0010(1)(t), and the Council may find that the standards contained in OAR 345-022-0100 have been satisfied.

T.8 REFERENCES

DeLorme. 2001. Oregon Atlas and Gazetteer.

Mottl, H. 2005. Recreation Planner. Prineville District, Bureau of Land Management. Personal communication via telephone conversation and e-mail with Carrie Konkol. August 19 and September 1, 2005.

U.S. Bureau of Land Management (BLM). 2001. John Day River Management Plan, Two Rivers, John Day, and Baker Resource Management Plan Amendments Record of Decision. February 2001.

Wetter, M., et al. 1996. Journey Through Time Management Plan. Prepared for Oregon Department of Transportation.

EXHIBIT U

PUBLIC SERVICES/SOCIOECONOMIC IMPACTS

OAR 345-021-0010(1)(u)

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TABLES

FIGURE *(located after text)*

ATTACHMENT

U.1 INTRODUCTION

OAR 345-021-0010(1)(u) *Information about significant potential adverse impacts of construction and operation of the proposed facility on the ability of public and private providers in the analysis area to provide the services listed in OAR 345-022-0110, providing evidence to support a finding by the Council as required by OAR 345-022-0110. The applicant shall include:*

Response: This exhibit describes potential adverse impacts related to the Biglow Canyon Wind Farm Facility (the Facility) on employment, population, housing, and transportation, and on the ability of affected communities to provide public services.

U.2 IMPORTANT ASSUMPTIONS USED TO EVALUATE POTENTIAL IMPACTS

OAR 345-021-0010(1)(u)(A) *The important assumptions the applicant used to evaluate potential impacts;*

Response: Potential impacts were evaluated on the basis of the assumptions described in the following subsections.

Employment

Construction

Facility construction is expected to take approximately 10 months. Preconstruction activities will begin in early 2007 and construction will be completed by the fourth quarter of 2007. During construction, an estimated average of 125 people will be employed at the Facility. A maximum of 250 people will be employed during peak construction. Most construction workers will be employees of construction and equipment manufacturing companies under contract to Orion Sherman County Wind Farm LLC (Applicant).

Construction workers will include a mix of locally hired workers within 30 miles of the Facility site (e.g., Sherman, Wasco, and Gilliam counties) for road and turbine pad construction. Specialized workers will be hired for specialized construction (e.g., substation and electrical transmission construction, turbine erection, turbine testing). For this analysis, the conservative assumption was made that 30 percent of the construction workers will be hired locally and the remainder will come from outside the three-county area. Local hiring could be greater and will depend on the availability of workers with appropriate skills. Additional workers might commute daily from communities outside the Facility area (i.e., Hood River, Oregon, and Klickitat County, Washington), which would lessen the impacts associated with the in-migration of outside workers. The Applicant's policy will be to hire locally to the extent possible.

Operations

An estimated 15 to 20 operational personnel will be employed at the Facility. Most of the operations and maintenance (O&M) staff will be hired locally, with the exception of those positions (for example, supervisor) that require previous experience at other wind

generation facilities (CH2M HILL, 2005; David Evans and Associates, 2005). Some specialized outside contractors might also be required on occasion (e.g., for repair of nacelles or meteorological services). It is assumed that Facility operations will begin by early 2008 and continue for at least 30 years and probably much longer. See Exhibit B for a discussion of Facility lifespan and operations.

Decommissioning

If the Facility were to be decommissioned, 15 to 20 operational jobs would be eliminated. Decommissioning the Facility would require removal of most facilities and restoration of disturbed areas. These activities would probably result in temporary construction employment less than that projected for Facility construction.

Population

Construction

Population in the analysis area[1] will change very little as a result of Facility construction. Assuming conservatively that only 30 percent of the construction workers will be local residents (from Gilliam, Sherman, and Wasco counties), an average of about 100 and a maximum of 175 new workers will be temporary residents (in-migrants) at the Facility. Assuming an average household size of at most 2.0 persons (many workers will not be accompanied by families or others), an estimated maximum of 350 temporary new residents might be associated with Facility construction during the peak construction period in summer. The actual number of temporary residents is likely to be less because of a combination of more local hiring and few workers bringing families or others with them. These in-migrants probably will settle in hotels, campgrounds or RV parks, houses, and temporary housing located within a commutable distance to the Facility site.

Operations

The number of new permanent residents resulting from Facility operations will be very small. An estimated maximum of 20 employees will be hired as part of the Facility, but most will already be local residents. Assuming conservatively that 20 percent (4) of these employees are in-migrants and that an average household size is 3.0 (higher than for temporary employees), as many as 12 new permanent residents could be added to the local population. That is insignificant, compared with the populations of Gilliam, Sherman, and Wasco counties.

Transportation

Access to the Facility area will be provided by primary and secondary transporter routes. These routes will be used to bring in equipment, materials, and workers from

[1] The analysis area for socioeconomic impacts extends 30 miles from the Facility site in Oregon. OAR 345-001-0010 (53)(d). See Figure U-1 for a depiction of the analysis area.

outside of the analysis area to the Facility site and will include state, county, and private roadways.

It is assumed that the primary transporter route will carry the majority of construction-related, heavy-duty and light-duty delivery vehicles, as well as workforce traffic. This route will begin from either eastbound or westbound I-84, and continue south on US 97 (from Biggs, Oregon) to the community of Wasco. From Wasco, the primary transporter route will continue east and then southeast on ORE 206 before heading due east on either Klondike Road or Hilderbrand Lane. Vehicles then will progress north on North Klondike Road to various county roads to access individual turbine string roads. County roads include sections of Medler Lane, Emigrant Springs Road, Oehman Road, Biglow Road, Beacon Road, and Herin Lane.

A secondary transporter route is assumed to begin from either eastbound or westbound I-84, but it will continue south on Scott Canyon Road (from Rufus, Oregon). From Scott Canyon Road, vehicles are able to access Herin Lane or Medler Lane, which can be used to access individual turbine string roads. Discussions with personnel at the Sherman County Roads Department (M. Coles, pers. comm.) revealed that Scott Canyon Road might not be suitable for large oversize or overweight trucks because of limitations related to the physical terrain.

During construction, a large number of trucks will be accessing the site on these transporter routes. Heavy-duty trucks will be carrying gravel and other materials required to improve or construct new turbine access roads from existing roadways. These heavy-duty trucks will also provide concrete for the turbine pads and footings. In addition to concrete and gravel trucks, lighter duty trucks will deliver water from the City of Wasco to the site. Water will be needed for dust control during road construction and for concrete batch plants. Light-duty trucks carrying electrical equipment and materials required for connection to existing power lines will also be present.

Facility construction is anticipated to take 10 months beginning in early 2007. During construction, an estimated average workforce of 125 people will be employed, with a maximum of 250 people during the peak months of construction. Construction workers will be hired locally for road and turbine pad construction as local expertise and availability permit. These local workers most likely will come from the nearby City of The Dalles and are anticipated to take I-84 eastbound to US 97 southbound to the Facility site. Some workers from outside the local area might temporarily relocate to communities closer to the Facility site. Workers needed for specialized construction (e.g., substation and electrical transmission construction, turbine erection, turbine testing) might come from areas outside the County, but when feasible, preference will be given to local workers.

An estimated 15 to 20 full-time personnel will be required for operations and maintenance of the Facility. It is assumed that these workers will be hired locally, with the exception of specialized personnel who might come from outside the area. It is assumed that Facility operations will begin in early 2008 and continue for at least 30 years.

U.3 PUBLIC AND PRIVATE PROVIDERS IN THE ANALYSIS AREA

OAR 345-021-0010(1)(u)(B) *Identification of the public and private providers in the analysis area that would likely be affected;*

Response

U.3.1 Population Within Analysis Area

While the Facility itself is entirely within Sherman County, the analysis area includes parts of Gilliam, Sherman, and Wasco counties and incorporated communities within a 30-mile radius of the Facility site (Figure U-1). Table U-1 presents historical population estimates for each of the counties and communities within the Facility area. The 2004 population for all of these communities is approximately 15,600, which accounts for about 56 percent of the entire population of Gilliam, Sherman, and Wasco counties. The largest community in the Facility area is The Dalles, located on the far western side of the Facility area in Wasco County. In 2004, The Dalles had a population of 12,410 people, accounting for about 80 percent of the population in incorporated communities within the analysis area.

From 1990 to 2004, communities in the analysis area added population at varying rates. With the exception of Rufus in Sherman County, all of the communities experienced a more rapid average annual growth rate from 1990-2000 than from 2000-2004.

Table U-1 Historical Population of Communities within the Facility Area

	Population			Avg. Annual Growth Rate	
	1990	2000	2004	1990-00	2000-04
Gilliam	**1,717**	**1,915**	**1,900**	**1.1%**	**-0.2%**
Arlington	425	524	570	2.1%	2.1%
Sherman	**1,918**	**1,934**	**1,900**	**0.1%**	**-0.4%**
Rufus	295	268	270	-1.0%	0.2%
Wasco	374	381	380	0.2%	-0.1%
Moro	292	337	320	1.4%	-1.3%
Grass Valley	160	171	170	0.7%	-0.1%
Wasco	**21,683**	**23,791**	**23,900**	**0.9%**	**0.1%**
The Dalles	11,021	12,156	12,410	1.0%	0.5%

Sources: Center for Population Research and Census, 2005; U.S. Census Bureau, 1990, 2000

Growth has occurred throughout the analysis area, but appears to have occurred mainly in the western part of the analysis area in The Dalles, which has added nearly 1,400 people since 1990. Other communities have also added residents, but not to the degree experienced in The Dalles. Sherman County was the only county in the analysis area to

lose population between 1990 and 2004, unlike Wasco and Gilliam Counties, which have grown by approximately 10.2 and 10.7 percent, respectively.

U.3.2 Public and Private Providers

Transportation

The providers of transportation services in Sherman County include the Sherman County Public Works Department and the Oregon Department of Transportation (ODOT).

State, county, or local roadways might be temporarily affected by traffic increases from construction vehicles accessing the site. Potential construction and operational impacts to traffic safety or maintenance on state highways from this Facility are anticipated to be inconsequential, as the state highway system (I-84, US 97, and ORE 206; see Figure U-1) is constructed to design, safety, and load-bearing standards. These roadways can accommodate vehicles at the legal load limit, thereby reducing the potential for significant traffic safety and maintenance impacts. County and local roadways might require improvement before construction can begin, and might need to be monitored during construction to ensure and protect the quality of the roadway after the Facility is complete.

Sewers and Sewage Treatment

Most of the cities in the analysis area have sewer systems and treatment facilities. Rural residences in the area generally use onsite private septic systems for sewage disposal. No community in the analysis area currently provides sewers or sewage treatment to the Facility.

Water

Most of the cities in the analysis area have public water systems that serve their respective incorporated areas, but those systems will not be used or affected by the Facility. During construction, the City of Wasco will provide water via water trucks. An onsite well will be drilled to provide water during operations.

Stormwater Drainage

The larger communities in the analysis area provide stormwater drainage facilities in urban areas. Other stormwater drainage facilities, such as ditches, grading, and detention ponds, are provided in rural areas (e.g., for roads). Currently, no community in the analysis area provides stormwater drainage service to the Facility site, with the exception of minimal stormwater drainage facilities associated with public roads maintained by Sherman County.

Solid Waste Management

The incorporated communities in the analysis area provide solid waste management services to their respective incorporated areas. Currently, no community in the analysis area provides solid waste management services to the Facility site. Solid waste disposal for the Facility during construction and operations will be provided by private contract with a local commercial hauler or haulers (e.g., Sunrise Disposal and Recycling). The public landfill nearest to the Facility site is the Columbia Ridge Recycling and Landfill.

Housing

Housing is provided to varying degrees in all of the incorporated and unincorporated communities in the analysis area. In general, housing is not provided as a government service except for subsidized housing for low income persons through a variety of government loans and other incentives. Provision of housing in a given area depends on a number of factors, including the supply of appropriately zoned land, builders and developers, and the demand for housing by potential residents. There is no government housing on the Facility site.

Table U-2 presents housing supply and availability data for communities within the analysis area. The 2000 census indicates that there are more than 6,100 housing units in the communities within the analysis area. The three county region of Gilliam, Sherman, and Wasco counties reported over 12,600 units in 2000. Housing vacancy rates for 2000 ranged from 6.1 percent in The Dalles to 21.0 percent in Rufus. The six communities' average vacancy rate of approximately 7.5 percent is less than the State of Oregon's average of 8.2 percent. The average rate is skewed because The Dalles accounts for such a large part of the analysis area's total and reported a vacancy rate of 6.1 percent in 2000. Without The Dalles, the other communities' average vacancy rate was 16.4 percent.

Police Protection

Local police service is provided by most of the incorporated cities in the analysis area. Police service on the Facility site is provided by the Sherman County Sheriff's Office, which is located in Moro.

Fire Protection

The entire Facility area is served by rural service providers. Both the City of Rufus and the City of Wasco have their own volunteer fire departments.

The site will be equipped with fire protection equipment in accordance with the Oregon Fire Code.

Health Care

Because population density in the analysis area is relatively low, hospitals and health care services tend to be regional. The hospital nearest the Facility site is the Mid-Columbia Medical Center, located in The Dalles. Ambulance service in the area is

provided by private service providers that contract with Sherman County. Providers offer basic, intermediate, and advanced life support emergency medical care and transportation.

Table U-2 Housing Supply in Communities within the Analysis Area

	Population		Avg. Annual Growth Rate	Vacancy Rate
	1990	2000	1990-00	2000
Gilliam	**932**	**1,043**	**1.1%**	**21.5%**
Arlington	192	278	3.8%	18.0%
Sherman	**900**	**935**	**0.4%**	**14.8%**
Rufus	144	162	1.2%	21.0%
Wasco	182	199	0.9%	14.1%
Moro	136	144	0.6%	8.3%
Grass Valley	81	94	1.5%	21.3%
Wasco	**10,476**	**10,651**	**0.2%**	**11.7%**
The Dalles	4,843	5,246	0.8%	6.1%

Source: U.S. Census Bureau, 2000

Schools

Five school districts and 14 individual schools are located in the socioeconomic analysis area. The schools closest to the Facility are operated by the Sherman County School District. The elementary schools are located in Wasco and Grass Valley; the high school (grades 7-12) is located in Moro.

U.4 SERVICE PROVIDERS IN COMMUNITIES

OAR 345-021-0010(1)(u)(C) *A description of any likely adverse impact to the ability of the providers identified in (B) to provide the services listed in OAR 345-022-0110;*

Response

U.4.1 Economic and Demographic Impacts

Population

Communities in the Facility area could experience a temporary increase in population as construction workers migrate to the area during the 10-month construction period. The increase in population could possibly have an adverse impact on the communities within the Facility area, if the additional workers were to place a strain on public services and housing. However, adverse impacts are not expected. In-migration for construction-related employment, as well as permanent O&M employment, is expected to be limited, and beneficial impacts could result. Temporary construction-related jobs

filled from outside of the analysis area are anticipated to last no more than 10 months. During that time workers will probably stay in one of the area motels, eat at local restaurants, and purchase other amenities such as gas and groceries, all having a beneficial impact on the local economy.

It is the desire of the Applicant to hire residents from the local communities to fill the long-term operational jobs. Some positions might require a certain skill set that will not be available locally. In-migrant operational staff and their families will not have a significant impact, either adverse or beneficial, on local population, particularly in Sherman County, which has lost population since 1990. Assuming 20 percent of the O&M positions are filled from outside the analysis area, approximately 12 new residents will be added to Sherman County's population, assuming all relocated within Sherman County and not in another county.

Economic Activity

The Facility is not expected to have an adverse impact on economic activity in the Facility area. Rather, revenues generated from purchases of goods and services in the local economy will be a benefit for public services, including schools and others services. Although Gilliam and Wasco counties will gain no revenues from the site operation through tax payments, residents from communities within those counties might be employed during the construction or operation phase of the Facility. Income earned by those individuals as a result of the proposed Facility will contribute to the local economy indirectly through local purchases. In addition, the proposed Facility itself will purchase goods and services from local and regional businesses—from facility maintenance services to office equipment to business services. Lease payments to local landowners will also benefit the local economy, because it is likely that a portion of the lease payments will be spent in nearby communities. A net inflow of dollars into the local economy will result, with a beneficial effect beyond that of the new employment.

Tax Revenues

No adverse impacts on County tax revenues are expected. Rather, annual property tax revenues to the County will increase as a result of the Facility. In addition, development of this Facility will lead to increased value of other properties because of the increase in wages and overall economic activity in the analysis area. The additional tax revenue generated by the Facility will increase the County's resources for providing roadways, police, and fire protection, and other services to its citizens.

U.4.2 Sewers and Sewage Treatment

Construction

The only sewage services required by the Facility during construction will be related to the handling of sewage from contract portable toilets. Because the sewage demands of the Facility will be minimal and temporary, no adverse impacts are anticipated.

Operations

The Applicant will install kitchen and bathroom facilities at its operation and maintenance building. The domestic-strength waste will be treated by the building's onsite septic system. No other sewage treatment will be needed for Facility operations. As described in (D), no adverse impacts are anticipated.

U.4.3 Water

Construction

It is estimated that approximately 12 million gallons of water will be required for construction activities. Peak day demand for Facility construction could reach 125,000 gallons per day. The City of Wasco will probably provide all of the water needed for construction. As demonstrated in Exhibit O, Wasco has adequate water to supply the Facility without impairing supply to existing users.

Operations

In extremely dry regions, maintenance of wind energy facilities must include turbine blade washing. Precipitation at the Biglow Canyon Wind Farm Facility, however, is adequate for keeping the blades reasonably clean, and wash water for the blades will not be required regularly during operations. It is possible that a contractor might conduct occasional blade washings. In this case, the contractor will purchase water from a private or municipal source with a valid water right.

The Facility will get its water from an onsite well. Water use is expected to average no more than 1,000 gallons per day and therefore require no water right permit. As water use for Facility operations will be only a small part of total agricultural water use in the Facility area, there will be no adverse impacts on existing water rights or on water use, and adequate water is available for intended uses.

U.4.4 Stormwater Drainage

Construction

Stormwater drainage impacts could occur during construction of new roads, staging areas, and turbine foundations. Application of the erosion control measures developed pursuant to the Facility's National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit No. 1200-C will prevent adverse impacts related to construction of these facilities. The Facility will be designed to maintain existing stormwater drainage patterns. Exhibit E discusses the 1200-C permits in more detail.

Operations

Through proper site design and other procedures described for construction activities in (D), no adverse impacts on stormwater drainage are anticipated during operations.

U.4.5 Solid Waste Management

Construction and Operations

Potential impacts from the Facility on the ability of communities to provide solid waste management services could result if the solid waste management needs from the Facility (during either construction or operations) could not be met through existing facilities and/or if meeting those needs interfered with the ability of service providers to meet other community waste management needs (e.g., if local landfill capacity were inadequate to handle the needs of the Facility). As described in (D), no such impacts from construction or operations are anticipated.

U.4.6 Housing

If in-migration were to result in a shortage of available housing, there could be adverse impacts on housing supply and rental costs. However, as described in (D), it is unlikely that the Facility will lead to significant adverse impacts. High vacancy rates reflect an adequate supply of housing (see Table U-2).

Construction

Typical housing options for temporary workers include campgrounds and other areas where workers can park trailers or other mobile housing, as well as motels, hotels, and apartments or other short-term rental homes. These types of temporary housing will be most available in the larger communities. According to employment and population projections for the Biglow Canyon Wind Farm Facility, temporary housing could be required for up to 175 new households during the peak construction period and for about 100 new households on average during the 10-month construction period. As described in (D), no significant adverse impacts on the ability of communities to provide housing are anticipated.

Operations

Permanent housing for about four new households will be required starting in 2007. As described in (D), no significant adverse impacts are anticipated.

U.4.7 Transportation

Traffic Volumes and Roadways

To evaluate the possible impacts of construction traffic associated with the Facility, traffic volumes for state highways that are part of the expected transporter routes were obtained. The Oregon Department of Transportation's (ODOT) Traffic Volume Tables for 2000 through 2004 were consulted for segments of the routes (ODOT, 2005a). Volumes were available from ODOT for all state routes on the system, which include segments of I-84 and US 97.

Sherman County was also consulted for traffic volumes on major county roads that might be used. Because of the rural nature of the area, the County does not monitor

traffic volumes on a yearly basis. However, Sherman County Road Department staff provided a qualitative description of traffic volumes on the roadways indicating that volumes are minimal; there is substantial traffic on roadway in the area only during harvest times for various crops.

Table U-3 shows the average daily traffic (ADT) volumes for the past 5 years on I-84, US 97, and ORE 206 at various milepost locations that will be included as part of the potential transporter routes. Interstate 84, also known as the Columbia River Highway Number 2, includes two paved lanes in each direction separated by barriers between the east and westbound lanes. Paved shoulders vary from 4 to 10 feet. US 97, also known as Sherman Highway Number 42, consists of one paved lane in each direction. These lanes are protected by guardrails in most areas but there are no barriers between lanes going opposite directions. US 97 covers hilly, rolling terrain between I-84 and the Facility site access in Wasco. ORE 206 is a two-lane, undivided rural roadway, with minimal widths of paved shoulders along most of its length.

Table U-3 Oregon State Highway Traffic Volumes and Lane Numbers (2005)

Highway	Location	Milepost	Number of Lanes	2000 ADT	2001 ADT	2002 ADT	2003 ADT	2004 ADT
I-84	East of ORE 206	97.44	4 with barrier	13700	13900	14400	14500	14400
I-84	East of US 97	104.86	4 with barrier	10800	11000	11000	11100	11000
I-84	East of Rufus	110.25	4 with barrier	10700	10800	10900	11000	10900
US 97	South of ORE 206	0.04	2 undivided	3100	3100	3200	3100	3100
ORE 206	West city limits of Wasco	15.07	2 undivided	400	330	340	350	380

Source: ODOT, 2005a,b

This table shows that traffic on most of the roadway segments within the Facility area has remained fairly constant over the past 5 years, increasing by less than 2 percent. The only segment steadily increasing in volume is I-84 near milepost 97.44, where the volume has increased by approximately 5 percent since 2000.

Pavement Conditions

Pavement conditions might have a relationship to traffic safety issues. Poor pavement with potholes might cause vehicles to swerve, resulting in unsafe vehicle operation. ODOT's Pavement Condition Map was consulted for District 9 (ODOT, 2003). Table U-4 shows the pavement condition on the map for state highways expected to be used as transporter routes.

A review of roadway conditions indicates poor conditions on US 97 between I-84 and the Wasco-Heppner Highway. This segment is included as a potential transporter route, so the condition will be reviewed before any construction traffic is added. If conditions are determined to be unsafe for construction traffic, the Applicant will discuss improvement options for the roadway with ODOT before construction starts.

Table U-4 Pavement Conditions

Highway	Pavement Condition
I-84	Good
US 97 (between I-84 and Wasco-Heppner Hwy.)	Poor
US 97 (South of Wasco-Heppner Hwy.)	Very Good
ORE 206	Good

Source: Oregon Department of Transportation, District 9, Pavement Condition Map, 2003.

Assuming that roadways are deemed safe for construction traffic, a system for monitoring degradation to pavement during construction will be developed. Roadways will be monitored for degradation (such as major potholes) so that safe travel paths can be maintained. The monitoring system could include site inspection and photographic cataloguing of existing road conditions so that pre-construction conditions can be compared with conditions after construction has been completed. The Applicant will discuss monitoring methods and preferred mitigation efforts with Sherman County Public Works and with ODOT before construction starts.

Pavement conditions on local county roadways vary from paved to dirt or gravel. For most segments of county road that will be used as transporter routes, the surface is paved. Major segments of transporter routes that include sections of gravel include Klondike Road between ORE 206 and Oehman Road, Herin Lane east of Oehman Road, Emigrant Springs Road east of Rayburn Road, and Biglow Road north of Emigrant Springs Road. These gravel road segments will be evaluated before and after construction of the Facility to determine what, if any, degradation has occurred. The roadway will be repaired to existing conditions or better.

Construction Traffic Volumes

Facility construction is not expected to result in traffic safety impacts. Although high volumes of vehicle and truck traffic might be added to the roadways in Sherman County, safety and traffic flow will be monitored to avoid adverse effects.

The size and weight of the vehicles are of concern largely in areas where roadways are designed for less than the legal load limit of 80,000 pounds, or where pavement conditions are poor. Oversize transporter trucks will be needed to bring in the parts of each turbine. Five oversize trucks are estimated per turbine: one overweight truck for the nacelle, one overlength truck for the blades, and three overlength trucks for the tower segments. Additional oversize vehicles will be required for transport of large construction operating equipment (cranes, bulldozers, etc.).

To estimate the number of construction trips the Facility will potentially produce, a similar wind facility (Stateline 1) is used for comparison. Stateline 1 involved the construction of a total of 127 turbines in Oregon. It was estimated that 12,956 trucks

would be required (roughly 105 trucks per turbine). These truck deliveries could include large turbine components, construction machinery, concrete mixing materials, electrical equipment, and water. Using this estimate, the anticipated 225 turbines of the Biglow Canyon Wind Farm Facility would require approximately 23,625 trucks for construction. Assuming approximately 10 months of construction, at 20 workdays per month of construction (possibly more workdays during the peak period of construction), this equates to approximately 260 truck trips per day added to background traffic patterns (130 trucks with one inbound trip and one outbound trip).

As previously established, I-84 has an ADT ranging from 10,900 vehicles to 14,400 vehicles within the Facility area. The Facility would cause an increase in traffic of less than 3 percent through all segments of I-84, and effects would be inconsequential. Similarly, an increase of up to 260 trips per day would raise the daily traffic volumes on US 97 by approximately 8.5 percent, a small percentage of total traffic. Delivery vehicles would be advised to avoid peak traffic hours (morning and afternoon commuting periods) of the surrounding communities to minimize the effects of construction.

In summary, the volumes of traffic that will be generated by the Facility represent a minimal amount of traffic with respect to the state highway system average daily traffic volumes. Based on traffic trips on transporter routes, construction of the Facility is not expected to have any traffic safety impacts to the state highway system.

Existing county roadway facilities included as part of the Facility's transporter routes will experience an increase in traffic volumes during construction, but traffic operations are anticipated to remain acceptable. Because of the rural nature of the area, the roadway currently supports very few trips and still has ample capacity. Additional construction traffic will increase the volume of vehicles on the roadway, but not to the point where capacity is reached. Therefore, even with traffic increases, construction is not anticipated to cause adverse affects to traffic operations.

Construction Traffic and Design Standards

State highways are designed and constructed to accommodate legal loads of 80,000 pounds without a permit. During the course of construction, it will be necessary for trucks exceeding the legal load limit to access the site via state highways. These trucks will be delivering turbines and other heavy construction equipment. Prior to construction, the transportation contractor will consult ODOT to determine if any segments of roadway or bridges are restricted for travel, as well as obtain any heavy haul permits required to allow transport of these loads. Because the state highways are built to accommodate overweight vehicles with permits, impacts to safety or roadway pavement conditions are not anticipated.

The contractor must also obtain authorization from Sherman County before proceeding with overweight loads on county maintained roadways. Sherman County roadways may be constructed to lower standards than the state highway system, and will be rated before construction to determine any special requirements or conditions for transport of overweight or oversize vehicles. These conditions would be imposed so that traffic safety and roadway integrity will be maintained.

All travel conditions and transportation equipment requirements set forth by either ODOT or Sherman County will be strictly adhered to.

Operational Impacts

Operational traffic impacts associated with the Facility are not anticipated. Operational trips include employees traveling to work in their personal vehicles, as well as specialized personnel required for inspections of the turbine strings who might travel in light-duty trucks. The occasional delivery truck might also access the site during operations. As discussed previously, construction of the Facility is not anticipated to cause adverse impacts on transportation, and once completed, the Facility will require far fewer traffic trips along the transporter routes. Therefore, adverse impacts to the transportation network are not anticipated during operation of the Facility.

U.4.8 Police Protection

Construction and Operations

Communities could experience adverse impacts on their ability to provide police protection if the Facility itself were to result in an increased need for police services (e.g., protection from vandalism or other crime during construction or operations), or if the additional temporary and/or permanent population from the Facility were to result in increased need. As described in (D), the Facility will not have an adverse impact on the ability of communities in the Facility area to provide police protection or law enforcement services.

U.4.9 Fire Protection

Construction and Operations

Adverse impacts on fire protection services could occur if Facility construction or operations, or the increased population associated with either, were to result in an increase in fires or in other needs for fire protection services beyond the ability of local fire departments to provide those services. During Facility construction, there could be some risk of accidental grass fires on the site. However, as described in section (a)(v) of Exhibit B and section D of this exhibit, Facility fire protection measures will minimize the risk of such fires and the Facility will not have an adverse impact on the ability of communities in the Facility area to provide fire protection services.

U.4.10 Health Care

Construction and Operations

Impacts on health care could occur if Facility construction activities and/or increases in temporary residents (during construction) and permanent residents (during operations) were to result in an increase in the use of routine and emergency health care services exceeding the capacity of local providers. As described in (D), impacts to health care services are anticipated to be minor.

U.4.11 Schools

Construction

Because construction work for the Facility will be short term and temporary, and because peak construction will occur during the summer months, no new students are anticipated in association with Facility construction. Therefore, no impacts on schools will result.

Operations

Assuming that about four new permanent households result from the Facility, approximately eight new school children (assuming two children per household) could move to the analysis area. As described in (D), no significant adverse impacts on schools are anticipated.

U.5 ADVERSE IMPACT TO THE ABILITY OF PROVIDERS TO PROVIDE SERVICES

OAR 345-021-0010(1)(u)(D) *Evidence that adverse impacts described in (C) are not likely to be significant, taking into account any measures the applicant proposes to avoid, reduce or otherwise mitigate the impacts; and*

Response

U.5.1 Economic and Demographic Impacts

The number of new temporary construction jobs and new permanent full-time and part-time jobs created from Facility construction and operations will represent less than 1.5 percent of total employment in the analysis area (Oregon State Employment Department, 2005). Because the Facility and the jobs will be located in an unincorporated part of the County, they will not substantially change the employment base of the County or that of a specific city or town.

U.5.2 Sewers and Sewage Treatment

Construction

During construction, contract portable toilets will be used. Sewage from portable toilets will be pumped regularly and disposed of at a local treatment facility.

Operations

Orion will install kitchen and bathroom facilities in its operation and maintenance building. In this case, the Facility will be served by an existing onsite sewage disposal (septic) system.

Because the Facility's sewage needs will be minimal during both construction and operations, the Facility will not have any significant adverse impact on the ability of any community in the area to provide sewers or sewage treatment.

U.5.3 Water

Construction

As indicated earlier, up to approximately 12 million gallons will be required for construction of the Facility. Peak day demand for construction is expected to range up to 125,000 gallons per day (mgd). The City of Wasco will provide the Facility's water during construction and the expected demand will not injure an existing water right or exceed the amount of water available to the City of Wasco or its ability to deliver water to other customers.

Operations

Orion will install kitchen and bathroom facilities in its operation and maintenance building. A nominal amount of water will be used for domestic purposes—no more than a total of 1,000 gallons per day, which will come from an onsite well and will not affect municipal water sources within the analysis area.

U.5.4 Stormwater Drainage

Construction

New and improved roads constructed as part of the Facility will be designed to maintain existing drainage patterns. Construction of roads, turbine foundations, and other Biglow Canyon Wind Farm facilities will be regulated by an erosion control plan and NPDES 1200-C construction permit that will require best management practice to minimize possible impacts from erosion or other impacts to soils. The Facility will use existing roads whenever possible; work on the access roads will include grading and regraveling of existing roads and construction of new roads.

Erosion control measures that will be followed during Facility construction and operation could include the following:

- Maintenance of vegetative buffer strips between the areas affected by construction activities and any receiving waters
- Installation of sediment fence/straw bale barriers at locations shown on the plans
- Straw mulching and discing at locations adjacent to the road that have been affected
- Planting of designated seed mixes at affected areas adjacent to the roads
- Creation of some construction equipment staging areas during the road work
- Installation of a sediment fence along the downslope side of disturbed areas as necessary, to minimize erosion

Areas that suffer impacts from the construction will be seeded in the fall when there is adequate soil moisture. They also will be reseeded in the spring if a healthy cover crop

does not grow. The sediment fence, check dams, and other erosion control measures will remain in place until the affected areas are well vegetated and the risk of erosion had been eliminated.

To the extent possible, haul truck traffic will be limited to improved road surfaces, limiting soil compaction and disturbances. Mitigation efforts to reduce impacts related to soil compaction will include scarifying and reseeding of affected areas after construction is completed. Proper erosion control methods will be employed to limit soil loss related to water and wind action, and all disturbed areas will be reclaimed at the end of construction activities.

Quarry stone or other similar materials will be used in the drainage ditches to mitigate the potential for erosion of the soil. Repair of underground cables could also be required during operations. Exposition of soils during these repairs would be localized and of short duration, and the potential for erosion would be minimal. Sand bags, straw bales, and silt fences could also be used to restrict erosion if periods of precipitation during repair are forecast.

All areas affected by the construction will be seeded when weather permits and when there is adequate soil moisture. They would be re-seeded in the following growing season if a healthy cover crop does not grow. The sediment fence and check dams will remain in place until the impacted areas are well vegetated and the risk of erosion has been eliminated. The property owner will then remove the sediment fence.

Given the erosion control plan and the measures that will be used to prevent and control adverse impacts during construction of the Facility, there will be no significant adverse impacts on the water quality of any receiving waters. In addition, the Facility will not alter existing drainage patterns, and, therefore, will not have adverse impacts on the ability of any community in the area to provide stormwater drainage.

Operations

Adherence to the site design and erosion control guidelines outlined for construction will prevent stormwater drainage impacts during operations as well. No adverse impacts on the ability of any community to provide stormwater drainage are anticipated from Facility operations.

Should the Energy Facility be retired, structures will be removed to 3 feet below the ground surface and soil surfaces will be reseeded, with the exception of the improved farm roads. The retirement plan is described in Exhibit W. The decision whether to reclaim new or expanded access roads will be left to the individual landowners.

Decommissioning requirements will include strict implementation of erosion control measures when soil is exposed to prevent erosion. In addition to re-vegetation requirements, erosion control measures will include the use of silt fences, straw bales, mulching, check dams, and other similar erosion control methods.

U.5.5 Solid Waste Management

Construction

As described in Exhibit G, little construction waste will require offsite disposal and very little solid waste will be generated during Facility operations. The landfill nearest the Facility site is the Columbia Ridge Recycling and Landfill. The Facility is not expected to have any significant adverse impact on the ability of any community in the area to provide solid waste management services.

Operations

As described in Exhibit G, only minimal amounts of solid waste will be generated by the Facility during operations. The Facility, therefore, will not have any significant adverse impact on the ability of any community in the area to provide solid waste management services.

U.5.6 Housing

Construction

Motels, hotels, and trailer or recreational vehicle (RV) parking would be the most available housing option for temporary residents. An internet search identified over 750 hotel and motel rooms within the analysis area in The Dalles, Moro, Rufus, Biggs, and Wasco (The Dalles Area Chamber of Commerce, 2005; Travel Oregon, 2005). Additional rooms might be available in establishments that do not have information on the internet. Furthermore, additional rooms might be available in communities in Washington State within 30 miles of the Facility (e.g., Goldendale, Washington). Additional temporary housing will be available in overnight facilities located at Oregon state parks and private RV campgrounds. Memaloose and Deschutes state parks together have nearly 100 sites that can accommodate RVs, as well as 67 tent sites (Oregon State Department of Parks and Recreation, 2005). Although not all of these housing facilities will be available at any given time, there is an adequate supply in relation to the anticipated number of temporary workers.

Operations

For the four new permanent households anticipated as a result of Facility operations, it is assumed that adequate opportunities will be available to purchase housing and/or to construct new housing within the analysis area. As discussed in Section B, there is a supply of vacant housing in the analysis area.

Given the factors described in this section and the general availability of housing opportunities, no significant adverse impacts on the ability of communities to provide housing are anticipated from Facility construction or operations.

U.5.7 Transportation

Adverse construction and operational impacts to traffic safety or travel times from the Facility are not anticipated.

Although construction-related traffic might cause short-term traffic delays (because of large delivery trucks), delays will be temporary and will be mitigated with measures that further minimize impacts. These measures could include:

- Providing notices to adjacent landowners when construction takes place to help minimize access disruptions
- Providing proper road signage and warnings of "Equipment on Road," "Truck Access," or "Road Crossings"
- Implementing traffic diversion equipment (such as advance signage and pilot cars) whenever possible when slow or oversized loads are being hauled
- Encouraging carpooling for the construction workforce to reduce traffic volume
- Employing flaggers as necessary to direct traffic when large equipment is exiting or entering public roads to minimize risk of accidents
- Maintaining at least one travel lane at all times so that roadways will not be closed to traffic as a result of construction vehicles entering or exiting public roads

Advance warning in the form of signage and notices to landowners could reduce the effects construction vehicles have on county roadways. Notices provided to landowners ahead of time will raise awareness among citizens about temporary access disruptions and potential delays and enable them to adjust their travel accordingly. To further reduce the effects of construction vehicles, flaggers will efficiently guide large or oversize vehicles as they enter or exit any public roadway.

Although short-term delays might occur, at least one travel lane of the transporter route will be kept open at all times to maintain traffic operations. Flaggers will facilitate two-way traffic on one lane by alternately restricting travel directions. This method would not require lane closures, detours, or reroutes. Flaggers will also monitor through traffic on public roadways as necessary, so that they are not in conflict with construction vehicles.

Unlike large construction vehicles, the construction workforce would most likely travel during the morning and afternoon peaks of a typical workday. Carpooling will be encouraged among workers, which will mean fewer vehicles on the roadway during this time, thus reducing the effect of construction on typical commuters.

U.5.8 Police Protection

Construction and Operations

The additional temporary and permanent work force is not anticipated to create any significant concerns. A letter from the Sherman County Sheriff's Office confirms that they provide services in the area of the Facility (see Attachment U-1). If needed, backup law enforcement would be available from the Oregon State Police (The Dalles Area Command in The Dalles) and from local police in the surrounding jurisdictions. The relatively small number of new temporary and permanent residents is not anticipated to place significant new demands on the providers of police protection in the area. Therefore, the Facility would not have a significant adverse impact on the ability of communities in the Facility area to provide police protection or law enforcement services.

U.5.9 Fire Protection

Construction

A conversation with the Sherman County Emergency Services Director indicated that he had no concerns about Facility construction or operations with respect to providing fire protection services (Payne, 2005). This statement is confirmed by a letter to that effect (see Attachment U-1). Steps that will be taken for preventing fires during construction include establishing roads before accessing the site (to allow vehicles to stay away from grass), using diesel vehicles whenever possible (to prevent potential ignition by catalytic converters), avoiding idling vehicles in grassy areas, and keeping cutting torches and similar equipment away from grass.

Operations

The relatively small number of new temporary and permanent residents is not anticipated to place significant new demands on the fire protection forces that serve the area.

For the preceding reasons, the Facility will have no impacts on the ability of surrounding communities to provide fire protection during construction or operations.

U.5.10 Health Care

Construction and Operations

To reduce the potential for health and safety risks, the Applicant will require all onsite construction contractors to prepare site health and safety plans before they begin construction activities. Each plan will inform employees and others what to do in case of emergencies. Plans will include locations of fire extinguishers, important telephone numbers, and first aid techniques. Nearby hospitals, their addresses, and their contact information will be listed. The plans will be maintained during construction and operations. Additional preventive measures could be included, such as briefings with

local hospitals and emergency service providers, identification of an emergency helicopter or aircraft landing area, and coordination with local fire officials.

Impacts on local health care services will be minimized by careful management of site health and safety risks. The small number of new temporary and permanent residents is not expected to place significant new demands on the health care facilities that serve the area.

U.5.11 Schools

Construction and Operations

As described in (C), no demand for school facilities is anticipated during Facility construction. Only minimal demand is expected from the small increase in local population resulting from new permanent employees during Facility operations.

Actual impacts on schools will depend on the housing choices of new residents with children, which is unknown. Given the dispersed area in which new residents are likely to settle, the small number of new school children expected, and the number of schools available, it is unlikely that any one school will receive more new students than it can accommodate. As a result, no significant adverse impacts on the ability of communities to provide school services are anticipated as a result of Facility construction or operation.

U.6 MONITORING PROGRAMS

OAR 345-021-0010(1)(u)(E) *The applicant's proposed monitoring program, if any, for impacts to the ability of the providers identified in (B) to provide the services listed in OAR 345-022-0010;*

Response: Because the Facility will have no significant impacts on the ability of public and private providers to provide the listed services, no monitoring program is proposed.

The Facility contractor and the construction manager will be in ongoing contact with Sherman County Department of Public Works during Facility construction. The Orion construction manager will monitor the implementation of the traffic control procedures written into the contract specifications.

County roadways that are part of transporter routes might need to be improved to accommodate construction-related traffic. Dirt and gravel roads might need upgrades, as might paved roads in poor condition. All county roads used for transport will be evaluated prior to construction to document conditions. If any degradation to a road occurs during construction, the roadway will be repaired to previously existing conditions or better.

Once construction is complete, these improved county roads will remain in place, providing increased quality of travel for the public.

U.7 CONCLUSION

The evidence provided in this exhibit demonstrates that the Council's community services standard has been met, because the Facility will not result in a significant adverse impact on the ability of any of the communities in the analysis area to provide the listed government services.

U.8 REFERENCES

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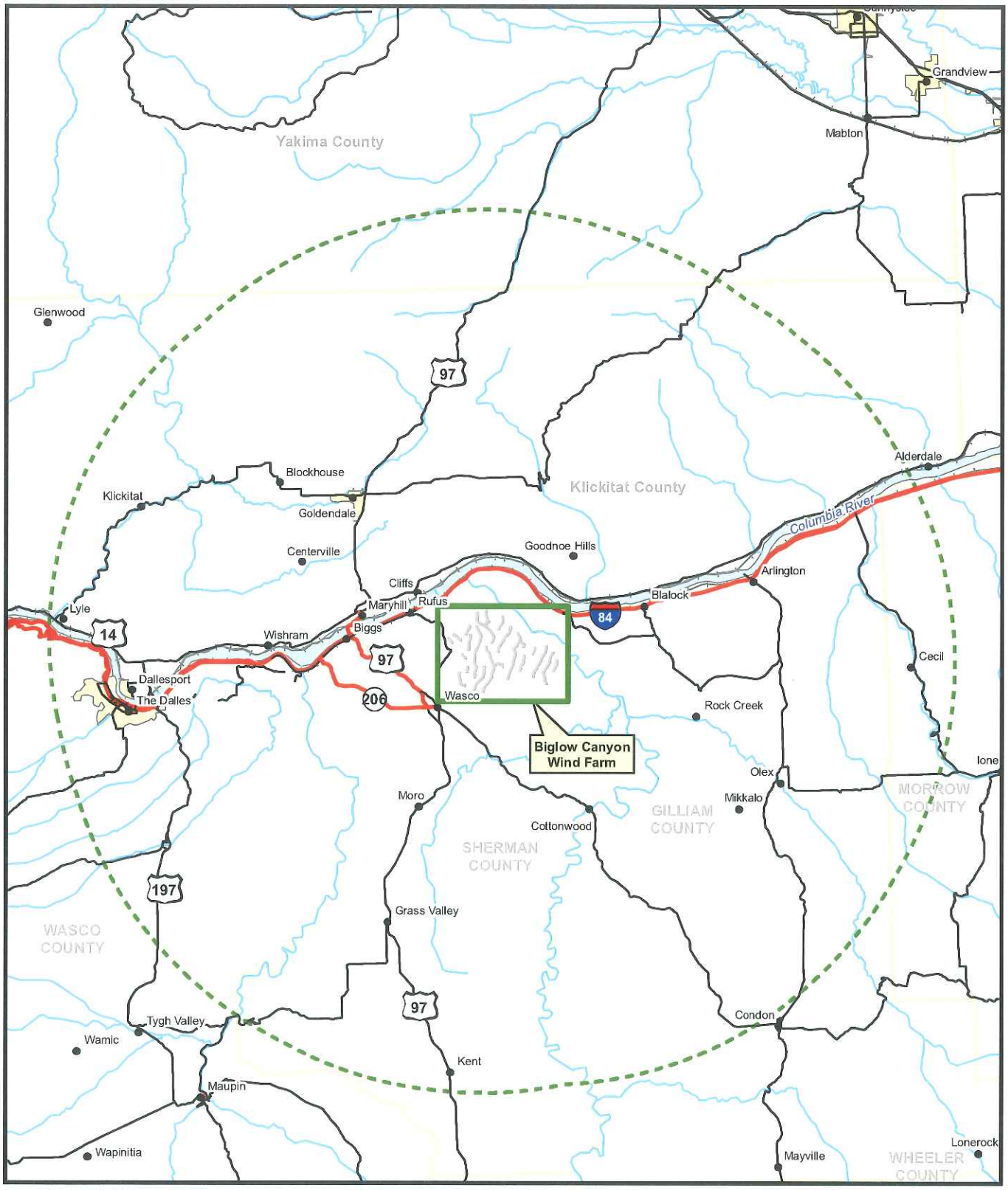
Figure



Legend

- Major Roads and Highways
- Major Transporter Routes
- Lakes and Rivers
- Proposed Turbine Corridors
- City Limits
- 30-mile Project Area Buffer

N

0 5 10 15

Miles

ORION ENERGY LLC

Figure U-1

Major Transporter Routes to the Biglow Canyon Wind Farm

Biglow Canyon Wind Farm

CH2MHILL

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ATTACHMENT U-1

Correspondence with Sherman County Sheriff's Office and Emergency Services Department

SHERMAN COUNTY
SHERIFF'S OFFICE
500 Court St. / PO Box 424
Moro, OR 97039
(541) 565-3622/Fx (541) 565-3312
Sheriff Brad Lohrey

September 12, 2005

Ms. Shana Alan
CH2M Hill
2300 NW Walnut Blvd.
Corvallis, OR 97330

Dear Ms. Alan:

The Sherman County Sheriff's Office is the primary response police agency for all of Sherman County.

The Biglow Wind Project is on the Local/North patrol area of our County. This project is in a relatively low crime area of our County.

The Sheriff's Office will respond appropriately and as necessary to all complaints that come from the Biglow Wind Project.

Sincerely,

Brad A. Lohrey, Sheriff
Sherman Co. S.O.

Sherman County Emergency Services
Shawn Payne, Director
309 Dewey Street
P.O. Box 139
Moro, Oregon 97039-0139
541.565.3100 541.565.3024 Fax

August 17, 2005

Shana Alan
CH2M HILL
2300 N.W. Walnut Blvd.
Corvallis, Oregon 97330

Dear Ms. Alan:

This letter is in response to our telephone conversation today. Fred Reser, North Sherman County RFPD Fire Chief and I have determined that the Biglow Project will not have a significant impact on Sherman County Emergency Services. This includes Sherman County Ambulance Service and North Sherman County RFPD. If you have any questions, please feel free to contact me at the above listed number.

Sincerely,

Shawn Payne

Shawn Payne, Director
Sherman County Emergency Services

EXHIBIT W

FACILITY RETIREMENT AND SITE RESTORATION

OAR 345-021-0010(1)(w)

TABLE OF CONTENTS

W.1 INTRODUCTION

OAR 345-021(1)(w) *Information about facility retirement and site restoration, providing evidence to support a finding by the Council as required by OAR 345-022-0050(1). The applicant shall include:*

(A) The estimated useful life of the proposed facility;

Response: For financial evaluation and contractual purposes, the Biglow Canyon Wind Farm Facility (Facility) is assumed to have a useful life of 20 to 30 years. However, the Facility could be "repowered" by replacing existing wind turbines, towers, and other infrastructure with new, more efficient turbines and related equipment. If the Facility were to be repowered, it could have a useful life longer than 30 years.

W.2 PROPOSED ACTIONS FOR FACILITY RETIREMENT AND SITE RESTORATION

(B) The actions that the applicant proposes for retirement of the facility and restoration of the site to a useful, non-hazardous condition;

Response: If the Facility is retired, Orion Sherman County Wind Farm LLC (Applicant) will obtain the necessary authorization from the appropriate regulatory agencies to proceed with decommissioning. A brief description of the decommissioning process follows.

The first step in decommissioning will be to dismantle turbines, towers, pad-mounted transformers, and related aboveground equipment. Turbine towers, nacelles, and pad-mounted transformers, for example, have considerable value and will be removed and sold. Unsalvageable material will be sold for scrap value or disposed of at authorized sites.

Subsequent steps in decommissioning will include removal of concrete turbine pads to an appropriate depth below the soil surface. The Applicant's agreements with landowners specify that in the event of project termination, the landowner may require turbine foundations to be removed to a depth of 3 feet below grade and soils to be restored. These landowner requirements will allow agricultural use of the Facility site after decommissioning has been completed. Reclamation procedures will be based on site-specific requirements and techniques commonly employed at the time the area is to be reclaimed, and will probably include regrading, to restore soil and original contours, and revegetation of all disturbed areas with native plant seed mixes or agricultural crops, as appropriate, based on the use of surrounding lands.

One of the final steps in decommissioning will be to remove Facility roads. Decommissioned roads will be reclaimed to restore the surface grade and soil to a condition useful for either agriculture or wildlife habitat, depending on the use of surrounding lands. Roads also could be left in place, based on landowner preference. It is expected that landowners generally will want the Applicant to decommission the new access roads built for the Facility, but not the widened sections of farm roads that pre-existed the Facility.

The parts of the Facility that will remain in place after decommissioning consist of the turbine foundations and the electrical and communication lines and conduits lying more than 3 feet below the ground surface.

All decommissioning activities will be consistent with a weed control plan approved by the County.

W.3 ESTIMATED COSTS OF FACILITY RETIREMENT AND SITE RESTORATION

(C) The estimated costs to retire the facility and restore the site to a useful, non-hazardous condition and a discussion of the methods and assumptions used to estimate retirement and restoration costs; and

Response: The cost of retiring the Facility will depend on the Applicant's choice of turbine vendor and, in particular, on the size and number of wind turbines installed. Consistent with the Applicant's "worst case" approach to this issue throughout the Application for Site Certificate (ASC), the following estimate is based on the case the Applicant deems to result in the greatest net retirement cost. This case is the minimum site layout of 225 GE 1.5-MW wind turbines.[1]

The Applicant estimates that the cost of retiring the Facility and restoring the Facility site will total $957,165 in 2005 dollars. This cost estimate is based on an itemized price quote from a contractor experienced in wind facility decommissioning, prepared for this Facility site location and for 225 GE 1.5-MW wind turbines (see Attachment W-1). This cost estimate includes removal of all the turbines and transformers, the substation, the aboveground transmission and collection lines, and the meteorological towers; excavation of the turbine foundations down to a depth of 3 feet; restoration of all soils to preconstruction grade; and reseeding, with appropriate seed mixes.

The scrap value of the steel in the turbine towers and nacelles is expected to equal $240.50 (in 2005 dollars) per metric ton. This is the seasonally adjusted price averaged over the last 48 months, available on the federal government's Producer Price Index (PPI) website, as shown at http://www.bls.gov/data/home.htm. There are approximately 167 metric tons of steel in the tower and nacelle of each 1.5-MW wind turbine. Thus the scrap value for the wind turbines in the Facility is expected to be $9,035,803. The net cost of retiring the Facility and restoring the site would therefore be the total gross cost of retiring the Facility and restoring the site, which is $9,905,953, less the scrap value of $9,035,803, for a resulting amount of $957,165.

The Applicant proposes to assume an additional 10 percent contingency, bringing the net retirement and restoration cost in 2005 dollars to $957,165. This amount will be sufficient to fund the restoration of the entire Facility site to a useful, nonhazardous

[1] The Applicant also seeks a site certificate condition that allows the site certificate holder to submit to the Department, prior to construction, a revised retirement cost estimate based on the actual turbine vendor, size, and number of turbines to be installed. Under delegated authority from the Council, and consistent with the methodological approach to retirement cost estimation approved in the site certificate, the Department would review this revised estimate and set the final amount of the required retirement security.

condition. Please see Exhibit M for a discussion of the Applicant's proposal to secure payment of this amount.

No amount has been included for cleanup and removal of hazardous substances because no such substances will be stored at the Facility site. The Facility is not expected to contaminate the soil in any way that requires cleanup at decommissioning. Although the Council typically imposes a hazardous substances cleanup contingency on gas-fired power plants (which store large quantities of fuel and other such substances), no such contingency is warranted here.

W.4 MONITORING PLAN

(D) For facilities that might produce site contamination by hazardous materials, any proposed monitoring plan, such as periodic environmental site assessment and reporting, or an explanation why a monitoring plan is unnecessary.

Response: A monitoring plan, such as periodic environmental site assessment and reporting, will not be necessary for this site because the Facility will not produce any site contamination by hazardous materials.

W.5 CONCLUSION

Based on the above information, the Applicant has satisfied the required OAR 345-021-0010(1)(w), and the Council may find that the standard contained in OAR 345-022-0050 has been satisfied.

ATTACHMENT W-1

Contractor Bid for Decommissioning

Blattner

D.H. Blattner & Sons, Inc.
400 County Road 50
Avon, MN 56310-8661
P: 320-356-7351
F: 320-356-7392
www.dhblattner.com

9/19/05

Mr. Pineda
Orion Energy LLC
1611 Telegraph Ave, Suite 1515
Oakland, CA 94612

RE: Sherman County Decommissioning Proposed Quantities

Mr. Pineda,

Blattner submits the following proposal for the removal of the Wind Turbine Generators, towers and foundations at the Sherman County wind Project.

The wind turbines and all auxiliary equipment associated with it shall be removed for salvage purposes and will be retained by the contractor. The foundation pads will be exposed to a depth of three (3) feet. Foundation slabs, walls, and bolts will be removed to a depth of three (3) feet below present grade. The transformer pads will be removed in their entirety including conduits to a depth of three (3) feet. Associated underground cable will be removed to extent possible, not exceeding three (3) feet. The foundation sites and roads will be graded to match the surrounding contours. All disturbed areas will be reseeded if topsoil is present at the site.

Price

225 GE 1.5 MW, 80 Meter tower	$ 9,905,953*
150 GE 3X MW, 80 Meter tower	$10,206,899*

*Value is based on 2005 dollar; no adjustments or predictions have been made for labor or equipment escalations for the time of actual decommissioning.

Please find the enclosed documents for inclusions, assumptions, and pricing information.
If you have any questions, please feel free to contact me at (320)-356-2351.

Respectfully,

Nik Maeder
D.H. Blattner and Sons, Inc.

Blattner

Project: Sherman County 1.5MW Machine
Owner: Orion
Location: Sherman County, OR
Date: 09/19/05

Wind Tower Decommission and Site Restoration Estimate

1.0 Substation Transformer

Substation:

	Quantity	Unit Cost	Extended	Assumptions
1.1 Removal of Substation	1 ea	$ 200,000.00	$ 200,000	Includes fencing, equipment and foundation removal
	Substation Totals:	$ 200,000.00	$ 200,000	

2.0 Turbines and Towers

Note A: Decommission of turbines and towers for this estimate will include demolition practices will be preformed in a manner enabling maximum resale/salvage of the unit.

Turbines: GE 1.5

Towers: 3 Section Steel - 80m

	Quantity	Unit Cost	Extended	Assumptions
2.1 Dismantle Turbine and Towers	225 ea	$ 22,500.00	$ 5,062,500	See Note A above
2.2 Disconnect Electrical within turbine and ready for disassembly	225 ea	$ 3,500.00	$ 787,500	
2.3 Removal of Transformers	225 ea	$ 1,000.00	$ 225,000	
	Turbine and Tower Totals:	$ 27,000.00	$ 6,075,000	

3.0 Tower Foundations

Note B: Tower foundations will be removed to a depth of three (3) feet below existing grade. Transformer foundations will be removed in their entirety. Conduits and connection will be removed to a depth of three (3) ft below grade. Foundation sites will be graded to match surrounding contours and restored to conditions that will support surrounding vegetation.

Type: Spread footings 48' Oct. - 16' Pedestal

	Quantity	Unit Cost	Extended	Assumptions
3.1 Foundation Removal, Disposal and Grading	225 ea	$ 7,610.00	$ 1,712,250	See Note B above
3.2 Transformer Pad Removal and Disposal	225 ea	$ 240.00	$ 54,000	
	Total per Foundation:	$ 7,850.00	$ 1,766,250	

4.0 Other Structures

Note C: Tower foundations will be removed to a depth of three (3) feet below existing grade. Junction boxes will be removed in their entirety. Conduits and connection will be removed to a depth of three (3) ft below grade. Sites will be graded to match surrounding contours and restored to conditions that will support surrounding vegetation.

	Quantity	Unit Cost	Extended	Assumptions
4.1 Meteorological Towers	4 ea	$ 5,500.00	$ 22,000	See Note C above
4.2 Junction Boxes	25 ea	$ 1,000.00	$ 25,000	
Total per Other Structures:			$ 47,000	

5.0 Tower Access and Site Roads

Note D: Aggregate base roads will be scarified and graded into adjacent soils to approximate existing topography, and covered with top soil from the site and vegetation re-established.

Type: 20' wide

	Quantity	Unit Cost	Extended	Assumptions
5.1 Roadway Obliteration	319,175 lf	$ 2.30	$ 734,103	See Note D above
5.2 Topsoil Respread	516 ac	$ 1,600.00	$ 825,600	50' wide path and 2/3 acre per WTG Site
5.3 Revegetation Seeding	516 ac	$ 500.00	$ 258,000	Per local Standards
Total per Other Structures:			$ 1,817,703	
Decommission Totals:			$ 9,905,953	

Blattner

Project: Sherman County 3.0MW Machine
Owner: Orion
Location: Sherman County, OR
Date: 09/19/05

Wind Tower Decommission and Site Restoration Estimate

1.0 Substation Transformer

Substation:

	Quantity	Unit Cost	Extended	Assumptions
1.1 Removal of Substation	1 ea	$ 200,000.00	$ 200,000	Includes fencing, equipment and foundation removal
	Substation Totals:	$ 200,000.00	$ 200,000	

2.0 Turbines and Towers

Note A: Decommission of turbines and towers for this estimate will include demolition practices will be preformed in a manner enabling maximum resale/salvage of the unit.

Turbines: GE 3.0x

Towers: 4 Section Steel - 85m

	Quantity	Unit Cost	Extended	Assumptions
2.1 Dismantle Turbine and Towers	150 ea	$ 45,000.00	$ 6,750,000	See Note A above
2.2 Disconnect Electrical within turbine and ready for disassembly	150 ea	$ 4,500.00	$ 675,000	
2.3 Removal of Transformers	150 ea	$ 1,000.00	$ 150,000	
	Turbine and Tower Totals:	$ 50,500.00	$ 7,575,000	

3.0 Tower Foundations

Note B: Tower foundations will be removed to a depth of three (3) feet below existing grade. Transformer foundations will be removed in their entirety. Conduits and connection will be removed to a depth of three (3) ft below grade. Foundation sites will be graded to match surrounding contours and restored to conditions that will support surrounding vegetation.

Type: Spread footings 48' Oct. - 16' Pedestal

	Quantity	Unit Cost	Extended	Assumptions
3.1 Foundation Removal, Disposal and Grading	150 ea	$ 7,610.00	$ 1,141,500	See Note B above
3.2 Transformer Pad Removal and Disposal	150 ea	$ 240.00	$ 36,000	
	Total per Foundation:	$ 7,850.00	$ 1,177,500	

4.0 Other Structures

Note C: Tower foundations will be removed to a depth of three (3) feet below existing grade. Junction boxes will be removed in their entirety. Conduits and connection will be removed to a depth of three (3) ft below grade. Sites will be graded to match surrounding contours and restored to conditions that will support surrounding vegetation.

	Quantity	Unit Cost	Extended	Assumptions
4.1 Meteorological Towers	4 ea	$ 5,500.00	$ 22,000	See Note C above
4.2 Junction Boxes	29 ea	$ 1,000.00	$ 29,000	
Total per Other Structures:			$ 51,000	

5.0 Tower Access and Site Roads

Note D: Aggregate base roads will be scarified and graded into adjacent soils to approximate existing topography, and covered with top soil from the site and vegetation re-established.

Type: 20' wide

	Quantity	Unit Cost	Extended	Assumptions
5.1 Roadway Obliteration	212,782 lf	$ 2.30	$ 489,399	See Note D above
5.2 Topsoil Respread	340 ac	$ 1,600.00	$ 544,000	50' wide path and 2/3 acre per WTG Site
5.3 Revegetation Seeding	340 ac	$ 500.00	$ 170,000	Per local Standards
Total per Other Structures:			$ 1,203,399	
Decommission Totals:			$ 10,206,899	

EXHIBIT X

NOISE

OAR 345-021-0010(1)(x)

TABLE OF CONTENTS

TABLES

FIGURES *(located after text)*

ATTACHMENT

X-1 Landowner Statements Regarding Noise Waivers

X.1 INTRODUCTION

OAR 345-021-0010(1)(x) *Information about noise generated by construction and operation of the proposed facility, providing evidence to support a finding by the Council that the proposed facility complies with the Oregon Department of Environmental Quality's noise control standards in OAR 340-035-0035. The applicant shall include:*

OAR-345-021-0010(1)(x)(A) *A baseline noise assessment for the proposed site and vicinity;*

Response: This exhibit provides a baseline noise assessment for the proposed Biglow Canyon Wind Farm Facility (Facility).

It is useful to understand how noise is defined and measured. Noise is defined as unwanted sound. Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. There are several different ways to measure noise, depending on the source of the noise, the receiver, and the reason for the noise measurement. Table X-1 summarizes the technical noise terms used in this exhibit.

Table X-1 Definitions of Acoustical Terms

Term	Definitions
Ambient noise level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the measured pressure to the reference pressure, which is 20 micropascals.
A-weighted sound pressure level (dBA)	The sound pressure level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighted filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted.
Statistical noise level (L_n)	The noise level exceeded during n percent of the measurement period, where n is a number between 0 and 100 (for example, L_{50} is the level exceeded 50 percent of the time)

Table X-2 shows the relative A-weighted noise levels of common sounds measured in the environment and in industry for various sound levels.

Table X-2 Typical Sound Levels Measured in the Environment and Industry

Noise Source At a Given Distance	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Impression
Civil defense siren (100 ft)	130		
Jet takeoff (200 ft)	120		Pain threshold
	110	Rock music concert	
Pile driver (50 ft)	100		Very loud
Ambulance siren (100 ft)			

Table X-2 Typical Sound Levels Measured in the Environment and Industry

Noise Source At a Given Distance	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Impression
	90	Boiler room	
Freight cars (50 ft)		Printing press plant	
Pneumatic drill (50 ft)	80	In kitchen with garbage disposal running	
Freeway (100 ft)			
	70		Moderately loud
Vacuum cleaner (10 ft)	60	Data processing center	
Department Store; Light traffic (100 ft)	50	Private business office	
Large transformer (200 ft)	40		Quiet
Soft whisper (5 ft)	30	Quiet bedroom	
	20	Recording studio	
	10		Hearing threshold

Source: Beranek, L.L., 1988

X.1.1 Study Area and Facility Site

The analysis area for noise impacts includes all areas in Oregon that could be affected by construction or operational noise resulting from the Facility.

The Facility site consists primarily of agricultural uses, with dryland wheat farming as the major crop in upland areas. In the upland area where the Facility will be located, scattered farm residences exist.

X.1.2 Existing Noise Conditions

In accordance with the recently revised Oregon Administrative Rules (OAR) addressing noise from wind energy facilities, this exhibit uses an assumed L_{50} ambient noise level of 26 dBA. For the OAR, the Facility is located on "previously unused" land, as defined in OAR Chapter 340, Division 35.

X.2 PREDICTED NOISE LEVELS

OAR-345-021-0010(1)(x)(B) *Predicted noise levels resulting from construction and operation of the proposed facility;*

Response

X.2.1 Construction

The U.S. Environmental Protection Agency (EPA) Office of Noise Abatement and Control studied noise from individual pieces of construction equipment, as well as from construction sites of power plants and other types of facilities (see Table X-3). Because specific information about types, quantities, and operating schedules of construction equipment is not known at this stage, data from the EPA document for industrial projects of similar size have been used. These data are conservative because the evolution of construction equipment has generally been toward quieter design. Use of these data is reasonable for estimating noise levels, given that they are still widely used by acoustical professionals.

Table X-3 Average Noise Levels from Common Construction at a Reference Distance of 50 feet (dBA)

Construction Equipment	Typical Average Noise Level at 50 ft, dBA
Air compressor	81
Backhoe	85
Concrete mixer	85
Concrete pump	82
Crane, mobile	83
Dozer	80
Generator	78
Grader	85
Loader	79
Paver	89
Pile driver	101
Pneumatic tool	85
Pump	76
Rock drill	98
Saw	78
Scraper	88
Shovel	82
Truck	91

Source: U.S. EPA, 1971

Table X-4 shows the total composite noise level at a reference distance of 50 feet, based on the equipment operating for each phase and the typical usage factor for each piece of equipment. The noise level at 1,500 feet is also shown. The calculated level at 1,500 feet is probably conservative, because the only attenuating mechanism considered was geometric spreading, which results in an attenuation rate of 6 dBA per doubling of distance; attenuation related to the presence of structures, trees or vegetation, ground effects, and terrain is not considered.

Table X-4 Composite Construction Site Noise Levels

Construction Phase	Composite Equipment Noise Level at 50 feet, dBA	Composite Equipment Noise Level at 1,500 feet, dBA
Clearing	88	58
Excavation	90	60
Foundation	89	59
Erection	84	54
Finishing	89	59

X.2.2 Operations

As described in Exhibit B, wind turbines will be sited within identified corridors approximately 500 feet wide. The locations of the turbine corridors are shown in Exhibit C, Figure C-2. The number of turbines in each corridor, the spacing between turbines, and their precise locations within the corridor will be determined by Orion Sherman County Wind Farm LLC (Applicant) prior to construction.

Wind turbines for this Facility will have an aggregate nominal nameplate generating capacity of up to 450 megawatts (MW). The turbines will consist of one of the following:

- Up to approximately 225 wind turbines, each with a nameplate capacity of approximately 1.5 MW (this Energy Facility layout is called the Minimum Turbine Layout)
- Up to approximately 150 wind turbines, each with a nameplate capacity of approximately 3.0 MW (this Energy Facility layout is called the Maximum Turbine Layout)
- Between 150 and 225 turbines, each with nameplate capacity of approximately 1.5 MW to 3.0 MW
- A Facility layout consisting of a combination of the foregoing

This exhibit evaluates operational noise levels for the Minimum Turbine Layout and the Maximum Turbine Layout based on the turbine characteristics identified in Table X-5 for two possible wind turbine options: the 1.5-MW General Electric (GE) wind turbine and the 3.0-MW GE wind turbine. The layouts evaluated are shown in Figures X-1 and X-2.

Table X-5 Characteristics of Analysis Turbines[1]

	GE 1.5 MW Turbine	GE 3.0 MW Turbine
Tower Type	Tubular	Tubular
Tower Height (meters)	80	85
Rotor Diameter (meters)	82.5	100

Table X-6 presents the maximum overall and octave band sound power levels for the 1.5-MW GE turbine, as provided by GE. Because the 3.0-MW turbine is relatively new, the noise levels for the 3.0-MW turbines are not yet available and were estimated by the Applicant to be 2 dB louder than the 1.5-MW turbines. The 1.5-MW GE turbines are the turbines permitted in the PPM Energy, Inc., Klondike II project and proposed for the Klondike III project.

Table X-6 Maximum Sound Power Levels

		Octave Band Center Frequency, Hz (A-weighted)							
	Overall	63	125	250	500	1,000	2,000	4,000	8,000
GE 1.5 MW	104	85	94	97	99	98	95	87	78
GE 3.0 MW[1]	106	87	96	99	101	100	97	89	80

[1] Estimated.

Each wind turbine was considered to be a point source of noise at hub height. Although not required by the rule, the octave band levels shown in Table X-6 were conservatively adjusted upwards by 2 dB in the model. This adjustment reflects the typical sound power levels warranted by the turbine manufacturer. Figures X-1 and X-2 present the noise contours for the Minimum Turbine Layout and the Maximum Turbine Layout, respectively, including the Facility substation.

After the precise turbine types and turbine layouts have been selected, and before construction of the Facility, the Applicant will submit for Oregon Department of Energy (ODOE) review the IEC 61400-11 or other appropriate noise test reports for the selected turbines, along with an acoustical analysis of the Facility. At that time, the Applicant will also submit to ODOE evidence that it has secured any necessary noise easements or non-occupancy agreements for sensitive receptors so that Facility noise levels will not exceed allowed levels under the applicable OAR standards. Based on the location of the surrounding noise sensitive receptors and the similarity between the noise contour lines for the Maximum Turbine Layout and the Minimum Turbine Layout, it is not anticipated that the general location and shape of the noise contour lines will change significantly when the exact turbines and precise layout are analyzed.

The high-voltage transmission lines associated with the Facility will be designed to ensure that audible noise from foul-weather corona will not exceed 50 dBA at the edge

[1] Information about GE turbines is presented in this exhibit for analysis purposes only; the Applicant has not made a selection of turbine vendor.

of the right-of-way (refer to Exhibit AA). Transformers are expected to have a National Electrical Manufacturers Association (NEMA) sound rating of 87 dBA.

X.3 COMPLIANCE WITH OAR 340-035-0035

OAR 345-021-0010(1)(x)(C) *An assessment of the proposed facility's compliance with the applicable noise regulations in OAR 340-035-0035;*

Response:

X.3.1 Summary of Regulations

OAR Chapter 340, Division 35, was recently revised to specifically address wind energy facilities. Specifically:

- OAR 340-035-0035(1)(b)(B)(iii)(I) establishes the option for a proposed wind energy facility to assume a background L_{50} ambient noise level of 26 dBA.

- OAR 340-035-0035(1)(b)(B)(iii)(IV) requires a proposed wind energy facility to satisfy the ambient noise standard, where a landowner has not waived the standard, by predicting facility noise levels at the appropriate measurement point, assuming that all of the proposed wind facility's turbines are operating between cut-in speed and the wind speed corresponding to the maximum sound power level established by IEC 61400-11. These predictions are to be compared to the assumed ambient noise level of 26 dBA, or to the actual ambient background L_{10} and L_{50} noise level, if measured. The facility complies with the ambient background standard, if this comparison shows that the increase in noise is not more than 10 dBA over this entire range of wind speeds.

- OAR 340-035-0035(1)(b)(B)(iii)(VI) requires that the facility predict compliance with the "Table 8" limits set forth in the regulations, which are summarized in Table X-7. Compliance must occur at the appropriate measurement point, with reference to the turbine's maximum sound power level, following procedures established by IEC 61400-11, and assuming that all of the proposed wind facility's turbines are operating at the maximum sound power level.

Assuming an ambient level of 26 dBA, the maximum allowable noise level produced by the Facility, as measured at a sensitive receptor such as a home, is an increase of 10 dBA over the ambient level across the entire range of wind speeds between the cut-in wind speed and the wind speed corresponding to the maximum sound power level, or 36 dBA (26 dBA +10 dBA). In accordance with OAR 340-035-0035(1)(b)(B)(iii)(IV), the 36-dBA level must be complied with when all turbines operate at the maximum sound power level established by IEC 61400-11. At wind speeds corresponding to sound power levels less than maximum (for example, during cut-in wind speeds), the resulting noise level also will be less. Therefore, it is not necessary to predict noise levels for each wind speed

between cut-in and the maximum sound power level when assuming an ambient level of 26 dBA.[2]

Table X-7 State of Oregon Statistical Noise Limits for Industrial and Commercial Sources (OAR-340-35-0035)

Statistical Descriptor	Maximum Permissible Statistical Noise Levels (dBA)	
	Daytime (7:00 a.m. – 10:00 p.m.)	Nighttime (10:00 p.m. – 7:00 a.m.)
L_{50}	55	50
L_{10}	60	55
L_1	75	60

Note:

Based on "Table 8" of OAR-340-0035: New Industrial and Commercial Noise Source Standards and OAR-340-0035(1)(b)(B(i).

dBA = decibel (A-weighted scale).

If the Facility complies with the OAR 340-035-0035(1)(b)(B)(iii)(IV) limit of 36 dBA at a receptor, it necessarily also complies with OAR 340-035-0035(1)(b)(B)(iii)(VI), namely the Table 8 limit of 50 dBA, at that same receptor.

In addition to the foregoing limits, OAR 340-35-035(1)(f) establishes standards that regulate octave band sound pressure levels and audible discrete tones. Such standards can be applied by the Oregon Department of Environmental Quality (DEQ) when it believes subsections (1)(a), (b), or (c) (summarized in Table X-7) do not adequately protect the health, safety, or welfare of the public.

Impulse noise is also regulated in OAR 340-35-035(1)(d), but wind turbines do not generate impulse noise.

The noise limits apply at "appropriate measurement points" on "noise sensitive property." The "appropriate measurement point" is defined as whichever of the following is farther from the noise source:

- 25 feet (7.6 meters) toward the noise source from that point on the noise sensitive building nearest the noise source
- That point on the noise-sensitive property line nearest the noise source

"Noise-sensitive property" is defined as "real property normally used for sleeping, or normally used as schools, churches, hospitals, or public libraries. Property used in industrial or agricultural activities is not noise-sensitive property unless it meets the foregoing criteria in more than an incidental manner." Residences are the only noise sensitive property identified in the Facility area.

[2]At receptors that have not waived the 10 dBA increment, the 26-dBA "assumed ambient" results in a regulatory limit of 36 dBA under ALL wind speeds. Therefore, it is only necessary to model the loudest scenario that occurs at the wind speed corresponding to the maximum sound power level.

X.3.2 Construction

OAR-340-35-035(5)(g) specifically exempts construction activity. Therefore, by regulatory definition, there will be no construction noise impacts. Section X.2.1 and Table X-4 present the expected construction noise levels.

Decommissioning activities will be similar in type to the activities anticipated during the construction phase, but shorter in duration. Therefore, decommissioning will not cause a significant noise impact.

X.3.3 Operations

The maximum operational noise levels for the Minimum Turbine Layout and the Maximum Turbine Layout based on the turbine characteristics identified in Table X-5 are presented in Figures X-1 and X-2.

After the precise turbine types and locations have been selected, and before construction of the Facility, the Applicant will submit for ODOE's review an acoustical analysis of the Facility. This information will contain more precise noise contours, but based on available information, the contours are not expected to be significantly different from those in Figures X-1 and X-2.

At noise-sensitive receptors where the Facility noise level, as modeled in this subsequent information set, exceeds the Table 8 limit of 50 dBA L_{50}, the Applicant will provide ODOE with evidence that it has entered into a non-occupancy agreement with relevant landowners to document removal of the residence from residential use such that it will no longer satisfy the definition of "noise-sensitive property." At the two noise sensitive properties which Figures X-1 and X-2 show to be inside the 50 dBA L_{50} contour, the property owners have indicated they are willing to enter into non-occupancy agreements to document removal of the properties from residential use. At noise sensitive receptors where the noise level exceeds 36 dBA but is less than 50 dBA, the Applicant will provide ODOE with evidence that it has secured the necessary waiver/noise easement from the property owner consistent with the requirements of OAR-340-35-035.

X.4 DESCRIPTION OF PROPOSED MITIGATION MEASURES

OAR 345-021-0010(1)(x)(D) *Any measures the applicant proposes to reduce noise levels or noise impacts;*

Response: The Applicant proposes to secure necessary non-occupancy agreements and waivers/noise easements in order to ensure that Oregon noise standards are met at all noise sensitive receptors. Otherwise, there will be no significant operations noise impacts, and therefore, no further mitigation is planned. Attachment X-1 contains preliminary statements from landowners regarding their willingness to discuss and enter into noise waivers and/or non-occupancy agreements with the Applicant.

X.5 ASSUMPTIONS AND METHODS

OAR 345-021-0010(1)(x)(E) *The assumptions and methods used in the noise analysis; and*

Response: Standard acoustical engineering methods were used in the noise analysis. The noise model, CADNA/A by DataKustik GmbH of Munich, Germany, is a sophisticated software program that enables complete noise modeling of complex industrial plants. The sound propagation factors used in the model have been adopted from ISO 9613 (ISO, 1993) and VDI 2714 (VDI, 1988). Atmospheric absorption for conditions of 10°C and 70 percent relative humidity (conditions that favor propagation) was computed in accordance with ISO 9613-1, *Calculation of the Absorption of Sound by the Atmosphere*, as typically requested by ODOE. Reductions resulting from terrain shielding were not included (that is, the Facility site was conservatively assumed to be flat).

All turbines and substations were assumed to be operating at the sound power levels shown in Table X-8. The modeled turbine levels were increased 2 dBA above the estimated maximum sound power level shown in Table X-6.

Table X-8 Modeled Octave Band Sound Power Levels[1]

	Overall	Octave Band Center Frequency, Hz (A-weighted)							
	(dBA)	63	125	250	500	1,000	2,000	4,000	8,000
GE 1.5-MW Turbine	106	87	96	99	101	100	97	89	80
GE 3.0-MW Turbine[2]	108	89	98	101	103	102	99	91	82
Substation Transformers (87 dBA NEMA)[1]	107	84	96	98	104	101	97	92	83

[1] Transformers [that] are expected to have a National Electrical Manufacturers Association (NEMA) sound rating of 87 dBA.

[2] Estimated.

OAR 340-035-0035(1)(b)(B)(iii)(I) establishes the option for a wind energy facility to assume a background L_{50} ambient noise level of 26 dBA. If the Applicant elects not to make this assumption when presenting its acoustical analysis of the final turbine layout before construction, it will provide supporting data for the background L_{50} ambient noise level used.

X.6 MONITORING PROGRAM

OAR 345-021-0010(1)(x)(F) *The applicant's proposed monitoring program, if any, for noise generated by construction and operation of the facility.*

Response: A noise monitoring program is not proposed because of the absence of any predicted impacts. However, the Applicant proposes a Site Certificate condition for noise as described in the following paragraph.

After the precise turbine types and locations have been selected, and before construction of the Facility, the Applicant will submit for ODOE's review an acoustical analysis of the Facility, along with evidence that it has secured any necessary noise waivers/easement

agreements or non-occupancy agreements. These materials will confirm compliance with OAR-340-35-035. The Applicant will not construct the Facility until ODOE confirms that the Facility complies with OAR-340-35-035.

X.7 CONCLUSION

This noise analysis concludes that applicable DEQ noise regulations will be met for the construction and operation of the Facility.

X.8 REFERENCES

Beranek, L.L. 1988. *Acoustical Measurements.* American Institute of Physics. Woodbury, New York.

CADNA/A Version 3.5. 2005. Datakustik, GmbH, Munich, Germany. August 2005. http://www.datakustik.de/frameset.php?lang=en

International Electrotechnical Commission (IEC) 61400-11. 2002. *Wind Turbine Generator Systems – Part 11: Acoustic Noise Measurement Techniques.* Geneva, Switzerland.

ISO. 1993. *Acoustics – Sound Attenuation During Propagation Outdoors.* Part 1: Calculation of the Absorption of Sound by the Atmosphere, 1993. Part 2: General Method of Calculation. International Organization for Standardization (ISO) 9613. International Organization for Standardization, Switzerland.

VDI, 1988. *Outdoor Sound Propagation.* VDI (Verein Deutscher Ingenieure) 2714, Verlag GmbH, Dussledorf, Beuth Verlag, Berlin, Koln, Germany.

U.S. Environmental Protection Agency (EPA). 1971. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances.*

Figures

Figure X-1

Predicted Noise Contours Potential 1.5 MW Minimum Turbine Layout

Biglow Canyon Wind Farm

ORION ENERGY LLC

Legend

- Potential Turbine Locations
- Proposed Turbine Corridors
- 36 dBA Noise Contour
- 50 dBA Noise Contour
- Houses
- Proposed Turbine Access Road
- Existing Roads
- Existing Highways
- Proposed 34.5-kV Collector System
- Potential Substation Locations
- Proposed Transmission Line
- Existing Transmission Line
- Existing Substation
- Proposed Substation / Proposed O&M Facility
- Proposed O&M Facility
- Streams

N W E S

0 0.5 1 1.5 2

Miles

CH2MHILL

Source:
Map created using the following USGS, 7.5-Minute Quad Maps: Klondike (1971), Quinton (1976), Rufus (1971), and Wasco (1987)

File Path: \\rosa\proj\OrionEnergyLlc\326775\GIS\MapDocuments\EFSC\Site Certificate Application\FigureX-1 - Predicted Noise Contours.mxd, Date: October 12, 2005 11:32:59 AM

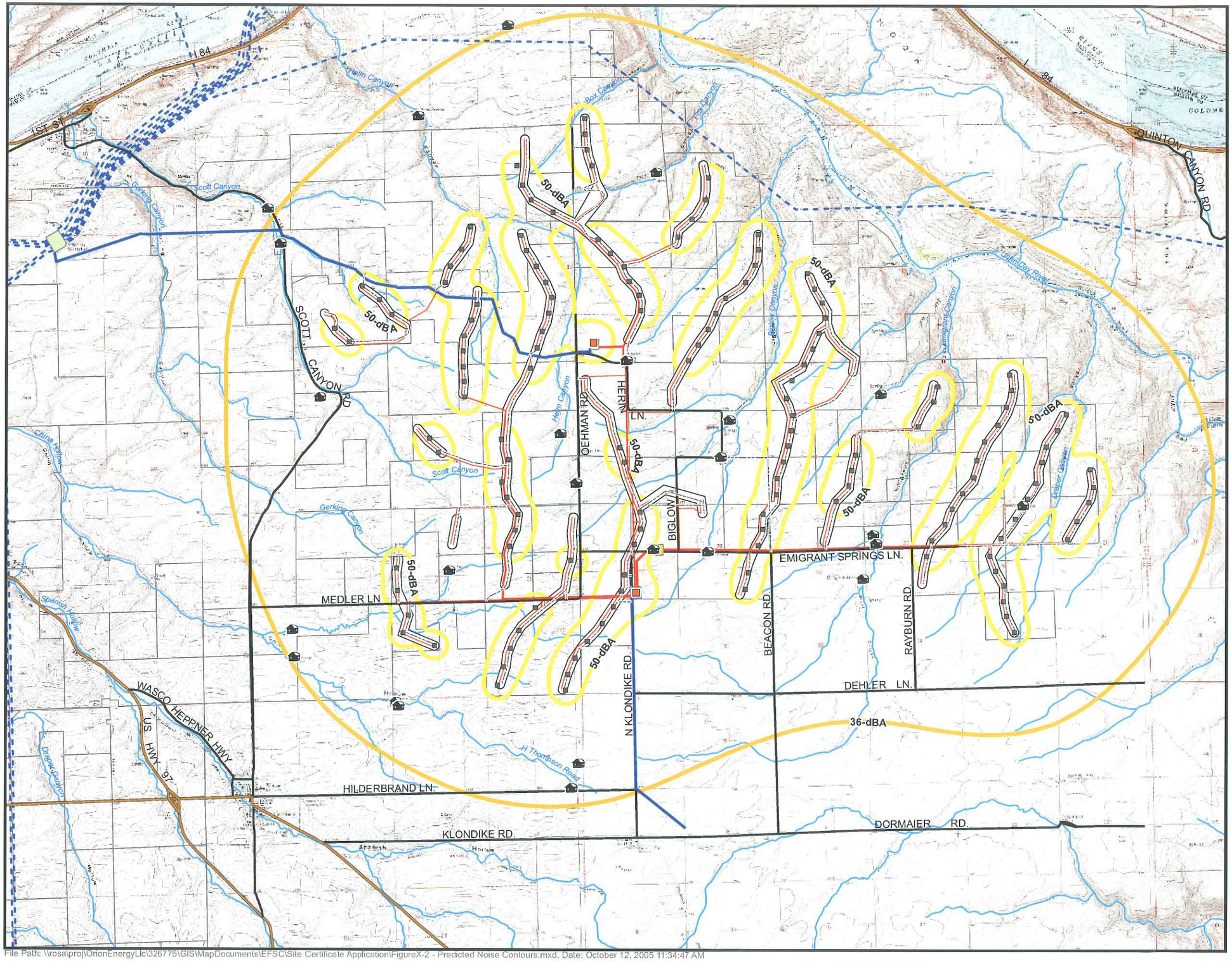


Figure X-2

Predicted Noise Contours Potential 3.0 MW Maximum Turbine Layout

Biglow Canyon Wind Farm

ORION ENERGY LLC

Legend

- Potential Turbine Locations
- Proposed Turbine Corridors
- 36 dBA Noise Contour
- 50 dBA Noise Contour
- Houses
- Proposed Turbine Access Road
- Existing Roads
- Existing Highways
- Proposed 34.5-kV Collector System
- Potential Substation Locations
- Proposed Transmission Line
- Existing Transmission Line
- Proposed Substation / Proposed O&M Facility
- Proposed O&M Facility
- Streams

N
W E
S

0 0.5 1 1.5 2
Miles

CH2MHILL

Source:
Map created using the following USGS, 7.5-Minute Quad Maps: Klondike (1971), Quinton (1976), Rufus (1971), and Wasco (1987)

File Path: \\rosa\proj\OrionEnergyLlc\326775\GIS\MapDocuments\EFSC\Site Certificate Application\FigureX-2 - Predicted Noise Contours.mxd, Date: October 12, 2005 11:34:47 AM

ATTACHMENT X-1

Landowner Statements Regarding Noise Waivers

Landowner Statement Regarding Noise Waivers

I own property and a residential dwelling in the vicinity of the proposed Biglow Canyon Wind Farm. I understand that the project, if built, may cause noise levels in excess of Oregon standards at the dwelling I own. I have considered this situation and am willing to enter a noise waiver as provided for in Oregon rules (or enter a non-occupancy agreement). Of course, this is subject to actually negotiating the terms of such an agreement, which I am ready to start with at Orion's request.

Name: Dewey Thomas

Address: PO Box 153 404 N. Hwy 97

Wasco, OR 97065

Signature: Dewey Thomas

Date: 9-26-05

Landowner Statement Regarding Noise Waivers

I own property and a residential dwelling in the vicinity of the proposed Biglow Canyon Wind Farm. I understand that the project, if built, may cause noise levels in excess of Oregon standards at the dwelling I own. I have considered this situation and am willing to enter a noise waiver as provided for in Oregon rules (or enter a non-occupancy agreement). Of course, this is subject to actually negotiating the terms of such an agreement, which I am ready to start with at Orion's request.

Name: Norman & Marilyn Feidley

Address: P.O. Box 46

Wasco, OR 97065

Signature: Marilyn M Feidley, Norman Feidley

Date: 9-26-05

Landowner Statement Regarding Noise Waivers

I own property and a residential dwelling in the vicinity of the proposed Biglow Canyon Wind Farm. I understand that the project, if built, may cause noise levels in excess of Oregon standards at the dwelling I own. I have considered this situation and am willing to enter a noise waiver as provided for in Oregon rules (or enter a non-occupancy agreement). Of course, this is subject to actually negotiating the terms of such an agreement, which I am ready to start with at Orion's request.

Name: Brett & Treva Gray

Address: 97642 Emigrant Springs Ln.
Wasco, Oregon 97065

Signature: Brett Gray Treva Gray

Date: 9-25-05

Landowner Statement Regarding Noise Waivers

I own property and a residential dwelling in the vicinity of the proposed Biglow Canyon Wind Farm. I understand that the project, if built, may cause noise levels in excess of Oregon standards at the dwelling I own. I have considered this situation and am willing to enter a noise waiver as provided for in Oregon rules (or enter a non-occupancy agreement). Of course, this is subject to actually negotiating the terms of such an agreement, which I am ready to start with at Orion's request.

Name: Marilyn M. Siddoway Chm.

Address: [illegible]

Signature: Marilyn M. Siddoway Chair

Date: 9-26-05

Landowner Statement Regarding Noise Waivers

I own property and a residential dwelling in the vicinity of the proposed Biglow Canyon Wind Farm. I understand that the project, if built, may cause noise levels in excess of Oregon standards at the dwelling I own. I have considered this situation and am willing to enter a noise waiver as provided for in Oregon rules (or enter a non-occupancy agreement). Of course, this is subject to actually negotiating the terms of such an agreement, which I am ready to start with at Orion's request.

Name: KENT THOMAS Melva Thomas

Address: 98509 EMIGRANT SPRINGS LANE

WASCO, ORE. 97065

Signature: Kent Thomas Melva D Thomas

Date: 9-25-05

Landowner Statement Regarding Noise Waivers

I own property and a residential dwelling in the vicinity of the proposed Biglow Canyon Wind Farm. I understand that the project, if built, may cause noise levels in excess of Oregon standards at the dwelling I own. I have considered this situation and am willing to enter a noise waiver as provided for in Oregon rules (or enter a non-occupancy agreement). Of course, this is subject to actually negotiating the terms of such an agreement, which I am ready to start with at Orion's request.

Name: Delta Johnson by POA Les Gray

Address: 73727 Emigrant Spring Lane.
Wasco, Ore. 97065

Signature: Delta Johnson by POA Les Gray

Date: 9/25/2005

Landowner Statement Regarding Noise Waivers

I own property and a residential dwelling in the vicinity of the proposed Biglow Canyon Wind Farm. I understand that the project, if built, may cause noise levels in excess of Oregon standards at the dwelling I own. I have considered this situation and am willing to enter a noise waiver as provided for in Oregon rules (or enter a non-occupancy agreement). Of course, this is subject to actually negotiating the terms of such an agreement, which I am ready to start with at Orion's request.

Name: E. L. Gray
Barbara A Gray

Address: 97327 Emigrant Ln, Land
Wasco, Or.

Barbara A Gray
Signature: E L Gray

Date: 9/25/2005

Landowner Statement Regarding Noise Waivers

I own property and a residential dwelling in the vicinity of the proposed Biglow Canyon Wind Farm. I understand that the project, if built, may cause noise levels in excess of Oregon standards at the dwelling I own. I have considered this situation and am willing to enter a noise waiver as provided for in Oregon rules (or enter a non-occupancy agreement). Of course, this is subject to actually negotiating the terms of such an agreement, which I am ready to start with at Orion's request.

Name: JOHN + NANCY FIELDS

Address: 75960 HWY 97
WASCO, OR 97065

Signature: John Fields Nancy Fields

Date: 9/25/05

Landowner Statement Regarding Noise Waivers

I own property and a residential dwelling in the vicinity of the proposed Biglow Canyon Wind Farm. I understand that the project, if built, may cause noise levels in excess of Oregon standards at the dwelling I own. I have considered this situation and am willing to enter a noise waiver as provided for in Oregon rules (or enter a non-occupancy agreement). Of course, this is subject to actually negotiating the terms of such an agreement, which I am ready to start with at Orion's request.

Name: James L. McCullough + Kathy McCullough

Address: PO Box 194

Wasco Ore. 97065

Signature: [signature] + Kathy McCullough

Date: 9-27-05

Landowner Statement Regarding Noise Waivers

I own property and a residential dwelling in the vicinity of the proposed Biglow Canyon Wind Farm. I understand that the project, if built, may cause noise levels in excess of Oregon standards at the dwelling I own. I have considered this situation and am willing to enter a noise waiver as provided for in Oregon rules (or enter a non-occupancy agreement). Of course, this is subject to actually negotiating the terms of such an agreement, which I am ready to start with at Orion's request.

Name: Macnab Inc.

Address: P.O. Box 194

Wasco OR 97065

Signature: Mary Macnab (president)

Date: 9-26-05

Landowner Statement Regarding Noise Waivers

I own property and a residential dwelling in the vicinity of the proposed Biglow Canyon Wind Farm. I understand that the project, if built, may cause noise levels in excess of Oregon standards at the dwelling I own. I have considered this situation and am willing to enter a noise waiver as provided for in Oregon rules (or enter a non-occupancy agreement). Of course, this is subject to actually negotiating the terms of such an agreement, which I am ready to start with at Orion's request.

Name: Doug Medler

Address: P.O. Box 1287
The Dalles OR 97058

Signature: Doug Medler

Date: 9-27-05

Landowner Statement Regarding Noise Waivers

I own property and a residential dwelling in the vicinity of the proposed Biglow Canyon Wind Farm. I understand that the project, if built, may cause noise levels in excess of Oregon standards at the dwelling I own. I have considered this situation and am willing to enter a noise waiver as provided for in Oregon rules (or enter a non-occupancy agreement). Of course, this is subject to actually negotiating the terms of such an agreement, which I am ready to start with at Orion's request.

Name: Robert E. Schad

Address: 7695 Tucker Road
Grass Valley, Ore. 97101

Signature: _____

Date: 9/27/05

Landowner Statement Regarding Noise Waivers

I own property and a residential dwelling in the vicinity of the proposed Biglow Canyon Wind Farm. I understand that the project, if built, may cause noise levels in excess of Oregon standards at the dwelling I own. I have considered this situation and am willing to enter a noise waiver as provided for in Oregon rules (or enter a non-occupancy agreement). Of course, this is subject to actually negotiating the terms of such an agreement, which I am ready to start with at Orion's request.

Name: Darlene J. Kaufman

Address: 2202 NE 156th Ave
Portland, OR 97230

Signature: Darlene J. Kaufman

Date: 092705

EXHIBIT Y

CARBON DIOXIDE EMISSIONS

OAR 345-021-0010(1)(y)

Exhibit Y requires information about a base load gas plant, a non-base load power plant, or a nongenerating energy facility that emits carbon dioxide. Exhibit Y is not required for this application because Orion Sherman County Wind Farm LLC (Applicant) is not proposing to construct any facilities that emit carbon dioxide.

EXHIBIT Z

COOLING TOWERS

OAR 345-021-0010(1)(z)

Exhibit Z requires information about evaporative cooling towers and cooling tower plumes. Exhibit Z is not required for this application because Orion Sherman County Wind Farm LLC (Applicant) is not proposing to construct an evaporative cooling tower.

EXHIBIT AA

ELECTRIC TRANSMISSION LINE

OAR 345-021-0010(1)(aa)
OAR 345-024-0090(1)
OAR 345-024-0090(2)

TABLE OF CONTENTS

TABLES

FIGURES *(located after text)*

ATTACHMENT

AA.1 INTRODUCTION

OAR 345-021-0010(1)(aa) *If the proposed facility includes an electric transmission line:*

See sections AA.2 and AA.3.

AA.2 ELECTRIC AND MAGNETIC FIELDS

(A) Information about the expected electric and magnetic fields, including:

AA.2.1 Distance from Transmission Line Center Line to Edge of Right-of-Way

(i) The distance in feet from the proposed center line of each proposed transmission line to the edge of the right-of-way;

Response: The Biglow Canyon Wind Farm Energy Facility (Facility) will include one of two alternative overhead transmission lines, along a route of either 3 miles or 7 miles in length. The overhead transmission lines will be constructed with either a 230-kilovolt (kV) line option or a 500-kV line option (see Exhibit B).

The overhead transmission line for the 230-kV option would be constructed within a 150-foot-wide corridor, approximately. Therefore, the centerline of the transmission line would be approximately 75 feet or more from the edge of the right-of-way.

The overhead transmission line for the 500-kV option would be constructed within a 200-foot–wide corridor, approximately. Therefore, the centerline of the transmission line would be approximately 100 feet or more from the edge of the right-of-way.

For the underground 34.5-kV collector circuits, the distance between the centerline of the 34.5-kV circuits and the edge of the right-of-way is undefined, because the entire wind farm is right-of-way for the collection circuits.

AA.2.2 Types of Occupied Structures within 200 Feet of Center Line of Proposed Transmission Lines

(ii) The type of each occupied structure, including but not limited to residences, commercial establishments, industrial facilities, schools, daycare centers, and hospitals, within 200 feet on each side of the proposed center line of each proposed transmission line.

Response: There are no occupied buildings, including residences, within 200 feet on each side of the proposed center line of the proposed overhead transmission line locations. However, there are four residences and a proposed O&M building site within 200 feet of the sections of the Facility's 34.5-kV underground collection circuit system.

AA.2.3 Distance from Proposed Center Lines to Structures

(iii) The approximate distance in feet from the proposed center line to each structure identified in (A);

Response: The approximate distance from the proposed center line of sections of the underground collection circuit to structures identified in AA.2.2 is provided in Table AA-1.

Table AA-1 Structures within 200 Feet of the 34.5-kV Underground Collection Circuit System

Structure Number[1]	Type of Structure	Distance to 34.5-kV Underground Circuit (ft)
1	O&M Building	6
2	Residence	38
3	Residence	49
4	Residence	62
5	Residence	167

[1] Structures are shown in Figure AA-1.

AA.2.4 Graphs of Electric and Magnetic Field Levels

(iv) At representative locations along each proposed transmission line, a graph of the predicated electric and magnetic fields levels from the proposed center line to 200 feet on each side of the proposed center line;

Response:

AA.2.4.1 Generation of Electric and Magnetic Fields (EMF)

All electric utility wires and devices generate alternating electric and magnetic fields (EMF). The earth itself generates steady-state magnetic and electric fields. The EMF produced by the alternating current (AC) electrical power system in the United States has a frequency of 60 hertz (Hz), meaning that the fields change from positive to negative and back to positive, 60 times per second.

This section addresses the estimates of the maximum possible 60-Hz AC electric and magnetic field strengths that will be produced by the proposed 34.5-kV underground collector circuits and the proposed 230-kV and 500-kV overhead transmission line alternatives. These estimates are computed for a height of 1 meter (3.3 feet) above the ground on the proposed line routes.

In AC power systems, voltage swings positive to negative and back to positive, a 360 degree cycle, 60 times every second. Current follows the voltage, flowing forward, reversing direction, and returning to the forward direction, again a 360 degree cycle, 60 times every second. Each AC 3-phase circuit carries power over three conductors. One phase of the circuit is carried by each of the three conductors. The AC voltage and current in each phase conductor is out of sync with the other two phases by 120 degrees, or one-third of the 360 degree cycle. The fields from these conductors tend to cancel out because of the phase difference. However, when a person stands under a transmission line, or over a buried circuit of underground cables, one conductor is always significantly closer and will contribute a net uncanceled field at the person's location.

Electric fields around transmission lines are produced by electrical charges, measured as voltage, on the energized conductor. Electric field strength is directly proportional to the line's voltage; that is, increased voltage produces a stronger electric field. The electric field is inversely proportional to the distance a sensor is from the conductors, so that the electric field strength declines as the distance from the conductor increases. For this transmission line, the voltage and electric field alternate at a frequency of 60 Hz. The strength of the electric field is measured in units of kilovolts per meter (kV/m). The voltage, and therefore the electric field, around a transmission line remains practically steady and is not affected by the common daily and seasonal fluctuations in usage of electricity by customers.

Magnetic fields around transmission lines are produced by the electrical load or the level of current flow, measured in terms of amperage, through the conductors. Like the electric field, the magnetic field alternates at a frequency of 60 Hz. The magnetic field strength is directly proportional to the amperage; that is, increased amperage produces a stronger magnetic field. The magnetic field is inversely proportional to the sensor's distance from the conductors. Also, like the electric field, the magnetic field strength declines as the distance from the conductor increases. Magnetic fields are expressed in units of milligauss (mG). However, unlike voltage, the amperage and therefore the magnetic field around a transmission line fluctuate daily and seasonally as the usage of electricity varies and the amount of current flow varies.

Considerable research has been conducted over the last 30 years on the possible biological and human health effects from EMF. This research has produced many studies that offer no uniform conclusions about whether long-term exposure to EMF is harmful or not. In the absence of conclusive or evocative evidence, many states, including Washington and Oregon, have chosen not to specify maximum levels of EMF. Instead, these states mandate a program of prudent avoidance, whereby EMF exposure to the public is to be minimized by encouraging electric utilities to use low-cost techniques to reduce the levels of EMF. The states reason that because there is no established scientific evidence linking EMF with health risks, it is difficult to justify expensive mitigations. The prudent-avoidance approach encourages new facilities to incorporate design features or configurations that will significantly reduce EMF exposure and risk levels, if the costs of those features or alternative configurations do not add significantly to the cost of the facility. A 5 percent construction cost premium is usually considered to be a significant increase in cost if done solely for the purpose of EMF risk mitigation.

AA.2.4.2 EMF Calculations for the 230-KV Overhead Transmission Line

For this Facility, EMF exposure risk is very low because the line will pass over and through undeveloped land. Construction with single wood poles, with the conductors configured in a triangle instead of horizontally, would reduce EMF levels on the right-of-way and under the conductors. However, a triangular configuration would not reduce EMF levels at any distance from the right-of way, nor would it significantly reduce EMF risk levels, which are judged to be extremely low with the standard horizontal conductor configuration. Triangular construction on single wood poles would require twice as many structure locations and would increase the cost of

construction by more than 5 percent, compared to the standard horizontal H-frame configuration.

The conductor arrangement proposed for the Facility 230-kV transmission line option consists of one, 3-phase, 230-kV circuit, with two conductors per phase (a total of 6 wires) and two shield wires for the first mile of the transmission line starting from the Biglow Canyon Substation. After the first mile, shield wires would no longer be required.

Figure AA-2 illustrates the typical structural configuration proposed for the 230-kV transmission line for the segment with shield wires. After the first mile, the transmission line will be built without the shield wires. Figure AA-3 illustrates the configuration of the transmission line without the shield wires. Except for special construction required for crossing under other transmission lines, the ground-level magnetic field intensity across the corridor is determined by the currents and geometry of these typical facilities.

AA.2.4.3 EMF Calculations for the 500-kV Overhead Transmission Line Option

For this Facility, EMF exposure risk is very low because the line will pass over and through undeveloped land. The conductor arrangement proposed for the Facility 500-kV transmission line option consists of one, 3-phase, 500-kV circuit (bundles of 3 conductors per phase; a total of 9 wires) and one shield wire. Figure AA-4 illustrates the structural configuration proposed for the 500-kV transmission line with shield wires. The ground-level magnetic field intensity across the corridor is determined by the currents and geometry of these typical facilities.

AA.2.4.4 Line Loads for EMF Calculation

It is important that any discussion of EMF include the assumptions used to calculate these fields. It is also important to remember that EMF in the vicinity of the power lines varies with regard to line design, line loading, distance from the line, and other factors. The electric field depends on line voltage, which remains nearly constant for a transmission line in normal operation. The magnetic field is proportional to line loading (amperage), which varies as power plant generation is changed by the wind. Maximum magnetic fields are produced at the maximum (peak) conductor currents.

Figure AA-2 is a cross section of the proposed transmission line corridor with shield wires present (230-kV option). Figure AA-3 is a cross section of the proposed transmission line without the shield wires (230-kV option). The entire overhead line in this study is rated for a nominal voltage of 230 kV. Line loading value assumed for the line is 600 MVA, or 1,506 amperes per phase (753 amperes per conductor), at peak system load. This value was used in the EMF study.

Figure AA-4 is a cross section of the proposed transmission line corridor with shield wires present (500-kV option). The entire overhead line in this study is rated for a nominal voltage of 500 kV. Line loading value assumed for the line is 600 MVA, or 693 amperes per phase (231 amperes per conductor) at peak system load. This value was used in the EMF study.

AA.2.4.5 Calculation Methods

To estimate the maximum fields, calculations are performed at mid-span where the conductor is positioned at its lowest point between structures (the estimated maximum sag point). The magnetic fields are computed at 1 meter above ground with a program called Corona and Field Effect Program (Version 3), developed by the Bonneville Power Administration. This program and others like it have been used to predict electric and magnetic field levels for many years, and results have been confirmed by field measurements performed by numerous utilities.

The actual distance between the centerline of a 230-kV circuit and the edge of the right-of-way is assumed to be 75 feet. The actual distance between the centerline of a 500-kV circuit and the edge of the right-of-way is assumed to be 100 feet.

AA.2.4.6 Results of EMF Calculations

230-kV Option

As shown in Table AA-2, magnetic field and electric field values are higher on the right-of-way than at the edges of the right-of-way.

Table AA-2 Calculated Maximum Magnetic and Electric Field Values for the 230-kV Line

		Magnetic Field (mGauss)			Electric Field (KV/M)		
Figure	Voltage	Left R/W (75')	Max. on R/W	Right R/W (75')	Left R/W (75')	Max. on R/W	Right R/W (75')
AA-5M and AA-5E	230-kV	55.7	305	55.7	0.8	3.7	0.8
AA-6M and AA-6E	230-kV	55.7	305	55.7	0.8	3.8	0.8

These results are plotted on the graphs in Figures AA-5M, AA-5E, AA-6M, and AA-6E. For the 230-kV line with shield wires, see Figure AA-5M for the magnetic field profile and Figure AA-5E for the electric field graph. For the 230-kV line without shield wires, see Figure AA-6M for the magnetic field profile and Figure AA-6E for the electric field graph.

500-kV Option

Table AA-3 gives the calculated values of the magnetic and the electric field values at left and right edges of the right-of-ways, and at the centerline, for the projected maximum currents during peak load, for minimum conductor ground clearances. The actual magnetic field values vary, as load varies daily, seasonally, and as conductor sag changes with ambient temperature. The levels shown represent the highest magnetic fields expected for the proposed Facility. Average fields along the ground between poles, and over a year's time would be considerably reduced from the peak values shown.

As shown in Table AA-3, magnetic field and electric field values are higher on the right-of-way than at the edges of the right-of-way.

Table AA-3 Calculated Maximum Magnetic and Electric Field Values for the 500-kV Line

		Magnetic Field (mGauss)			Electric Field (KV/M)		
Figure	Voltage	Left R/W (100')	Max. on R/W	Right R/W (100')	Left R/W (100')	Max. on R/W	Right R/W (100')
AA-7M and AA-7E	500-kV	11.0	78.6	12.9	1.01	8.2	0.83

These results are plotted on the graphs in Figures AA-7M and AA-7E. For the 500-kV line with shield wires, see Figure AA-7M for the magnetic field profile and Figure AA-7E for the electric field graph.

AA.2.4.7 EMF Calculations for 34.5-KV Underground Collection System

For an underground 34.5-kV circuit, the electric field is totally contained within the insulation of the cable. Each cable has a semi-conducting insulation shield and a grounded concentric neutral, made up of multiple strands of copper wire that encircle the cable just under the outer jacket. This means that the cable jacket has no measurable voltage to ground, or between other cable jackets, and that the cables can be safely touched, although it is not recommended. Because the electric field is contained within the buried cables, no electric field is measurable at the surface of the ground.

For an overhead transmission line, the conductors are isolated above the ground and insulated by air. Therefore the electric field is not contained, and a net field strength is measurable on the ground.

Underground cables do not contain the magnetic field. Therefore, the net magnetic field of buried cables is measurable on the surface of the ground above the cables.

AA.2.4.8 Calculation Method

The calculation methods used for the analysis that follows are provided in Chapter 8 of the *Transmission Line Reference Book, 345-kV and Above* (EPRI, 1987). The software tool program used for these analyses is based on the methods and equations given in the referenced text. This Bonneville Power Administration tool is called the Corona and Field Effect Program (Version 3). This program and others like it have been used to predict electric and magnetic field levels for many years. The predicted values of field strength from these programs have been consistently confirmed by field measurements.

To estimate the maximum fields, calculations are performed for a height of 1 meter above the ground, and at mid-span where the conductor is positioned at its lowest point between structures (the estimated maximum sag point).

AA.2.4.9 34.5-kV Configuration and Line Loading

Maximum magnetic fields are produced at the maximum conductor currents. The Facility's largest cables will carry the maximum currents. For this EMF analyses, the

maximum line loading is assumed to be 600 amperes per phase, and the cable is assumed to be 1,000 kcmil Aluminum, with 345 mils of XLPE-TR insulation. The underground trench is assumed to be 48 inches deep and all cables are assumed to be direct buried in a trefoil arrangement.

AA.2.4.10 Calculation Results

Electric Fields: The underground cable construction contains the electric field within the cable insulation so that no electric field is present external to the cables.

Magnetic Fields: Maximum magnetic fields are computed at 1 meter aboveground with a program called Corona and Field Effect Program (Version 3) developed by the Bonneville Power Administration.

To estimate maximum fields that might occur, one needs to consider locations where (1) a circuit is remote from other circuits and (2) a circuit parallels other circuits.

Case 1—34.5-kV Underground Cable Remote from Other Circuits

For this case, the distance between the centerline of 34.5-kV circuits and the edge of the right-of-way is undefined because the entire Facility is considered right-of-way.

Figure AA-8 illustrates the profile of the resulting magnetic field strength perpendicular to the underground circuit.

Case 2—34.5-kV Underground Circuit Parallel to Other Circuits

For this case, three parallel 34.5-kV circuits are considered. The distance between the centerline of 34.5-kV circuit is assumed to be 10 feet to achieve thermal isolation.

Figure AA-9 illustrates the profile of magnetic fields resulting from this construction.

AA.2.4.11 Conclusion

The maximum magnetic field values for the underground 34.5-kV collection system occur for the main feeder circuits (1,000 kcmil cables) that are isolated from other circuits. This is because some cancellation of fields occurs when several circuits are in proximity.

The maximum magnetic field value for the underground circuits occurs directly over the buried cable of an isolated circuit, and will be 62.9 mG.

No electric field is present external to the cable.

AA.2.5 Measures Proposed to Reduce Electric or Magnetic Field Levels

(v) Any measures the applicant proposes to reduce electric or magnetic field levels;

Response: For the 230-kV options, no measures are proposed to reduce electric or magnetic fields for the following reasons:

- There are no nearby residences closer than 315 feet to the line. At the this distance, EMF levels are extremely low.
- Mitigating construction would increase cost by more than 5 percent.
- EMF levels are not excessive.

For the 500-kV option, reasonable and prudent efforts have been made to reduce electric and magnetic fields of the proposed line. Both triangular and horizontal construction configurations were analyzed. The triangular construction configuration produces the lowest EMF fields.

Further field ground-level reductions are possible only by increasing conductor ground clearances. However, this is impractical for several reasons:

- There are no nearby residences closer than 315 feet to the line. At the this distance, EMF levels are extremely low.
- Significantly taller poles will increase construction costs by more than 5 percent.
- EMF levels, as designed, are less than Oregon requirements and suggested limits.

AA.2.6 Assumptions and Methods Used in Electric and Magnetic Field Analyses

(vi) The assumptions and methods used in the electric and magnetic field analysis, including the current in amperes on each proposed transmission line; and

Response: See response *(iv)*. In addition, Attachment AA-1 shows data inputs and assumptions used in the electric and magnetic field analysis. The BPA Corona and Field Effects (Version 3) program was used.

AA.2.7 Monitoring Program

(vii) The applicant's proposed monitoring program, if any, for actual electric and magnetic field levels;

Response: No program for monitoring actual electric and magnetic field levels is proposed at this time.

AA.3 ALTERNATE METHODS

(B) An evaluation of alternate methods and costs of reducing radio interference likely to be caused by the transmission line in the primary reception area near interstate, U.S., and state highways;

Response:

AA.3.1 Radio and TV Interference Generation

Electric transmission lines are designed to be efficient by economically minimizing both resistive-related, and corona-related losses. Resistive losses occur in the aluminum conductor (wire) and result in heating losses that are carried away by the air in convective cooling. The resistive losses also radiate away in the infrared electromagnetic frequency spectrum; therefore, resistive losses do not contribute in any way to radio and television reception interference. Radio interference (RI) and television interference (TVI) are caused by transmission line corona.

Transmission line corona is the physical phenomenon of air ionization at the surface of the conductor. When corona is produced, it is heard as snaps, crackles, and pops. Under the line on a dark night, corona might be visible as a glow around the conductor. Corona losses are principally a function of the conductor diameter and the voltage of the transmission line. Transmission line designers have two options to reduce the surface voltage gradient at the conductor surface and thus minimize corona losses: (1) increase the diameter of the conductor or (2) increase the effective diameter by using multiple conductors held apart by spacers.

Because designers take special steps to control corona losses, corona effects and corona losses are primarily a foul weather phenomenon. The small diameters of rain droplets increase voltage gradients and lead to ionization of air in the vicinity of the conductors. Corona causes audible noise, and also generates electromagnetic noise throughout the electromagnetic spectrum. Fortunately, electromagnetic corona noise amplitude and power is inversely proportional to frequency, and is also inversely proportional to the square of distance from the source. This being the case, RI and TVI are confined to the area within a few hundred feet of a high-voltage transmission lines. RI is more likely to be a problem because the power in corona-caused electromagnetic radiation at AM radio frequencies (0.535-1.605 MHz) is much greater than at TV and FM radio frequencies (54-108 MHz). RI or TVI corona noise of all frequencies attenuates with the square of the distance from the conductor; therefore, corona noise dims quickly to insignificance with distance from the centerline of the facility.

AA.3.2 RI and TVI Calculations

The electric utility industry has developed methods for calculating the RI and TVI performance of transmission lines. The most recent, and most comprehensive, summary of corona phenomena, and corona-caused electromagnetic noise analysis methods, are presented in the EPRI (1987). The analysis that follows for the proposed 230-kV overhead transmission facilities for the Biglow Canyon Wind Farm Facility uses the Bonneville Power Administration Corona and Field Effects Program, based on the calculation methods set forth in Chapters 4 and 5 of EPRI (1987).

This analysis produces values of RI and TVI that are measured in decibel microvolts/meter. These units are designed to be used in signal-to-noise calculations because RI and

TVI pose problems only when the strength is significant compared to the received signal.

AA.3.2.1 Analysis for the 230-kV Overhead Transmission Line Option

For this radio and TV interference analysis, the nominal line voltage is assumed to be 230 kV. The conductor is assumed to be two conductors per phase of 954-kcmil ACSR "Cardinal" with a diameter of 1.196 inches.

Figures AA-2 and AA-3 illustrate typical configurations of the proposed 230-kV transmission line structure.

Figure AA-10 (in db microvolts/meter) presents the RI levels to a distance of 200 feet on either side of the centerline.

Figure AA-11 (in db microvolts/meter) presents the TVI levels to a distance of 200 feet on either side of the centerline.

Conclusions for the 230-kV Overhead Transmission Line Option

The proposed power line will generate random corona radiation incidentally, during wet weather, because of raindrops on the wire. The power levels thus generated will be so low as to be difficult to detect, even with amplified receivers, at any significant distance from the power line.

The 230-kV transmission line proposed for this Facility is of conventional design and will have RI and TVI performance typical for the industry. As such, RI and TVI produced by the line will not be a problem or nuisance any more than the typical 230-kV line. For example, southbound travelers on Oregon's I-5 are within 100-200 feet of a BPA 230-kV line for much of the distance between Wilsonville and Salem. This BPA line has the same voltage and conductor, and apparently has acceptable RI performance. The Biglow Canyon transmission line will be located in eastern Oregon, which has a much drier climate and thus will have fewer corona-causing conditions than the Willamette Valley example.

Cars traveling near or under the proposed line in foul weather might experience some RI when tuning weak stations. Residential AM radio receivers within 300 feet of the centerline also might detect RI when tuning weak and distant AM stations, especially in bad weather.

This Facility will be designed and constructed with conventional transmission line methods, configurations, and materials. These types of 230-kV facilities have traditionally performed well in fair weather, and without unacceptable electromagnetic corona noise generation, even in foul weather. The levels of radio and TV noise calculated here indicate typical values. Therefore, corona is not expected to cause any interference, except in wet weather, and then, only for AM receiver equipment located within a few hundred feet of the centerline.

AA.3.2.2 Analysis for the 500-kV Overhead Transmission Line Option

For this radio and TV interference analyses, the nominal line voltage is assumed to be 500 kV. The conductor is assumed to be a triple-bundle per phase of 1,272-kcmil ACSR "Pheasant" with a diameter of 1.382 inches.

Figure AA-4 illustrates typical configurations of the proposed 500-kV transmission line structure.

Figure AA-12 (in db microvolts/meter) presents the RI levels to a distance of 200 feet on either side of the centerline.

Figure AA-13 (in db microvolts/meter) presents the TVI levels to a distance of 200 feet on either side of the centerline.

Figure AA-14 (in dba) presents the audible noise levels to a distance of 200 feet on either side of the centerline.

Conclusions for the 500-kV Overhead Transmission Line Option

The proposed power line will generate random corona radiation incidentally, during wet weather, because of raindrops on the wire. The power levels thus generated will be so low as to be difficult to detect, even with amplified receivers, at any significant distance from the power line.

Ground clearance was increased beyond the NESC minimum so that audible noise from foul-weather corona comply with the Oregon night limit of 50 dba for noise-sensitive receptors at the right-of-way edge (OAR Chapter 340, Division 35, Noise Control Regulations for Industry and Commerce, Table 8).

The 500-kV transmission line proposed for this Facility is of conventional design and will have RI and TVI performance typical for the industry. As such, RI and TVI produced by the line will not be a problem or nuisance any more than the typical 500-kV line.

This Facility will be designed and constructed with conventional transmission line methods, configurations, and materials. These types of facilities have traditionally performed well in fair weather, and without unacceptable electromagnetic corona noise generation, even in foul weather. The levels of radio and TV noise calculated here indicate typical values. Therefore, corona is not expected to cause any interference, except in wet weather, and then only for AM receiver equipment located within a few hundred feet of the centerline.

AA.4 ALTERNATING CURRENT FIELDS

OAR 345-024-0090(1) *Can design, construct, and operate the proposed transmission line so that alternating current electric fields do not exceed 9 kV per meter at one meter above the ground surface in areas accessible to the public;*

Response: See Figures AA-1E and AA-2E. The electric field on the right-of-way of the proposed 230-kV line does not exceed 4 kV per meter. See Figure AA-7E. The electric field on the right-of-way of the proposed 500-kV line does not exceed 8.2 kV per meter.

AA.5 INDUCED CURRENTS

OAR 345-024-0090(2) *Can design, construct, and operate the proposed transmission line so that induced currents resulting from the transmission line and related or supporting facilities will be as low as reasonably achievable;*

Response:

AA.5.1 Induced Voltage Phenomena

Voltage is the electrical pressure that pushes current through a conducting wire or object. An animal or object, such as a bird, person, vehicle, or barbed-wire fence that is insulated from ground, and in an electric field will possess an induced voltage. A bird flying through the field is safe because the induced voltage cannot make current flow through the bird, unless there is a conducting path for the current. Induced voltage on a metallic object, such as a fence or a large metal roof, can be a hazard only when the object is shorted to ground through a person or animal, allowing a path for significant current to flow. The conductivity of the air around the overhead conductor will determine the upper limit of the current that can flow when the object is shorted to ground.

A common induced voltage hazard occurs on fences that parallel overhead transmission lines. If the fence is ungrounded, it possesses the voltage of the net electric field of the overhead conductors. A person touching such a fence becomes a conducting path for the current and can feel a momentary shock if the available current is sufficient. The AC static voltage on the fence bleeds off quickly but can be annoying or hazardous. This hazard is easily removed by periodically bonding the fence wires to grounding rods driven into the soil, which guarantees that the fence and the pedestrian are at equal potential.

AA.5.2 Induced Current Phenomena

A current-carrying conductor will induce a current to flow in another conductor that is parallel to it. Induced currents result from the net AC magnetic field. In the common case cited in AA.5.1.1, grounded fences create electrical loops in which induced currents can flow. The value of the induced current depends upon the magnetic field strength, the size, and shape of the conducting object, and the object-to-ground resistance.

Induced currents are not hazardous to people because almost no voltage is involved. However, induced currents are a concern for railroad communications and pipeline cathodic protection systems that parallel transmission lines. Several mitigation techniques are available to solve these problems.

AA.5.2.1 Induced Current from the Proposed 230-kV Overhead Transmission Line

As stated in AA.5.1.1, induced voltage can present a hazard by creating the potential for hazardous current to flow through a person or animal that might contact a metallic object in the electric field. Figures AA-1M, AA-1E, AA-2M, and AA-2E show the electric and magnetic field values computed at right angles to the proposed centerline. Table AA-2 indicates that the average electric field is at its maximum of 4 kV per meter at a location approximately 25 feet to the left and right of centerline. These values are significantly lower than the recommended maximum value of 9 kV per meter. Therefore, the potential hazard is much less than it would be at 9-kV per meter.

Orion Sherman County Wind Farm LLC (Applicant) intends to provide appropriate grounding of fences that parallel the transmission line. Also, any metal-roofed buildings in proximity to the line will be similarly grounded. This grounding practice is commonly done for transmission lines and will mitigate the shock hazard associated with the induced voltage.

AA.5.2.2 Induced Current from the Proposed 500-kV Underground Line

As stated in AA5.1.1, induced voltages can present a hazard by creating the potential for hazardous currents to flow through a person or animal that might contact a metallic object in the electric field. Figures AA-3M and AA-3E show the electric and magnetic field values computed at right angles to the proposed centerline. Table AA-3 indicates that the average electric field is at its maximum of 8.2 kV per meter at a location approximately 20 feet to the left of centerline. These values are lower than the recommended maximum value of 9 kV per meter. Therefore, the potential hazard is less than it would be at 9 kV per meter.

AA.5.2.3 Induced Current from the Proposed 34.5-kV Underground Line

As stated earlier in this response (AA.2.4.7), the underground 34.5-kV cables do not generate electric fields and will not cause a voltage to appear on fences that parallel the underground circuits. Therefore, the grounding of fences in proximity to the underground lines is unnecessary.

As also stated in AA.2.4.7, underground circuits generate only magnetic fields, and these fields pose no shock hazard to people. Mitigation of magnetic fields might be required only for paralleling pipelines or other such facilities.

AA.6 CONCLUSION

Based on the above information, the Applicant has satisfied the required OAR 345-021-0010(1)(aa), and the Council may find that the standard contained in OAR 345-024-0090 has been satisfied.

AA.7 REFERENCES

EPRI. 1987. Transmission Line Reference Book, 345-kV and Above. Second Edition revised. Publication No. EL-2500, Electric Power Research Institute, Palo Alto, California.

Figures

Figure AA-1

Structures within 200 Feet of 34.5-kV Underground Collector Circuits

Biglow Canyon Wind Farm

ORION ENERGY LLC

Legend

- Houses within 200 feet of Underground Collectors
- Proposed Met Tower
- Proposed Turbine Corridors
- Proposed Facility Access Roads
- Existing Dirt Roads
- Existing Paved Roads
- Proposed 34.5-kV Underground Collector System
- Existing Transmission Line
- Proposed Transmission Line
- Proposed Staging Areas
- Existing Substation
- Proposed Substation / Proposed O&M Facility
- Proposed O&M Facility
- Streams

* Power Lines may be constructed to 500-kV

N
W E
S

0 0.5 1 1.5 2
Miles

CH2MHILL

Source:
Map created using the following USGS, 7.5-Minute Quad Maps: Klondike (1971), Quinton (1976), Rufus (1971), and Wasco (1987)

File Path: \\rosa\proj\OrionEnergyLlc\326775\GIS\MapDocuments\EFSC\Site Certificate Application\Figure AA-1 - Structures Within 200-ft of Underground Collectors.mxd, Date: October 12, 2005 11:04:56 AM

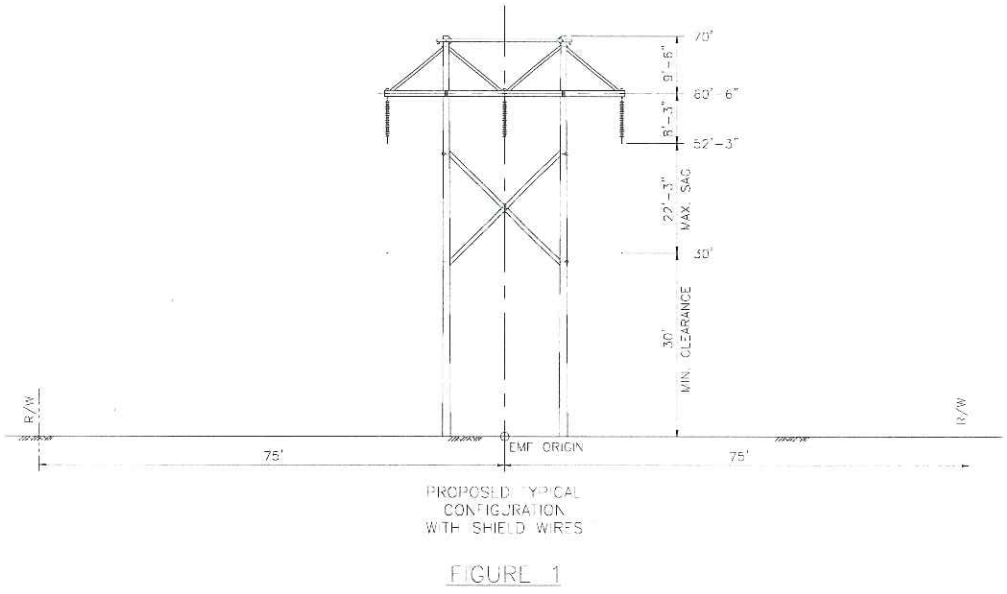


Figure AA-2 Proposed Typical 230-kV Configuration with Shield Wires

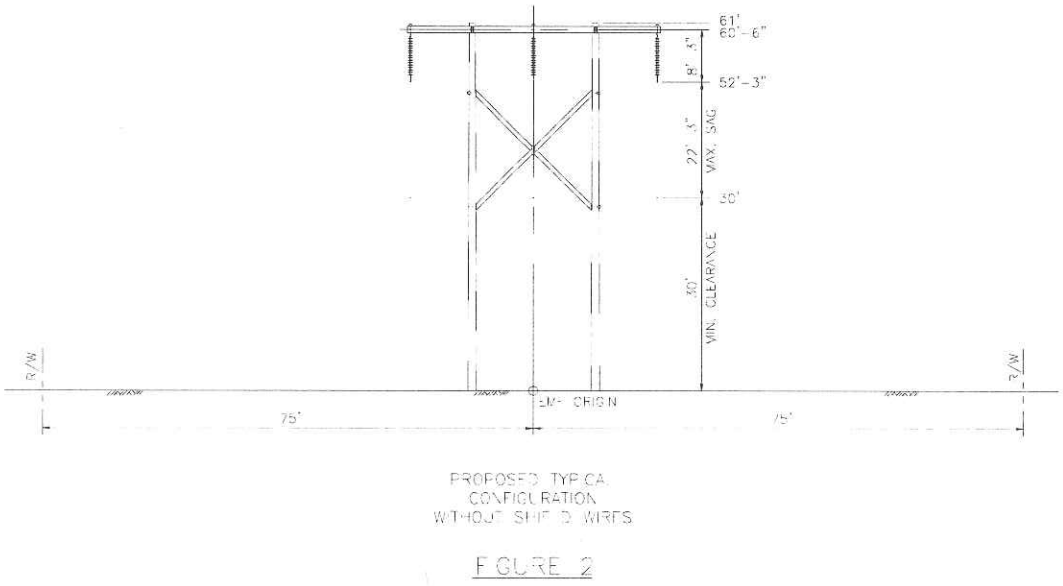
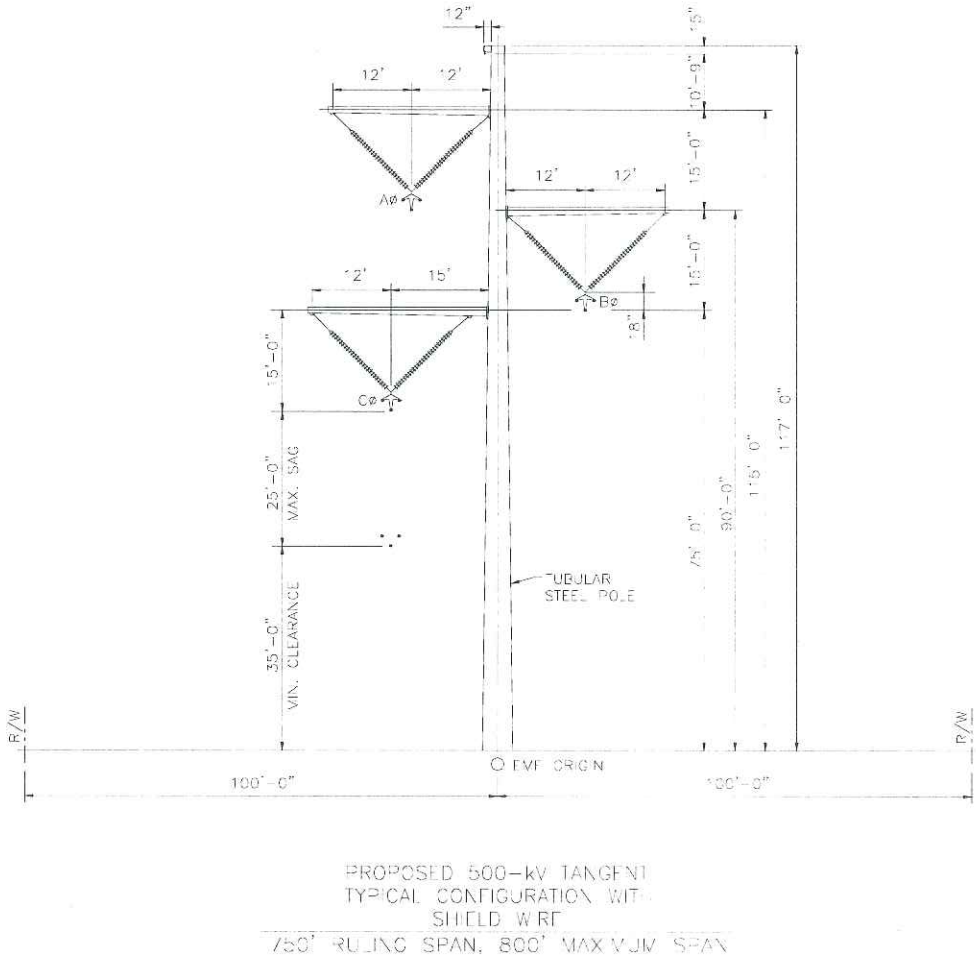


Figure AA-3 Proposed Typical 230-kV Configuration without Shield Wires



PROPOSED 500-kV TANGENT
TYPICAL CONFIGURATION WITH
SHIELD WIRE
750' RULING SPAN, 800' MAX VUM SPAN

Figure AA-4 Proposed Typical 500-kV Configuration with Shield Wires

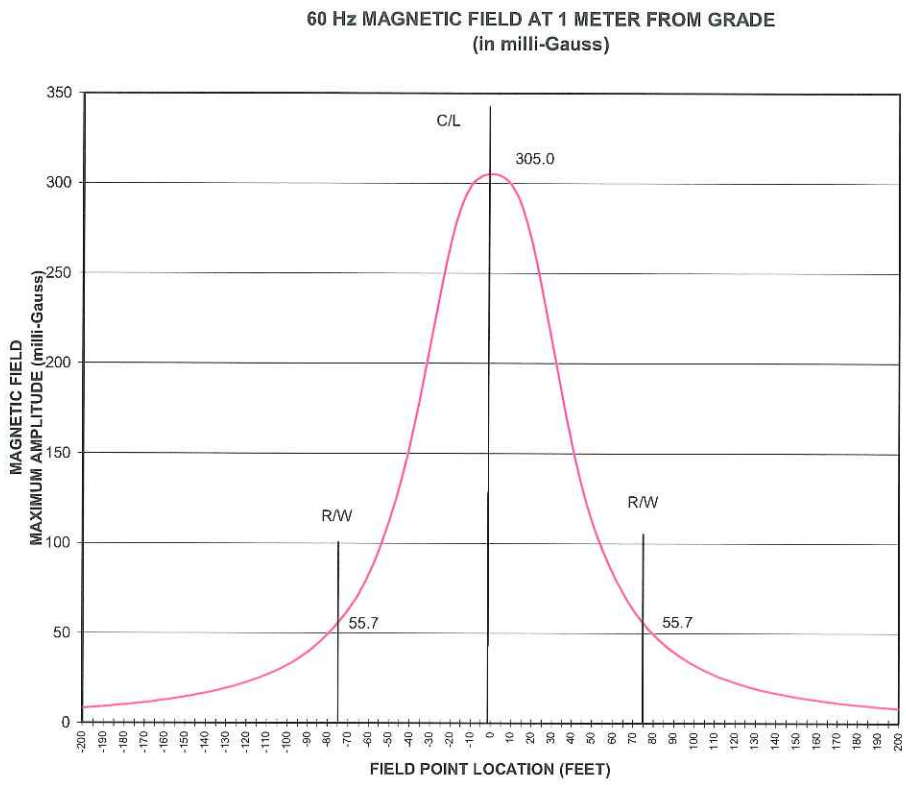


Figure AA-5M Magnetic Field Profile for 230-kV Line with Shield Wires

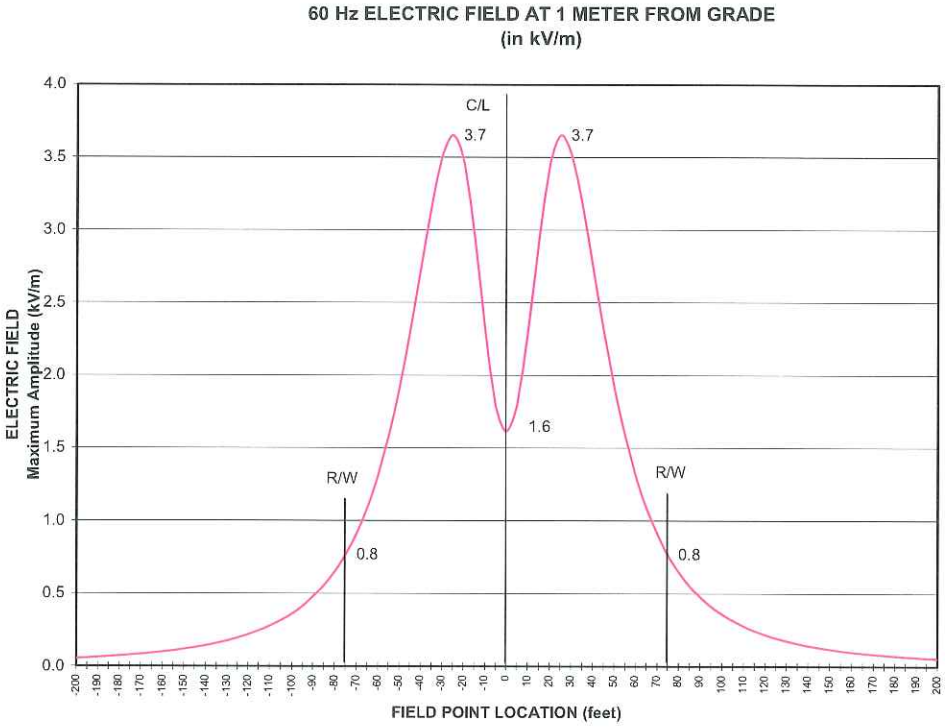


Figure AA-5E Electric Field Profile for 230-kV Line with Shield Wires

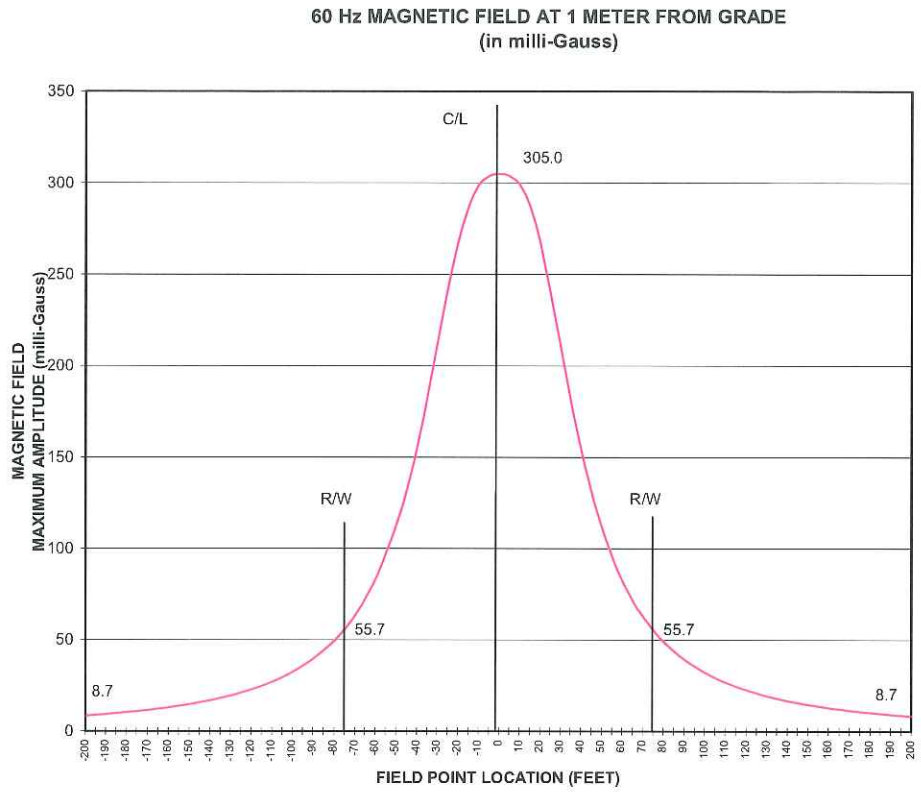


Figure AA-6M Magnetic Field Profile for 230-kV Line without Shield Wires

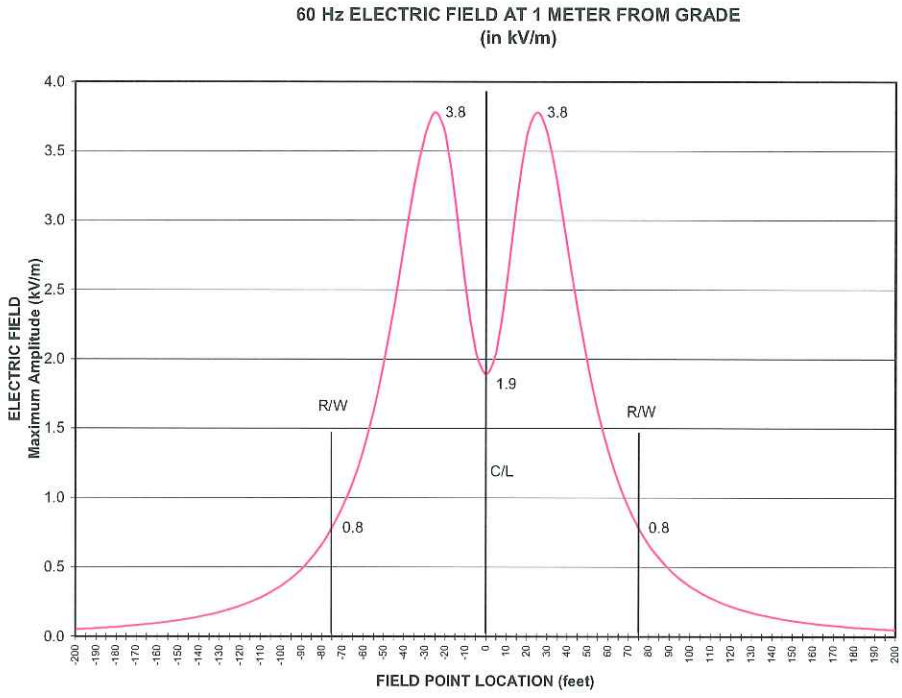


Figure AA-6E Electric Field Profile for 230-kV Line without Shield Wires

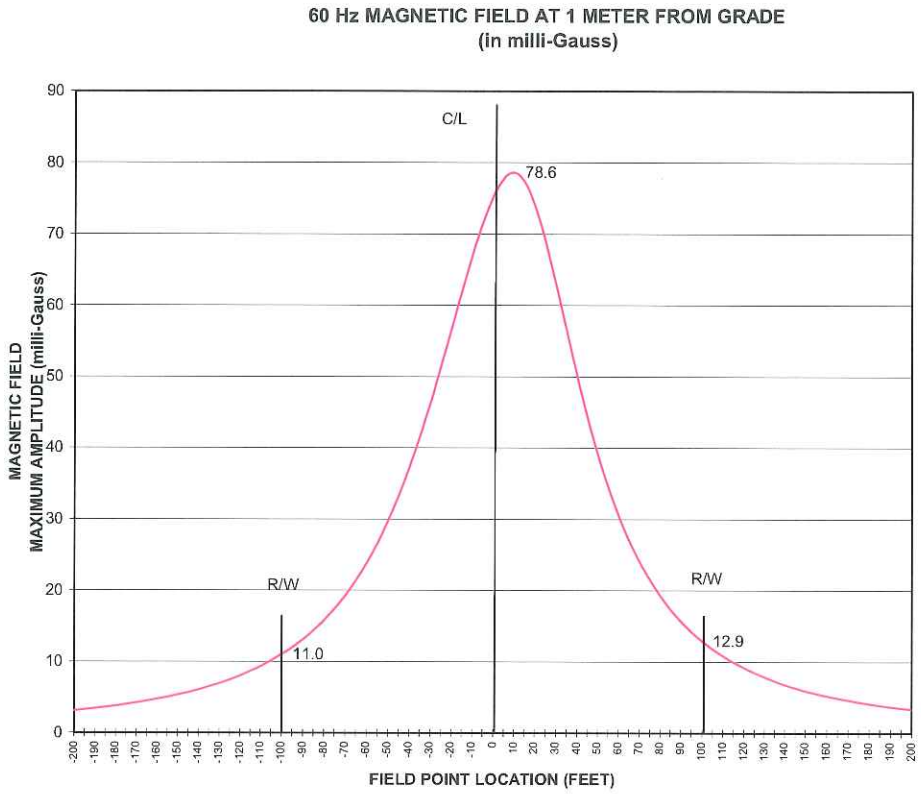


Figure AA-7M Magnetic Field Profile for 500-kV Line with Shield Wires

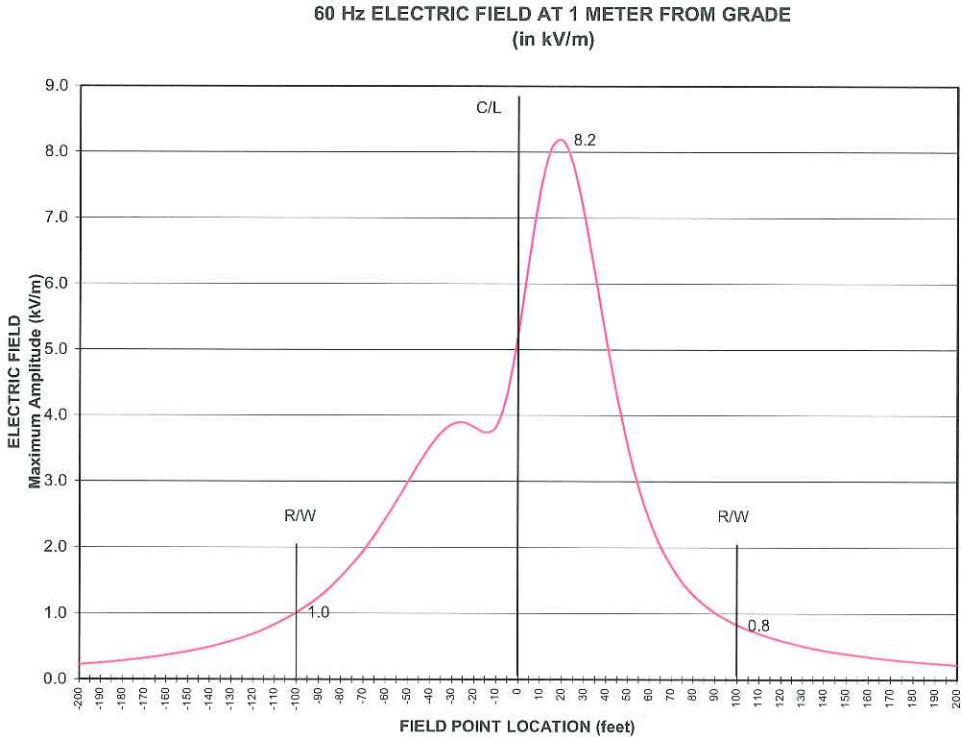


Figure AA-7E Electric Field Profile for 500-kV line with Shield Wires

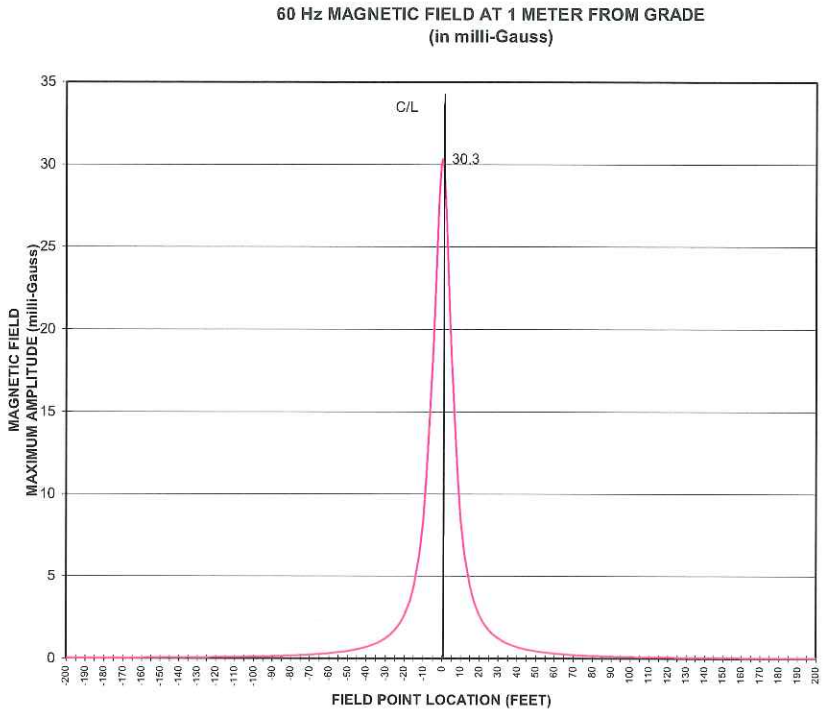


Figure AA-8 Magnetic Field Profile for One 34.5-kV Underground Circuit

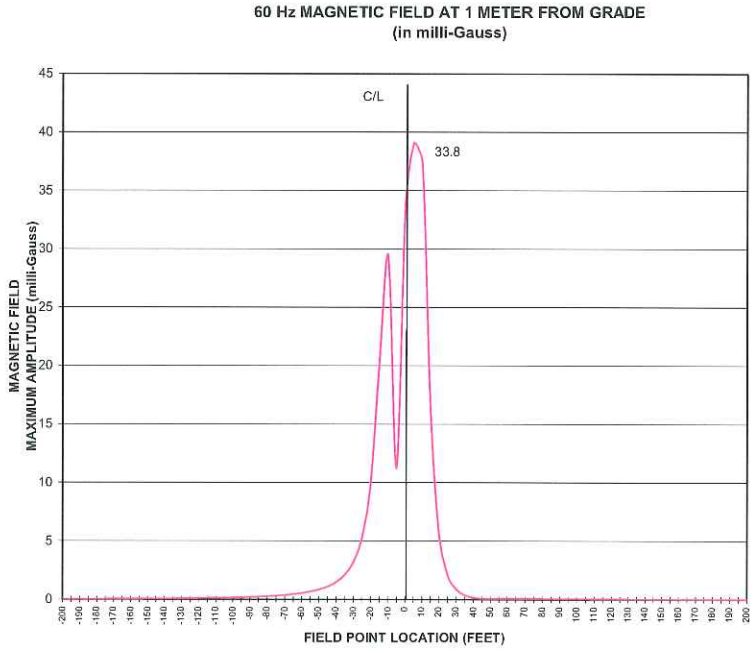


Figure AA-9 Magnetic Field Profile for Three 34.5-kV Underground Parallel Circuits

Figure AA-10 Radio Interference Profile for the 230-kV Overhead Transmission Line Option

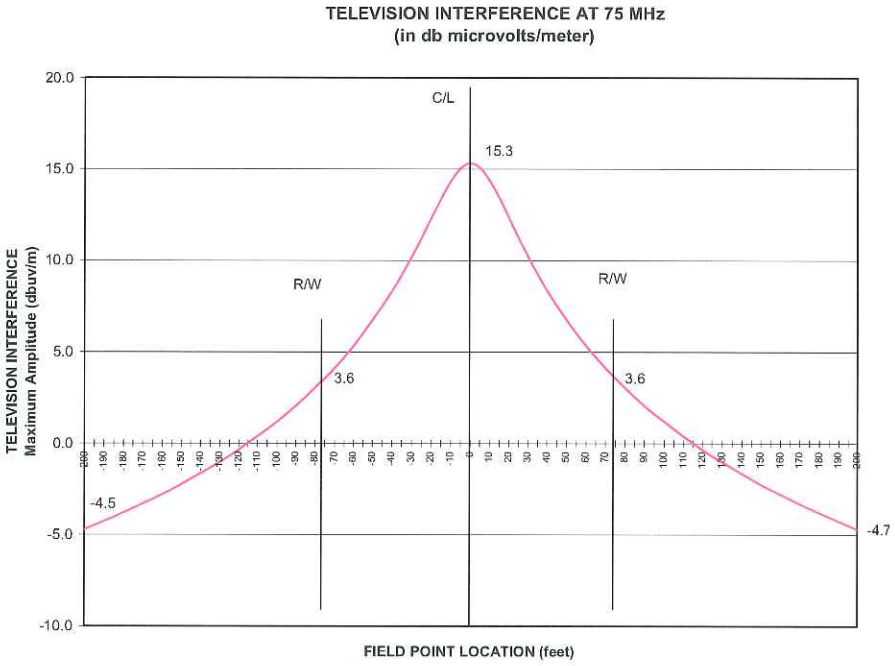


Figure AA-11 Television Interference Profile for the 230-kV Overhead Transmission Line Option

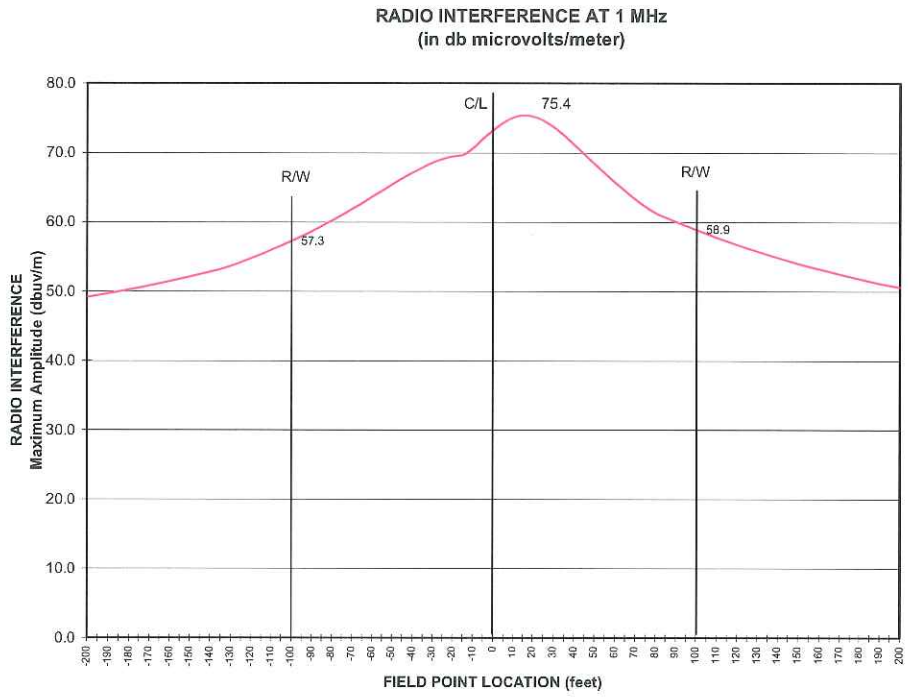


Figure AA-12 Radio Interference Profile for the 500-kV Overhead Transmission Line Option

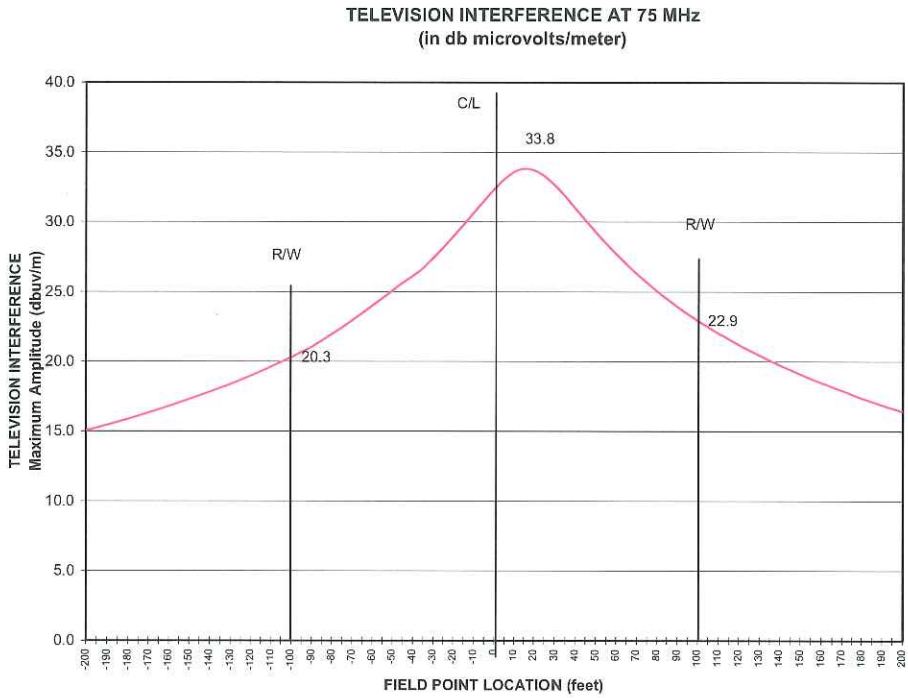


Figure AA-13 Television Interference Profile for the 500-kV Overhead Transmission Line Option

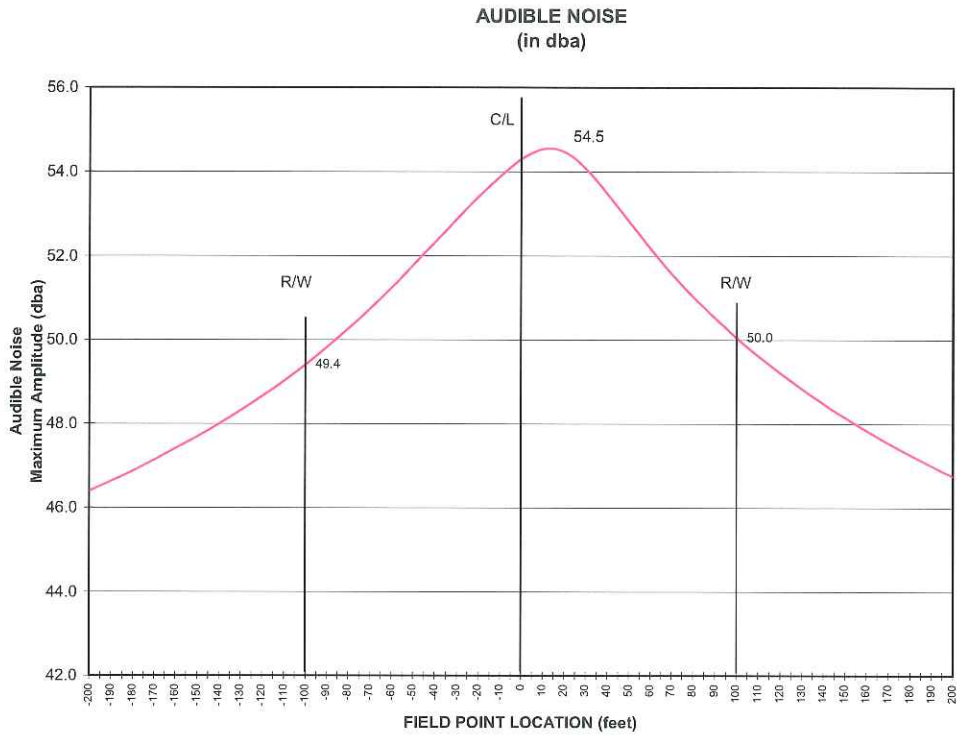


Figure AA-14 Audible Noise Interference Profile for the 500-kV Overhead Transmission Line Option

ATTACHMENT AA-1

AC Electric and Magnetic Field Analysis

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Û     C O R O N A   A N D   F I E L D          Û
Û E F F E C T S   P R O G R A M   V E R .  3   Û
Û   Source: Bonneville Power Administration     Û
ÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛÛ
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INPUT DATA LIST

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****************** BIGLOW CANYON WIND FARM**************
FIGURE AA-2 230-KV SHIELDED 954 KCMIL CARDINAL COND 600 MVA-1506A PER PHASE
1,0, 3, 5,0.0,   2.00,   1.00,    .00

(ENGLISH UNITS OPTION)

(GRADIENTS ARE COMPUTED BY PROGRAM)

PHYSICAL SYSTEM CONSISTS OF  5 CONDUCTORS, OF WHICH  3 ARE ENERGIZED PHASES

OPTIONS: 'COMB'
  5.000,  5.000, 10.000,    .000,  1.000, 75.000,  3.280,  2.000,  3.280
 'CIR1-A  ','A',  -19.50,   30.00, 2,   1.196,  18.000, 140.000,     .000,   1.506,    .000
 'CIR1-B  ','A',     .00,   30.00, 2,   1.196,  18.000, 140.000,-120.000,   1.506,    .000
 'CIR1-C  ','A',   19.50,   30.00, 2,   1.196,  18.000, 140.000, 120.000,   1.506,    .000
 'SH-1    ','A',   -9.75,   35.00, 2,    .385,  18.000,     .000,    .000,    .000,    .000
 'SH-2    ','A',    9.75,   35.00, 2,    .385,  18.000,     .000,    .000,    .000,    .000
 41 -200.0    5.0
 40    5.0    5.0
  0     .0     .0
1COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, OZONE CONCENTRATION, GROUND GRADIENT AND MAGNETIC FIELD
****************** BIGLOW CANYON WIND FARM**************
FIGURE AA-2 230-KV SHIELDED 954 KCMIL CARDINAL COND 600 MVA-1506A PER PHASE
```

	DIST. FROM CENTER OF TOWER (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON DIAM. (IN)	NO. OF SUBCON	SUBCON SPACING (IN)	VOLTAGE L-N (KV)	PHASE ANGLE (DEGREES)	CURRENT (kAmps)	CORONA LOSSES (KW/MI)
CIR1-A	-19.50	30.00	11.11	1.20	2	18.00	140.00	.00	1.51	1.335
CIR1-B	.00	30.00	12.30	1.20	2	18.00	140.00	-120.00	1.51	2.597
CIR1-C	19.50	30.00	11.11	1.20	2	18.00	140.00	120.00	1.51	1.335
SH-1	-9.75	35.00	5.70	.38	2	18.00	.00	.00	.00	.000
SH-2	9.75	35.00	5.70	.38	2	18.00	.00	.00	.00	.000

AN MICROPHONE HT.= 5.0 FT, RI ANT. HT.= 5.0 FT, TV ANT. HT.= 10.0 FT, ALTITUDE=   .0 FT
RI FREQ= 1.000 MHZ, TV FREQ= 75.000 MHZ, WIND VEL.(OZ)= 2.000 MPH, GROUND CONDUCTIVITY =   2.0 MMHOS/M
E-FIELD TRANSDUCER HT.=   3.3FT, B-FIELD TRANSDUCER HT.= 3.3FT

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE (RAIN) L50 DBA	AUDIBLE NOISE (FAIR) L50 DBA	RADIO INTERFERENCE (RAIN) L50 DBUV/M	RADIO INTERFERENCE (FAIR) L50 DBUV/M	TVI TOTAL RAIN DBUV/M	OZONE FOR RAIN RATE OF 1.00 IN/HR AT 0. FT LEVEL PPB	ELECTRIC FIELD KV/M	MAGNETIC FIELD GAUSS
-200.0	23.6	-1.4	24.6	7.6	-4.7	.000000	.053	.00828
-195.0	23.7	-1.3	24.9	7.9	-4.5	.000000	.056	.00871
-190.0	23.8	-1.2	25.2	8.2	-4.3	.000000	.061	.00917
-185.0	24.0	-1.0	25.5	8.5	-4.0	.000000	.065	.00967
-180.0	24.1	-.9	25.9	8.9	-3.8	.000000	.070	.01021
-175.0	24.2	-.8	26.2	9.2	-3.6	.000000	.076	.01080
-170.0	24.4	-.6	26.6	9.6	-3.3	.000000	.082	.01143
-165.0	24.5	-.5	27.0	10.0	-3.1	.000000	.090	.01213
-160.0	24.7	-.3	27.3	10.3	-2.8	.000000	.097	.01289
-155.0	24.8	-.2	27.7	10.7	-2.5	.000000	.106	.01372
-150.0	25.0	.0	28.2	11.2	-2.2	.000000	.117	.01464
-145.0	25.1	.1	28.6	11.6	-2.0	.000000	.128	.01565
-140.0	25.3	.3	29.1	12.1	-1.7	.000000	.141	.01677
-135.0	25.5	.5	29.5	12.5	-1.3	.000000	.156	.01801
-130.0	25.7	.7	30.0	13.0	-1.0	.000000	.174	.01940
-125.0	25.9	.9	30.6	13.6	-.7	.000000	.194	.02095
-120.0	26.1	1.1	31.1	14.1	-.3	.000000	.217	.02269
-115.0	26.3	1.3	31.7	14.7	.0	.000000	.244	.02465
-110.0	26.5	1.5	32.3	15.3	.4	.000000	.276	.02687
-105.0	26.7	1.7	32.9	15.9	.8	.000000	.314	.02941
-100.0	26.9	1.9	33.6	16.6	1.2	.000000	.358	.03231
-95.0	27.2	2.2	34.3	17.3	1.6	.000000	.412	.03566
-90.0	27.4	2.4	35.1	18.1	2.1	.000000	.476	.03953
-85.0	27.7	2.7	35.9	18.9	2.5	.000000	.554	.04406
-80.0	28.0	3.0	36.7	19.7	3.0	.000000	.649	.04937
-75.0	**28.3**	**3.3**	**37.6**	**20.6**	**3.6**	**.000000**	**.766**	**.05566**
-70.0	28.6	3.6	38.6	21.6	4.1	.000000	.910	.06316
-65.0	28.9	3.9	39.6	22.6	4.7	.000000	1.089	.07215
-60.0	29.3	4.3	40.7	23.7	5.3	.000000	1.310	.08302
-55.0	29.7	4.7	42.1	25.1	6.0	.000000	1.582	.09621
-50.0	30.1	5.1	43.7	26.7	6.7	.000000	1.912	.11224
-45.0	30.5	5.5	45.3	28.3	7.5	.000000	2.302	.13165
-40.0	30.9	5.9	47.0	30.0	8.3	.000000	2.736	.15484
-35.0	31.4	6.4	48.6	31.6	9.2	.000000	3.170	.18173
-30.0	31.8	6.8	50.0	33.0	10.2	.000000	3.517	.21130
-25.0	32.3	7.3	51.0	34.0	11.2	.000000	3.651	.24112
-20.0	32.6	7.6	52.5	35.5	12.3	.000000	3.464	.26757
-15.0	33.0	8.0	54.1	37.1	13.4	.000000	2.955	.28730
-10.0	33.3	8.3	55.5	38.5	14.4	.000329	2.298	.29894
-5.0	33.4	8.4	56.4	39.4	15.1	.004422	1.784	.30389
.0	33.5	8.5	56.8	39.8	15.3	.010357	1.613	.30502
5.0	33.4	8.4	56.4	39.4	15.1	.014608	1.784	.30389
10.0	33.3	8.3	55.5	38.5	14.4	.018150	2.298	.29894
15.0	33.0	8.0	54.1	37.1	13.4	.029940	2.955	.28730
20.0	32.6	7.6	52.5	35.5	12.3	.044154	3.464	.26757
25.0	32.3	7.3	51.0	34.0	11.2	.053603	3.651	.24112
30.0	31.8	6.8	50.0	33.0	10.2	.059082	3.517	.21130
35.0	31.4	6.4	48.6	31.6	9.2	.065609	3.170	.18173
40.0	30.9	5.9	47.0	30.0	8.3	.071187	2.736	.15484
45.0	30.5	5.5	45.3	28.3	7.5	.073865	2.302	.13165
50.0	30.1	5.1	43.7	26.7	6.7	.074211	1.912	.11224
55.0	29.7	4.7	42.1	25.1	6.0	.073133	1.582	.09621
60.0	29.3	4.3	40.7	23.7	5.3	.071282	1.310	.08302
65.0	28.9	3.9	39.6	22.6	4.7	.069054	1.089	.07215

70.0	28.6	3.6	38.6	21.6	4.1	.066678	.910	.06316
75.0	**28.3**	**3.3**	**37.6**	**20.6**	**3.6**	**.064285**	**.766**	**.05566**
80.0	28.0	3.0	36.7	19.7	3.0	.061944	.649	.04937
85.0	27.7	2.7	35.9	18.9	2.5	.059694	.554	.04406
90.0	27.4	2.4	35.1	18.1	2.1	.057553	.476	.03953
95.0	27.2	2.2	34.3	17.3	1.6	.055527	.412	.03566
100.0	26.9	1.9	33.6	16.6	1.2	.053616	.358	.03231
105.0	26.7	1.7	32.9	15.9	.8	.051818	.314	.02941
110.0	26.5	1.5	32.3	15.3	.4	.050126	.276	.02687
115.0	26.3	1.3	31.7	14.7	.0	.048535	.244	.02465
120.0	26.1	1.1	31.1	14.1	-.3	.047037	.217	.02269
125.0	25.9	.9	30.6	13.6	-.7	.045627	.194	.02095
130.0	25.7	.7	30.0	13.0	-1.0	.044297	.174	.01940
135.0	25.5	.5	29.5	12.5	-1.3	.043042	.156	.01801
140.0	25.3	.3	29.1	12.1	-1.7	.041857	.141	.01677
145.0	25.1	.1	28.6	11.6	-2.0	.040736	.128	.01565
150.0	25.0	.0	28.2	11.2	-2.2	.039674	.117	.01464
155.0	24.8	-.2	27.7	10.7	-2.5	.038667	.106	.01372
160.0	24.7	-.3	27.3	10.3	-2.8	.037712	.097	.01289
165.0	24.5	-.5	27.0	10.0	-3.1	.036804	.090	.01213
170.0	24.4	-.6	26.6	9.6	-3.3	.035940	.082	.01143
175.0	24.2	-.8	26.2	9.2	-3.6	.035118	.076	.01080
180.0	24.1	-.9	25.9	8.9	-3.8	.034333	.070	.01021
185.0	24.0	-1.0	25.5	8.5	-4.0	.033585	.065	.00967
190.0	23.8	-1.2	25.2	8.2	-4.3	.032869	.061	.00917
195.0	23.7	-1.3	24.9	7.9	-4.5	.032185	.056	.00871
200.0	23.6	-1.4	24.6	7.6	-4.7	.031530	.053	.00828

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Û      C O R O N A   A N D   F I E L D        Û
Û E F F E C T S   P R O G R A M   V E R .  3  Û
Û   Source: Bonneville Power Administration   Û
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****************** BIGLOW CANYON WIND FARM*************
FIGURE AA-3 230-KV NO SHIELD 954 ACSR CARDINAL 600MVA-1506A
1,0, 3, 3,0.0,   2.00,    1.00,     .00

(ENGLISH UNITS OPTION)

(GRADIENTS ARE COMPUTED BY PROGRAM)

PHYSICAL SYSTEM CONSISTS OF  3 CONDUCTORS, OF WHICH  3 ARE ENERGIZED PHASES

OPTIONS: 'COMB'
  5.000,  5.000, 10.000,    .000,  1.000, 75.000,  3.280,  2.000,  3.280
 'CIR1-A  ','A',  -19.50,   30.00, 2,   1.196,  18.000, 140.000,     .000,    1.506,     .000
 'CIR1-B  ','A',     .00,   30.00, 2,   1.196,  18.000, 140.000,-120.000,    1.506,     .000
 'CIR1-C  ','A',   19.50,   30.00, 2,   1.196,  18.000, 140.000, 120.000,    1.506,     .000
 41 -200.0     5.0
 40    5.0     5.0
  0     .0      .0
1COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, OZONE CONCENTRATION, GROUND GRADIENT AND MAGNETIC FIELD
****************** BIGLOW CANYON WIND FARM*************
FIGURE AA-3 230-KV NO SHIELD 954 ACSR CARDINAL 600MVA-1506A
```

	DIST. FROM CENTER OF TOWER (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON DIAM. (IN)	NO. OF SUBCON	SUBCON SPACING (IN)	VOLTAGE L-N (KV)	PHASE ANGLE (DEGREES)	CURRENT (kAmps)	CORONA LOSSES (KW/MI)
CIR1-A	-19.50	30.00	10.98	1.20	2	18.00	140.00	.00	1.51	1.237
CIR1-B	.00	30.00	11.92	1.20	2	18.00	140.00	-120.00	1.51	2.110
CIR1-C	19.50	30.00	10.98	1.20	2	18.00	140.00	120.00	1.51	1.237

AN MICROPHONE HT.= 5.0 FT, RI ANT. HT.= 5.0 FT, TV ANT. HT.= 10.0 FT, ALTITUDE= .0 FT
RI FREQ= 1.000 MHZ, TV FREQ= 75.000 MHZ, WIND VEL.(OZ)= 2.000 MPH, GROUND CONDUCTIVITY = 2.0 MMHOS/M
E-FIELD TRANSDUCER HT.= 3.3FT, B-FIELD TRANSDUCER HT.= 3.3FT

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE (RAIN) L50 DBA	AUDIBLE NOISE (FAIR) L50 DBA	RADIO INTERFERENCE (RAIN) L50 DBUV/M	RADIO INTERFERENCE (FAIR) L50 DBUV/M	TVI TOTAL RAIN DBUV/M	OZONE FOR RAIN RATE OF 1.00 IN/HR AT 0. FT LEVEL PPB	ELECTRIC FIELD KV/M	MAGNETIC FIELD GAUSS
-200.0	22.3	-2.7	22.9	5.9	-6.4	.000000	.051	.00828
-195.0	22.5	-2.5	23.2	6.2	-6.2	.000000	.054	.00871
-190.0	22.6	-2.4	23.6	6.6	-5.9	.000000	.059	.00917
-185.0	22.7	-2.3	23.9	6.9	-5.7	.000000	.063	.00967
-180.0	22.9	-2.1	24.2	7.2	-5.5	.000000	.069	.01021
-175.0	23.0	-2.0	24.6	7.6	-5.2	.000000	.074	.01080
-170.0	23.1	-1.9	24.9	7.9	-5.0	.000000	.081	.01143
-165.0	23.3	-1.7	25.3	8.3	-4.7	.000000	.088	.01213
-160.0	23.4	-1.6	25.7	8.7	-4.5	.000000	.096	.01289
-155.0	23.6	-1.4	26.1	9.1	-4.2	.000000	.105	.01372
-150.0	23.7	-1.3	26.5	9.5	-3.9	.000000	.116	.01464
-145.0	23.9	-1.1	26.9	9.9	-3.6	.000000	.128	.01565
-140.0	24.1	-.9	27.4	10.4	-3.3	.000000	.141	.01677
-135.0	24.3	-.7	27.9	10.9	-3.0	.000000	.157	.01801
-130.0	24.4	-.6	28.4	11.4	-2.7	.000000	.175	.01940
-125.0	24.6	-.4	28.9	11.9	-2.4	.000000	.195	.02095
-120.0	24.8	-.2	29.4	12.4	-2.0	.000000	.219	.02269
-115.0	25.0	.0	30.0	13.0	-1.7	.000000	.247	.02465
-110.0	25.3	.3	30.6	13.6	-1.3	.000000	.280	.02687
-105.0	25.5	.5	31.3	14.3	-.9	.000000	.319	.02941
-100.0	25.7	.7	31.9	14.9	-.5	.000000	.365	.03231
-95.0	26.0	1.0	32.7	15.7	-.1	.000000	.420	.03566
-90.0	26.2	1.2	33.4	16.4	.4	.000000	.486	.03953
-85.0	26.5	1.5	34.2	17.2	.9	.000000	.567	.04406
-80.0	26.8	1.8	35.1	18.1	1.4	.000000	.665	.04937
-75.0	**27.1**	**2.1**	**36.0**	**19.0**	**1.9**	**.000000**	**.785**	**.05566**
-70.0	27.4	2.4	37.1	20.1	2.4	.000000	.933	.06316
-65.0	27.7	2.7	38.5	21.5	3.0	.000000	1.117	.07215
-60.0	28.1	3.1	39.9	22.9	3.7	.000000	1.344	.08302
-55.0	28.5	3.5	41.4	24.4	4.3	.000000	1.623	.09621
-50.0	28.9	3.9	43.1	26.1	5.1	.000000	1.962	.11224
-45.0	29.3	4.3	44.7	27.7	5.8	.000000	2.362	.13165
-40.0	29.7	4.7	46.4	29.4	6.7	.000000	2.809	.15484
-35.0	30.2	5.2	48.0	31.0	7.6	.000000	3.259	.18173
-30.0	30.6	5.6	49.4	32.4	8.6	.000000	3.624	.21130
-25.0	31.0	6.0	50.4	33.4	9.6	.000000	3.781	.24112
-20.0	31.4	6.4	50.9	33.9	10.7	.000000	3.622	.26757
-15.0	31.7	6.7	52.5	35.5	11.7	.000000	3.146	.28730
-10.0	32.0	7.0	53.8	36.8	12.7	.000298	2.528	.29894
-5.0	32.1	7.1	54.8	37.8	13.4	.004003	2.050	.30389
.0	32.2	7.2	55.1	38.1	13.7	.009375	1.892	.30502
5.0	32.1	7.1	54.8	37.8	13.4	.013224	2.050	.30389
10.0	32.0	7.0	53.8	36.8	12.7	.016256	2.528	.29894
15.0	31.7	6.7	52.5	35.5	11.7	.025389	3.146	.28730
20.0	31.4	6.4	50.9	33.9	10.7	.036258	3.622	.26757
25.0	31.0	6.0	50.4	33.4	9.6	.043434	3.781	.24112
30.0	30.6	5.6	49.4	32.4	8.6	.047656	3.624	.21130
35.0	30.2	5.2	48.0	31.0	7.6	.053253	3.259	.18173
40.0	29.7	4.7	46.4	29.4	6.7	.058240	2.809	.15484
45.0	29.3	4.3	44.7	27.7	5.8	.060743	2.362	.13165
50.0	28.9	3.9	43.1	26.1	5.1	.061208	1.962	.11224
55.0	28.5	3.5	41.4	24.4	4.3	.060421	1.623	.09621
60.0	28.1	3.1	39.9	22.9	3.7	.058949	1.344	.08302
65.0	27.7	2.7	38.5	21.5	3.0	.057140	1.117	.07215
70.0	27.4	2.4	37.1	20.1	2.4	.055193	.933	.06316
75.0	**27.1**	**2.1**	**36.0**	**19.0**	**1.9**	**.053222**	**.785**	**.05566**
80.0	26.8	1.8	35.1	18.1	1.4	.051290	.665	.04937
85.0	26.5	1.5	34.2	17.2	.9	.049430	.567	.04406

90.0	26.2	1.2	33.4	16.4	.4	.047658	.486	.03953
95.0	26.0	1.0	32.7	15.7	-.1	.045980	.420	.03566
100.0	25.7	.7	31.9	14.9	-.5	.044398	.365	.03231
105.0	25.5	.5	31.3	14.3	-.9	.042908	.319	.02941
110.0	25.3	.3	30.6	13.6	-1.3	.041506	.280	.02687
115.0	25.0	.0	30.0	13.0	-1.7	.040187	.247	.02465
120.0	24.8	-.2	29.4	12.4	-2.0	.038946	.219	.02269
125.0	24.6	-.4	28.9	11.9	-2.4	.037777	.195	.02095
130.0	24.4	-.6	28.4	11.4	-2.7	.036675	.175	.01940
135.0	24.3	-.7	27.9	10.9	-3.0	.035635	.157	.01801
140.0	24.1	-.9	27.4	10.4	-3.3	.034653	.141	.01677
145.0	23.9	-1.1	26.9	9.9	-3.6	.033724	.128	.01565
150.0	23.7	-1.3	26.5	9.5	-3.9	.032844	.116	.01464
155.0	23.6	-1.4	26.1	9.1	-4.2	.032010	.105	.01372
160.0	23.4	-1.6	25.7	8.7	-4.5	.031219	.096	.01289
165.0	23.3	-1.7	25.3	8.3	-4.7	.030467	.088	.01213
170.0	23.1	-1.9	24.9	7.9	-5.0	.029751	.081	.01143
175.0	23.0	-2.0	24.6	7.6	-5.2	.029070	.074	.01080
180.0	22.9	-2.1	24.2	7.2	-5.5	.028420	.069	.01021
185.0	22.7	-2.3	23.9	6.9	-5.7	.027800	.063	.00967
190.0	22.6	-2.4	23.6	6.6	-5.9	.027207	.059	.00917
195.0	22.5	-2.5	23.2	6.2	-6.2	.026641	.054	.00871
200.0	22.3	-2.7	22.9	5.9	-6.4	.026098	.051	.00828

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Û      C O R O N A   A N D   F I E L D        Û
Û E F F E C T S   P R O G R A M   V E R.  3   Û
Û   Source: Bonneville Power Administration   Û
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INPUT DATA LIST

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            9/23/2005           09:25:03
****************** BIGLOW CANYON WIND FARM 500-KV STEEL TRANS LINE PROJE
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FIGURE AA-4 PROPOSED 500-KV STEEL POLE (Three-cond bundle-PHEASANT)-600 MVA-693A PER PHASE

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1,0, 3, 4,0.0,   2.00,   1.00,    .00

(ENGLISH UNITS OPTION)

(GRADIENTS ARE COMPUTED BY PROGRAM)

PHYSICAL SYSTEM CONSISTS OF  4 CONDUCTORS, OF WHICH  3 ARE ENERGIZED PHASES

OPTIONS: 'COMB'
  5.000,  5.000, 10.000,    .000,  1.000, 75.000,  3.280,  2.000,  3.280
 'CIR1-A  ','A',   13.00,   65.00, 3,   1.382,  18.000, 318.000,     .000,     .693,     .000
 'CIR1-B  ','A',  -13.00,   50.00, 3,   1.382,  18.000, 318.000,-120.000,     .693,     .000
 'CIR1-C  ','A',   16.00,   35.00, 3,   1.382,  18.000, 318.000, 120.000,     .693,     .000
 'CIR1-SH ','A',    6.00,   91.50, 1,    .385,    .000,    .000,    .000,     .000,     .000
  41 -200.0    5.0
  40    5.0    5.0
   0     .0     .0
1COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, OZONE CONCENTRATION, GROUND GRADIENT AND MAGNETIC FIELD
****************** BIGLOW CANYON WIND FARM 500-KV STEEL TRANS LINE PROJE
PROPOSED 500-KV STEEL POLE (Three-cond bundle-PHEASANT)-600 MVA-693A PER
```

	DIST. FROM CENTER OF TOWER (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON DIAM. (IN)	NO. OF SUBCON	SUBCON SPACING (IN)	VOLTAGE L-N (KV)	PHASE ANGLE (DEGREES)	CURRENT (kAmps)	CORONA LOSSES (KW/MI)
CIR1-A	13.00	65.00	16.87	1.38	3	18.00	318.00	.00	.69	61.014
CIR1-B	-13.00	50.00	16.71	1.38	3	18.00	318.00	-120.00	.69	57.280
CIR1-C	16.00	35.00	17.35	1.38	3	18.00	318.00	120.00	.69	73.324
CIR1-SH	6.00	91.50	13.08	.38	1	.00	.00	.00	.00	.000

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AN MICROPHONE HT.=  5.0 FT, RI ANT. HT.=  5.0 FT, TV ANT. HT.= 10.0 FT, ALTITUDE=       .0 FT
RI FREQ=  1.000 MHZ, TV FREQ=  75.000 MHZ, WIND VEL.(OZ)= 2.000 MPH, GROUND CONDUCTIVITY =   2.0 MMHOS/M
E-FIELD TRANSDUCER HT.=   3.3FT, B-FIELD TRANSDUCER HT.=   3.3FT
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LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE (RAIN) L50 DBA	AUDIBLE NOISE (FAIR) L50 DBA	RADIO INTERFERENCE (RAIN) L50 DBUV/M	RADIO INTERFERENCE (FAIR) L50 DBUV/M	TVI TOTAL RAIN DBUV/M	OZONE FOR RAIN RATE OF 1.00 IN/HR AT 0. FT LEVEL PPB	ELECTRIC FIELD KV/M	MAGNETIC FIELD GAUSS
-200.0	46.4	21.4	49.2	32.2	15.0	.000000	.220	.00310
-195.0	46.5	21.5	49.4	32.4	15.2	.000000	.233	.00325
-190.0	46.6	21.6	49.7	32.7	15.4	.000000	.247	.00342
-185.0	46.8	21.8	50.0	33.0	15.7	.000000	.262	.00359
-180.0	46.9	21.9	50.3	33.3	15.9	.000000	.279	.00379
-175.0	47.0	22.0	50.5	33.5	16.1	.000000	.297	.00400
-170.0	47.1	22.1	50.8	33.8	16.3	.000000	.317	.00422
-165.0	47.3	22.3	51.1	34.1	16.6	.000000	.339	.00447
-160.0	47.4	22.4	51.5	34.5	16.8	.000000	.363	.00473
-155.0	47.6	22.6	51.8	34.8	17.0	.000000	.389	.00502
-150.0	47.7	22.7	52.1	35.1	17.3	.000000	.419	.00534
-145.0	47.8	22.8	52.5	35.5	17.5	.000000	.452	.00569
-140.0	48.0	23.0	52.8	35.8	17.8	.000000	.489	.00607
-135.0	48.2	23.2	53.2	36.2	18.1	.000000	.530	.00648
-130.0	48.3	23.3	53.7	36.7	18.4	.000000	.577	.00695
-125.0	48.5	23.5	54.2	37.2	18.7	.000000	.629	.00745
-120.0	48.7	23.7	54.8	37.8	19.0	.000000	.687	.00802
-115.0	48.8	23.8	55.3	38.3	19.3	.000000	.753	.00865
-110.0	49.0	24.0	56.0	39.0	19.6	.000000	.829	.00935
-105.0	49.2	24.2	56.6	39.6	19.9	.000000	.914	.01013
-100.0	**49.4**	**24.4**	**57.3**	**40.3**	**20.3**	**.000000**	**1.011**	**.01101**
-95.0	49.6	24.6	57.9	40.9	20.7	.000000	1.121	.01200
-90.0	49.8	24.8	58.7	41.7	21.0	.000000	1.247	.01311
-85.0	50.0	25.0	59.4	42.4	21.5	.000000	1.390	.01438
-80.0	50.3	25.3	60.2	43.2	22.0	.000000	1.553	.01581
-75.0	50.5	25.5	61.0	44.0	22.4	.000000	1.738	.01744
-70.0	50.7	25.7	61.9	44.9	23.0	.000000	1.945	.01930
-65.0	51.0	26.0	62.7	45.7	23.5	.000000	2.177	.02142
-60.0	51.2	26.2	63.6	46.6	24.0	.000000	2.431	.02384
-55.0	51.5	26.5	64.5	47.5	24.5	.000000	2.704	.02659
-50.0	51.8	26.8	65.4	48.4	25.1	.000000	2.988	.02972
-45.0	52.1	27.1	66.3	49.3	25.6	.000000	3.270	.03326
-40.0	52.3	27.3	67.1	50.1	26.1	.000000	3.529	.03722
-35.0	52.6	27.6	67.9	50.9	26.7	.000000	3.738	.04160
-30.0	52.9	27.9	68.6	51.6	27.4	.000000	3.867	.04637
-25.0	53.2	28.2	69.1	52.1	28.2	.000000	3.894	.05145
-20.0	53.4	28.4	69.5	52.5	29.0	.000000	3.825	.05672
-15.0	53.7	28.7	69.7	52.7	29.8	.000000	3.740	.06202
-10.0	53.9	28.9	70.7	53.7	30.6	.000000	3.828	.06710
-5.0	54.1	29.1	72.0	55.0	31.5	.000000	4.322	.07170
.0	54.3	29.3	73.3	56.3	32.3	.000078	5.245	.07545
5.0	54.4	29.4	74.3	57.3	33.1	.004043	6.372	.07790
10.0	54.5	29.5	75.1	58.1	33.6	.022781	7.397	.07861
15.0	54.5	29.5	75.4	58.4	33.8	.055620	8.051	.07725
20.0	54.5	29.5	75.3	58.3	33.7	.092433	8.183	.07385
25.0	54.3	29.3	74.7	57.7	33.3	.126101	7.803	.06878
30.0	54.1	29.1	73.7	56.7	32.6	.184542	7.051	.06271
35.0	53.8	28.8	72.6	55.6	31.8	.304487	6.115	.05628
40.0	53.5	28.5	71.2	54.2	31.0	.431586	5.155	.05002
45.0	53.1	28.1	69.8	52.8	30.1	.533157	4.274	.04421
50.0	52.8	27.8	68.4	51.4	29.3	.606914	3.517	.03901
55.0	52.5	27.5	67.1	50.1	28.5	.658089	2.897	.03444
60.0	52.2	27.2	65.8	48.8	27.7	.691995	2.402	.03046
65.0	51.9	26.9	64.5	47.5	27.0	.712877	2.013	.02702
70.0	51.6	26.6	63.3	46.3	26.3	.724006	1.709	.02405
75.0	51.3	26.3	62.2	45.2	25.7	.727886	1.471	.02149

80.0	51.0	26.0	61.3	44.3	25.0	.726426	1.284	.01927
85.0	50.8	25.8	60.7	43.7	24.5	.721077	1.134	.01735
90.0	50.5	25.5	60.1	43.1	23.9	.712934	1.013	.01568
95.0	50.3	25.3	59.5	42.5	23.4	.702824	.912	.01422
100.0	**50.0**	**25.0**	**58.9**	**41.9**	**22.9**	**.691367**	**.828**	**.01294**
105.0	49.8	24.8	58.4	41.4	22.5	.679027	.756	.01182
110.0	49.6	24.6	57.8	40.8	22.0	.666149	.693	.01083
115.0	49.4	24.4	57.3	40.3	21.6	.652993	.639	.00995
120.0	49.2	24.2	56.8	39.8	21.2	.639747	.591	.00917
125.0	49.0	24.0	56.3	39.3	20.8	.626553	.548	.00848
130.0	48.8	23.8	55.8	38.8	20.4	.613512	.509	.00786
135.0	48.7	23.7	55.3	38.3	20.1	.600697	.475	.00730
140.0	48.5	23.5	54.9	37.9	19.7	.588159	.443	.00680
145.0	48.3	23.3	54.5	37.5	19.4	.575934	.415	.00634
150.0	48.1	23.1	54.1	37.1	19.1	.564043	.389	.00593
155.0	48.0	23.0	53.7	36.7	18.8	.552499	.365	.00556
160.0	47.8	22.8	53.3	36.3	18.5	.541308	.343	.00521
165.0	47.7	22.7	52.9	35.9	18.2	.530472	.323	.00490
170.0	47.5	22.5	52.5	35.5	17.9	.519988	.305	.00462
175.0	47.4	22.4	52.2	35.2	17.7	.509849	.288	.00436
180.0	47.3	22.3	51.8	34.8	17.4	.500048	.273	.00412
185.0	47.1	22.1	51.5	34.5	17.1	.490575	.258	.00390
190.0	47.0	22.0	51.2	34.2	16.9	.481421	.245	.00369
195.0	46.9	21.9	50.9	33.9	16.6	.472575	.232	.00351
200.0	46.7	21.7	50.6	33.6	16.4	.464026	.221	.00333

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Û       C O R O N A   A N D   F I E L D          Û
ÛE F F E C T S   P R O G R A M   V E R.  3       Û
Û   Source: Bonneville Power Administration      Û
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INPUT DATA LIST

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                 9/23/2005            12:23:39
****************** BIGLOW CANYON WIND FARM*************
FIGURE AA-8 34.5-KV UNDERGROUND,1000KCMIL 600A, 4"spacings,48" DEEP
1,0, 3, 3,0.0,    2.00,    1.00,     .00

(ENGLISH UNITS OPTION)

(GRADIENTS ARE COMPUTED BY PROGRAM)

PHYSICAL SYSTEM CONSISTS OF  3 CONDUCTORS, OF WHICH  3 ARE ENERGIZED PHASES

OPTIONS: 'COMB'
 5.000,  5.000, 10.000,    .000,  1.000, 75.000,   6.280,  2.000,   6.280
'CIR1-A  ','A',     -.17,     .10, 1,    1.170,     .000,  21.920,      .000,      .600,      .000
'CIR1-B  ','A',      .00,     .10, 1,    1.170,     .000,  21.920,-120.000,      .600,      .000
'CIR1-C  ','A',      .17,     .10, 1,    1.170,     .000,  21.920, 120.000,      .600,      .000
 41 -200.0     5.0
 40    5.0     5.0
  0     .0      .0
1COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, OZONE CONCENTRATION, GROUND GRADIENT AND MAGNETIC FIELD
****************** BIGLOW CANYON WIND FARM*************
FIGURE AA-4 34.5-KV UNDERGROUND,1000KCMIL 600A, 4"spacings,38" DEEP
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	DIST. FROM CENTER OF TOWER (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON DIAM. (IN)	NO. OF SUBCON	SUBCON SPACING (IN)	VOLTAGE L-N (KV)	PHASE ANGLE (DEGREES)	CURRENT (kAmps)	CORONA LOSSES (KW/MI)
CIR1-A	-.17	.10	13.68	1.17	1	.00	21.92	.00	.60	1.929
CIR1-B	.00	.10	16.12	1.17	1	.00	21.92	-120.00	.60	5.600
CIR1-C	.17	.10	13.68	1.17	1	.00	21.92	120.00	.60	1.929

AN MICROPHONE HT.= 5.0 FT, RI ANT. HT.= 5.0 FT, TV ANT. HT.= 10.0 FT, ALTITUDE=   .0 FT
RI FREQ= 1.000 MHZ, TV FREQ= 75.000 MHZ, WIND VEL.(OZ)= 2.000 MPH, GROUND CONDUCTIVITY =   2.0 MMHOS/M
E-FIELD TRANSDUCER HT.= 6.3FT, B-FIELD TRANSDUCER HT.= 6.3FT

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE (RAIN) L50 DBA	AUDIBLE NOISE (FAIR) L50 DBA	RADIO INTERFERENCE (RAIN) L50 DBUV/M	RADIO INTERFERENCE (FAIR) L50 DBUV/M	TVI TOTAL RAIN DBUV/M	OZONE FOR RAIN RATE OF 1.00 IN/HR AT 0. FT LEVEL PPB	ELECTRIC FIELD KV/M	MAGNETIC FIELD GAUSS
-200.0	36.2	11.2	-11.1	-28.1	9.0	.000000	.000	.00003
-195.0	36.4	11.4	-10.8	-27.8	9.5	.000000	.000	.00003
-190.0	36.5	11.5	-10.5	-27.5	9.9	.000000	.000	.00003
-185.0	36.6	11.6	-10.2	-27.2	10.4	.000000	.000	.00003
-180.0	36.8	11.8	-9.8	-26.8	10.9	.000000	.000	.00004
-175.0	36.9	11.9	-9.5	-26.5	11.3	.000000	.000	.00004
-170.0	37.0	12.0	-9.1	-26.1	11.8	.000000	.000	.00004
-165.0	37.2	12.2	-8.7	-25.7	12.4	.000000	.000	.00004
-160.0	37.3	12.3	-8.3	-25.3	12.9	.000000	.000	.00005
-155.0	37.5	12.5	-7.9	-24.9	13.4	.000000	.000	.00005
-150.0	37.7	12.7	-7.5	-24.5	14.0	.000000	.000	.00005
-145.0	37.8	12.8	-7.0	-24.0	14.6	.000000	.000	.00006
-140.0	38.0	13.0	-6.6	-23.6	15.2	.000000	.000	.00006
-135.0	38.2	13.2	-6.1	-23.1	15.8	.000000	.000	.00006
-130.0	38.4	13.4	-5.6	-22.6	16.5	.000000	.000	.00007
-125.0	38.6	13.6	-5.0	-22.0	17.2	.000000	.000	.00007
-120.0	38.8	13.8	-4.4	-21.4	17.9	.000000	.000	.00008
-115.0	39.0	14.0	-3.8	-20.8	18.6	.000000	.000	.00009
-110.0	39.2	14.2	-3.2	-20.2	19.4	.000000	.000	.00010
-105.0	39.4	14.4	-2.5	-19.5	20.2	.000000	.000	.00010
-100.0	39.7	14.7	-1.8	-18.8	21.0	.000000	.000	.00012
-95.0	39.9	14.9	-1.0	-18.0	21.9	.000000	.000	.00013
-90.0	40.2	15.2	-.2	-17.2	22.8	.000000	.000	.00014
-85.0	40.5	15.5	.7	-16.3	23.8	.000000	.000	.00016
-80.0	40.8	15.8	1.6	-15.4	24.8	.000000	.000	.00018
-75.0	41.1	16.1	2.6	-14.4	25.9	.000000	.000	.00020
-70.0	41.4	16.4	3.7	-13.3	27.1	.000000	.000	.00023
-65.0	41.8	16.8	4.9	-12.1	28.4	.000000	.001	.00027
-60.0	42.2	17.2	6.2	-10.8	29.7	.000000	.001	.00032
-55.0	42.6	17.6	7.6	-9.4	31.2	.000000	.001	.00038
-50.0	43.1	18.1	9.1	-7.9	32.8	.000000	.001	.00046
-45.0	43.6	18.6	10.9	-6.1	34.6	.000000	.001	.00056
-40.0	44.2	19.2	12.8	-4.2	36.5	.000000	.001	.00071
-35.0	44.8	19.8	15.0	-2.0	38.7	.000000	.002	.00092
-30.0	45.6	20.6	17.6	.6	41.1	.000000	.002	.00124
-25.0	46.4	21.4	20.6	3.6	43.9	.000000	.003	.00175
-20.0	47.5	22.5	24.3	7.3	47.1	.000000	.005	.00265
-15.0	48.8	23.8	28.9	11.9	50.9	.000000	.009	.00440
-10.0	50.5	25.5	34.9	17.9	55.2	.000000	.017	.00839
-5.0	52.8	27.8	42.9	25.9	59.3	.000000	.036	.01834
.0	54.6	29.6	49.1	32.1	61.3	.000000	.056	.03033
5.0	52.8	27.8	42.9	25.9	59.3	53.006800	.036	.01834
10.0	50.5	25.5	34.9	17.9	55.2	29.198730	.017	.00839
15.0	48.8	23.8	28.9	11.9	50.9	20.602070	.009	.00440
20.0	47.5	22.5	24.3	7.3	47.1	16.086390	.005	.00265
25.0	46.4	21.4	20.6	3.6	43.9	13.277420	.003	.00175
30.0	45.6	20.6	17.6	.6	41.1	11.350550	.002	.00124
35.0	44.8	19.8	15.0	-2.0	38.7	9.941267	.002	.00092
40.0	44.2	19.2	12.8	-4.2	36.5	8.862745	.001	.00071
45.0	43.6	18.6	10.9	-6.1	34.6	8.008971	.001	.00056
50.0	43.1	18.1	9.1	-7.9	32.8	7.315182	.001	.00046
55.0	42.6	17.6	7.6	-9.4	31.2	6.739493	.001	.00038
60.0	42.2	17.2	6.2	-10.8	29.7	6.253583	.001	.00032
65.0	41.8	16.8	4.9	-12.1	28.4	5.837588	.001	.00027
70.0	41.4	16.4	3.7	-13.3	27.1	5.477149	.000	.00023
75.0	41.1	16.1	2.6	-14.4	25.9	5.161622	.000	.00020
80.0	40.8	15.8	1.6	-15.4	24.8	4.882940	.000	.00018

85.0	40.5	15.5	.7	-16.3	23.8	4.634880	.000	.00016
90.0	40.2	15.2	-.2	-17.2	22.8	4.412555	.000	.00014
95.0	39.9	14.9	-1.0	-18.0	21.9	4.212078	.000	.00013
100.0	39.7	14.7	-1.8	-18.8	21.0	4.030313	.000	.00012
105.0	39.4	14.4	-2.5	-19.5	20.2	3.864701	.000	.00010
110.0	39.2	14.2	-3.2	-20.2	19.4	3.713137	.000	.00010
115.0	39.0	14.0	-3.8	-20.8	18.6	3.573868	.000	.00009
120.0	38.8	13.8	-4.4	-21.4	17.9	3.445424	.000	.00008
125.0	38.6	13.6	-5.0	-22.0	17.2	3.326565	.000	.00007
130.0	38.4	13.4	-5.6	-22.6	16.5	3.216232	.000	.00007
135.0	38.2	13.2	-6.1	-23.1	15.8	3.113519	.000	.00006
140.0	38.0	13.0	-6.6	-23.6	15.2	3.017647	.000	.00006
145.0	37.8	12.8	-7.0	-24.0	14.6	2.927939	.000	.00006
150.0	37.7	12.7	-7.5	-24.5	14.0	2.843807	.000	.00005
155.0	37.5	12.5	-7.9	-24.9	13.4	2.764734	.000	.00005
160.0	37.3	12.3	-8.3	-25.3	12.9	2.690267	.000	.00005
165.0	37.2	12.2	-8.7	-25.7	12.4	2.620007	.000	.00004
170.0	37.0	12.0	-9.1	-26.1	11.8	2.553598	.000	.00004
175.0	36.9	11.9	-9.5	-26.5	11.3	2.490725	.000	.00004
180.0	36.8	11.8	-9.8	-26.8	10.9	2.431108	.000	.00004
185.0	36.6	11.6	-10.2	-27.2	10.4	2.374493	.000	.00003
190.0	36.5	11.5	-10.5	-27.5	9.9	2.320654	.000	.00003
195.0	36.4	11.4	-10.8	-27.8	9.5	2.269388	.000	.00003
200.0	36.2	11.2	-11.1	-28.1	9.0	2.220510	.000	.00003

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Û        C O R O N A   A N D   F I E L D           Û
Û E F F E C T S   P R O G R A M   V E R .  3       Û
Û   Source: Bonneville Power Administration        Û
ÛÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÛ
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INPUT DATA LIST

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                  9/23/2005            12:27:48
****************** BIGLOW CANYON WIND FARM*************
FIGURE AA-9 (3)34.5-KV UG,1000KCMIL 600A
1,0, 9, 9,0.0,   2.00,   1.00,     .00

(ENGLISH UNITS OPTION)

(GRADIENTS ARE COMPUTED BY PROGRAM)

PHYSICAL SYSTEM CONSISTS OF  9 CONDUCTORS, OF WHICH  9 ARE ENERGIZED PHASES

OPTIONS: 'COMB'
  5.000,  5.000, 10.000,   .000,  1.000, 75.000,  6.280,  2.000,  6.280
'CIR1-A  ','A',     -.17,    .10, 1,   1.170,    .000,  21.920,     .000,     .600,     .000
'CIR1-B  ','A',      .00,    .10, 1,   1.170,    .000,  21.920,-120.000,     .600,     .000
'CIR1-C  ','A',      .17,    .10, 1,   1.170,    .000,  21.920, 120.000,     .600,     .000
'CIR2-A  ','A',   -10.17,    .10, 1,   1.170,    .000,  21.920,     .000,     .600,     .000
'CIR2-B  ','A',   -10.00,    .10, 1,   1.170,    .000,  21.920,-120.000,     .600,     .000
'CIR2-C  ','A',    -9.83,    .10, 1,   1.170,    .000,  21.920, 120.000,     .600,     .000
'CIR3-A  ','A',    10.17,    .10, 1,   1.170,    .000,  21.920,     .000,     .600,     .000
'CIR3-B  ','A',    10.00,    .10, 1,   1.170,    .000,  21.920,-120.000,     .600,     .000
'CIR3-C  ','A',     9.83,    .10, 1,   1.170,    .000,  21.920, 120.000,     .600,     .000
 41 -200.0    5.0
 40    5.0    5.0
  0     .0     .0
1COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, OZONE CONCENTRATION, GROUND GRADIENT AND MAGNETIC FIELD
****************** BIGLOW CANYON WIND FARM*************
FIGURE AA-5 (3)34.5-KV UG,1000KCMIL 600A
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	DIST. FROM CENTER OF TOWER (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON DIAM. (IN)	NO. OF SUBCON	SUBCON SPACING (IN)	VOLTAGE L-N (KV)	PHASE ANGLE (DEGREES)	CURRENT (kAmps)	CORONA LOSSES (KW/MI)
CIR1-A	-.17	.10	13.68	1.17	1	.00	21.92	.00	.60	1.928
CIR1-B	.00	.10	16.12	1.17	1	.00	21.92	-120.00	.60	5.601
CIR1-C	.17	.10	13.68	1.17	1	.00	21.92	120.00	.60	1.928
CIR2-A	-10.17	.10	13.68	1.17	1	.00	21.92	.00	.60	1.928
CIR2-B	-10.00	.10	16.12	1.17	1	.00	21.92	-120.00	.60	5.601
CIR2-C	-9.83	.10	13.68	1.17	1	.00	21.92	120.00	.60	1.929
CIR3-A	10.17	.10	13.68	1.17	1	.00	21.92	.00	.60	1.929
CIR3-B	10.00	.10	16.12	1.17	1	.00	21.92	-120.00	.60	5.601
CIR3-C	9.83	.10	13.68	1.17	1	.00	21.92	120.00	.60	1.928

AN MICROPHONE HT.= 5.0 FT, RI ANT. HT.= 5.0 FT, TV ANT. HT.= 10.0 FT, ALTITUDE= .0 FT
RI FREQ= 1.000 MHZ, TV FREQ= 75.000 MHZ, WIND VEL.(OZ)= 2.000 MPH, GROUND CONDUCTIVITY = 2.0 MMHOS/M
E-FIELD TRANSDUCER HT.= 6.3FT, B-FIELD TRANSDUCER HT.= 6.3FT

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE (RAIN) L50 DBA	AUDIBLE NOISE (FAIR) L50 DBA	RADIO INTERFERENCE (RAIN) L50 DBUV/M	RADIO INTERFERENCE (FAIR) L50 DBUV/M	TVI TOTAL RAIN DBUV/M	OZONE FOR RAIN RATE OF 1.00 IN/HR AT 0. FT LEVEL PPB	ELECTRIC FIELD KV/M	MAGNETIC FIELD GAUSS
-200.0	41.0	16.0	-10.5	-27.5	9.9	.000000	.000	.00003
-195.0	41.1	16.1	-10.2	-27.2	10.4	.000000	.000	.00004
-190.0	41.3	16.3	-9.8	-26.8	10.9	.000000	.000	.00004
-185.0	41.4	16.4	-9.5	-26.5	11.3	.000000	.000	.00004
-180.0	41.5	16.5	-9.1	-26.1	11.8	.000000	.000	.00004
-175.0	41.7	16.7	-8.7	-25.7	12.4	.000000	.000	.00005
-170.0	41.8	16.8	-8.3	-25.3	12.9	.000000	.000	.00005
-165.0	42.0	17.0	-7.9	-24.9	13.4	.000000	.000	.00005
-160.0	42.1	17.1	-7.5	-24.5	14.0	.000000	.000	.00006
-155.0	42.3	17.3	-7.0	-24.0	14.6	.000000	.000	.00006
-150.0	42.4	17.4	-6.6	-23.6	15.2	.000000	.000	.00007
-145.0	42.6	17.6	-6.1	-23.1	15.8	.000000	.000	.00007
-140.0	42.8	17.8	-5.6	-22.6	16.5	.000000	.000	.00008
-135.0	43.0	18.0	-5.0	-22.0	17.2	.000000	.000	.00008
-130.0	43.2	18.2	-4.4	-21.4	17.9	.000000	.000	.00009
-125.0	43.3	18.3	-3.8	-20.8	18.6	.000000	.000	.00010
-120.0	43.6	18.6	-3.2	-20.2	19.4	.000000	.000	.00011
-115.0	43.8	18.8	-2.5	-19.5	20.2	.000000	.001	.00012
-110.0	44.0	19.0	-1.8	-18.8	21.0	.000000	.001	.00013
-105.0	44.2	19.2	-1.0	-18.0	21.9	.000000	.001	.00015
-100.0	44.5	19.5	-.2	-17.2	22.8	.000000	.001	.00016
-95.0	44.7	19.7	.7	-16.3	23.8	.000000	.001	.00018
-90.0	45.0	20.0	1.6	-15.4	24.8	.000000	.001	.00021
-85.0	45.3	20.3	2.6	-14.4	25.9	.000000	.001	.00024
-80.0	45.6	20.6	3.7	-13.3	27.1	.000000	.001	.00027
-75.0	45.9	20.9	4.9	-12.1	28.4	.000000	.001	.00032
-70.0	46.3	21.3	6.2	-10.8	29.7	.000000	.001	.00037
-65.0	46.6	21.6	7.6	-9.4	31.2	.000000	.002	.00045
-60.0	47.0	22.0	9.1	-7.9	32.8	.000000	.002	.00054
-55.0	47.5	22.5	10.9	-6.1	34.6	.000000	.002	.00067
-50.0	48.0	23.0	12.8	-4.2	36.5	.000000	.003	.00085
-45.0	48.5	23.5	15.0	-2.0	38.7	.000000	.004	.00110
-40.0	49.2	24.2	17.6	.6	41.1	.000000	.005	.00149
-35.0	49.9	24.9	20.6	3.6	43.9	.000000	.006	.00211
-30.0	50.7	25.7	24.3	7.3	47.1	.000000	.009	.00318
-25.0	51.8	26.8	28.9	11.9	50.9	.000000	.014	.00524
-20.0	53.1	28.1	34.9	17.9	55.2	.000000	.023	.00977
-15.0	54.9	29.9	42.9	25.9	59.3	.000000	.042	.02035
-10.0	56.6	31.6	49.1	32.1	61.3	.000000	.049	.02939
-5.0	56.6	31.6	42.9	25.9	59.3	53.008730	.014	.01124
.0	57.1	32.1	49.1	32.1	61.3	29.199790	.042	.03384
5.0	56.6	31.6	42.9	25.9	59.3	73.612450	.025	.03910
10.0	56.6	31.6	49.1	32.1	61.3	45.287280	.050	.03736
15.0	54.9	29.9	42.9	25.9	59.3	86.889720	.042	.01640
20.0	53.1	28.1	34.9	17.9	55.2	56.637940	.023	.00554
25.0	51.8	26.8	28.9	11.9	50.9	43.822540	.014	.00210

30.0	50.7	25.7	24.3	7.3	47.1	36.301160	.009	.00088
35.0	49.9	24.9	20.6	3.6	43.9	31.228940	.006	.00038
40.0	49.2	24.2	17.6	.6	41.1	27.529600	.005	.00016
45.0	48.5	23.5	15.0	-2.0	38.7	24.690750	.004	.00009
50.0	48.0	23.0	12.8	-4.2	36.5	22.432440	.003	.00009
55.0	47.5	22.5	10.9	-6.1	34.6	20.586900	.002	.00010
60.0	47.0	22.0	9.1	-7.9	32.8	19.046700	.002	.00010
65.0	46.6	21.6	7.6	-9.4	31.2	17.739440	.002	.00010
70.0	46.3	21.3	6.2	-10.8	29.7	16.614360	.001	.00010
75.0	45.9	20.9	4.9	-12.1	28.4	15.634740	.001	.00009
80.0	45.6	20.6	3.7	-13.3	27.1	14.773250	.001	.00009
85.0	45.3	20.3	2.6	-14.4	25.9	14.009160	.001	.00008
90.0	45.0	20.0	1.6	-15.4	24.8	13.326360	.001	.00008
95.0	44.7	19.7	.7	-16.3	23.8	12.712180	.001	.00007
100.0	44.5	19.5	-.2	-17.2	22.8	12.156510	.001	.00007
105.0	44.2	19.2	-1.0	-18.0	21.9	11.651130	.001	.00006
110.0	44.0	19.0	-1.8	-18.8	21.0	11.189340	.001	.00006
115.0	43.8	18.8	-2.5	-19.5	20.2	10.765580	.001	.00006
120.0	43.6	18.6	-3.2	-20.2	19.4	10.375220	.000	.00005
125.0	43.3	18.3	-3.8	-20.8	18.6	10.014370	.000	.00005
130.0	43.2	18.2	-4.4	-21.4	17.9	9.679704	.000	.00005
135.0	43.0	18.0	-5.0	-22.0	17.2	9.368411	.000	.00004
140.0	42.8	17.8	-5.6	-22.6	16.5	9.078061	.000	.00004
145.0	42.6	17.6	-6.1	-23.1	15.8	8.806557	.000	.00004
150.0	42.4	17.4	-6.6	-23.6	15.2	8.552074	.000	.00004
155.0	42.3	17.3	-7.0	-24.0	14.6	8.313024	.000	.00004
160.0	42.1	17.1	-7.5	-24.5	14.0	8.088006	.000	.00003
165.0	42.0	17.0	-7.9	-24.9	13.4	7.875791	.000	.00003
170.0	41.8	16.8	-8.3	-25.3	12.9	7.675290	.000	.00003
175.0	41.7	16.7	-8.7	-25.7	12.4	7.485534	.000	.00003
180.0	41.5	16.5	-9.1	-26.1	11.8	7.305662	.000	.00003
185.0	41.4	16.4	-9.5	-26.5	11.3	7.134901	.000	.00003
190.0	41.3	16.3	-9.8	-26.8	10.9	6.972560	.000	.00003
195.0	41.1	16.1	-10.2	-27.2	10.4	6.818016	.000	.00002
200.0	41.0	16.0	-10.5	-27.5	9.9	6.670707	.000	.00002

EXHIBIT BB

OTHER INFORMATION

OAR 345-021-0010(1)(bb)

TABLE OF CONTENTS

BB.1 INTRODUCTION

OAR 345-021-0010(1)(bb) *Any other information that the Office requests in the project order;*

Response: Please refer to Section BB.2.

BB.2 SITING STANDARDS FOR WIND ENERGY FACILITIES

OAR 345-024-0015 *To issue a site certificate for a proposed wind energy facility, the Council must find that the applicant:*

BB.2.1 Reduce Visual Impacts

OAR 345-024-0015(1) *Can design and construct the facility to reduce visual impact by methods including, but not limited to:*

(a) Not using the facility for placement of advertising, except that advertising does not include the manufacturer's label or signs required by law[.]

Response: Orion Sherman County Wind Farm LLC (Applicant) will not allow advertising to be used on any part of the Biglow Canyon Wind Farm (Facility) site. Signs will be limited to those required by law or for safety and convenience, including signs posting the maximum traffic speed, stop signs at intersections of access roads, and warning signs on or near electrical equipment. Turbine nacelles will be printed with the turbine manufacturer's logo.

(b) Using the minimum lighting necessary for safety and security purposes and using techniques to prevent casting glare from the site, except as otherwise required by the Federal Aviation Administration or the Oregon Department of Transportation, Transportation Development Branch, Aeronautics Section[.]

Response: Only the minimum lighting will be used on turbine strings required by the Federal Aviation Administration (FAA). The operations and maintenance (O&M) facility will have exterior lighting (low impact) for safety and security purposes.

(c) Using only those signs necessary for facility operation and safety and signs required by law[.]

Response: As discussed in (a) above, no signs will be posted at the Facility except as required for Facility operation and safety. These are likely to be signs posting the maximum traffic speed on certain access roads, stop signs at intersections of access roads, and warning signs posted on or near electrical equipment.

BB.2.2 Restrict Public Access

OAR 345-024-0015(2) *Can design and construct the facility to restrict public access by the following methods:*

(a) *For a horizontal-axis wind energy facility with tubular towers, using locked access sufficient to prevent unauthorized entry to the interior of the tower[.]*

Response: The Facility will use horizontal-axis wind turbines on tubular towers. Access to each tower will be via a locked access door accessible only to authorized Facility staff.

(b) *For a horizontal-axis wind energy facility with lattice-type towers:*

(A) *Removal of wind facility tower climbing fixtures to 12 feet from the ground.*

(B) *Installation of a locking, anti-climb device on the wind facility tower; or*

(C) *Installation of a protective fence at least 6 feet high with a locking gate[.]*

Response: Lattice-type towers will not be used at the Facility.

(c) *For a vertical-axis wind energy facility, installation of a protective fence at least 6 feet high with a locking gate[.]*

Response: The Facility will provide horizontal-axis wind energy. Vertical-axis turbines will not be used.

BB.2.3 Reduce Cumulative Adverse Environmental Impacts

OAR 345-024-0015(3) *Can design and construct facility to reduce cumulative adverse environmental impacts in the vicinity to the extent practicable by measures including, but not limited to, the following, where applicable:*

(a) *Using existing roads to provide access to the facility site, or if new roads are needed, minimizing the amount of land used for new roads and locating them to reduce adverse environmental impacts[.]*

Response: To the maximum extent feasible, the Applicant proposes to use existing roads to access the Facility area, because doing so minimizes both environmental impacts and Facility construction costs. The Facility site is in a relatively low-density area of the state, where existing public and private roads are widely dispersed. Nonetheless, the proposed Facility configuration is able to make use of approximately 0.685 miles of existing roads, which will be improved and widened. Approximately 40.49 miles of new roads will have to be constructed to access ridges where no roads currently exist.

Potential adverse environmental impacts were considered and analyzed in locating the proposed new roads. Road construction will not significantly impact wetlands, other waters of the State, or fish and wildlife habitat. Further discussions of the impacts of roadways can be found in other exhibits.

(b) *Combining transmission lines and points of connection to local distribution lines[.]*

Response: Electrical lines for the Facility will consist primarily of underground 34.5-kilovolt (kV) collector cables that follow road rights-of-way where possible.

Collector cable routes will be combined where cables run close to one another. Underground cables reduce fire hazard and eliminate bird perching risks.

(c) Connecting the facility to existing substations, or if new substations are needed, minimizing the number of new substations[.]

Response: Two transmission alternatives will be considered for connecting the Facility to the Bonneville Power Administration (BPA) existing high-voltage transmission system.

Alternative 1

Interconnect with the BPA system[1] by constructing a new substation and a 3-mile-long, overhead transmission line.

Under this alternative, an overhead transmission line approximately 3 miles in length will be constructed from a new substation located in the southern section of the Facility site to a location at or near the existing Klondike Schoolhouse substation.

Alternative 2

Construct a new substation near the center of the Facility site, and a 7-mile-long, overhead transmission line.

Under this alternative, an overhead transmission line approximately 7 miles in length will be constructed from a new Facility substation located near the center of the Facility site to an electric transformer or switching facility to be installed at BPA's John Day substation or switchyard. The transmission line will deliver electricity to BPA's high-voltage transmission system.

(d) Avoiding, to the extent practicable, the creation of artificial habitat for raptors or raptor prey. Artificial habitat may include, but is not limited to:

(A) Above-ground portions of foundations surrounded by soil where weeds can accumulate;

Response: All aboveground portions of the foundations (i.e., turbine pads) will be graveled to reduce the potential for weed infestation and raptor use. The Applicant will implement an ongoing weed control plan at the Facility in consultation with the appropriate agencies and with minimal adverse impacts.

(B) Electrical equipment boxes on or near the ground that can provide shelter and warmth[.]

Response: The only two structures at each turbine site will be the tower itself and a pad-mounted transformer. Both of these structures will be enclosed and will provide no opportunities for shelter or warmth for wildlife.

(C) Horizontal perching opportunities on the towers or related structures.

[1] A new BPA transmission line might be built to connect the proposed Klondike III wind energy facility of PPM Energy, Inc. (the "Klondike III Project"), as well as the Facility, to the BPA transmission system. PPM submitted a site certificate application for the Klondike III Project to the Oregon Department of Energy on May 13, 2005. BPA held scoping meetings for the Klondike III line on March 1 and April 27, 2005, in connection with the preparation of an Environmental Impact Study.

Response: The Facility will offer no perching opportunities on towers or related structures. The Facility overhead transmission structures will be equipped with antiperching devices. The Facility's turbines will use tubular steel towers (rather than lattice towers), which provide no horizontal perching opportunities. Meteorological towers also will be tubular rather than lattice-type.

EXHIBIT CC

OTHER LEGAL CITATIONS

OAR 345-021-0010(1)(cc)

TABLE OF CONTENTS

CC.1 INTRODUCTION

Exhibit CC must identify all state statutes and administrative rules and local government ordinances containing standards or criteria that the proposed Biglow Canyon Wind Farm facility (Facility) must meet for the Council to issue a site certificate, other than statutes, rules, and ordinances identified in Exhibit E.

This Exhibit is organized in accordance with the application requirements contained in OAR 345-021-0010(1)(cc).

CC.2 ADDITIONAL STATUTES, RULES, AND ORDINANCES

OAR 345-021-0010(1)(cc) *Identification, by legal citation, of all state statutes and administrative rules and local government ordinances containing standards or criteria that the proposed facility must meet for the Council to issue a site certificate, other than statutes, rules and ordinances identified in Exhibit E, and identification of the agencies administering those statutes, administrative rules and ordinances. The applicant shall identify all statutes, administrative rules and ordinances that the applicant knows to be applicable to the proposed facility, whether or not identified in the project order. To the extent not addressed by other materials in the application, the applicant shall include a discussion of how the proposed facility meets the requirements of the applicable statutes, administrative rules and ordinances.*

Response: The following statutes, rules, and local ordinances are referenced in various exhibits but are not addressed in Exhibit E. Discussion of compliance with these laws is found in each applicable Exhibit of this site certificate application and is not repeated here.

1. **Oregon Department of Agriculture**—Plant Conservation Biology Program—ORS 564; OAR Chapter 603, Division 73.

   Agency: Oregon Department of Agriculture
   635 Capitol Street, N.E.
   Salem, OR 97301-2532
   (503)986-4550

2a. **Department of Environmental Quality**—Water Quality—ORS Chapter 468 and 468B; OAR Chapter 340, Divisions 14, 41, 45, 52, and 55.

   Agency: Oregon Department of Environmental Quality
   2146 NE 4th Street, Suite 104
   Bend, OR 97701
   (541)388-6146

2b. **Department of Environmental Quality**—Noise—ORS 467; OAR Chapter 340, Division 35.

Agency: Oregon Department of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204-1390
(503)229-5696

3. **Oregon Department of Fish and Wildlife** – Habitat Conservation Division – ORS 496 and ORS 506; OAR Chapter 635, Divisions 100 and 415.

Agency: Oregon Department of Fish and Wildlife
2501 S.W. First Avenue
P.O. Box 59
Portland, OR 97207
(503)872-5268

4. **Department of Geology and Mineral Industries** – OAR Chapter 632.

Agency: Oregon Department of Geology
800 N.E. Oregon Street, Suite 965
Portland, OR 97232
(503)731-4100

5. **Oregon Parks and Recreation Department** – Historic Preservation Section – ORS 197, ORS 358, an ORS 390; OAR Chapter 736.

Agency: State Historic Preservation Office
Parks and Recreation Department
1115 Commercial Street, N.E., Suite 2
Salem, OR 97301-1012
(503)378-6305

6. **Oregon Division of State Lands** – Wetlands – ORS 196; OAR Chapter 141.

Agency: Oregon Division of State Lands
775 Summer Street, N.E., Suite 100
Salem, OR 97301-1279
(503)378-3805

7. **Sherman County** – Land Use –ORS 197 and 215; Sherman County Comprehensive Plan and Zoning Ordinance

Exhibit K identifies the numerous state statutes, administrative rules, and local government ordinances that contain land use standards or criteria the Facility must meet for issuance of a site certificate. Exhibit K also includes a discussion of how the Facility meets the requirements of the applicable statutes, rules, and ordinances identified therein. Rather than repeat those statutes, rules, and local ordinances here, Orion Sherman County Wind Farm LLC (Applicant) requests that the Council refer to Exhibit K.

CC.3 AFFIDAVIT

OAR 345-021-0010(1)(cc)(2) *The applicant shall submit an affidavit with the original application that, to the applicant's best knowledge and belief, the information in the application is true and accurate. If the applicant is not an individual, the affidavit must be signed by an individual authorized to act on behalf of the applicant. The applicant shall include a copy of the affidavit in each copy of the application.*

Response: The required affidavit is included as Attachment CC-1.

CC.4 DOCUMENTS PREPARED IN CONNECTION WITH ENVIRONMENTAL ASSESSMENT OR ENVIRONMENTAL IMPACT STATEMENT

OAR 345-021-0010(1)(cc)(3) *Documents prepared in connection with an environmental assessment or environmental impact statement for the proposed facility under the National Environmental Policy Act of 1970, if any, may contain some of the information required under section (1) of this rule. The applicant may copy relevant sections of such documents into the appropriate exhibits of the site certificate application. The applicant may otherwise submit full copies of those documents and include, in the appropriate exhibits of the site certificate application, cross-references to the relevant sections of those documents. The applicant may use such documents only to avoid duplication. The applicant shall include additional information in the site certificate application as needed to meet the requirements of section (1) of this rule.*

Response: The Facility will require federal approval to interconnect the Facility to BPA's high-voltage electric transmission system in the Pacific Northwest. It is anticipated that the decision to offer terms to interconnect the Facility would be consistent with BPA's Business Plan Final Environmental Impact Statement (BP EIS) (DOE/EIS-0183, June 1995), and the Business Plan Record of Decision (BP ROD, August 1995). Consequently, any decision and subsequent approval for the interconnection would be tiered to the Business Plan ROD. Because a ROD for the electrical interconnection of the Facility is not yet available, information from BP EIS or ROD is not included in this site certificate application.

CC.5 INDEX OR TABLE OF CONTENTS FOR ALL EXHIBITS REQUIRED BY THIS RULE

OAR 345-021-0010(1)(cc)(4) *In each application for a site certificate submitted to the Office of Energy, the applicant shall include an index or table of contents clearly identifying by page number the location of each exhibit required by this rule. The applicant shall submit the original application for a site certificate and ten copies to the Office and shall prepare and distribute additional copies of the application as required by OAR 345-021-0050. In addition to the printed*

copies, the applicant shall submit the text (including appendices and graphical information to the extent practical) of the application in electronic format suitable to the Office.

Response: The site certificate application includes an introductory table of contents clearly identifying the location of each exhibit required by OAR 345-021-0010. The original application for a site certificate and ten copies are being submitted to the Oregon Department of Energy. Additional copies are being distributed as required by OAR 345-021-0050. Electronic copies of text, figures, and attachments are being submitted to the Oregon Department of Energy.

ATTACHMENT CC-1

Affidavit of Authenticity

AFFIDAVIT OF AUTHENTICITY

STATE OF CALIFORNIA,)
) ss.
County of Alameda,)

I, James J. Eisen, being first duly sworn, depose and say as follows:

1. I am the Vice President of Orion Sherman County Wind Farm, LLC ("Applicant") and am authorized to act on Applicant's behalf.

2. Applicant is submitting that certain Application for Site Certificate for the Biglow Canyon Wind Farm ("Application"), with which this Affidavit is included. To my best knowledge and belief, the information in the Application is true and accurate.

ORION SHERMAN COUNTY WIND FARM, LLC

By: _____
James J. Eisen, Vice President

SUBSCRIBED AND SWORN TO before me this 11th day of October, 2005.

_____
Notary Public for California
My Commission Expires: 6/28/08

LAURIE MAZER
Commission # 1497533
Notary Public - California
Alameda County
My Comm. Expires Jun 28, 2008