CHAPTER 3
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1. INTRODUCTION AND CHAPTER ORGANIZATION

Introduction

This chapter provides a description of the affected environment for the Valley County Wind Energy Project (VCWEP) that is potentially affected by construction, operation and maintenance, and decommissioning of the proposed wind farm, 230kV transmission line, and substation. The chapter will describe the VCWEP area within these three categories:

Human Environment

- Land Use
- Transportation
- Visual Resources
- Socioeconomics and Public Services
- Environmental Justice
- Noise
- Health and Safety

Natural Environment

- Biological Resources
- Water Resources and Wetlands
- Air Quality
- Geology and Geohazards
- Soils
- Paleontology

Cultural Resources

The description of the affected environment contained in this chapter is provided as a basis to evaluate impacts of the VCWEP. Resources described in this chapter were inventoried for the VCWEP components described in Chapter 2. The methods used to

inventory existing environmental resources varied among the resources and are summarized in each resource section of this chapter.

This chapter further describes the potential consequences, or impacts, on the environment that could result from the construction, operation and maintenance, and decommissioning of the VCWEP. Impacts are defined as modifications to the existing condition of the environment that would be brought about by the Proposed Action or Alternatives.

Impacts can be beneficial (positive) or adverse (negative), and can result from the Project action directly or indirectly. Impacts can be permanent, long lasting (long-term) or temporary (short-term). Long-term impacts are defined as those that would substantially remain for the life of the Project or beyond. Short-term impacts are defined as those changes to the environment during construction that generally would revert to pre-construction condition at or within a few years of the end of construction. Impacts can vary in intensity from no change or only slightly discernible change, to a full modification of the environment.

This chapter also discusses cumulative impacts, irreversible and irretrievable commitment of resources, as well as unavoidable adverse impacts.

3.2. LAND USE

This section provides an overview of current land jurisdiction and ownership as well as land uses within the Valley County Wind Energy Project (VCWEP) area. Emphasis is placed on areas where facilities associated with the VCWEP and alternatives would be located. In addition, the section discusses specific federal, state, and local agency jurisdictions within the VCWEP area and identifies relevant planning documents and associated land use designations as well as other regulatory constraints that may be applicable to the VCWEP. It also discusses potential land use impacts of the VCWEP and Alternatives, and identifies mitigation measures designed to limit or reduce those impacts.

3.2.1 Affected Environment

The following subsections define the VCWEP study methods, area setting and land use classifications within the VCWEP area, followed by a more detailed discussion of specific land uses within areas that VCWEP facilities would be located.

3.2.1.1 Study Methods

The land use inventory for the VCWEP area was compiled by reviewing, refining and updating existing data. Following this, an investigation and interpretation of existing maps and 1:12,000 scale United States Geological Survey (USGS) 1996 black and white Digital Orthophoto Quarter Quadrangles (DOQQs) was undertaken. Selected 2002 color Farm Service Agency (FSA) aerial photography was also used to identify the occurrence of land uses since 1996. The existing mapped information was subsequently verified by ground reconnaissance between June and September, 2004. In addition, federal, state, and

local land resource agencies and organizations were contacted by telephone, letter or meetings to update official information and to solicit further input.

The study components contained in the land use inventory include:

- land jurisdiction and ownership
- existing land use
- planned land use
- parks, recreation, and preservation areas

The individual holdings of private landowners were specifically identified but are not included in this document. Existing land uses were identified by existing physical-surface uses and land-use designations. Planned land uses are those uses of land sought to be carried out in the future. The parks, recreation, and preservation areas are defined as areas where the established or proposed land use is primarily for recreational enjoyment or to protect and preserve a valuable environmental resource.

Maps of various scales were used in compiling the land use database. Two land use inventory maps, at a scale of 1:50,000, were generated to graphically portray information relating to each component (see Map 4 and 5). These inventory maps include Land Jurisdiction and Ownership as well as Land Use. Planned land use and parks, recreation, and preservation areas were included on the Land Use Inventory Map. The VCWEP data was compiled for land use within the wind farm 500 MW build out area and out to five miles from the edge of the wind farm area to support the visual analysis. Data was also collected within a four-mile wide study corridor (two miles on each side of the assumed centerline) of each 230kV transmission line alternative, and a ½ mile study area around the Antelope Creek Substation site. A comprehensive listing of data sources is provided in Chapter 6 *References*.

3.2.1.2 Study Area Overview

The following discussion provides an overview of existing land use in the VCWEP area.

Land Jurisdiction and Ownership

Land jurisdiction and ownership was identified and delineated using data obtained from the Montana Natural Resources Information System (NRIS) Geographic Information System (GIS). The NRIS GIS acts as a clearinghouse for GIS databases.

Public land (including Bankhead-Jones L.U. land), administered by the United States Department of the Interior (USDI), Bureau of Land Management (BLM), state trust land administered by the Montana Department of Natural Resources and Conservation (DNRC), Valley County owned land, and private land under county jurisdiction are all present in the VCWEP area.

Bankhead-Jones L.U. land consists of parcels of land once held in private ownership that were acquired by the BLM through the provisions of the Bankhead-Jones Farm Tenant Act of 1937 which authorized Federal acquisition of submarginal" farmlands considered to be incapable of producing sufficient income to support the farm owner. Bankhead-Jones L.U. land differs from public land in the manner in which the BLM may dispose of it and with respect to the management of subsurface mineral rights.

A right-of-way permit would be required to cross BLM public land.

Montana state trust lands are administered and managed for the benefit of the public schools and the other endowed institutions in Montana, under the direction of the State Board of Land Commissioners. The Real Estate Management Bureau of the Trust Land Management Division is responsible for reviewing and processing applications for rights-of way and easements across surface lands and navigable waterways administered by the state.

A right-of-way easement would be required on Valley County owned land.

Right-of-way easements on private lands will be acquired through negotiations with landowners.

In addition to the above categories, incorporated areas were inventoried in the VCWEP area. Incorporated areas include incorporated cities, which as political subdivisions of the state have authority to plan and control land uses within an area of delineated boundaries. Under the authority delegated by the state, these local governments exercise control over the development of land through planning and zoning and subdivision ordinances and engage in long-range comprehensive planning. In addition, these local governments are empowered to annex adjoining private land. A portion of the City of Glasgow is located in the VCWEP area.

Existing Land Use

The VCWEP is located in northeastern Montana's Hi-Line region in Valley County. Existing land use identifies various surface structures, improvements and land use designations occurring within the study area as of September 2004. The following categories, listed below, were developed to differentiate between types of existing land use.

Residential

The incorporated City of Glasgow (2000 population of 3,253) and the unincorporated community of St. Marie (2000 population of 183) can both be found in the VCWEP area. The City of Glasgow, the county seat of Valley County, is situated along U.S. Highway 2 in the Milk River Valley while St. Marie is located east of Montana Highway 24, approximately 14 miles northeast of the City of Glasgow. Other population centers include the unincorporated communities of Vandalia and Tampico, as well as mobile home parks, large-lot rural residential development, and farmsteads. Farmsteads represent isolated residential structures with structures associated with farming or ranching operations. Most residences are located south of U.S. Highway 2.

Commercial, Industrial, and Public and Institutional

Commercial, Industrial, and Public and Institutional uses are primarily found in and around Glasgow. Currently, there are no plans for future schools in the VCWEP area (Nyquist 2004 and Hageman 2004).

Communication Site

Commercial microwave, cellular and radio towers are generally located in and around Glasgow. One microwave facility was identified at a Northern Border Pipeline compressor station, located approximately 29 miles north of the City of Glasgow. A second microwave facility was identified adjacent to Northwestern Energy's Richardson Coulee Substation. A communication site associated with a Nemont Telephone Cooperative building was also identified west of Montana Highway 24, approximately 3 miles southwest of St. Marie.

Agriculture

Ranching and farming are an important part of the economy in Valley County. The number of farms increased slightly between 2002 and 1997, while the acreage in farms increased 15 &.

Agriculture (crops and livestock) is a predominate land use within the study area. Other forms of agriculture in the study area include Montana Department of Agriculture registered general (commercial) apiaries which are used for honey production and/or pollination. General (commercial) apiary registrations are apiaries placed by permission on someone's property and contains more than 5 hives.

The crops category includes irrigated and non-irrigated field crops. Irrigated cropland occupies a significant portion of the Milk River valley within the VCWEP area. The land is irrigated primarily by surface flooding, though center-pivot irrigation systems are also used north of Vandalia. Among the crops grown on irrigated land, the most common are alfalfa and small grains such as wheat and barley. Other crops grown include grass and grain hays, silage, safflower, corn, and livestock pasture.

Non-irrigated cropland (dryland agriculture) comprises the bulk of cultivated land in the VCWEP area and is generally found on the adjacent uplands. Principal crops include wheat, barley, oats and grain hay. Not all the acres devoted to dryland agriculture are planted each year. Much of the land is cultivated under an alternate crop-fallow system.

Aerial spraying (crop dusting) is used to control insects weeds, and diseases in some agricultural areas.

Crop type at any one location is variable and occasionally in fallow. Data on the actual crop types grown specifically within or near the VCWEP area was not available. As such, crop data was obtained from the Montana Department of Agriculture at the county level. Specific irrigation methods used in the field (center pivot and flood) also vary depending on soil properties, topography, and cost.

Irrigated and non-irrigated 2002 harvested acreage for all crops in Valley County can be found in Table 3.2-1. Information on crops planted and harvested for Valley County in 2002, is provided in Table 3.2-2. Table 3.2-1 2002 Valley County Estimates – Irrigated and Non-irrigated Harvested Crop Acreage [1]

Irrigated Harvested Acres	Non-irrigated Harvested Acres
30,000	371,000

(1) 2003 Montana Agricultural Statistics, 2001-2002 County Estimates

Crops included are: all wheat, barley, oats, sugar beets, potatoes, and hay.

Table 3.2-2 2002 Valley County Estimates – Crops Planted and Harvested

Crop	Acres Planted	Acres Harvested
Winter Wheat	1,600	700
Durum Wheat	14,300	14,100
Other Spring Wheat	280,000	272,000
Barley	19,900	10,300
Oats	5,900	2,000
Corn	*	----
Corn, For Grain	----	*
Corn, For Silage	----	*
Potatoes	*	*
Sugar Beets	*	*
Dry Beans	1,700	1,400
All Hay	----	102,000
All Hay, Alfalfa	----	38,000
All Hay, All Other	----	64,000

Note: * Either zero or insufficient data for publication
Source: 2003 Montana Agricultural Statistics, 2001-2002 County Estimates

A portion of the Bureau of Reclamation's (BOR) Milk River Project is located within the VCWEP area. The entire project furnishes water for the irrigation of about 121,000 acres of land. A water supply is furnished to project lands which are divided into the Chinook, Malta, and Glasgow Divisions and the Dodson Pumping Unit. The lands extend about 165 miles along the river from near the City of Havre to a point 6 miles below the Town of Nashua.

At the Vandalia Diversion Dam, 3 miles west of Vandalia, the Vandalia South Canal diverts water on the south side of the river for the irrigation of land near Tampico, City of

Glasgow, and Town of Nashua, comprising the Glasgow Irrigation District. The Vandalia South Canal from the diversion dam has its point of diversion in the SW¼NW¼ of Sec 7, T30N, R37E. The Vandalia South Canal has a length of 42.75 miles and a design capacity of 300 cubic feet per second.

The storage works are operated by the Bureau of Reclamation. The distribution systems are operated and maintained by the Glasgow Irrigation District.

The Glasgow Irrigation District (GID) supplies water to 100 members irrigating 18,011 acres, in the Milk River Valley. The kinds of crops, number of acres, and average crop yields associated with the 18,011 acres of this irrigated land is shown in Table 3.2-3.

Table 3.2-3 Kinds of crops, number of acres, and average crop yields associated with 18,011 acres of irrigated land within the Glasgow Irrigation District

Crop	Number of Acres	Average Yield
Spring Wheat	2,414	42 bu/ac
Barley (feed)	695	65 bu/ac
Oats	389	83 bu/ac
Alfalfa	7,857	4 tons/ac
Grass Hay	2,538	1.2 tons/ac
Grain Hay	1,958	1.2 tons/ac
Silage	868	20 tons/ac
Irrigated Pasture	1,292	2 AUMs

Source: John R. Lacey, Ph.D. Economic Importance of Glasgow Irrigation District. December 5, 2002.

A Special Use Permit would need to be obtained from the BOR if the final transmission line route would cross BOR owned lands or would modify BOR ditches and canals. If the final transmission line route crossed BOR ditches and canals for which BOR only has an easement and no modifications to the ditches or canals occur, an Acknowledgement of Easement Crossing would need to be obtained from BOR, (Stiles 2004)

Some land within the study area also has also been classified as Important Farmland and Conservation Reserve Program (CRP) land.

Land identified as being Important Farmland is based on soil types. The Secretary of Agriculture determines which soil types are of high agricultural value and designates them as important farmland. In accordance with the Farmland Protection Act of 1981, important farmland includes all land that is defined as prime, unique, or farmlands of statewide or local importance. Natural Resources and Conservation Service defines these as follows:

Prime Farmland Land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and within allowable soil erosion tolerance, as determined by NRCS.

Unique Farmland Land other than prime farmland that is used for the production of specific high-value food and fiber crops, as determined by NRCS. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of specific crops when treated and managed according to acceptable farming methods.

Local or Statewide Importance Land other than prime or unique farmland that is determined to be important by the appropriate State, tribal, or unit of local government agency or agencies, with concurrence by the State Conservationist.

U.S. Congressional Public Law 95-87 (*Federal Register* January 31, 1978: Part 657) requires the NRCS to identify and map prime and unique farmland. These farmlands are protected under the Farmland Protection Act of 1981. According to a review of the important farmland mapping obtained from the NRCS, the following two types of important farmland were identified in the VCWEP area:

"prime farmland if irrigated"

"farmland of statewide importance"

The CRP is a voluntary program for agricultural landowners and operators, who receive annual rental payments and cost-share assistance to establish long-term, resource-conserving covers on eligible land. Participants enroll in CRP contracts for 10 to 15 years. The Commodity Credit Corporation (CCC), through the Farm Service Agency (FSA), administers the program with program support provided by a number of technical service providers including the Natural Resources conservation Service (NRCS), Cooperative State Research, Education and Extension Service (CSREES), U.S. Forest Service, state forestry agencies, and local Soil and Water Conservation Districts. Valley County land enrolled in the CRP totaled 209,460.9 acres for 2004 (NRCS 2004).

Grazing land includes non-cropland and non-CRP land made up of several different vegetation cover types, which are grazed by livestock (see vegetation cover types in Section 3.6 *Biological Resources*). Livestock includes cattle, sheep, and horses. Number of head of livestock for Valley County in 2002 is provided in Table 3.2-4.

Table 3.2-4 2002 Valley County Estimates – Number of Head of Livestock

Livestock	Number of Head
All Cattle & Calves	84,000
All Cattle & Calves, Beef Cows & Heifers (1)	49,000
All Cattle & Calves, Milk Cows & Heifers (1)	**
All Sheep & Lambs	3,800
Hogs & Pigs	**

Note: (1) That have calved. ** Insufficient data for publication.
Source: 2003 Montana Agricultural Statistics, 2001-2002 County Estimates

Most BLM land within the VCWEP area is allocated for livestock grazing. BLM land complements state and private grazing land. Cow/calf and yearling cattle are the most significant classes of livestock authorized. A few horses are authorized in conjunction with cattle permits.

Three selective management categories have been developed to prioritize grazing allotments according to management needs. Improve (I) category allotments are managed to improve current unsatisfactory resource conditions and receive the highest priority for funding and management actions. Maintain (M) category allotments are managed to maintain current satisfactory resource conditions and are actively managed to ensure that resource values do not decline. Custodial (c) category allotments are managed custodially by the BLM to protect resource conditions and values. Grazing licenses and permits are issued for a ten-year period and are reviewed through an evaluation process.

The Montana DNRC Agriculture and Grazing Management Bureau is responsible for leasing and managing agreements for crop (agricultural) and rangeland (grazing) uses on school trust lands. Crops raised on state trust lands are primarily dryland hay and small grains.

Valley County owned land is also leased for grazing.

Types of existing structural rangeland improvements within the study area include wells, pipelines, troughs, fences, guzzlers, reservoirs and cattle guards.

Air Facility

Refer to Section 3.3 *Transportation*.

Resource Extraction

The resource extraction category includes oil and gas wells, and active surface mines.

Oil and Gas

A large portion of the federal mineral estate, subsurface state trust land, and subsurface Valley County owned land have been leased or are available for leasing for oil and gas. Currently there are no producing oil and gas wells in the VCWEP area. An exploration well, however, was identified being drilled on a state school trust land oil and gas mineral lease near the proposed wind farm 500 MW build out area (T33N, R39E, Section 19). There is the likelihood of additional gas exploration in or around the VCWEP area in the future. According to BLM's Final Judith-Valley-Phillips Resource Management Plan and Environmental Impact Statement, the VCWEP area has a high and moderate potential for oil and gas development. The high potential area is generally located west of Tampico while the remaining area has been classified as having a moderate potential. Historically, most oil and gas exploration in and around the VCWEP area has been geared toward natural gas. The Bowdoin Dome gas field is located west and northwest of the VCWEP area (mostly in Phillips County). Gas produced in this area is collected into sales lines operated by the Williston Basin Interstate Pipeline Company.

Surface Mines

Surface mining present in the VCWEP area was identified in this category. Sand and gravel deposits are numerous within the study area and many extractive operations are found along the Milk River and its tributaries as well as along upland terraces formed by previous fluvial deposition.

MDEQ permitted opencut sand and gravel operations were identified within the study area. The Opencut Mining Act (82-4-4-1 et. Seq., MCA) and regulations apply to the mining of bentonite, clay, scoria, soil materials, peat, sand or gravel. An operator may not conduct Opencut mining operations that result in the removal of a total of 10,000 cubic yards or more of materials and overburden until the department has issued a permit to the operator for the reclamation of the land affected.

No MDEQ permitted hard rock mines or coal mines (strip or underground mining operations) were identified in the VCWEP area.

In addition, BLM's policy on public lands is to make mineral material (i.e., sand, building stone, gravel, pumice, cinders, and clay) available to the public and local governmental agencies whenever possible and whenever it is environmentally acceptable. Mineral material is sold to the public at fair market value, but is given free to states, counties, or other government entities for public projects. A limited amount may also be provided free to non-profit groups. No BLM mineral material sites were identified within the VCWEP area.

Mining Claims

No active BLM mining claims were identified in the VCWEP area.

Linear Features

The subcategories of linear features are:

- Electrical Transmission Lines

- Major Pipelines
- Major Irrigation Canals
- Railroads (Refer to Section 3.3 *Transportation*)
- Federal, State, and County Roadways (Refer to Section 3.3 *Transportation*)

Electrical transmission lines in the VCWEP area with a voltage of 50kV or greater were located and mapped. Northwestern Energy (NWE) and Northern Electric Cooperative currently operate 69kV transmission lines within the VCWEP area.

Two major pipelines run through the VCWEP area. Northern Border Pipeline Company owns and operates a 42-inch pipeline which transports natural gas from the Montana-Saskatchewan border to interconnecting pipelines in the upper Midwestern United States. Williston Basin Interstate Pipeline Company operates a 10-inch pipeline (Saco – Morgan Creek Line) that transmits natural gas from the Bowdoin gas field east for local distribution via smaller diameter pipelines. Proposed Dry Prairie Rural Water Supply core water transmission lines as well as distribution lines were also identified in the study area around and north of Glasgow. These lines are part of the Fort Peck Reservation Rural Water System Project.

One major irrigation canal crosses the VCWEP area. The Vandalia South Canal and associated laterals are operated by the Glasgow Irrigation District. Irrigation ditches within the VCWEP area are designed to flow toward the Milk River.

Other utilities located in the study area include fiber optic transmission lines and telephone lines.

Planned Land Use

The following planned land uses were assessed for this study component: (1) comprehensive plans and zoning ordinances for the VCWEP area (2) land or resource management plans and (3) proposed land uses identified through agency contacts.

Public lands administered by the BLM in the VCWEP area are guided by the Approved Valley Resource Area Resource Management Plan (RMP). The approved RMP (September 1994) includes those decisions from the proposed Judith-Valley-Phillips RMP and final environmental impact statement (1992) that pertain to the Valley Resource Area (RA) with the exception of those decisions for oil and gas leasing. The approved RMP sets forth the land use decisions, terms and conditions for guiding future management of lands and minerals administered by the BLM within the Valley RA. The Valley Resource Area name has been changed to the Valley County Planning Area (PA) and those BLM lands are administered out of the Glasgow Field Station of the Malta Field Office. The Valley County planning area encompasses 2,698,017 acres, of which 1,019,886 surface acres (38%) and 1,134,644 acres of mineral estate (42%) are administered by the BLM.

There is one designated right-of-way corridor through the Valley PA. This designation was established for the Northern Border Pipeline by the Federal Register Publication dated August 28, 1979. The RMP does not identify corridors because of the small amounts of BLM land along occupied corridors. Avoidance areas and windows were not identified in the PA. The Bitter Creek Wilderness Study Area (WSA) is a temporary exclusion area, pending wilderness area determinations. Wilderness Study Areas are not subject to right-of-way application. Right-of-ways outside of WSAs will be considered on a case-by-case basis with appropriate stipulations from the BLM Manual Handbook H-2801-1 incorporated into the right-of-way grant. The primary authorities for issuing of right-of-ways are the Federal Land Policy and Management Act (FLPMA) of 1976 and the Mineral Leasing Act of 1920 (MLA).

The BLM has also prepared a draft Wind Energy Development Programmatic Environmental Impact Statement (PEIS). The scope of the draft PEIS analysis includes an assessment of the positive and negative environmental, social, and economic impacts; discussion of relevant mitigation measures to address these impacts; and identification of appropriate, programmatic policies and best management practices (BMPs) to be included in the proposed Wind Energy Development Program. The scope includes all BLM-administered lands in the western United States, excluding Alaska.

Farm Service Agency's (FSA) final PEIS for the CRP was published in the Federal Register on February 17, 2003. A Record of Decision for the PEIS was published in the Federal Register on May 8, 2003. Withdrawal of a portion of land from a CRP contract for the production of wind energy is consistent with decision reached in the PEIS. Individual projects require the appropriate level of analysis under the NEPA.

Pursuant to 77-1-301, MCA, the DNRC manages the surface and mineral resources for the benefit of the common schools and other endowed institutions in the State of Montana, within six administrative land offices, under the direction of the State Board of Land Commissioners. The Department's obligation for management and administration of Trust Land is to obtain the greatest benefit for the beneficiaries. The greatest monetary return must be weighed against the long-term productivity of the land to ensure continued future returns to the trusts. The division is divided into four bureaus: Forest Management, Mineral Management, Agriculture and Grazing Management, and Real Estate Management. The Northeastern Land Office facilitates local management of the Trust Lands within the VCWEP area.

The Trust Land Management Division (the Division) of the Montana DNRC has prepared a Draft Programmatic Environmental Impact Statement (June 21, 2004) to analyze and disclose impacts, and compare alternative management strategies for real estate management on state Trust Lands. The Final Environmental Impact Statement will identify a preferred alternative that will, in turn, become the Real Estate Management Plan. The Plan will provide the Division's Real Estate Management Bureau with consistent policy, direction and guidance in its management of real estate activities on the state's 5.1 million acres of Trust Lands.

The Valley County Board of County Commissioners (Board) has established a Planning Board and community-based subcommittee to advise and assist the Board in formulating county policy with respect to land and resource use issues. The subcommittee is known as the *Resource Use Committee* and the plan they are working on is known as the *Resource Use Plan*, which is one component of the County Comprehensive Plan. The following draft manual in the interim stage of composition. It is the intention of the "Valley County Resource Use Plan" be the forerunner of the completed manual, "Valley County Land and Resource Use Plan". The adoption of the final plan is projected for July 1, 2005.

Although not currently adopted, The Valley County Resource Use Plan states as a policy:

"1. GOAL: Encourage appropriate mineral and energy resource exploration and development in Valley County.

Objective 1A: Encourage elimination of unreasonable or unfounded barriers, prohibitions, and impediments to mineral and energy resource exploration and development.

Objective 1B: Support the retention of existing mineral and energy operations, consistent with sound economic and environmental practices.

Objective 1C: Support large and small-scale mineral and energy resource exploration consistent with sound economic and environmental practices.

Valley County does not have any zoning regulations or special/conditional use permit requirements for wind farms, transmission lines, or substations."

Parks, Recreation, and Preservation Areas

Dispersed outdoor recreation is the predominant type of recreation within the VCWEP area and surrounding region. Dispersed recreational use in the VCWEP area and vicinity includes: hunting (big game and upland game birds), fishing, hiking, wildlife observation, photography, backpacking, horseback riding, skiing, snowmobiling, mountain biking, picnicking, sightseeing, off highway vehicle, (OHV) use, rock hounding, and camping in the Bitter Creek WSA.

Hunting

Common species hunted include sage grouse, sharp-tailed grouse, Hungarian partridge, pheasant, mule deer, white-tailed deer, and antelope. Most opportunities occur in the riparian areas along major drainages and along the Milk River. Sage grouse, sharp-tailed grouse, and Hungarian partridge are located in most parts of the county. Pheasants are less numerous and confined mostly to the farming areas along the Milk River. Mule deer are the most numerous of the big game animals, occupying coulees bordering major streams. White-tailed deer are mostly confined to the Milk River, Frenchman Creek, Rock Creek, and a few other smaller stream bottoms. Antelope are found throughout the county. Hunting opportunities also arise on private lands as a result of MFWP actions, through the block management program and conservation easements. The block

management program is a cooperative effort between MWFP, landowners, and land management agencies to provide free public hunting access to private and isolated public land. Conservation easements negotiated by MWFP preserve wildlife habitat. These areas generally offer some level of public hunting access. Lands enrolled in the Upland Game Bird Habitat Enhancement Program and Migratory Bird Stamp Program also offer hunting opportunities.

Most BLM lands are legally accessible via a public road, navigable waterway, or adjacent state or federal land that are open to hunting. Permission must be obtained from the landowner to cross adjacent private land to hunt on BLM land.

Hunting also occurs on state school trust land and private land. Hunting on private land is subject to landowner discretion.

Fishing

Fishing opportunities within the VCWEP area occur along the Milk River. Fair to good fishing is present in the Milk River for sauger, walleye, and catfish on a seasonal basis. MFWP has assigned the Milk River, from river mile 0.0 to river mile 120.7, a Habitat Class of 1 and a Sport Class of 3. As such, MFWP has determined that this segment of the Milk River has a final Fisheries Resource Value of *Outstanding*. The final Fisheries Resource Value was determined as the higher of the two values (Habitat and Species Value and Sport Fishery Value). The following *angling use-days per year* data (Table 3.2-5) are provided for the Milk River.

Table 3-2.5 Angling Use Days Per Year (Milk River) From (river mile 0.0) to (river mile 130.0)

	Total			Resident			Non Resident			Ranking	
Year	**Press.**	**s.d.**	**Trips**	**Press.**	**s.d.**	**Trips**	**Press.**	**s.d.**	**Trips**	**State**	**Region**
2003	2,206	806	55	2,206	806	55	0	0	0	169	9
2001	2,074	712	53	2,074	712	53	0	0	0	174	11
1999	2,082	562	50	2,006	557	48	76	76	2	195	12
1997	2,485	755	76	2,384	751	73	101	75	3	162	11

Source: Biannual Statewide Angling Use Survey conducted via mail by MFWP Information Services Unit in Bozeman.

BLM Recreation Management

The BLMs Valley County Planning Area contains two recreation management areas, Valley with 366, 486 acres and South Valley with 643,400 acres. Portions of both of these areas are within the VCWEP area. The Valley Recreation Management Area (RMA) is an extensive recreation management area where a limited commitment of resources provide dispersed and unstructured recreational activities. Four undeveloped recreation sites within this RMA were identified in the study area. These sites include

three fishing reservoirs (Atlas, Gay and Langen) and a day use area along the Milk River (Faraasen Park). Atlas Reservoir is located in T32N, R38E, Section 24, Gay Reservoir in T33N, R37E, Section 2, and Langen Reservoir in T33N, R38E, Section 26. Faraasen Park is situated approximately 6 miles northwest of Glasgow. Faraasen Park development plans include a parking lot, an interpretive nature trail and improved wildlife habitat and riparian areas. The Bitter Creek WSA has been selected for a wildlife viewing zone under the Watchable Wildlife program.

The South Valley RMA is a special recreation management area which provides opportunities for hunting, scenic and wildlife viewing and driving for pleasure. One undeveloped recreation site within this RMA (Shoot Reservoir) was identified in the VCWEP area. This fishing reservoir is located in T28N, R38E, Section 10.

Generally, BLM land provides a wide range of recreational opportunities from picnicking, sightseeing and watching wildlife to hunting and fishing. These opportunities meet a diversity of visitor preferences. Participation in specific recreational activities varies with the season of the year. Hunting dominates the scene in the fall with limited snowmobiling and cross-country skiing during the winter. Springtime activities include fishing, sightseeing and photography. Camping, picnicking, pleasure driving, sightseeing, and hiking dominate recreation during the summer months along with dispersed Off-Highway Vehicle (OHV) use. Overall, BLM land supports the heaviest use occurring during the fall hunting seasons. BLM land received about 9000 recreation visits in 2004. One recreation management area (RMA) primarily comprises the VCWEP area. The Valley RMA is dispersed recreation oriented, with little or no intensive use or facilities present. OHV use is primarily associated with other activities such as hunting, fishing and driving for pleasure. These activities account for approximately 75% of the total visitor use in the VCWEP area. The major types of off highway vehicles used are the two-wheel or four-wheel drive pickup and the all terrain vehicle (ATV). The numerous unimproved roads and trails scattered throughout the VCWEP area provide access for off highway travel.

Motorized vehicle use on BLM public lands is managed according to the June 2003 Off Highway Vehicle Record of Decision (ROD) Environmental Impact Statement and Plan Amendment for the Judith-Valley-Phillips RMP. With this decision, these lands are designated limited yearlong for motorized wheeled cross-country travel. Limited area means an area restricted at certain times, in certain areas, and/or to certain vehicular use. It restricts motorized wheeled cross-country travel, with some exceptions, throughout the study area to protect riparian areas, wetlands, crucial wildlife habitat, threatened or endangered species, soils and vegetation, aquatic resources, and to reduce user conflicts.

Through subsequent site-specific planning, the BLM will designate roads and trails for motorized use. BLM is currently inventorying, mapping, and analyzing existing roads and trails for evaluation and designation as open, seasonally open, or closed.

Most snowmobiling is done for the enjoyment derived from operating the machine and is considered dispersed recreation use.

Six outfitters currently hold special recreation permits from the Glasgow Field Station for big game hunting.

BLM Wilderness Study Area

There are currently no designated BLM wilderness areas within the VCWEP area. One wilderness study area (WSA), Bitter Creek, is located in the VCWEP area. WSAs are remote and undeveloped lands with at least 5,000 acres. They offer primitive and unconfined recreation opportunities and/or some special resource values. The Bitter Creek WSA was determined by BLM to be not suitable for wilderness designation. Since this area is a WSA, management is guided by the Interim Management Policy for Lands Under Wilderness Review until they are acted upon by Congress. Congress can designate the WSA or portions thereof as wilderness, deny designation or continue study of the area. There is no timetable set for when Congress must act on this designation. The Bitter Creek WSA is located approximately 25 miles northwest of the City of Glasgow, and 18 miles south of the Canadian border. The WSA contains 59,600 acres of BLM land located in three roadless segments identified as Bitter Creek South, Bitter Creek West and Bitter Creek East. Major recreation interests include hunting, wildlife viewing, hiking, sightseeing, nature study, and photography. Other recreational uses include camping, backpacking, and horsebacking. A watchable wildlife area (Bitter Creek Wildlife Viewing Area) is situated on the eastern rim of the Bitter Creek WSA where hawks and eagles can be seen soaring over the WSA. This rim differs in elevation by as much as 600 feet from the floor of the WSA.

The area is managed for sparse use which is appealing to individuals who value for example; challenge, remoteness, harsh conditions, risk taking, pioneering, self-reliance, and minimal social encounters. OHV use is restricted yearlong to the numbered roads only, while foot and horse travel carry no restrictions.

If Congress adopts BLM's recommendation and releases Bitter Creek from WSA status, a plan for management of the WSA as an ACEC would be initiated. The Bitter Creek WSA was found to meet the criteria as a potential ACEC due to the scenic diversity and variety of vegetation types and wildlife habitats. An ACEC is an area where special management attention is required to protect important historic, cultural or scenic values, fish and wildlife resources or other natural systems, or to protect life and safety from natural hazards.

Montana Department of Transportation

Rest Area

Long range plans of MDOT's Glendive District call for the elimination of the Vandalia (Glasgow) Rest Area located along U.S. Highway 2, approximately 13 miles northwest of Glasgow. Construction of a new rest area is planned along U.S. Highway 2 at the western edge of Glasgow (Mengel 2004).

Montana Fish, Wildlife & Parks

Park and Recreation Facilities

As of October 28, 2004, no state parks or recreation facilities are proposed in the study area (Baxter 2004).

Recreational Trails

The *Montana State Trails Plan* Inventory of Montana's Trail System did not identify any recreational trails within the VCWEP area.

Land and Water Conservation Site

Section 6(f) resources are those acquired through the use of Land and Water Conservation Funds (LWCF). The LWCF (Public Law 88-578) was enacted by Congress to provide money to federal, state, and local governments to purchase lands for maintaining or enhancing recreational opportunities, clean water, wildlife habitat, scenic resources, historic sites, and wilderness areas (Land and Water Conservation Fund, 2003; U.S. Forest Service, 2003). Resources that have been purchased using LWCF cannot be converted to other than public outdoor recreation uses without the approval of the Department of Interior's National Park Service (NPS). Section 6(f) directs the NPS to assure that replacement lands of equal value, location, and usefulness are provided to mitigate conversions of these lands for other than public outdoor recreation uses.

One Section 6(f) Site (Glasgow Base Pond Fishing Access Site) was identified in the VCWEP area and is administered by the MFWP.

Land uses inventoried, but not present in the VCWEP area, are identified in Appendix A.

3.2.1.3 Wind Farm

The following discussion provides a description of land jurisdiction and ownership as well as land uses in the wind farm project area (Project area). A summary of this land status and use is also provided by phase as phasing results in the overall make up the Proposed Action and alternatives.

Proposed Action – 500 MW Facility (Phases I, II, III, IV)

Land Jurisdiction and Ownership

The wind farm is located in north-central Valley County, approximately 30 miles northwest of the City of Glasgow. VCWEP area encompasses a total of 20,120 acres with land jurisdiction and ownership consisting of a mixture of BLM, state and private lands. Table 3.2-6 shows land surface jurisdiction/ownership by phase within VCWEP area. Land jurisdiction and ownership is depicted in the Land Use Map 4 and 5.

Table 3.2-6 Land Jurisdiction/Ownership – Proposed Action

Phase	Bureau of Land Management (acres)	Montana Department of Natural Resources and Conservation (acres)	Private (acres)
I	261	284	549
II	1,050	21	1,729
III	2,307	753	2,460
IV	7,661	894	2,151
Total	11,279	1,952	6,889

Source: Montana State Library/NRIS

Existing Land Use

VCWEP area is characterized by a rural landscape of rolling plains and tablelands. No residences are located within VCWEP area. Livestock grazing is the principal land use in VCWEP area, although non-irrigated cropland (dryland agriculture) is present as well. No Important Farmland or CRP lands are located in VCWEP area.

VCWEP area is permitted for livestock grazing. Five BLM grazing allotments were identified within VCWEP area and prescribe rest-rotation, deferred-rotation or seasonal grazing. Cattle are grazed on one allotment or another from March 1 through February 28. Grazing allocation and management of these allotments are found in Table 3.2-7 and by phase in Table 3.2-8.

Table 3.2-7 BLM Livestock Grazing Allocation and Management – Proposed Action

Allotment # & Name	Management Category	Grazing method/season	BLM AUMs	Other AUMs	BLM Acres	Other Acres	Permit Issued
4054 SOUTH FORK BITTER CREEK	I	DR April 15 – October 29	4,116	0	33,314	9,000	No
4059 WARDS DAM	M	DR May 1 – November 6	535	0	2, 286	1,440	Yes
4071 UPPER CANYON	I	DR April 1 –	1,459	0	10,266	1,270	Yes

CREEK		October 31					
4300 DRY FORK	M	S May 1 – September 20	13	0	52	0	Yes
4301 UPPER BUGGY CREEK	M	RR March 1 – February 28	1,958	0	9,864	7,119	Yes

Management Category: I =Improve, M=Maintained, S=Seasonal
Grazing Method: RR = Rest Rotation, DR = Deferred Rotation, S = Seasonal
Source: BLM Glasgow Field Statio

Table 3.2-8 BLM Grazing Allotments by Phase – Proposed Action

Phase	Allotment # & Name
I	4054 SOUTH FORK BITTER CREEK, 4071 UPPER CANYON CREEK
II	4054 SOUTH FORK BITTER CREEK
III	4054 SOUTH FORK BITTER CREEK, 4301 UPPER BUGGY CREEK
IV	4054 SOUTH FORK BITTER CREEK, 4059 WARDS DAM, 4071 UPPER CANYON CREEK, 4300 DRY FORK, 4301 UPPER BUGGY CREEK

Montana DNRC School Trust lands are also being leased under agreement for grazing use within all four phases of VCWEP area.

Grazing land (non-irrigated pasture/rangeland) is the largest agricultural use classification at 94% of the total land. Another 6% is classified as non-irrigated cropland. Table 3.2-9 summarizes agricultural land (cropland) and non-irrigated pasture/rangeland within VCWEP area.

Table 3.2-9 Agricultural Land (Cropland) and Non-irrigated Pasture/Rangeland – Proposed Action (acres)

Phase	Agricultural Land (Dryland Cultivated)	Non-irrigated Pasture/Rangeland
I	213	881
II	532	2,268
III	357	5,163
IV	152	10,554
Total	**1,254**	**18,866**

A Northern Border Pipeline Company 42-inch natural gas pipeline is located in phases I, II and IV. The associated compressor station and microwave facility are situated entirely within Phase IV.

Federal and state oil and gas leases also exist within all four phases of VCWEP area.

Existing land use is depicted in the Map 5: Land Use

Planned Land Use

Public lands administered by the BLM in VCWEP area are guided by the Approved Valley Resource Area RMP. According to the RMP, livestock grazing will continue to be managed through development and monitoring of allotment management plans (AMP) or similar grazing plans and supervision of grazing use. Rights-of-way outside of WSAs are considered on a case-by-case basis with appropriate stipulations from the BLM Manual Handbook H-2801-1 incorporated into the rights-of-way (ROW) grant.

Valley County currently does not have an adopted county Comprehensive Plan. Valley County also is not zoned or has any special/conditional use permit requirements for wind farms.

There is a likelihood of additional gas exploration in VCWEP area in the future.

Parks, Recreation, and Preservation Areas

Dispersed recreation opportunities exist within VCWEP area and primarily consist of hunting, wildlife viewing and OHV travel. The Bitter Creek WSA is located immediately west of phases I and III of the proposed wind farm site and is not directly impacted by VCWEP. An interagency watchable wildlife brochure exists which features the Bitter Creek watchable wildlife area, drawing tourists to the western Project area vicinity.

Alternative A – 150 MW Facility (Phases I and II)

Land Jurisdiction and Ownership

The wind farm is located in north-central Valley County, approximately 30 miles northwest of the City of Glasgow. VCWEP area encompasses a total of 3,894 acres with land jurisdiction and ownership consisting of a mixture of BLM, state and private lands. Table 3.2-10 shows land surface jurisdiction/ownership by phase within VCWEP area. Land jurisdiction and ownership is depicted in the Map 4: Land Jurisdiction.

Table 3.2-10 Land Jurisdiction/Ownership – Alternative A

Phase	Bureau of Land Management (acres)	Montana Department of Natural Resources and Conservation (acres)	Private (acres)
I	261	284	549
II	1,050	21	1,729
Total	**1,311**	**305**	**2,278**

Source: Montana State Library/NRIS

Existing Land Use

VCWEP area is characterized by a rural landscape of rolling plains and tablelands. No residences are located within VCWEP area. Livestock grazing is the principal land use in VCWEP area, although non-irrigated cropland (dryland agriculture) is present as well. No Important Farmland or CRP lands are located in VCWEP area.

VCWEP area is permitted for livestock grazing. Two BLM grazing allotments were identified within VCWEP area and prescribe deferred-rotation grazing. Cattle are grazed on one allotment or another from April 1 through October 31. Grazing allocation and management of these allotments are found in Table 3.2-11 and by phase in Table 3.2-12.

Table 3.2-11 BLM Livestock Grazing Allocation and Management – Alternative A

Allotment # & Name	Management Category	Grazing method/season	BLM AUMs	Other AUMs	BLM Acres	Other Acres	Permit Issued
4054 SOUTH FORK BITTER CREEK	I	DR April 15 – October 29	4,116	0	33,314	9,000	No
4071 UPPER CANYON CREEK	I	DR April 1 – October 31	1,459	0	10,266	1,270	Yes

Management Category: I =Improve;
Grazing Method: RR = Rest Rotation, DR = Deferred Rotation, S = Seasonal
Source: BLM Glasgow Field Station

Table 3.2-12 BLM grazing allotments by phase – Alternative A

Phase	Allotment # & Name
I	4054 SOUTH FORK BITTER CREEK, 4071 UPPER CANYON CREEK
II	4054 SOUTH FORK BITTER CREEK

Montana DNRC School Trust lands are also being leased under agreement for grazing use within these two phases of VCWEP area.

Grazing land (non-irrigated pasture/rangeland) is the largest agricultural use classification at 76% of the total land. Another 24% is classified as non-irrigated cropland. Table 3.2-13 summarizes agricultural land (cropland) and non-irrigated pasture/rangeland within VCWEP area.

Table 3.2-13 Agricultural Land (Cropland) and Non-irrigated Pasture/Rangeland – Alternative A (acres)

Phase	Agricultural Land (Dryland Cultivated)	Non-irrigated Pasture/Rangeland
I	213	881
II	532	2,268
Total	**745**	**3,149**

A Northern Border Pipeline Company 42-inch natural gas pipeline is located in phases I

and II.

Federal and state oil and gas leases also exist within both phases of VCWEP area.

Existing land use is depicted in the Map 5: Land Use

Planned Land Use

Public lands administered by the BLM in VCWEP area are guided by the Approved Valley Resource Area RMP. According to the RMP, livestock grazing will continue to be managed through development and monitoring of allotment management plans (AMP) or similar grazing plans and supervision of grazing use. Rights-of-way outside of WSAs are considered on a case-by-case basis with appropriate stipulations from the BLM Manual Handbook H-2801-1 incorporated into the ROW grant.

Valley County currently does not have an adopted county Comprehensive Plan. Valley County also is not zoned or has any special/conditional use permit requirements for wind farms.

There is a likelihood of additional gas exploration in the VCWEP area in the future.

Parks, Recreation, and Preservation Areas

Dispersed recreation opportunities exist within VCWEP area and primarily consist of hunting, wildlife viewing and OHV travel. The Bitter Creek WSA is located immediately west of Phase I of the proposed wind farm site and is not directly impacted by VCWEP. An interagency watchable wildlife brochure exists which features the Bitter Creek watchable wildlife area, drawing tourists to the western Project area vicinity.

Alternative B – 300 MW Facility (Phases I, II and III)

Land Jurisdiction and Ownership

The wind farm is located in north-central Valley County, approximately 30 miles northwest of the City of Glasgow. VCWEP area encompasses a total of 9,414 acres with land jurisdiction and ownership consisting of a mixture of BLM, state and private lands. Table 3.2-14 shows land surface jurisdiction/ownership by phase within VCWEP area. Land jurisdiction and ownership is depicted in the MMap 4: Land Jurisdiction.

Table 3.2-14 Land Jurisdiction/Ownership – Alternative B

Phase	Bureau of Land Management (acres)	Montana Department of Natural Resources and Conservation (acres)	Private (acres)
I	261	284	549
II	1,050	21	1,729
III	2,307	753	2,460
Total	**3,618**	**1,058**	**4,738**

Source: Montana State Library/NRIS

Existing Land Use

VCWEP area is characterized by a rural landscape of rolling plains and tablelands. No residences are located within VCWEP area. Livestock grazing is the principal land use in VCWEP area, although non-irrigated cropland (dryland agriculture) is present as well. No Important Farmland or CRP lands are located in VCWEP area.

VCWEP area is permitted for livestock grazing. Three BLM grazing allotments were identified within VCWEP area and prescribe rest-rotation or deferred-rotation seasonal

grazing. Cattle are grazed on one allotment or another from March 1 through February 28. Grazing allocation and management of these allotments are found in Table 3.2-15 and by phase in Table 3.2-16.

Table 3.2-15 BLM Livestock Grazing Allocation and Management – Alternative B

Allotment # & Name	Management Category	Grazing method/season	BLM AUMs	Other AUMs	BLM Acres	Other Acres	Permit Issued
4054 SOUTH FORK BITTER CREEK	I	DR April 15 – October 29	4,116	0	33,314	9,000	No
4071 UPPER CANYON CREEK	I	DR April 1 – October 31	1,459	0	10,266	1,270	Yes
4301 UPPER BUGGY CREEK	M	RR March 1 – February 28	1,958	0	9,864	7,119	Yes

Management Category: I =Improve, M=Maintained;
Grazing Method: RR = Rest Rotation, DR = Deferred Rotation, S = Seasonal
Source: BLM Glasgow Field Station

Table 3.2-16 BLM grazing allotments by phase – Alternative B

Phase	Allotment # & Name
I	4054 SOUTH FORK BITTER CREEK, 4071 UPPER CANYON CREEK
II	4054 SOUTH FORK BITTER CREEK
III	4054 SOUTH FORK BITTER CREEK, 4301 UPPER BUGGY CREEK

Montana DNRC School Trust lands are also being leased under agreement for grazing use within all four phases of VCWEP area.

Grazing land (non-irrigated pasture/rangeland) is the largest agricultural use classification at 87% of the total land. Another 13% is classified as non-irrigated cropland. Table 3.2-

17 summarizes agricultural land (cropland) and non-irrigated pasture/rangeland within VCWEP area.

Table 3.2-17 Agricultural Land (Cropland) and Non-irrigated Pasture/Rangeland – Alternative B (acres)

Phase	Agricultural Land (Dryland Cultivated)	Non-irrigated Pasture/Rangeland
I	213	881
II	532	2,268
III	357	5,163
Total	**1,102**	**8,312**

A Northern Border Pipeline Company 42-inch natural gas pipeline is located in phases I and II.

Federal and state oil and gas leases also exist within all three phases of VCWEP area.

Existing land use is depicted in the Map 5: Land Use

Planned Land Use

Public lands administered by the BLM in VCWEP area are guided by the Approved Valley Resource Area RMP. According to the RMP, livestock grazing will continue to be managed through development and monitoring of allotment management plans (AMP) or similar grazing plans and supervision of grazing use. Rights-of-way outside of WSAs are considered on a case-by-case basis with appropriate stipulations from the BLM Manual Handbook H-2801-1 incorporated into the ROW grant.

Valley County currently does not have an adopted county Comprehensive Plan. Valley County also is not zoned or has any special/conditional use permit requirements for wind farms.

There is a likelihood of exploratory oil and gas drilling in VCWEP area in the future.

Parks, Recreation, and Preservation Areas

Dispersed recreation opportunities exist within VCWEP area and primarily consist of hunting, wildlife viewing and OHV travel. The Bitter Creek WSA is located immediately west of phases I and III of the proposed wind farm site and is not directly impacted by VCWEP. An interagency watchable wildlife brochure exists which features the Bitter Creek watchable wildlife area, drawing tourists to the western Project area vicinity.

3.2.1.4 230kV Transmission Line

Alternative Route C – East Central Route (Proposed Action)

Land Jurisdiction and Ownership

The study corridor for the 34.8 mile Alternative Route C is located in Valley County. BLM public land represents 35.6% of the land crossed by this alternative. Montana state trust land comprises approximately 32.2% of the land crossed by the alternative while private land similarily makes up approximately 32.2%. Land jurisdiction/ownership crossed by Alternative Route C is depicted in Table 3.2-18.

Land jurisdiction and ownership is depicted in the Map 4, Land Jurisdiction.

Table 3.2-18 Land Jurisdiction/Ownership Crossed by Alternative Route C

Land Jurisdiction/Ownership	Miles	%
Bureau of Land Management	12.4	35.6
Montana Department of Natural Resources and Conservation	11.2	32.2
Valley County	0.0	0.0
Private	11.2	32.2
Total	**34.8**	**100.0**

Source: Montana State Library/NRIS

Existing Land Use

The study corridor is characterized by a rural landscape of rolling plains and tablelands. Residential development within the study corridor is for the most part dispersed and rural in character. Fifty-one residential dwellings are located within the study corridor as are other land uses including agriculture (crops and livestock). Livestock grazing is the principal land use in the study corridor, although irrigated cropland and non-irrigated cropland (dryland agriculture) are present as well.

Irrigated cropland occupies a significant portion of the Milk River valley within the study corridor. The land is irrigated primarily by surface flooding. Among the crops grown on irrigated land, the most common are alfalfa and small grains such as wheat and barley. Other crops grown include grass and grain hays, silage, safflower, corn, and livestock pasture. Non-irrigated cropland (dryland agriculture) comprises the bulk of cultivated land in the study corridor and is generally found on the adjacent uplands. Principal crops include wheat, barley, oats and grain hay. Not all the acres devoted to dryland agriculture

are planted each year. Much of the land is cultivated under an alternate crop-fallow system.

Important Farmland is also located in the study corridor. Prime farmland if irrigated is crossed by Link 11 from milepost 10.4 to milepost 11.2 and from milepost 11.6 to 11.7. Farmland of Statewide Importance is crossed by Link 22 from milepost 1.6 to milepost 1.9 and from milepost 2.3 to milepost 2.6. No CRP lands are crossed in the study corridor.

The area is permitted for livestock grazing. Eight BLM grazing allotments which prescribe rest-rotation, deferred-rotation or seasonal grazing were identified as being crossed in the study corridor. Cattle are grazed on one allotment or another from March 1 through February 28. Grazing allocation and management of these allotments are found in Table 3.2-19.

Table 3.2-19 BLM Livestock Grazing Allotments Crossed by Alternative Route C

Allotment # & Name	Management Category	Grazing method/season	BLM AUMs	Other AUMs	BLM Acres	Other Acres	Permit Issued
4054 SOUTH FORK BITTER CREEK	I	DR April 15 – October 29	4,116	0	33,314	9,000	No
4102 DRY COULEE	M	S April 16 – October 15	355	0	1,829	482	Yes
4103	C	S June 1 – August 30	110	0	413	0	Yes
4106 UPPER RICHARDSON	M	S May 16 – October 15	573	0	3,031	292	Yes
4301 UPPER BUGGY CREEK	M	RR March 1 – February 28	1,958	0	9,864	7,119	Yes
4303 BUGGY CREEK	I	RR April 15 – November 25	5,658	0	28,422	18,735	Yes

4308 SPRING COULEE	M	S April 10 – October 31	1,044	0	4,914	282	Yes
4309 WESTFORK	M	S April 15 – November 8	568	0	2,424	4,145	Yes

Management Category: I =Improve, M=Maintained, S=Seasonal
Grazing Method: RR = Rest Rotation, DR = Deferred Rotation, S = SeasonalSource: BLM Glasgow Field Station

Agricultural land (cropland) and non-irrigated pasture/rangeland crossed in the study corridor is presented by Link and Milepost in Table 3.2-20.

Table 3.2-20 Agricultural Land (Cropland) and Non-irrigated Pasture/Rangeland Crossed by Alternative Route C (miles)

Link	Milepost Begin	Milepost End	Distance (Miles)	Description/Classification
1	0.0	0.7	0.7	Agricultural Land (Dryland Cultivated)
1	0.7	1.0	0.3	Non-Irrigated Pasture/Rangeland
3	0.0	0.6	0.6	Non-Irrigated Pasture/Rangeland
3	0.6	1.0	0.4	Agricultural Land (Dryland Cultivated)
3	1.0	3.5	2.5	Non-Irrigated Pasture/Rangeland
3	3.5	3.7	0.2	Agricultural Land (Dryland Cultivated)
3	3.7	3.8	0.1	Non-Irrigated Pasture/Rangeland
6	0.0	5.2	5.2	Non-Irrigated Pasture/Rangeland
11	0.0	16.9	16.9	Non-Irrigated Pasture/Rangeland
11	16.9	17.6	0.7	Agricultural Land (Dryland Cultivated)
20	0.0	0.1	0.1	Agricultural Land (Dryland Cultivated)
20	0.1	0.3	0.2	Non-Irrigated Pasture/Rangeland
22	0.0	1.6	1.6	Non-Irrigated Pasture/Rangeland
22	1.6	2.0	0.4	Agricultural Land (Flood Irrigated Cropland)
22	2.0	2.4	0.4	Agricultural Land (Dryland Cultivated)
22	2.4	2.5	0.1	Agricultural Land (Flood Irrigated Cropland)
22	2.6	2.8	0.2	Agricultural Land (Dryland Cultivated)
22	2.9	3.3	0.4	Agricultural Land (Dryland Cultivated)
22	3.3	3.4	0.1	Non-Irrigated Pasture/Rangeland
22	3.5	3.7	0.2	Non-Irrigated Pasture/Rangeland
22	3.7	4.6	0.9	Agricultural Land (Flood Irrigated Cropland)
22	4.6	5.0	0.4	Non-Irrigated Pasture/Rangeland
22	5.0	6.0	1.0	Agricultural Land (Dryland Cultivated)
22	6.0	6.4	0.4	Non-Irrigated Pasture/Rangeland
Total			**1.4**	**Agricultural Land (Flood Irrigated Cropland)**
Total			**4.1**	**Agricultural Land (Dryland Cultivated)**
Total			**28.5**	**Non-Irrigated Pasture/Rangeland**

A Northern Border Pipeline Company compressor station and microwave facility are located within the study corridor. An additional microwave facility was identified

adjacent to Northwestern Energy's Richardson Coulee Substation. Natural gas pipelines were also identified in the study corridor. A Northern Border Pipeline Company 42-inch natural gas pipeline is crossed by Link 1 from milepost 0.7 to milepost 0.8and a Williston Basin Interstate Pipeline Company 6-inch natural gas lateral (valley industrial park) is crossed by Link 11 from milepost 9.8 to milepost 9.9. Two Williston Basin Interstate Pipeline Company (10-inch and 8-inch) natural gas pipelines are crossed by Link 22 from milepost 3.1 to milepost 3.2-

One MDEQ permitted Opencut sand and gravel operation, Maag, Permit #204, is located in the study corridor.

Federal and state oil and gas leases exist within the study corridor. Alternative Route C crosses 10.6 miles of authorized federal leases and 1.8 miles of state leases.

Glasgow Irrigation District canals were also located in the study corridor. The Vandalia South Main Canal is crossed by Link 22 from milepost 4.9 to milepost 5.0. Link 22 is also crossed by lateral canal V63 (from milepost 3.0 to milepost 3.1), lateral canal V85 (from milepost 3.7 to milepost 3.8), and lateral canal V90 (from milepost 4.6 to milepost 4.7).

Existing land use is depicted in the Map 5: Land Use

Planned Land Use

Public lands administered by the BLM in VCWEP area are guided by the Approved Valley Resource Area RMP. According to the RMP, livestock grazing will continue to be managed through development and monitoring of allotment management plans (AMP) or similar grazing plans and supervision of grazing use. Rights-of-way outside of WSAs are considered on a case-by-case basis with appropriate stipulations from the BLM Manual Handbook H-2801-1 incorporated into the ROW grant.

Valley County currently does not have an adopted county Comprehensive Plan. Valley County also is not zoned or has any special/conditional use permit requirements for transmission lines.

No platted subdivisions were identified in the study corridor.

There is a likelihood of gas exploration in the study corridor in the future.

Planned land use is depicted in the Land Use Map Volume.

Parks, Recreation, and Preservation Areas

Dispersed recreation opportunities exist within the study corridor and primarily consist of hunting, fishing, wildlife viewing and OHV travel.

The Bitter Creek WSA is located in the study corridor and offers a number of dispersed recreation opportunities (refer to the Bitter Creek WSA discussion in the Study Area

Overview). The Bitter Creek WSA has been selected for a wildlife viewing zone under the Watchable Wildlife program.

Three BLM undeveloped recreation sites were identified in the study corridor. These sites include two fishing reservoirs (Atlas and Langen) and a day use area along the Milk River (Faraasen Park). Atlas Reservoir is located in T32N, R38E, Section 24, and Langen Reservoir in T33N, R38E, Section 26. Faraasen Park is situated approximately 6 miles northwest of the City Glasgow. Faraasen Park development plans include a parking lot, an interpretive nature trail and improved wildlife habitat and riparian areas.

The 3,802.90 acre Tampico Ranch Conservation Easement Wildlife Management Area is located within the study corridor, approximately 6 miles northwest of Glasgow. The management goal of this conservation easement of to provide year round habitat for wildlife by maximizing wetland productivity and planting agricultural fields to dense nesting cover, and to provide public recreational opportunities. Hunting opportunities: Archery and rifle seasons for white-tailed deer are open to licensed hunters. Upland bird and waterfowl hunting opportunities exist for pheasants, ducks and geese. Wildlife viewing: White-tailed deer and pheasants are present year-round. Waterfowl are abundant spring through fall, and furbearers, such as beaver, muskrat, and mink are present year round. Wildlife viewing on the Tampico property requires permission from ranch headquarters.

One interpretive point ("Buffalo Country") is situated within the study corridor. This site incorporates a roadside pull-off with an interpretive sign that describes a place and event of historical interest. The site, maintained by MDOT's Glendive District, is located along the south side of U.S. Highway 2, approximately 5.8 miles northwest of the City of Glasgow.

Alternative Route A – Highway 24 Route

Land Jurisdiction and Ownership

The study corridor for the 40.5 mile Alternative Route A is located in Valley County. BLM public land represents 15.8% of the land crossed by this alternative. Montana state trust land comprises approximately 40.5% of the land crossed by the alternative, while Valley County land and private land make up approximately 0.5% and 43.2%, respectively. The northwest portion of the City of Glasgow is also located in the study corridor. This incorporated area of the City of Glasgow, however, is not crossed by the alternative. Land jurisdiction/ownership crossed by Alternative Route A is depicted in Table 3.2-21.

Land jurisdiction and ownership are depicted in the MMap 4: Land Jurisdiction.

Table 3.2-21 Land Jurisdiction/Ownership Crossed by Alternative Route A

Land Jurisdiction/Ownership	Miles	%
Bureau of Land Management	6.4	15.8
Montana Department of Natural Resources and Conservation	16.4	40.5
Valley County	0.2	0.5
Private	17.5	43.2
Total	**40.5**	**100.0**

Source: Montana State Library/NRIS

Existing Land Use

The study corridor is characterized by a rural landscape of rolling plains and tablelands. With the exception of the unincorporated community of St. Marie and subdivisions near the City of Glasgow, residential development within the study corridor is for the most part dispersed and rural in character. 357 residential dwellings are located within the study corridor as are other land uses including agriculture (crops and livestock). One school was identified just outside of the study corridor. R L Irle School, a prekindergarten to 3rd grade school, is within the Glasgow K-12 Schools District. The school is located at 825 8th North in the City of Glasgow. Currently, there are no plans for future schools in the District (Hageman 2004). Livestock grazing is the principal land use in the study corridor, although irrigated cropland and non-irrigated cropland (dryland agriculture) are present as well.

Irrigated cropland occupies a significant portion of the Milk River valley within the study corridor. The land is irrigated primarily by surface flooding. Among the crops grown on irrigated land, the most common are alfalfa and small grains such as wheat and barley. Other crops grown include grass and grain hays, silage, safflower, corn, and livestock pasture. Non-irrigated cropland (dryland agriculture) comprises the bulk of cultivated land in the study corridor and is generally found on the adjacent uplands. Principal crops include wheat, barley, oats and grain hay. Not all the acres devoted to dryland agriculture are planted each year. Much of the land is cultivated under an alternate crop-fallow system.

Important Farmland is located in the study corridor. Prime farmland if irrigated is crossed by Link 5 from milepost 19.3 to milepost 19.4, from milepost 19.7 to milepost 20.2, and from milepost 20.7 to 21.1. Farmland of Statewide Importance is crossed by Link 24 from milepost 0.6 to milepost 1.5. CRP lands are also crossed in the study corridor. CRP land is crossed by Link 5 from milepost 15.0 to 15.4 and from milepost 22.0 to milepost 22.5.

The area is permitted for livestock grazing. Five BLM grazing allotments which prescribe deferred-rotation or seasonal grazing were identified as being crossed in the study corridor. Cattle are grazed on one allotment or another from March 16 through November 16. Grazing allocation and management of these allotments are found in Table 3.2-22.

Table 3.2-22 BLM Livestock Grazing Allotments Crossed by Alternative Route A

Allotment # & Name	Management Category	Grazing method/season	BLM AUMs	Other AUMs	BLM Acres	Other Acres	Permit Issued
4054 SOUTH FORK BITTER CREEK	I	DR April 15 – October 29	4,116	0	33,314	9,000	No
4111 FOSS COULEE	M	S May 5 – November 1	553	0	2,773	360	Yes
4121 LOWER CHERRY CREEK	M	S April 15 – October 1	166	0	640	0	Yes
4128 MIDDLE FOSS COULEE	M	S April 15 – October 15	588	0	860	50	Yes
4129 CHERRY CREEK FORKS	M	S March 16 – November 16	31	0	160	0	Yes

Management Category: I =Improve, M=Maintained, S=Seasonal
Grazing Method: RR = Rest Rotation, DR = Deferred Rotation, S = Seasonal
Source: BLM Glasgow Field Station

Agricultural land (cropland) and non-irrigated pasture/rangeland crossed in the study corridor is presented by Link and Milepost in Table 3.2-23.

Table 3.2-23 Agricultural Land (Cropland) and Non-irrigated Pasture/Rangeland Crossed by Alternative Route A (miles)

Link	Milepost Begin	Milepost End	Distance (Miles)	Description/Classification
1	0.0	0.7	0.7	Agricultural Land (Dryland Cultivated)
1	0.7	1.0	0.3	Non-Irrigated Pasture/Rangeland
3	0.0	0.6	0.6	Non-Irrigated Pasture/Rangeland
3	0.6	1.0	0.4	Agricultural Land (Dryland Cultivated)
3	1.0	3.5	2.5	Non-Irrigated Pasture/Rangeland
3	3.5	3.7	0.2	Agricultural Land (Dryland Cultivated)
3	3.7	3.8	0.1	Non-Irrigated Pasture/Rangeland
5	0.0	10.5	10.5	Non-Irrigated Pasture/Rangeland
5	10.6	15.0	4.4	Non-Irrigated Pasture/Rangeland
5	15.4	22.0	6.6	Non-Irrigated Pasture/Rangeland
5	22.5	22.6	0.1	Agricultural Land (Dryland Cultivated)
5	22.6	24.1	1.5	Non-Irrigated Pasture/Rangeland
5	24.1	24.7	0.6	Agricultural Land (Flood Irrigated Cropland)

5	24.7	24.8	0.1	Non-Irrigated Pasture/Rangeland
5	24.8	25.2	0.4	Agricultural Land (Dryland Cultivated)
5	25.2	26.4	1.2	Non-Irrigated Pasture/Rangeland
5	26.4	26.9	0.5	Agricultural Land (Dryland Cultivated)
23	0.0	0.8	0.8	Agricultural Land (Dryland Cultivated)
23	0.8	2.0	1.2	Non-Irrigated Pasture/Rangeland
24	0.0	0.6	0.6	Agricultural Land (Flood Irrigated Cropland)
24	0.7	0.8	0.1	Agricultural Land (Dryland Cultivated)
24	1.0	1.5	0.5	Agricultural Land (Dryland Cultivated)
24	1.5	2.5	1.0	Agricultural Land (Flood Irrigated Cropland)
24	2.5	2.6	0.1	Agricultural Land (Dryland Cultivated)
24	2.6	2.8	0.2	Agricultural Land (Flood Irrigated Cropland)
24	2.8	2.9	0.1	Non-Irrigated Pasture/Rangeland
24	2.9	3.0	0.1	Agricultural Land (Dryland Cultivated)
24	3.0	3.2	0.2	Non-Irrigated Pasture/Rangeland
24	3.2	3.5	0.3	Agricultural Land (Flood Irrigated Cropland)
24	3.5	3.8	0.3	Non-Irrigated Pasture/Rangeland
24	3.8	3.9	0.1	Agricultural Land (Flood Irrigated Cropland)
24	3.9	4.2	0.3	Non-Irrigated Pasture/Rangeland
24	4.2	6.1	1.9	Agricultural Land (Dryland Cultivated)
24	6.1	6.6	0.5	Non-Irrigated Pasture/Rangeland
Total			**2.8**	**Agricultural Land (Flood Irrigated Cropland)**
Total			**5.8**	**Agricultural Land (Dryland Cultivated)**
Total			**30.4**	**Non-Irrigated Pasture/Rangeland**

A Northern Border Pipeline Company compressor station and microwave facility are located within the study corridor. Additional microwave facilities identified in the study corridor include a facility located adjacent to Northwestern Energy's Richardson Coulee Substation, and a communication site associated with a Nemont Telephone Cooperative building west of Montana Highway 24, approximately three miles southwest of St. Marie. Natural gas pipelines and proposed water distribution lines were also identified in the study corridor. A Northern Border Pipeline Company 42-inch natural gas pipeline is crossed by Link 1 from milepost 0.7 to milepost 0.8and a Williston Basin Interstate Pipeline Company 6-inch natural gas lateral (valley industrial park) is crossed by Link 5 from milepost 13.4 to milepost 13.5. Two Williston Basin Interstate Pipeline Company (10-inch and 8-inch) natural gas pipelines are crossed by Link 24 from milepost 1.7 to milepost 1.8. Link 5 also crosses a Dry Prairie Rural Water Supply water distribution line from milepost 15.4 to milepost 15.5, from milepost 23.4 to milepost 23.5, from milepost 23.8 to milepost 23.9, and from milepost 25.1 to milepost 25.2.

One MDEQ permitted opencut sand and gravel operation, Maag, Permit #204, is located in the study corridor.

Federal and state oil and gas leases exist within the study corridor. Alternative Route A crosses 6.8 miles of authorized federal leases and 4.1 miles of state leases.

Glasgow Irrigation District canals were also located in the study corridor. The Vandalia South Main Canal is crossed by Link 24 from milepost 4.2 to milepost 4.3 and paralled from milepost 3.5 to milepost 3.8. Link 24 is also crossed by lateral canal V63 from milepost 1.6 to milepost 1.7.

One registered general (commercial) apiary site was crossed by Link 5 from milepost 24.2 to milepost 24.8. Link 24 also crosses another registered general (commercial) apiary site from milepost 2.0 to milepost 2.6.

Existing land use is depicted in the Map 5: Land Use.

Planned Land Use

Public lands administered by the BLM in VCWEP area are guided by the Approved Valley Resource Area RMP. According to the RMP, livestock grazing will continue to be managed through development and monitoring of allotment management plans (AMP) or similar grazing plans and supervision of grazing use. Rights-of-way outside of WSAs are considered on a case-by-case basis with appropriate stipulations from the BLM Manual Handbook H-2801-1 incorporated into the ROW grant.

Valley County currently does not have an adopted county Comprehensive Plan. Valley County also is not zoned or has any special/conditional use permit requirements for transmission lines.

The following five platted subdivisions were identified in the study corridor:

- Cherry Valley Estates (1 tract)
- Golden Meadow Estates (30 tracts)
- Hartsock Subd (3 tracts)
- Kirkland Sub-Division (4 tracts)
- Moen Tract (36 tracts)

Golden Meadow Estates, is crossed by Link 5 from milepost 24.7 to milepost 25.3.

One proposed minor residential subdivision (amended plat of tract 12 Golden Meadow Estates) was identified in the study area. The proposed subdivision is located in T29N, R39E, NE¼ NW¼ of Section 14.

There is a likelihood of gas exploration in the study corridor in the future.

Parks, Recreation, and Preservation Areas

Dispersed recreation opportunities exist within the study corridor and primarily consist of hunting, fishing, wildlife viewing and OHV travel.

The Bitter Creek WSA is located in the study corridor and offers a number of dispersed recreation opportunities (refer to the Bitter Creek WSA discussion in the Study Area Overview). The Bitter Creek WSA has been selected for a wildlife viewing zone under the Watchable Wildlife program.

Two BLM undeveloped recreation sites were identified in the study corridor. These sites include two fishing reservoirs (Langen and Shoot). Langen Reservoir in located in T33N, R38E, Section 26 and Shoot Reservoir in T28N, R38E, Section 10.

One Section 6(f) Site (Glasgow Base Pond Fishing Access Site) was identified in the study corridor and is administered by the MFWP.

The Valley County Fairgrounds, located within the City of Glasgow, is located within the study corridor as is the City of Glasgow's Bundy Park.

Alternative Route B – Jensen Trail Route

Land Jurisdiction and Ownership

The study corridor for the 37.1 mile Alternative Route B is located in Valley County. BLM public land represents 14.3% of the land crossed by this alternative. Montana state trust land comprises approximately 41.2% of the land crossed by the alternative while private land makes up approximately 44.5%. The northwest portion of the City of Glasgow is also located in the study corridor. This incorporated area of the City of Glasgow, however, is not crossed by the alternative. Land jurisdiction/ownership crossed by Alternative Route B is depicted in Table 3.2-24.

Land jurisdiction and ownership is depicted in the MMap 4: Land Jurisdiction..

Table 3.2-24 Land Jurisdiction/Ownership Crossed by Alternative Route B

Land Jurisdiction/Ownership	**Miles**	**&**
Bureau of Land Management	5.3	14.3
Montana Department of Natural Resources and Conservation	15.3	41.2
Valley County	0.0	0.0
Private	16.5	44.5
Total	**37.1**	**100.0**

Source: Montana State Library/NRIS

Existing Land Use

The study corridor is characterized by a rural landscape of rolling plains and tablelands. With the exception of subdivisions near the City of Glasgow, residential development within the study corridor is for the most part dispersed and rural in character. 180 residential dwellings are located within the study corridor as are other land uses including agriculture (crops and livestock). One school was identified just outside of the study corridor. R L Irle School, a prekindergarten to 3rd grade school, is within the Glasgow K-12 Schools District. The school is located at 825 8th North in the City of Glasgow. Currently, there are no plans for future schools in the District (Hageman 2004). Livestock grazing is the principal land use in the study corridor, although irrigated cropland and non-irrigated cropland (dryland agriculture) are present as well.

Irrigated cropland occupies a significant portion of the Milk River valley within the study corridor. The land is irrigated primarily by surface flooding. Among the crops grown on irrigated land, the most common are alfalfa and small grains such as wheat and barley. Other crops grown include grass and grain hays, silage, safflower, corn, and livestock pasture. Non-irrigated cropland (dryland agriculture) comprises the bulk of cultivated land in the study corridor and is generally found on the adjacent uplands. Principal crops include wheat, barley, oats and grain hay. Not all the acres devoted to dryland agriculture are planted each year. Much of the land is cultivated under an alternate crop-fallow system.

Important Farmland is located in the study corridor. Farmland of Statewide Importance is crossed by Link 24 from milepost 0.6 to milepost 1.5. CRP lands are also crossed in the study corridor. CRP land is crossed by Link 10 from milepost 13.2 to milepost 13.7, from milepost 14.2 to milepost 14.7, and from milepost 15.2 to milepost 15.7.

The area is permitted for livestock grazing. Six BLM grazing allotments which prescribe rest-rotation, deferred-rotation or seasonal grazing were identified as being crossed in the study corridor. Cattle are grazed on one allotment or another from March 1 through February 28. Grazing allocation and management of these allotments are found in Table 3.2-25.

Table 3.2-25 BLM Livestock Grazing Allotments Crossed by Alternative Route B

Allotment # & Name	Management Category	Grazing method/season	BLM AUMs	Other AUMs	BLM Acres	Other Acres	Permit Issued
4054 SOUTH FORK BITTER CREEK	I	DR April 15 – October 29	4,116	0	33,314	9,000	No
4106 UPPER RICHARDSON	M	S May 16 – October 15	573	0	3,031	292	Yes
4108 UPPER	C	S	103	0	480	0	Yes

MARTIN COULEE		May 1 – September 1					
4301 UPPER BUGGY CREEK	M	RR March 1 – February 28	1,958	0	9,864	7,119	Yes
4309 WESTFORK	M	S April 15 – November 8	568	0	2,424	4,145	Yes
4310 NORTH WESTFORK	C	S April 15 – October 30	116	550	397	2,525	Yes

Management Category: I =Improve, M=Maintained, S=Seasonal
Grazing Method: RR = Rest Rotation, DR = Deferred Rotation, S = Seasonal
Source: BLM Glasgow Field Station

Agricultural land (cropland) and non-irrigated pasture/rangeland crossed in the study corridor is presented by Link and Milepost in Table 3.2-26.

Table 3.2-26 Agricultural Land (Cropland) and Non-irrigated Pasture/Rangeland Crossed by Alternative Route B (miles)

Link	Milepost Begin	Milepost End	Distance (Miles)	Description/Classification
1	0.0	0.7	0.7	Agricultural Land (Dryland Cultivated)
1	0.7	1.0	0.3	Non-Irrigated Pasture/Rangeland
3	0.0	0.6	0.6	Non-Irrigated Pasture/Rangeland
3	0.6	1.0	0.4	Agricultural Land (Dryland Cultivated)
3	1.0	3.5	2.5	Non-Irrigated Pasture/Rangeland
3	3.5	3.7	0.2	Agricultural Land (Dryland Cultivated)
3	3.7	3.8	0.1	Non-Irrigated Pasture/Rangeland
6	0.0	5.2	5.2	Non-Irrigated Pasture/Rangeland
10	0.0	11.2	11.2	Non-Irrigated Pasture/Rangeland
10	11.2	12.2	1.0	Agricultural Land (Dryland Cultivated)

10	12.2	13.2	1.0	Non-Irrigated Pasture/Rangeland
10	13.7	14.2	0.5	Non-Irrigated Pasture/Rangeland
10	14.7	15.2	0.5	Agricultural Land (Dryland Cultivated)
10	15.7	17.2	1.5	Non-Irrigated Pasture/Rangeland
18	0.0	1.0	1.0	Agricultural Land (Dryland Cultivated)
23	0.0	0.8	0.8	Agricultural Land (Dryland Cultivated)
23	0.8	2.0	1.2	Non-Irrigated Pasture/Rangeland
24	0.0	0.6	0.6	Agricultural Land (Flood Irrigated Cropland)
24	0.7	0.8	0.1	Agricultural Land (Dryland Cultivated)
24	1.0	1.5	0.5	Agricultural Land (Dryland Cultivated)
24	1.5	2.5	1.0	Agricultural Land (Flood Irrigated Cropland)
24	2.5	2.6	0.1	Agricultural Land (Dryland Cultivated)
24	2.6	2.8	0.2	Agricultural Land (Flood Irrigated Cropland)
24	2.8	2.9	0.1	Non-Irrigated Pasture/Rangeland
24	2.9	3.0	0.1	Agricultural Land (Dryland Cultivated)
24	3.0	3.2	0.2	Non-Irrigated Pasture/Rangeland
24	3.2	3.5	0.3	Agricultural Land (Flood Irrigated Cropland)
24	3.5	3.8	0.3	Non-Irrigated Pasture/Rangeland
24	3.8	3.9	0.1	Agricultural Land (Flood Irrigated Cropland)
24	3.9	4.2	0.3	Non-Irrigated Pasture/Rangeland
24	4.2	6.1	1.9	Agricultural Land (Dryland Cultivated)
24	6.1	6.6	0.5	Non-Irrigated Pasture/Rangeland
Total			**2.2**	**Agricultural Land (Flood Irrigated Cropland)**
Total			**7.3**	**Agricultural Land (Dryland Cultivated)**

Total			**25.5**	**Non-Irrigated Pasture/Rangeland**

Source: MontanaCadastral Mapping Project

A Northern Border Pipeline Company compressor station and microwave facility are located within the study corridor. An additional microwave facility was identified adjacent to Northwestern Energy's Richardson Coulee Substation. Natural gas pipelines were also identified in the study corridor. A Northern Border Pipeline Company 42-inch natural gas pipeline is crossed by Link 1 from milepost 0.7 to milepost 0.8and a Williston Basin Interstate Pipeline Company 6-inch natural gas lateral (valley industrial park) is crossed by Link 10 from milepost 8.6 to milepost 8.7. Two Williston Basin Interstate Pipeline Company (10-inch and 8-inch) natural gas pipelines are crossed by Link 24 from milepost 1.7 to 1.8.

One MDEQ permitted Opencut sand and gravel operation, Maag, Permit #204, is located in the study corridor.

Federal and state oil and gas leases exist within the study corridor. Alternative Route B crosses 5.2 miles of authorized federal leases and 1.1 miles of pending federal leases. Alternative Route B also crosses 1.8 miles of state leases.

Glasgow Irrigation District canals were also located in the study corridor. The Vandalia South Main Canal is crossed by Link 24 from milepost 4.2 to milepost 4.3 and paralled from milepost 3.5 to milepost 3.8. Link 24 is also crossed by lateral canal V63 from milepost 1.6 to milepost 1.7.

One registered general (commercial) apiary site was crossed by Link 24 from milepost 2.0 to milepost 2.6.

Existing land use is depicted in the Map 5: Land Use..

Planned Land Use

Public lands administered by the BLM in VCWEP area are guided by the Approved Valley Resource Area RMP. According to the RMP, livestock grazing will continue to be managed through development and monitoring of allotment management plans (AMP) or similar grazing plans and supervision of grazing use. Rights-of-way outside of WSAs are considered on a case-by-case basis with appropriate stipulations from the BLM Manual Handbook H-2801-1 incorporated into the ROW grant.

Valley County currently does not have an adopted county Comprehensive Plan. Valley County also is not zoned or has any special/conditional use permit requirements for transmission lines.

Tewenty-seven platted subdivisions were identified in the study corridor. Names and number of tracts of these subdivisions are found in Table 3.2-27.

Table 3.2-27 Platted Subdivisions within Alternative Route B Study Corridor

Subdivision	Number of Tracts
Bell First Add (Glasgow)	1
Golden Meadow Estates	30
Hartsock Subd	19
Hartsock-Hatton-Hektner Trs	5
Hektner Cherry Creek Sub Tr	54
Hektner Cherry Crk Sub 1st Add	8
Hektner Tracts	4
Irvin Cherry Creek Subd	8
Jerome-Schneider Tract	5
Jerome-Schneider 1st Add	3
Johnson, Roy E Subd	3
Kamfer First Add (Glasgow)	4
Kamfer Second Add (Glasgow)	1
Kirkland Sub-Division	4
Lind Suburban Tract	17
Schulund Valley View 1st Add	83
Schulund Valley View 2nd Add	68
Schulund Valley View Add	25
Stahl Cherry Creek Subd	11
Stahl Sunnyside Subd	3
Star-Char-El 1st Addn	4
Star-Char-El Add (Glasgow)	2
Sunny Hills Subd	22
Sunset Heights Add (Glasgow)	10
Sunset Heights First Add	1
Sutter Subd	26
SVV 1st Add Amd (Lot 120A)	1

Source: Montana Cadastral Mapping Project

One proposed minor residential subdivision (amended plat of tract 12 Golden Meadow Estates) was identified in the study area. The proposed subdivision is located in T29N, R39E,NE¼ NW¼ of Section 14.

There is a likelihood of gas exploration in the study corridor in the future.

Platted subdivisions are depicted in Map 5: Land Use.

Parks, Recreation, and Preservation Areas

Dispersed recreation opportunities exist within the study corridor and primarily consist of hunting, fishing, wildlife viewing and OHV travel.

The Bitter Creek WSA is located in the study corridor and offers a number of dispersed recreation opportunities (refer to the Bitter Creek WSA discussion in the Study Area Overview). The Bitter Creek WSA has been selected for a wildlife viewing zone under the Watchable Wildlife program.

Three BLM undeveloped recreation sites were identified in the study corridor. These sites include three fishing reservoirs (Atlas, Langen, and Shoot). Atlas Reservoir is located in T32N, R38E, Section 24, and Langen Reservoir in T33N, R38E, Section 26. Shoot Reservoir is located in T28N, NE¼ NW¼R38E, Section 10.

The Valley County Fairgrounds, located within Glasgow, is located within the study corridor as is the City of Glasgow's Bundy Park.

Alternative Route D – Britsch Road Route

Land Jurisdiction and Ownership

The study corridor for the 37.1 mile Alternative Route D is located in Valley County. BLM public land represents 52.6% of the land crossed by this alternative. Montana state trust land comprises approximately 10.2% of the land crossed by the alternative, while Valley County land and private land make up approximately 1.9% and 35.3%, respectively. Land jurisdiction/ownership crossed by Alternative Route D is depicted in Table 3.2-28.

Land jurisdiction and ownership is depicted in the Map 4: Land Jurisdiction.

Table 3.2-28 Land Jurisdiction/Ownership Crossed by Alternative Route D

Land Jurisdiction/Ownership	Miles	%
Bureau of Land Management	19.5	52.6
Montana Department of Natural Resources and Conservation	3.8	10.2
Valley County	0.7	1.9
Private	13.1	35.3
Total	**37.1**	**100.00**

Source: Montana State Library/NRIS

Existing Land Use

The study corridor is characterized by a rural landscape of rolling plains and tablelands and includes the community of Vandalia. Residential development within the study corridor is for the most part dispersed and rural in character. 28 residential dwellings are located within the study corridor as are other land uses including agriculture (crops and livestock). Livestock grazing is the principal land use in the study corridor, although irrigated cropland and non-irrigated cropland (dryland agriculture) are present as well. The land is irrigated primarily by surface flooding, though center-pivot irrigation systems are also used north of Vandalia.

Irrigated cropland occupies a significant portion of the Milk River valley within the study corridor. The land is irrigated primarily by surface flooding, though center-pivot irrigation systems are also used north of Vandalia. Among the crops grown on irrigated land, the most common are alfalfa and small grains such as wheat and barley. Other crops grown include grass and grain hays, silage, safflower, corn, and livestock pasture. Non-irrigated cropland (dryland agriculture) comprises the bulk of cultivated land in the study corridor and is generally found on the adjacent uplands. Principal crops include wheat, barley, oats and grain hay. Not all the acres devoted to dryland agriculture are planted each year. Much of the land is cultivated under an alternate crop-fallow system.

Important Farmland is located in the study corridor. Prime farmland if irrigated is crossed by Link 14 from milepost 1.5 to milepost 1.9. Farmland of Statewide Importance is crossed by Link 14 from milepost 4.7 to milepost 4.9. Link 16 also crosses Farmland of Statewide Importance from milepost 0.0 to milepost 0.1, from milepost 0.2 to milepost 0.6, from milepost 1.7 to milepost 2.0, and from milepost 3.7 to milepost 3.9. CRP lands are also crossed in the study corridor. CRP land is crossed by Link 14 from milepost 1.0 to 1.5, and from milepost 2.8 to milepost 3.0.

The area is permitted for livestock grazing. Eight BLM grazing allotments which prescribe rest-rotation, deferred-rotation or seasonal grazing were identified as being crossed in the study corridor. Cattle are grazed on one allotment or another from March 1 through February 28. Grazing allocation and management of these allotments are found in Table 3.2-29.

Table 3.2-29 BLM Livestock Grazing Allotments Crossed by Alternative Route D

Allotment # & Name	Management Category	Grazing method/season	BLM AUMs	Other AUMs	BLM Acres	Other Acres	Permit Issued
4071 UPPER CANYON CREEK	I	DR April 1 – October 31	1,459	0	10,266	1,270	Yes
4078 UPPER LIME CREEK	M	RR June 1 – October 31	504	0	3,163	185	Yes

4079 SOUTH LIME CREEK	M	S April 16 – October 31	456	0	3,163	185	Yes
4080 HALL COULEE	M	S April 1 – October 9	276	0	1,548	1,746	No
4088 ELLSWORTH COULEE	I	S March 1 – February 28	234	0	1,281	0	Yes
4540 HAY COULEE	M	DR March 1 – February 28	565	0	3,316	2,800	No
4541 LOWER HAY COULEE	C	S May 1 – October 15	97	0	570	320	No
4542 ANTELOPE CREEK	I	S April 1 – November 15	801	0	4,633	9,064	No

Management Category: I =Improve, M=Maintained, S=Seasonal
Grazing Method: RR = Rest Rotation, DR = Deferred Rotation, S = Seasonal
Source: BLM Glasgow Field Station

Agricultural land (cropland) and non-irrigated pasture/rangeland crossed in the study corridor is presented by Link and Milepost in Table 3.2-30.

Table 3.2-30 Agricultural Land (Cropland) and Non-irrigated Pasture/Rangeland Crossed by Alternative Route D (miles)

Link	Milepost Begin	Milepost End	Distance (Miles)	Description/Classification
2	0.0	0.4	0.4	Agricultural Land (Dryland Cultivated)
2	0.4	7.7	7.3	Non-Irrigated Pasture/Rangeland
9	0.0	10.8	10.8	Non-Irrigated Pasture/Rangeland
14	0.0	1.0	1.0	Agricultural Land (Dryland Cultivated)
14	1.5	1.9	0.4	Agricultural Land (Dryland Cultivated)
14	2.0	2.8	0.8	Agricultural Land (Dryland Cultivated)
14	3.0	3.3	0.3	Agricultural Land (Dryland Cultivated)
14	3.3	4.5	1.2	Agricultural Land (Flood Irrigated Cropland)
14	4.5	4.9	0.4	Agricultural Land (Dryland Cultivated)

16	0.1	0.2	0.1	Agricultural Land (Dryland Cultivated)
16	0.3	0.4	0.1	Agricultural Land (Dryland Cultivated)
16	0.6	1.3	0.7	Non-Irrigated Pasture/Rangeland
16	1.3	1.5	0.2	Agricultural Land (Dryland Cultivated)
16	1.5	1.7	0.2	Non-Irrigated Pasture/Rangeland
16	1.7	1.8	0.1	Agricultural Land (Flood Irrigated Cropland)
16	1.8	2.2	0.4	Non-Irrigated Pasture/Rangeland
16	2.2	2.5	0.3	Agricultural Land (Dryland Cultivated)
16	2.5	12.1	9.6	Non-Irrigated Pasture/Rangeland
25	0.0	0.8	0.8	Non-Irrigated Pasture/Rangeland
25	0.8	1.0	0.2	Agricultural Land (Flood Irrigated Cropland)
25	1.0	1.1	0.1	Non-Irrigated Pasture/Rangeland
25	1.1	1.3	0.2	Agricultural Land (Dryland Cultivated)
Total			**1.5**	**Agricultural Land (Flood Irrigated Cropland)**
Total			**4.2**	**Agricultural Land (Dryland Cultivated)**
Total			**29.9**	**Non-Irrigated Pasture/Rangeland**

A Northern Border Pipeline Company compressor station is located within the study corridor. An additional microwave facility was identified adjacent to Northwestern Energy's Richardson Coulee Substation. Natural gas pipelines were also identified in the study corridor. A Northern Border Pipeline Company 42-inch natural gas pipeline is crossed by Link 2 from milepost 1.5 to milepost 1.6 and a Williston Basin Interstate Pipeline Company 10-inch natural gas pipeline by Link 16 from milepost 0.6 to milepost 0.7.

MDEQ permitted Opencut sand and gravel operations are crossed in the study corridor. The first operation, Ellsworth, Permit #167, is crossed by Link 9 from milepost 9.6 to milepost 9.8. This permit is issued to the Valley County Road Department. The second operation, Winder, Permit #FRM-001, is crossed by Link 14 from milepost 1.5 to milepost 1.7. This permit is issued to Fossum Ready Mix.

Federal and state oil and gas leases exist within the study corridor. Alternative Route B crosses 4.5 miles of authorized federal leases and 9.1 miles of pending federal leases. Alternative Route B also crosses 2.0 miles of state leases.

One Glasgow Irrigation District canal, the Vandalia South Main Canal, is crossed by Link 16 from milepost 0.6 to milepost 0.7.

Existing land use is depicted in the Map 5: Land Use

Planned Land Use

Public lands administered by the BLM in VCWEP area are guided by the Approved Valley Resource Area RMP. According to the RMP, livestock grazing will continue to be

managed through development and monitoring of allotment management plans (AMP) or similar grazing plans and supervision of grazing use. Rights-of-way outside of WSAs are considered on a case-by-case basis with appropriate stipulations from the BLM Manual Handbook H-2801-1 incorporated into the ROW grant.

Valley County currently does not have an adopted county Comprehensive Plan. Valley County also is not zoned or has any special/conditional use permit requirements for wind farms.

Two platted subdivisions were identified in the study corridor. Mckay Add (Vandalia) consists of 24 tracts and the Vandalia Original Townsite consists of 12 tracts.

There is a likelihood of exploratory oil and gas drilling in VCWEP area in the future.

Planned land use is depicted in the Map 5: Land Use.

Parks, Recreation, and Preservation Areas

Dispersed recreation opportunities exist within the study corridor and primarily consist of hunting, wildlife viewing and OHV travel.

The Bitter Creek WSA is located in the study corridor and offers a number of dispersed recreation opportunities (refer to the Bitter Creek WSA discussion in the Study Area Overview). The Bitter Creek WSA has been selected for a wildlife viewing zone under the Watchable Wildlife program.

Alternative Route E – West Central Route

Land Jurisdiction and Ownership

The study corridor for the 33.1 mile Alternative Route E is located in Valley County. BLM public land represents 46.5% of the land crossed by this alternative. Montana state trust land comprises approximately 9.4% of the land crossed by the alternative, while Valley County land and private land make up approximately 0.3% and 43.8%, respectively. Land jurisdiction/ownership crossed by Alternative Route E is depicted in Table 3.2-31.

Land jurisdiction and ownership is depicted in the Map 4: Land Jurisdiction.

Table 3.2-31 Land Jurisdiction/Ownership Crossed by Alternative Route E

Land Jurisdiction/Ownership	Miles	%
Bureau of Land Management	15.4	46.5
Montana Department of Natural Resources and Conservation	3.1	9.4

Land Jurisdiction/Ownership	Miles	%
Valley County	0.1	0.3
Private	14.5	43.8
Total	**33.1**	**100.0**

Source: Montana State Library/NRIS

Existing Land Use

The study corridor is characterized by a rural landscape of rolling plains and tablelands and includes the community of Tampico. Residential development within the study corridor is for the most part dispersed and rural in character. 37 residential dwellings are located within the study corridor as are other land uses including agriculture (crops and livestock). Livestock grazing is the principal land use in the study corridor, although irrigated cropland and non-irrigated cropland (dryland agriculture) are present as well.

Irrigated cropland occupies a significant portion of the Milk River valley within the study corridor. The land is irrigated primarily by surface flooding. Among the crops grown on irrigated land, the most common are alfalfa and small grains such as wheat and barley. Other crops grown include grass and grain hays, silage, safflower, corn, and livestock pasture. Non-irrigated cropland (dryland agriculture) comprises the bulk of cultivated land in the study corridor and is generally found on the adjacent uplands. Principal crops include wheat, barley, oats and grain hay. Not all the acres devoted to dryland agriculture are planted each year. Much of the land is cultivated under an alternate crop-fallow system.

Important Farmland is located in the study corridor. Prime farmland if irrigated is crossed by Link 12 from milepost 7.1 to milepost 7.3. Farmland of Statewide Importance is also crossed by Link 12 from milepost 7.7 to milepost 7.8, from milepost 7.9 to milepost 8.5, and from milepost 8.8 to milepost 8.9. CRP lands are also crossed in the study corridor. CRP land is crossed by Link 12 from milepost 4.9 to 5.8, and from milepost 6.0 to milepost 6.5.

The area is permitted for livestock grazing. Four BLM grazing allotments which prescribe rest-rotation, deferred-rotation or seasonal grazing were identified as being crossed in the study corridor. Cattle are grazed on one allotment or another from March 1 through February 28. Grazing allocation and management of these allotments are found in Table 3.2-32.

Table 3.2-32 BLM Livestock Grazing Allotments Crossed by Alternative Route E

Allotment # & Name	Management Category	Grazing method/season	BLM AUMs	Other AUMs	BLM Acres	Other Acres	Permit Issued
4054 SOUTH FORK BITTER CREEK	I	DR April 15 – October 29	4,116	0	33,314	9,000	No
4089 ALKALI COULEE	M	S May 20 – September 21	179	0	920	240	Yes
4301 UPPER BUGGY CREEK	M	RR March 1 – February 28	1,958	0	9,864	7,119	Yes
4303 BUGGY CREEK	I	RR April 15 – November 25	5,658	0	28,422	18,735	Yes

Management Category: I =Improve, M=Maintained, S=Seasonal
Grazing Method: RR = Rest Rotation, DR = Deferred Rotation, S = Seasonal
Source: BLM Glasgow Field Station

Agricultural land (cropland) and non-irrigated pasture/rangeland crossed in the study corridor is presented in Table 3.2-33.

Table 3.2-33 Agricultural Land (Cropland) and Non-irrigated Pasture/Rangeland Crossed by Alternative Route E (miles)

Link	Milepost Begin	Milepost End	Distance (Miles)	Description/Classification
1	0.0	0.7	0.7	Agricultural Land (Dryland Cultivated)
1	0.7	1.0	0.3	Non-Irrigated Pasture/Rangeland
4	0.0	4.4	4.4	Non-Irrigated Pasture/Rangeland
8	0.0	8.4	8.4	Non-Irrigated Pasture/Rangeland
12	0.0	2.9	2.9	Non-Irrigated Pasture/Rangeland
12	2.9	3.9	1.0	Agricultural Land (Dryland Cultivated)
12	3.9	4.9	1.0	Non-Irrigated Pasture/Rangeland
12	5.8	6.0	0.2	Non-Irrigated Pasture/Rangeland
12	6.5	7.6	1.1	Non-Irrigated Pasture/Rangeland
12	7.7	8.4	0.7	Agricultural Land (Dryland Cultivated)
12	8.7	8.9	0.2	Non-Irrigated Pasture/Rangeland

Link	Milepost Begin	Milepost End	Distance (Miles)	Description/Classification
12	8.9	9.2	0.3	Agricultural Land (Dryland Cultivated)
12	9.2	9.4	0.2	Non-Irrigated Pasture/Rangeland
12	9.4	9.5	0.1	Agricultural Land (Dryland Cultivated)
17	0.0	0.2	0.2	Non-Irrigated Pasture/Rangeland
17	0.2	1.0	0.8	Agricultural Land (Dryland Cultivated)
17	1.5	2.7	1.2	Agricultural Land (Dryland Cultivated)
17	2.7	6.3	3.6	Non-Irrigated Pasture/Rangeland
17	6.3	6.4	0.1	Agricultural Land (Dryland Cultivated)
17	6.4	7.0	0.6	Non-Irrigated Pasture/Rangeland
17	7.0	7.1	0.1	Agricultural Land (Dryland Cultivated)
17	7.1	7.3	0.2	Non-Irrigated Pasture/Rangeland
17	7.3	7.6	0.3	Agricultural Land (Dryland Cultivated)
17	7.6	8.1	0.5	Non-Irrigated Pasture/Rangeland
25	0.0	0.8	0.8	Non-Irrigated Pasture/Rangeland
25	0.8	1.0	0.2	Agricultural Land (Flood Irrigated Cropland)
25	1.0	1.1	0.1	Non-Irrigated Pasture/Rangeland
25	1.1	1.3	0.2	Agricultural Land (Dryland Cultivated)
Total			**0.2**	**Non-Irrigated Pasture/Rangeland**
Total			**5.5**	**Agricultural Land (Dryland Cultivated)**
Total			**24.7**	**Non-Irrigated Pasture/Rangeland**

A Northern Border Pipeline Company compressor station and microwave facility are located within the study corridor. An additional microwave facility was identified adjacent to Northwestern Energy's Richardson Coulee Substation. Natural gas pipelines were also identified in the study corridor. A Northern Border Pipeline Company 42-inch natural gas pipeline is crossed by Link 1 from milepost 0.7 to milepost 0.8 and a Williston Basin Interstate Pipeline Company 10-inch natural gas pipeline by Link 17 from milepost 0.0 to milepost 0.1.

One MDEQ permitted Opencut sand and gravel operation, Martin, Permit #167, is located in the study corridor.

Federal and state oil and gas leases exist within the study corridor. Alternative Route E crosses 6.9 miles of authorized federal leases and 7.4 miles of pending federal leases. Alternative Route E also crosses 1.6 miles of state leases.

One Glasgow Irrigation District canal, the Vandalia South Main Canal, is crossed by Link 12 from milepost 8.9 to milepost 9.0.

Existing land use is depicted in the Map 5: Land Use

Planned Land Use

Public lands administered by the BLM in VCWEP area are guided by the Approved Valley Resource Area RMP. According to the RMP, livestock grazing will continue to be

managed through development and monitoring of allotment management plans (AMP) or similar grazing plans and supervision of grazing use. Rights-of-way outside of WSAs are considered on a case-by-case basis with appropriate stipulations from the BLM Manual Handbook H-2801-1 incorporated into the ROW grant.

Valley County currently does not have an adopted county Comprehensive Plan. Valley County also is not zoned or has any special/conditional use permit requirements for wind farms.

One 24 tract platted subdivision, Tampico Original Townsite, is located in the study corridor.

There is a likelihood of gas exploration in the study corridor in the future.

Plotted subdivisions are depicted in the Map 5: Land Use

Parks, Recreation, and Preservation Areas

Dispersed recreation opportunities exist within the study corridor and primarily consist of hunting, wildlife viewing and OHV travel.

The Bitter Creek WSA is located in the study corridor and offers a number of dispersed recreation opportunities (refer to the Bitter Creek WSA discussion in the Study Area Overview). The Bitter Creek WSA has been selected for a wildlife viewing zone under the Watchable Wildlife program.

One BLM undeveloped recreation site (Langen fishing reservoir) was identified in the study corridor. Langen Reservoir is located in T33N, R38E, Section 26.

The 3,802.90 acre Tampico Ranch Conservation Easement Wildlife Management Area is also located within the study corridor, approximately 6 miles northwest of Glasgow. The management goal of this conservation easement of to provide year round habitat for wildlife by maximizing wetland productivity and planting agricultural fields to dense nesting cover, and to provide public recreational opportunities. Hunting opportunities: Archery and rifle seasons for white-tailed deer are open to licensed hunters. Upland bird and waterfowl hunting opportunities exist for pheasants, ducks and geese. Wildlife viewing: White-tailed deer and pheasants are present year-round. Waterfowl are abundant spring through fall, and furbearers, such as beaver, muskrat, and mink are present year round. Wildlife viewing on the Tampico property requires permission from ranch headquarters.

3.2-1.5 Antelope Creek Substation

Land Ownership

The proposed substation site is located in Valley County, adjacent to NWE's Richardson Coulee Substation, on 5 acres of private land (T29N, R38E, SW ¼ of section 33). Land ownership within the ½ mile study area around the proposed substation is also private. The substation would be constructed and operated by Western.

Existing Land Use

Land within the proposed substation site is currently rangeland used for livestock grazing (cattle). Within the ½ mile study area, one residence is located approximately 1,900 feet northwest of the proposed substation. Other land uses within the ½ mile study area include the Billingsley private airstrip to the north, Northwestern Energy's Richardson Coulee Substation and associated microwave facility to the west, and agricultural land (dryland cultivated) to the south.

Planned Land Use

The proposed substation site is not zoned. There are no Valley County special/conditional use permit requirements for electrical substations.

Parks, Recreation, and Preservation Areas

No existing or proposed parks, recreation, and preservation areas exist on or within the ½ mile study area.

3.2-2 Environmental Consequences and Mitigation Measures

This section discusses potential land use impacts that could occur as a result of the construction, operation, and maintenance of VCWEP and Alternatives. Where land use impacts were identified, an evaluation was conducted to determine if one or more mitigation measures to reduce impacts would be effective in avoiding or reducing (e.g., intensity and/or duration) the potential impact.

3.2-2.1 Assessment Methodology

Introduction

Impacts can be beneficial (positive) or adverse (negative), and can result from VCWEP action directly or indirectly. Impacts can be permanent, long lasting (long-term) or temporary (short-term). Long-term impacts are defined as those that would substantially remain for the life of VCWEP or beyond. Short-term impacts are defined as those changes to the environment during construction that generally would revert to pre-construction condition at or within a few years of the end of construction. Impacts can vary in significance from no change or only slightly discernible change, to a full modification of the environment.

Methods

In order to determine impact intensity, impact assessment methodology was developed utilizing the following criteria:

Resource sensitivity – the probable response of a particular resource to project-related activities

Resource quality – the pre-project condition of the resource potentially affected

Resource quantity – the amount of the resource potentially affected.

Duration of impact – the period of time over which the resource would be affected, measured as short-term (within a few years) or long-term (life of VCWEP and beyond).

Time of year – the season or period of time which the resource would be affected.

Once established, these criteria were systematically applied to each land use. The results of the evaluation were used to determine potential impacts to land uses. Using the impact assessment and mitigation planning process, the predicted effects of VCWEP were compared with the pre-Project environment to determine the initial impacts on land use resources. Applying this criteria to the wind farm, 230kV transmission line, and Antelope Substation yielded qualitative levels of high, moderate, low or no-identifiable impacts:

High Impact Assigned to those land use categories where the officially stated or approved land use restriction, plan or policy would be violated or where land use sensitivity was major and/or where the sensitivity was moderate but modified by moderate to high quantity levels. Land use impacts would be considered high if VCWEP would substantially preclude the primary existing or planned use of the land, result in a major change in overall land use patterns, create considerable conflict with permitted land uses, substantially alter existing recreational activities, or create extensive new recreational opportunities in the area.

Moderate Impact – Assigned to those land use categories whose sensitivity is moderate or where sensitivity is minimum, and quantity is high. Land use impacts would be considered moderate if VCWEP would create a modest change in the primary existing or planned use of the land, overall land use patterns, recreational opportunities, or slightly conflict with permitted land uses.

Low Impact – Assigned to those land use categories where sensitivity is minimum (excluding the above). Land use impacts would be considered low if the VCWEP. would not noticeably change the primary existing or planned use of the land, would cause only, at most, a minor change in overall land use patterns or recreational opportunities, and would not conflict with permitted land uses.

No-Identifiable Impact –Assigned to those land use categories where no measurable impact would occur to the specific resource under investigation. Small changes and stresses to the resource are not always adverse, some are neutral and therefore not identifiable impacts.

Generic and selectively committed mitigation measures that would effectively reduce or eliminate impacts were then applied to initial impacts to determine the “residual” impacts of VCWEP and alternatives on land use resources. Generic mitigation measures were applied to all affected areas as part of VCWEP. Selectively committed mitigation measures were applied, on a case-by-case basis where appropriate. Data collected as part of the proposed 230kV transmission line and alternatives inventory and analysis, are compiled in the Land Use Impact Table found in Appendix A. The data table shows the milepost location of potential impacts, the access level (ground disturbance level), the land use feature, the initial impact level, the recommended mitigation measure(s), and the

residual impact level. Refer to Chapter 2 for a description of the generic snd selectively committed mitigation measures.

Impact Types

Impact types were identified by considering what effects the construction, operation, and maintenance of VCWEP could have on the pre-Project, or existing, environment. Inventoried land uses were evaluated to determine the types of the potential direct and indirect impacts that could occur from the VCWEP and alternatives. Adverse impacts on land uses were considered if the VCWEP or alternatives would:

- displace, alter, or otherwise physically affect any existing, developing or planned residential, commercial, industrial, governmental or institutional use or activity
- displace, alter, or otherwise physically affect any existing agricultural use or activity
- displace, alter, or otherwise physically affect any existing or planned air facility or air travel-related activity
- alter or otherwise physically affect any established, designated or planned park, recreation, preservation, or educational use area or activity
- affect applicable general and regional plans and/or approved, adopted, or officially stated policies, goals, or operations of communities or governmental agencies

A variety of mitigation measures may be implemented to reduce potential impacts to land use resources. In addition to generic mitigation measures, selectively committed mitigation measures were applied on a case-by case basis when appropriate. Selectively committed mitigation measures utilized to minimize potential impacts to land use resources include:

S4: To limit new or improved accessibility into the area, all new access undesired or not required for maintenance will be closed using the most effective and least environmentally damaging methods appropriate to that area with concurrence of the landowner or land manager.

S5: To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S12: Single-pole tubular steel structures will be utilized to minimize ground disturbance, operational conflicts, and/or visual contrast.

S18: VCWEP will comply with all appropriate regulations of the Federal Aviation Administration (FAA), and a Notice of Proposed Construction or Alteration form (Form 7460-1) would be required of Wind Hunter pursuant to Federal Aviation Regulations, Part

77. Final locations, structures, and structure heights, including wind turbines, transmission lines, meteorological towers, and construction equipment that might impact air navigation such as cranes used to assemble the towers, would be submitted to the FAA for VCWEP. The form would be sent to the manager of the FAA Regional Air Traffic Division Office having jurisdiction over the area where the planned construction would be located. If acceptable to the FAA, white lights will be utilized on turbines and towers to minimize the risk of avian collisions. Coordination with the Department of Defense will be conducted regarding the location and potential effects of VCWEP upon operations in military airspace. The owner/operator of private airports and airstrips potentially affected by VCWEP will also be contacted.

S19: Construction will be timed, whenever practical, to minimize disruption of normal seasonal activities for cropland (planting and harvesting) and non-irrigated pasture/rangeland.

S20: Coordination with landowners, lessees, and companies during final transmission line design will be conducted, to the extent feasible, to align the transmission line, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

S21: To the extent feasible, Project facilities, including poles and access roads will be installed along the edges of borders of property. Consultation with the landowner or land management agency will be conducted to identify facility locations that create the least potential for impact to property and its uses.

S22: Farmers will be compensated for crop damage and compacted soils will be restored.

S23: On agricultural land, transmission towers, and right-of-way will be aligned with field boundaries to the greatest extent practicable and transmission towers will be placed near field boundaries, access roads and fences to reduce the impact to farm operation and agricultural production. Where this is not possible because of irregular field boundaries, the transmission towers will be placed on or perpendicular to the row crops wherever feasible, so that transmission lines do not run diagonally to the crop rows.

S25: Areas of disturbed soil will be reclaimed using weed-free grasses, forbs, and shrubs. Reclamation activities will be undertaken as early as possible on disturbed areas.

S32: To avoid or minimize potential microwave facility line-of-sight communication interference, coordination with the Northern Border Pipeline Company will occur during the determination of specific wind turbine locations.

S33: Construction staging areas and pulling sites shall be located adjacent to roads where practical. Coordination with landowners will be conducted to establish construction areas (such as conductor pulling and splicing areas and construction yards) on non-agricultural or in areas with less sensitive crops, where feasible.

S34: During Project construction, it will be necessary to remove cattle from areas where blasting or heavy equipment operations are taking place. Arrangements will made with landowners and livestock owners to keep livestock out of these areas during those periods.

S35: A stipulation will be included in easement agreements with landowners along the right-of-way that landowners and/or farmers and ranchers will be reimbursed for the value of the crops lost and the cost of any delay or interruption in necessary farming or grazing practices as a result of any interrupted use of cropland or grazing land.

S36: Construction operations will avoid, to the extent feasible, disturbance of agricultural soil during the wet season (moist soil is generally more susceptible to compaction than dry soil). The use of heavy equipment on agricultural land, will be minimized, to avoid soil compaction.

S37: Placing tower structures at the edge of fields where canals or irrigation ditches are located, will be avoided.

S38: Landowners will be consulted to determine which aerial applicators cover agricultural lands within the vicinity of the wind farm and approved transmission line route. Written notification will be provided to aerial applicators when meteorological towers, wind turbines and the 230kV transmission line and tower structures will be erected. Aerial applicators will also be provided with maps clearly showing the location of the meteorological towers, wind turbines and the 230kV transmission line and tower structures.

S39: During the right-of-way acquisition process, coordination with each affected landowner will be conducted in order to develop an alignment and specific tower locations, to provide clear information about the right-of-way acquisition process compensation and construction and maintenance activities, and to understand landowner plans for use of the transmission corridor area in order to minimize the impact of tower and right-of-way location.

S40: Existing roads will be used to the maximum extent possible, but only if in safe and environmentally sound locations. New access roads will be designed and constructed to the appropriate standard no higher than necessary to accommodate their intended functions (e.g., traffic volume and weight of vehicles). Abandoned roads and roads that are no longer needed will be re-contoured and re-vegetated.

S43: Notice to landowners will be provided when construction takes place to help minimize access disruptions.

S50: During construction and operation, traffic would be restricted to the roads developed for VCWEP. Use of other unimproved roads should be restricted to emergency situations.

S53: Prior to construction of the transmission line, coordination with beekeepers would occur to minimize potential environmental impacts, and to mitigate general disruption caused by the construction activities

3.2-2.3 Wind Farm

Proposed Action – 500 MW Facility (Phases I, II, III, IV)

The wind farm consists of a number of turbine strings, with General Electric 1.5 MW wind turbine structures. Each structure is approximately 388.8 feet tall (including the turbine blades), with a rotor diameter of 252.6 ft. Each turbine has a 15 foot diameter foundation. The turbines are linked by access roads and underground and aboveground 34.5kV electrical distribution lines. A new 230kV transmission line would interconnect the collector substation with a new Western substation (Antelope Creek) located approximately seven miles west of the City of Glasgow. Impacts related to the 230kV transmission line can be found in Section 3.2.2.4.

Construction would take 6 to 8 months per phase. Phase I is proposed to begin in late 2007; Phase II in 2010; Phase III in 2013; and Phase IV in 2017.

Monitoring and Testing Impacts

Site monitoring and testing would generally result in temporary, localized impacts to existing land uses associated with the meteorological towers and minimum-specification access roads (if required). Since a meteorological tower would occupy only a few square feet, a low impact to existing land uses would be expected. However, the presence of the towers and possible access roads may impact more remote dispersed recreational experiences.

Construction Impacts

Land use impacts during construction of the wind farm and associated facilities (Project) would be low. With the exception of phase IV, agricultural land (dryland cultivated) is located on private land currently leased to Wind Hunter. Construction activities would be coordinated with landowners to minimize disturbance of farm operations.

Potential direct impacts include adding a system of wind turbines and associated facilities to the existing land uses, which include crop production and cattle grazing. Project construction would temporarily alter 523.5 acres of land, temporarily interfering with existing agricultural land (dryland cultivated) and non-irrigated pasture/rangeland uses (grazing operations). All areas temporarily disturbed would be restored to their original condition. Cattle or other livestock would need to be removed from the most intensive construction areas. Livestock grazing, the primary land use in the area, could continue around Project facilities.

Project construction would permanently alter an estimated 113.8 acres of agricultural land (dryland cultivated) and non-irrigated pasture/rangeland to accommodate Project facilities including turbine tower foundations, access roads, underground and overhead

transmission lines, substations, operations and maintenance center, and other supporting facilities.

The permanent conversion of approximately 12.1 acres of (agricultural land (dryland cultivated) and 101.7 acres of non-irrigated pasture/rangeland to commercial utility use (i.e., wind farm development) would be an unavoidable impact of VCWEP. 12.1 acres of agricultural land (dryland cultivated) would be removed from production for the life of VCWEP (at minimum, 20 years). This reduction represents .03% of the total non-irrigated harvested cropland (371,000 acres) in Valley County for 2002. 102.3 acres of non-irrigated pasture/rangeland would be removed for the life of VCWEP (at minimum, 20 years). The proposed reduction in these land uses would have a minimal impact on livestock grazing, given the county's abundance of grazing lands.

Temporarily and permanently disturbed agricultural land (dryland cultivated) and non-irrigated pasture/rangeland), by phase in VCWEP area, is presented in Table 3.2-34 below.

Table 3.2-34 Wind Farm Disturbance (acres) – Proposed Action

	Phase I – 50MW Area	**Phase II – 100MW Area**	**Phase III – 150 MW Area**	**Phase IV – 200MW Area**	**Total**
Temporary Disturbance Area	62.9	102.4	153.5	207.8	**526.6**
Agricultural Land (dryland cultivated)	13.3	22.8	13.2	3.1	**52.4**
Non-irrigated Pasture/Rangeland	49.6	79.6	140.3	204.7	**474.2**
Permanent Disturbance Area	19.3	21.0	31.5	42.6	**114.4**
Agricultural Land (dryland cultivated)	4.1	4.7	2.7	0.6	**12.1**
Non-irrigated Pasture/Rangeland	15.2	16.3	28.8	42.0	**102.3**

Overall, direct impacts to recreational resource and opportunities would be low. Recreation use, including OHV travel and big game and upland bird hunting, would be displaced from the lands occupied by wind turbine and associated facilities. Most current recreation activity within VCWEP site, which consists of limited informal use, would be able to resume at current levels during operation and maintenance. There are no formal

recreational facilities in the vicinity of VCWEP site. Construction of VCWEP could encourage sightseeing by travelers.

Construction activities outside of the Bitter Creek WSA boundary could impact recreational use within the WSA due to reduction of WSA qualities and the sense of solitude from human activities. Construction noise, dust, and possible access restrictions are all temporary impacts to the WSA that could result from construction of wind turbines and associated facilities.

Potential impacts on adjacent land use from construction-related noise and dust are discussed in Section 3.14, *Noise*, and Section 3.15, *Air Quality*.

Operation and Maintenance Impacts

Operation and Maintenance impacts on land use would be low. Permanent land use impacts are based on the amount of land that would be displaced by the wind farm and associated facilities and by the compatibility of the wind farm and associated facilities with existing, adjacent uses. Permanently converted acreage would compose only a small portion of that available within VCWEP site (Phases I, II, III, IV). 12.1 out of 1,254 acres of agricultural land (dryland cultivated), or 1%, and 101.7 acres out of 18,866 acres of non-irrigated pasture/rangeland, or <1%, would be permanently converted to energy production. Private landowners would receive compensation for VCWEP use of their property through a lease agreement with Wind Hunter.

VCWEP would be compatible with a wide variety of land uses and generally would not preclude recreational, wildlife habitat conservation, livestock grazing, oil and gas leasing, or other activities that currently occur within VCWEP area. VCWEP area is not zoned.

The potential does exist, however, for Project wind turbines to cause line-of-sight communication interference with Northern Border Pipeline Company's C.S.1 CS01 microwave site and the Crow Creek Tower microwave site. The 300 foot C.S.1 site is located southeast of the wind farm, while the 120 foot Crow Creek Tower site is located northwest of the wind farm.

With the exception of aerial crop dusting, VCWEP would not appreciably disrupt the current and planned agricultural uses of the land. Given the turbine spacing, the operation of agricultural equipment would not be impaired, but some plowing patterns may have to be adjusted. VCWEP would not alter existing fencing around VCWEP site except to add gates, which would be kept locked, to certain access roads. The landowner would have keys to the gates. The presence of a transmission line can be hazardous to aerial crop spraying operations and typically increases cost to farmers when they cross agricultural land (i.e., additional amounts of pesticide application around the transmission line).

No operation and maintenance impacts on existing recreational activities are anticipated. VCWEP may cause a minor increase in the number of sightseers, but this impact would be low.

Impacts on private landowner-approved recreation activities such as hunting could occur during Project operation. However, these impacts are expected to be minimal. Hunting on private lands leased for VCWEP would be at the discretion of the individual landowner and Wind Hunter.

The operating workforce for VCWEP would range from 12 to 20 employees. Because of the small size of the operating work force, no substantial increase in the demand for recreational services and opportunities would occur in VCWEP area.

Operating wind turbines would be visible from the Bitter Creek WSA (see Section 3.4 *Visual Resources*, for a detailed discussion of the anticipated aesthetic effects of VCWEP). Longer-term impacts could arise from the visual intrusion of wind farm facilities across landscapes that provide little or no visual screening, allowing them to be seen by WSA recreational visitors from certain perspectives (refer to Section 3.4 *Visual Resources* for discussion of impacts).

Decommissioning Impacts

Low impacts to land use would be anticipated during decommissioning. Upon decommissioning, land use impacts would be largely reversible, and disturbed lands would be restored to their original condition through grading and planting. Once facilities were removed, acreage taken out of cropland and non-irrigated pasture/rangeland use could be returned to these prior uses. Livestock grazing, if occurring at that time, would be abated during the period of decommissioning activities. Local landowners may decide to continue to use and maintain some of the access roads installed by VCWEP. No permanent land use impacts are expected to result from decommissioning.

Potential recreational impacts from decommissioning would be low, including possible minor and temporary interruption of big game and upland bird hunting, and a minor increase in roadside sightseeing. However, once the site is reclaimed to pre-Project conditions, recreational use in the affected area could resume.

Mitigation Measures

The duration and extent of wind farm impacts can be reduced through implementation of Mitigation Measures **S4**, **S22**, **S32**, **S34**, **S38**, **S40, S43** and **S50**.

S4: To limit new or improved accessibility into the area, all new access undesired or not required for maintenance will be closed using the most effective and least environmentally damaging methods appropriate to that area with concurrence of the landowner or land manager.

S20: Coordination with landowners, lessees, and companies during final wind farm and transmission line design will be conducted, to the extent feasible, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

S22: Farmers will be compensated for crop damage and compacted soils will be restored.

S32: To avoid or minimize potential microwave facility line-of-sight communication interference, coordination with the Northern Border Pipeline Company will occur during the determination of specific wind turbine locations.

S34: During Project construction, it will be necessary to remove cattle from areas where blasting or heavy equipment operations are taking place. Arrangements will made with landowners and livestock owners to keep livestock out of these areas during those periods.

S38: Landowners will be consulted to determine which aerial applicators cover agricultural lands within the vicinity of the wind farm and approved transmission line route. Written notification will be provided to aerial applicators when meteorological towers, wind turbines and the 230kV transmission line and tower structures will be erected. Aerial applicators will also be provided with maps clearly showing the location of the meteorological towers, wind turbines and the 230kV transmission line and tower structures.

S38 requires notification to aerial applicators of new meteorological towers, wind turbines and the 230kV transmission line. However, while this measure would likely reduce the level of impact, the safety hazard to aerial applicators would remain high.

S40: Existing roads will be used to the maximum extent possible, but only if in safe and environmentally sound locations. New access roads will be designed and constructed to the appropriate standard no higher than necessary to accommodate their intended functions (e.g., traffic volume and weight of vehicles). Abandoned roads and roads that are no longer needed will be re-contoured and re-vegetated.

S43: Notice to landowners will be provided when construction takes place to help minimize access disruptions.

S50: During construction and operation, traffic would be restricted to the roads developed for VCWEP. Use of other unimproved roads should be restricted to emergency situations.

Alternative A – 150 MW Facility (Phases I and II)

Construction Impacts

Land use impacts during construction of the wind farm and associated facilities (Project) would be low. Agricultural land (dryland cultivated) is located on private land currently leased to Wind Hunter. Construction activities would be coordinated with landowners to minimize disturbance of farm operations.

Potential direct impacts include adding a system of wind turbines and associated facilities to the existing land uses, which include crop production and cattle grazing. Project construction would temporarily alter 165.3 acres of land, temporarily interfering with

existing agricultural land (dryland cultivated) and non-irrigated pasture/rangeland uses (grazing operations). All areas temporarily disturbed would be restored to their original condition. Cattle or other livestock would need to be removed from the most intensive construction areas. Livestock grazing, the primary land use in the area, can continue around Project facilities.

Project construction would permanently alter an estimated 40.3 acres of agricultural land (dryland cultivated) and non-irrigated pasture/rangeland to accommodate Project facilities including turbine tower foundations, access roads, underground and overhead transmission lines, substations, operations and maintenance center, and other supporting facilities.

The permanent conversion of approximately 8.8 acres of (agricultural land (dryland cultivated) and 31.5 acres of non-irrigated pasture/rangeland to commercial utility use (i.e., wind farm development) would be an unavoidable impact of VCWEP. 8.8 acres of agricultural land (dryland cultivated) would be removed from production for the life of VCWEP (at minimum, 20 years). This reduction represents <1% of the total non-irrigated harvested cropland (371,000 acres) in Valley County for 2002. 31.5 acres of non-irrigated pasture/rangeland would be removed for the life of VCWEP (at minimum, 20 years). The proposed reduction in these land uses would have a minimal impact on livestock grazing, given the county's abundance of grazing lands.

Temporarily and permanently disturbed agricultural land (dryland cultivated) and non-irrigated pasture/rangeland), by phase in VCWEP area, is presented in Table 3.2-35 below.

Table 3.2-35 Wind Farm Disturbance (acres) – Alternative A

	Phase I – 50MW Area	**Phase II – 100MW Area**	**Total**
Temporary Disturbance Area	62.9	102.4	**165.3**
Agricultural Land (dryland cultivated)	13.3	22.8	**36.1**
Non-irrigated Pasture/Rangeland	49.6	79.6	**129.2**
Permanent Disturbance Area	19.3	21.0	**40.3**
Agricultural Land (dryland cultivated)	4.1	4.7	**8.8**
Non-irrigated Pasture/Rangeland	15.2	16.3	**31.5**

Overall, direct impacts to recreational resource and opportunities would be low. Recreation use, including OHV travel and big game and upland bird hunting, would be displaced from the lands occupied by wind turbine and associated facilities. Most current recreation activity within VCWEP site, which consists of limited informal use, would be able to resume at current levels during operation and maintenance. There are no formal recreational facilities in the vicinity of VCWEP site. Construction of VCWEP could encourage sightseeing by travelers.

Construction activities outside of the Bitter Creek WSA boundary could impact recreational use within the WSA due to reduction of WSA qualities and the sense of solitude from human activities. Construction noise, dust, and possible access restrictions are all temporary impacts to the WSA that could result from construction of wind turbines and associated facilities.

Potential impacts on adjacent land use from construction-related noise and dust are discussed in Section 3.14, *Noise*, and Section 3.15, *Air Quality*.

Operation and Maintenance Impacts

Operation and Maintenance impacts on land use would be low. Permanent land use impacts are based on the amount of land that would be displaced by the wind farm and associated facilities and by the compatibility of the wind farm and associated facilities with existing, adjacent uses. Permanently converted acreage would compose only a small portion of that available within VCWEP site (Phases I and II). 8.8 out of 745 acres of agricultural land (dryland cultivated), or 1.2%, and 31.5 acres out of 3,149 acres of non-irrigated pasture/rangeland, or <1%, would be permanently converted to energy production. Private landowners would receive compensation for VCWEP use of their property through a lease agreement with Wind Hunter.

VCWEP would be compatible with a wide variety of land uses and generally would not preclude recreational, wildlife habitat conservation, livestock grazing, oil and gas leasing, or other activities that currently occur within VCWEP area. VCWEP area is not zoned.

The potential does exist, however, for Project wind turbines to cause line-of-sight communication interference with Northern Border Pipeline Company's C.S.1 CS01 microwave site and the Crow Creek Tower microwave site. The 300 foot C.S.1 site is located southeast of the wind farm, while the 120 foot Crow Creek Tower site is located northwest of the wind farm.

With the exception of aerial crop dusting, VCWEP would not appreciably disrupt the current and planned agricultural uses of the land. Given the turbine spacing, the operation of agricultural equipment would not be impaired, but some plowing patterns may have to be adjusted. VCWEP would not alter existing fencing around VCWEP site except to add gates, which would be kept locked, to certain access roads. The landowner would have keys to the gates. The presence of a transmission line can be hazardous to aerial crop spraying operations and typically increases cost to farmers when they cross agricultural land (i.e., additional amounts of pesticide application around the transmission line).

No operation and maintenance impacts on existing recreational activities are anticipated. VCWEP may cause a minor increase in the number of sightseers, but this impact would be low.

Impacts on private landowner-approved recreation activities such as hunting could occur during Project operation. However, these impacts are expected to be minimal. Hunting on private lands leased for VCWEP would continue to be at the discretion of the individual landowner and Wind Hunter.

The operating workforce for VCWEP would range from 12 to 20 employees. Because of the small size of the operating work force, no substantial increase in the demand for recreational services and opportunities would occur in VCWEP area.

Operating wind turbines would be visible from the Bitter Creek WSA (see Section 3.4 *Visual Resources*, for a detailed discussion of the anticipated aesthetic effects of VCWEP). Longer-term impacts could arise from the visual intrusion of wind farm facilities across landscapes that provide little or no visual screening, allowing them to be seen by WSA recreational visitors from certain perspectives (refer to Section 3.4 *Visual Resources* for discussion of impacts).

Decommissioning Impacts

Low impacts to land use would be anticipated during decommissioning. Upon decommissioning, land use impacts would be largely reversible, and disturbed lands would be restored to their original condition through grading and planting. Once facilities were removed, acreage taken out of cropland and non-irrigated pasture/rangeland use could be returned to these prior uses. Livestock grazing, if occurring at that time, would be abated during the period of decommissioning activities. Local landowners may decide to continue to use and maintain some of the access roads installed by VCWEP. No permanent land use impacts are expected to result from decommissioning.

Potential recreational impacts from decommissioning would be low, including possible minor and temporary interruption of big game and upland bird hunting, and a minor increase in roadside sightseeing. However, once the site is reclaimed to pre-Project conditions, recreational use in the affected area could resume.

Mitigation Measures

The duration and extent of wind farm impacts can be reduced through implementation of Mitigation Measures **S4**, **S20, S22**, **S32**, **S34**, **S38**, **S40, S43** and **S50**.

S4: To limit new or improved accessibility into the area, all new access undesired or not required for maintenance will be closed using the most effective and least environmentally damaging methods appropriate to that area with concurrence of the landowner or land manager.

S20: Coordination with landowners, lessees, and companies during final wind farm and transmission line design will be conducted, to the extent feasible, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations,

natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

S22: Farmers will be compensated for crop damage and compacted soils will be restored.

S32: To avoid or minimize potential microwave facility line-of-sight communication interference, coordination with the Northern Border Pipeline Company will occur during the determination of specific wind turbine locations.

S34: During Project construction, it will be necessary to remove cattle from areas where blasting or heavy equipment operations are taking place. Arrangements will made with landowners and livestock owners to keep livestock out of these areas during those periods.

S38: Landowners will be consulted to determine which aerial applicators cover agricultural lands within the vicinity of the wind farm and approved transmission line route. Written notification will be provided to aerial applicators when meteorological towers, wind turbines and the 230kV transmission line and tower structures will be erected. Aerial applicators will also be provided with maps clearly showing the location of the meteorological towers, wind turbines and the 230kV transmission line and tower structures.

S38 requires notification to aerial applicators of new meteorological towers, wind turbines and the 230kV transmission line. However, while this measure would likely reduce the level of impact, the safety hazard to aerial applicators would remain high.

S40: Existing roads will be used to the maximum extent possible, but only if in safe and environmentally sound locations. New access roads will be designed and constructed to the appropriate standard no higher than necessary to accommodate their intended functions (e.g., traffic volume and weight of vehicles). Abandoned roads and roads that are no longer needed will be re-contoured and re-vegetated.

S43: Notice to landowners will be provided when construction takes place to help minimize access disruptions.

S50: During construction and operation, traffic would be restricted to the roads developed for VCWEP. Use of other unimproved roads should be restricted to emergency situations.

Alternative B – 300 MW Facility (Phases I, II and III)

Construction Impacts

Land use impacts during construction of the wind farm and associated facilities (Project) would be low. With the exception of phase IV, agricultural land (dryland cultivated) is located on private land currently leased to Wind Hunter. Construction activities would be coordinated with landowners to minimize disturbance of farm operations.

Potential direct impacts include adding a system of wind turbines and associated facilities to the existing land uses, which include crop production and cattle grazing. Project construction would temporarily alter 318.8 acres of land, temporarily interfering with existing agricultural land (dryland cultivated) and non-irrigated pasture/rangeland uses (grazing operations). All areas temporarily disturbed would be restored to their original condition. Cattle or other livestock would need to be removed from the most intensive construction areas. Livestock grazing, the primary land use in the area, can continue around Project facilities.

Project construction would permanently alter an estimated 71.8 acres of agricultural land (dryland cultivated) and non-irrigated pasture/rangeland to accommodate Project facilities including turbine tower foundations, access roads, underground and overhead transmission lines, substations, operations and maintenance center, and other supporting facilities.

The permanent conversion of approximately 11.5 acres of (agricultural land (dryland cultivated) and 60.3 acres of non-irrigated pasture/rangeland to commercial utility use (i.e., wind farm development) would be an unavoidable impact of VCWEP. 11.5 acres of agricultural land (dryland cultivated) would be removed from production for the life of VCWEP (at minimum, 20 years). This reduction represents <1% of the total non-irrigated harvested cropland (371,000 acres) in Valley County for 2002. 60.3 acres of non-irrigated pasture/rangeland would be removed for the life of VCWEP (at minimum, 20 years). The proposed reduction in these land uses would have a minimal impact on livestock grazing, given the county's abundance of grazing lands.

Temporarily and permanently disturbed agricultural land (dryland cultivated) and non-irrigated pasture/rangeland), by phase in VCWEP area, is presented in Table 3.2-36 below.

Table 3.2-36 - Wind Farm Disturbance (acres) – Alternative B

	Phase I – 50MW Area	**Phase II – 100MW Area**	**Phase III – 150 MW Area**	**Total**
Temporary Disturbance Area	62.9	102.4	153.5	**318.8**
Agricultural Land (dryland cultivated)	13.3	22.8	13.2	**49.3**
Non-irrigated Pasture/Rangeland	49.6	79.6	140.3	**269.5**
Permanent Disturbance Area	19.3	21.0	31.5	**71.8**

Agricultural Land (dryland cultivated)	4.1	4.7	2.7	**11.5**
Non-irrigated Pasture/Rangeland	15.2	16.3	28.8	**60.3**

Overall, direct impacts to recreational resource and opportunities would be low. Recreation use, including OHV travel and big game and upland bird hunting, would be displaced from the lands occupied by wind turbine and associated facilities. Most current recreation activity within VCWEP site, which consists of limited informal use, would be able to resume at current levels during operation and maintenance. There are no formal recreational facilities in the vicinity of VCWEP site. Construction of VCWEP could encourage sightseeing by travelers.

Construction activities outside of the Bitter Creek WSA boundary could impact recreational use within the WSA due to reduction of WSA qualities and the sense of solitude from human activities. Construction noise, dust, and possible access restrictions are all temporary impacts to the WSA that could result from construction of wind turbines and associated facilities.

Potential impacts on adjacent land use from construction-related noise and dust are discussed in Section 3.14, *Noise*, and Section 3.15, *Air Quality*.

Operation and Maintenance Impacts

Operation and Maintenance impacts on land use would be low. Permanent land use impacts are based on the amount of land that would be displaced by the wind farm and associated facilities and by the compatibility of the wind farm and associated facilities with existing, adjacent uses. Permanently converted acreage would compose only a small portion of that available within VCWEP site (Phases I, II and III). 11.5 out of 1,102 acres of agricultural land (dryland cultivated), or 1.0%, and 60.3 acres out of 8,312 acres of non-irrigated pasture/rangeland, or 0.7%, would be permanently converted to energy production. Private landowners would receive compensation for VCWEP use of their property through a lease agreement with Wind Hunter.

VCWEP would be compatible with a wide variety of land uses and generally would not preclude recreational, wildlife habitat conservation, livestock grazing, oil and gas leasing, or other activities that currently occur within VCWEP area. VCWEP area is not zoned.

The potential does exist, however, for Project wind turbines to cause line-of-sight communication interference with Northern Border Pipeline Company's C.S.1 CS01 microwave site and the Crow Creek Tower microwave site. The 300 foot C.S.1 site is located southeast of the wind farm, while the 120 foot Crow Creek Tower site is located northwest of the wind farm.

With the exception of aerial crop dusting, VCWEP would not appreciably disrupt the current and planned agricultural uses of the land. Given the turbine spacing, the operation of agricultural equipment would not be impaired, but some plowing patterns may have to be adjusted. VCWEP would not alter existing fencing around VCWEP site except to add gates, which would be kept locked, to certain access roads. The landowner would have keys to the gates. The presence of a transmission line can be hazardous to aerial crop spraying operations and typically increases cost to farmers when they cross agricultural land (i.e., additional amounts of pesticide application around the transmission line).

No operation and maintenance impacts on existing recreational activities are anticipated. VCWEP may cause a minor increase in the number of sightseers, but this impact would be low.

Impacts on private landowner-approved recreation activities such as hunting could occur during Project operation. However, these impacts are expected to be minimal. Hunting on private lands leased for VCWEP would continue to be at the discretion of the individual landowner and Wind Hunter.

The operating workforce for VCWEP would range from 12 to 20 employees. Because of the small size of the operating work force, no substantial increase in the demand for recreational services and opportunities would occur in VCWEP area.

Operating wind turbines would be visible from the Bitter Creek WSA (see Section 3.4 *Visual Resources*, for a detailed discussion of the anticipated aesthetic effects of VCWEP). Longer-term impacts could arise from the visual intrusion of wind farm facilities across landscapes that provide little or no visual screening, allowing them to be seen by WSA recreational visitors from certain perspectives (refer to Section 3.4 *Visual Resources* for discussion of impacts).

Decommissioning Impacts

Low impacts to land use would be anticipated during decommissioning. Upon decommissioning, land use impacts would be largely reversible, and disturbed lands would be restored to their original condition through grading and planting. Once facilities were removed, acreage taken out of cropland and non-irrigated pasture/rangeland use could be returned to these prior uses. Livestock grazing, if occurring at that time, would be abated during the period of decommissioning activities. Local landowners may decide to continue to use and maintain some of the access roads installed by VCWEP. No permanent land use impacts are expected to result from decommissioning.

Potential recreational impacts from decommissioning would be low, including possible minor and temporary interruption of big game and upland bird hunting, and a minor increase in roadside sightseeing. However, once the site is reclaimed to pre-Project conditions, recreational use in the affected area could resume.

Mitigation Measures

The duration and extent of wind farm impacts can be reduced through implementation of Mitigation Measures **S4**, **S22**, **S32**, **S34**, **S38**, **S40, S43** and **S50**.

S20: Coordination with landowners, lessees, and companies during final wind farm and transmission line design will be conducted, to the extent feasible, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

S22: Farmers will be compensated for crop damage and compacted soils will be restored.

S32: To avoid or minimize potential microwave facility line-of-sight communication interference, coordination with the Northern Border Pipeline Company will occur during the determination of specific wind turbine locations.

S34: During Project construction, it will be necessary to remove cattle from areas where blasting or heavy equipment operations are taking place. Arrangements will made with landowners and livestock owners to keep livestock out of these areas during those periods.

S38: Landowners will be consulted to determine which aerial applicators cover agricultural lands within the vicinity of the wind farm and approved transmission line route. Written notification will be provided to aerial applicators when meteorological towers, wind turbines and the 230kV transmission line and tower structures will be erected. Aerial applicators will also be provided with maps clearly showing the location of the meteorological towers, wind turbines and the 230kV transmission line and tower structures.

S38 requires notification to aerial applicators of new meteorological towers, wind turbines and the 230kV transmission line. However, while this measure would likely reduce the level of impact, the safety hazard to aerial applicators would remain high.

S40: Existing roads will be used to the maximum extent possible, but only if in safe and environmentally sound locations. New access roads will be designed and constructed to the appropriate standard no higher than necessary to accommodate their intended functions (e.g., traffic volume and weight of vehicles). Abandoned roads and roads that are no longer needed will be re-contoured and re-vegetated.

S43: Notice to landowners will be provided when construction takes place to help minimize access disruptions.

S50: During construction and operation, traffic would be restricted to the roads developed for VCWEP. Use of other unimproved roads should be restricted to emergency situations.

3.2-2.4 230kV Transmission Line

Wind Hunter would have to convert the lease of these parcels and withdraw some or all of the parcels from the CRP, through contract revisions with the FSA and the landowners.

This section describes the potential impacts resulting from the 230kV transmission line and identifies mitigation measures that would reduce or avoid adverse impacts.

Impacts on land uses and on recreation uses within the study area could result from various project-related construction activities including: establishment of construction yards and staging areas; clearing and grading for new access roads; clearing and excavating tower sites and installing towers; removal of obstructions (e.g., vegetation and trees) in ROW; and installing conductors. The long-term placement of towers and lines could conflict with existing land uses in and near the proposed ROW. In addition, maintenance activities could affect land uses and recreational activities.

The types of impacts and mitigation measures are described below. The specific locations where each impact could occur and recommended mitigation measures are presented in the Land Use Impact Table (Appendix A).

Alternative Route C – East Central Route (Proposed Action)

Existing Land Use

Impacts to existing land use include the following:

1. **Dust, noise, and construction related traffic impacts near residential areas.** These impacts would be considered low because construction-related effects would be temporary and mitigation measures would be implemented as part of construction to minimize these effects. Further discussion of these impacts and measures that would be taken to mitigate them can be found in Sections 3.14 *Noise*, and 3.15 *Air Quality*.

2. **Short-term and indirect disturbance to the rural or open space character of some areas**. Because of the short duration of construction at any one location, these impacts would be low. No selectively committed mitigation measures were recommended.

3. **Short-term and direct ground disturbance/disruption of agricultural land (flood irrigated cropland and dryland cultivated cropland), Important Farmland (Prime farmland if irrigated and Farmland of Statewide Importance), and non-irrigated pasture/rangeland uses** leading to high, moderate, and low impacts.

Since precise locations for tower structures, pulling and tensioning sites, staging areas, and access roads have not been identified, assumptions were made about overall land disturbance, based on project description information (e.g., number of tower structures per mile, size of pulling and tensioning sites, size of staging areas, and acreage for new roads). Laydown areas for each structure would temporarily disturb approximately 83.5 acres of vegetation. Vegetation would be crushed, but no blading would occur. Pulling and tensioning sites would temporarily disturb approximately 16.5 acres. Vegetation would be crushed, but no blading would occur. These sites would be located at points of intersection with the total acreage disturbance potentially changing during final 230kV

transmission line design. A staging area also would temporarily disturb five acres of vegetation. No specific site has been located for this area as the construction contractor will make this selection. Because these locations have not been specifically identified, it is unknown what type of vegetation would be temporarily disturbed. All areas temporarily disturbed would be allowed to revert to their previous use.

The permanent conversion of approximately 2.4 acres of agricultural land (flood irrigated cropland and dryland cultivated cropland) and 58.4 acres of non-irrigated pasture/rangeland to utility related use (i.e., 230kV transmission line) would be an unavoidable impact of VCWEP. 2.4 acres of agricultural land (flood irrigated cropland and dryland cultivated cropland) would be removed from production for the life of VCWEP. This reduction represents <1% of the total irrigated and non-irrigated harvested cropland (401,000 acres) in Valley County for 2002. 58.4 acres of non-irrigated pasture/rangeland would be removed for the life of VCWEP. The proposed reduction in these land uses would have a minimal impact on livestock grazing, given the county's abundance of grazing lands.

Depending on specific project activity, timing and duration, construction activities could disrupt a portion of the planting, growing, irrigation, and/or harvesting of produce. In addition soil compaction may occur as a result of construction equipment and activities, necessitating remedial activities to restore agricultural uses.

The loss of productive farmland would result in financial impacts on farmers. Crop values have a wide variation from year to year. Because of this wide fluctuation, it is not practical to attempt to quantify a definite value per acre for farmland that may be lost as a result of the 230kV transmission line, as that value is likely to change by the time ROW easement acquisitions are pursued. When ROW easement negotiations occur, average values will be calculated.

Placement of transmission line towers may cause additional time and effort to maneuver agricultural equipment around tower structure footings. The level of farming difficulty and effort caused by presence of transmission towers depends on the crop, with generally more difficulty for crops with rows that are perpendicular or diagonal to the transmission lines, rather than parallel. Potential secondary effects include collisions with tower structures and damage to farm equipment, restrictions on nighttime operations (due to the potential for accidents), restrictions on normal crop rotations because of operational considerations, and increased difficulty in leasing fields with tower structures. Impacts related to the need for farmers to increase weed and pest control activities around tower structure bases also exist.

Impacts on flood irrigation would be minimal. Long-term 230kV transmission line effects on irrigation practices include interference with canals and ditches at field borders. Within the Glasgow Irrigation District, a Special Use Permit would need to be obtained from the BOR if the final transmission line route would cross BOR owned lands or would modify BOR ditches and canals. If the final transmission line route crossed BOR ditches and canals for which BOR only has an easement and no modifications to the ditches or canals occur, an Acknowledgement of Easement Crossing would need to be obtained

from BOR. The Vandalia South Main Canal is crossed by Link 22 from milepost 4.9 to milepost 5.0. Link 22 is also crossed by lateral canal V63 (from milepost 3.0 to milepost 3.1) lateral canal V85 (from milepost 3.7 to milepost 3.8), and lateral canal V90 (from milepost 4.6 to milepost 4.7).

The presence of a transmission line can be hazardous to aerial crop spraying operations and typically increases cost to farmers when they cross agricultural land. In addition to the obvious safety hazards, there is a potential for lower effectiveness of aerial spraying and higher costs for materials and aircraft operations (i.e., additional amounts of pesticide application around the transmission line).

Prime farmland if irrigated and Farmland of Statewide Importance are based on soil types. Impacts on this defined farmland is primarily from construction activities. Such impacts are considered low because of the short duration of construction activities, the restoration of agricultural lands to their pre-existing soil types and graded levels, and the resumption of agricultural activities. The provisions of the Federal Farmland Protection Act (FPPA) require evaluation of important farmland status when federal funds are used for activities that may directly or indirectly convert farmland. Agricultural land classified as Prime farmland if irrigated (Link 11, from milepost 10.4 to milepost 11.2 and from milepost 11.6 to milepost 11.7) is currently not irrigated. Because the 230kV transmission line has the potential to convert Farmland of Statewide Importance to non-agricultural use (Link 22, from milepost 1.6 to milepost 1.9 and from milepost 2.3 to milepost 2.6), a Farmland Conversion Impact Rating for Corridor Type Projects Form (CPA-106) will be completed for the approved 230kV transmission line.

Cattle or other livestock would need to be removed from the most intensive construction areas. In livestock pasture and grazing areas, temporary removal of fencing and gates to provide construction vehicle access could also require restriction of livestock to other fenced areas and could temporarily reduce the amount of land available for grazing. Construction activities could also temporarily disrupt livestock access to supplementary feeding and watering stations. No livestock mortalities, however, are expected as a direct result of construction. Due to the short duration of the construction disturbance, the construction activity along the 230kV transmission line is expected to have a low and temporary adverse effect on adjacent livestock grazing. Livestock grazing could continue around the 230kV transmission line during operations.

The duration and extent of these impacts can be reduced through implementation of Mitigation Measures **S4**, **S5**, **S12**, **S18**, **S19**, **S20**, **S21**, **S22**, **S23**, **S25**, **S33**, **S34**, **S35**, **S36**, **S37**, **S38**, **S39**, and **S40**.

S4: To limit new or improved accessibility into the area, all new access undesired or not required for maintenance will be closed using the most effective and least environmentally damaging methods appropriate to that area with concurrence of the landowner or land manager.

S5: To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not

limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S12: Single-pole tubular steel structures will be utilized to minimize ground disturbance, operational conflicts, and/or visual contrast.

S18: VCWEP will comply with all appropriate regulations of the Federal Aviation Administration (FAA), and a Notice of Proposed Construction or Alteration form (Form 7460-1) would be required of Wind Hunter pursuant to Federal Aviation Regulations, Part 77. Final locations, structures, and structure heights, including wind turbines, transmission lines, meteorological towers, and construction equipment that might impact air navigation such as cranes used to assemble the towers, would be submitted to the FAA for VCWEP. The form would be sent to the manager of the FAA Regional Air Traffic Division Office having jurisdiction over the area where the planned construction would be located. If acceptable to the FAA, white lights will be utilized on turbines and towers to minimize the risk of avian collisions. Coordination with the Department of Defense will be conducted regarding the location and potential effects of VCWEP upon operations in military airspace. The owner/operator of private airports and airstrips potentially affected by VCWEP will also be contacted.

S19: Construction will be timed, whenever practical, to minimize disruption of normal seasonal activities for cropland (planting and harvesting) and non-irrigated pasture/rangeland.

S20: Coordination with landowners, lessees, and companies during final transmission line design will be conducted, to the extent feasible, to align the transmission line, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

S21: To the extent feasible, Project facilities, including poles and access roads will be installed along the edges of borders of property. Consultation with the landowner or land management agency will be conducted to identify facility locations that create the least potential for impact to property and its uses.

S22: Farmers will be compensated for crop damage and compacted soils will be restored.

S23: On agricultural land, transmission towers, and right-of-way will be aligned with field boundaries to the greatest extent practicable and transmission towers will be placed near field boundaries, access roads and fences to reduce the impact to farm operation and agricultural production. Where this is not possible because of irregular field boundaries, the transmission towers will be placed on or perpendicular to the row crops wherever feasible, so that transmission lines do not run diagonally to the crop rows.

S25: Areas of disturbed soil will be reclaimed using weed-free grasses, forbs, and shrubs. Reclamation activities will be undertaken as early as possible on disturbed areas.

S33: Construction staging areas and pulling sites shall be located adjacent to roads where practical. Coordination with landowners will be conducted to establish construction areas (such as conductor pulling and splicing areas and construction yards) on non-agricultural or in areas with less sensitive crops, where feasible.

S34: During Project construction, it will be necessary to remove cattle from areas where blasting or heavy equipment operations are taking place. Arrangements will made with landowners and livestock owners to keep livestock out of these areas during those periods.

S35: A stipulation will be included in easement agreements with landowners along the right-of-way that landowners and/or farmers and ranchers will be reimbursed for the value of the crops lost and the cost of any delay or interruption in necessary farming or grazing practices as a result of any interrupted use of cropland or grazing land.

S36: Construction operations will avoid, to the extent feasible, disturbance of agricultural soil during the wet season (moist soil is generally more susceptible to compaction than dry soil). The use of heavy equipment on agricultural land, will be minimized, to avoid soil compaction.

S37: Placing tower structures at the edge of fields where canals or irrigation ditches are located, will be avoided.

S38: Landowners will be consulted to determine which aerial applicators cover agricultural lands within the vicinity of the wind farm and approved transmission line route. Written notification will be provided to aerial applicators when meteorological towers, wind turbines and the 230kV transmission line and tower structures will be erected. Aerial applicators will also be provided with maps clearly showing the location of the meteorological towers, wind turbines and the 230kV transmission line and tower structures.

S38 requires notification to aerial applicators of new meteorological towers, wind turbines and the 230kV transmission line. However, while this measure would likely reduce the level of impact, the safety hazard to aerial applicators would remain high.

S39: During the right-of-way acquisition process, coordination with each affected landowner will be conducted in order to develop an alignment and specific tower locations, to provide clear information about the right-of-way acquisition process compensation and construction and maintenance activities, and to understand landowner plans for use of the transmission corridor area in order to minimize the impact of tower and right-of-way location.

S40: Existing roads will be used to the maximum extent possible, but only if in safe and environmentally sound locations. New access roads will be designed and constructed to the appropriate standard no higher than necessary to accommodate their intended

functions (e.g., traffic volume and weight of vehicles). Abandoned roads and roads that are no longer needed will be re-contoured and re-vegetated.

4. **A Northern Border Pipeline Company 42-inch natural gas pipeline is crossed by Link 1 from milepost 0.7 to milepost 0.8and a Williston Basin Interstate Pipeline Company 6-inch natural gas lateral (valley industrial park) is crossed by Link 11 from milepost 9.8 to milepost 9.9. Two Williston Basin Interstate Pipeline Company (10-inch and 8-inch) natural gas pipelines are crossed by Link 22 from milepost 3.1 to milepost 3.2.** Impacts to these pipelines would be reduced through the use of Mitigation Measure S5 and S20.

S5: To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S20: Coordination with landowners, lessees, and companies during final transmission line design will be conducted, to the extent feasible, to align the transmission line, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

5. **Alternative Route C crosses 10.6 miles of authorized federal leases and 1.8 miles of state leases.** Impacts to federal and state oil and gas leases would be reduced through the use of Mitigation Measure **S5** and **S20**.

S5: To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S20: Coordination with landowners, lessees, and companies during final transmission line design will be conducted, to the extent feasible, to align the transmission line, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

Planned Land Use

No identifiable impacts to planned land use were identified. No comprehensive plan, policy or zoning regulation would preclude the siting of the transmission line. Te aid in minimization of planned land use impacts, Mitigation Measure **S39** will be implemented.

S39: During the right-of-way acquisition process, coordination with each affected landowner will be conducted in order to develop an alignment and specific tower locations, to provide clear information about the right-of-way acquisition process compensation and construction and maintenance activities, and to understand landowner plans for use of the transmission corridor area in order to minimize the impact of tower and right-of-way location.

Parks, Recreation, and Preservation Areas

Impacts to parks, recreation, and preservation areas include the following:

6. **Short-term, direct and indirect disturbance of recreational use**.

Since most of the recreational activity that would be disturbed by the transmission line is dispersed (wildlife watching, hunting and fishing) disturbance from the transmission line would be minor. Some recreational activities could be diverted during construction, but would resume once construction ended. The recreational experience of recreationists using adjacent properties during construction could also be affected. Because of the short duration of construction at any one location, these impacts would be low. Once construction is complete at any particular location, the low impacts would cease to exist.

Activities outside of the WSA boundary could impact recreational use within the WSA due to reduction of WSA qualities and the sense of solitude from human activities. Construction noise, dust, and possible access restrictions are all temporary impacts to the WSAs that could result from construction of the 230kV transmission line. Further discussion of these impacts and measures that would be taken to mitigate them can be found in Sections 3.14 *Noise*, and 3.15 *Air Quality*. Longer-term impacts could arise from the visual intrusion of the 230kV transmission line across landscapes that provide little or no visual screening, allowing them to be seen by WSA recreational visitors from certain perspectives (refer to Section 3.4 *Visual Resources* for discussion of impacts).

It is also possible construction-related truck traffic and construction activity could temporarily delay existing access from the east to the WSA and areas outside the WSA for recreational purposes. Impacts to these roads would be short-term in nature. While travel on these roads could be delayed by construction activities, they would not be blocked or access restricted. An Access Road Use Plan would be developed to minimize impacts to public use of existing roads in the wind farm area. This plan would conform to the requirements of the BLM, State, and local agencies.

7. **Increased public access into areas containing sensitive plant and wildlife communities or cultural resources**. Construction and maintenance of the 230kV transmission line would require the improvement of existing roads and the construction of new roads into remote areas. This could increase access into areas containing sensitive plant and wildlife communities or cultural resources. To aid in minimization of this effect, Mitigation Measure **S4** will be implemented.

S4: To limit new or improved accessibility into the area, all new access undesired or not required for maintenance will be closed using the most effective and least

environmentally damaging methods appropriate to that area with concurrence of the landowner or land manager.

However, public access would be restricted by gates and fences on private lands.

Residual impact levels associated with Alternative C included the following: 0.0 miles of high, 1.3 miles of moderate, 33.5 miles of low, and 0.0 miles of no-identifiable. These residual impacts were determined utilizing the Assessment Methodology outlined in Section 3.2-2.1.

Alternative Route A – Highway 24 Route

Existing Land Use

Impacts to existing land use include the following:

1. **Dust, noise, and construction related traffic impacts near residential areas.** These impacts would be considered low because construction-related effects would be temporary and mitigation measures would be implemented as part of construction to minimize these effects. Further discussion of these impacts and measures that would be taken to mitigate them can be found in Sections 3.14 *Noise*, and 3.15 *Air Quality*.

2. **Short-term and indirect disturbance to the rural or open space character of some areas.** Because of the short duration of construction at any one location, these impacts would be low. No selectively committed mitigation measures were recommended.

3. **Short-term and direct disruption of apiary sites.** One registered general (commercial) apiary site was crossed by Link 5 from milepost 24.2 to milepost 24.8. Link 24 also crosses another registered general (commercial) apiary site from milepost 2.0 to milepost 2.6. To aid in minimization of these effects, Mitigation Measure **S53** will be implemented.

S53: Prior to construction of the transmission line, coordination with beekeepers would occur to minimize potential environmental impacts, and to mitigate general disruption caused by the construction activities.

4. **Short-term and direct ground disturbance/disruption of agricultural land (flood irrigated cropland and dryland cultivated cropland), Important Farmland (Prime farmland if irrigated and Farmland of Statewide Importance), and non-irrigated pasture/rangeland uses** leading to high, moderate, and low impacts.

Since precise locations for tower structures, pulling and tensioning sites, staging areas, and access roads have not been identified, assumptions were made about overall land disturbance, based on project description information (e.g., number of tower structures per mile, size of pulling and tensioning sites, size of staging areas, and acreage for new

roads). Laydown areas for each structure would temporarily disturb approximately 97.2 acres of vegetation. Vegetation would be crushed, but no blading would occur. Pulling and tensioning sites would temporarily disturb approximately 16 acres. Vegetation would be crushed, but no blading would occur. These sites would be located at points of intersection with the total acreage disturbance potentially changing during final 230kV transmission line design. A staging area also would temporarily disturb five acres of vegetation. No specific site has been located for this area as the construction contractor will make this selection. Because these locations have not been specifically identified, it is unknown what type of vegetation would be temporarily disturbed. All areas temporarily disturbed would be allowed to revert to their previous use.

The permanent conversion of approximately 6.1 acres of agricultural land (flood irrigated cropland and dryland cultivated cropland) and 89.2 acres of non-irrigated pasture/rangeland to utility related use (i.e., 230kV transmission line) would be an unavoidable impact of VCWEP. 6.1 acres of agricultural land (flood irrigated cropland and dryland cultivated cropland) would be removed from production for the life of VCWEP. This reduction represents <1% of the total irrigated and non-irrigated harvested cropland (401,000 acres) in Valley County for 2002. 89.2 acres of non-irrigated pasture/rangeland would be removed for the life of VCWEP. The proposed reduction in these land uses would have a minimal impact on livestock grazing, given the county's abundance of grazing lands.

Depending on specific project activity, timing and duration, construction activities could disrupt a portion of the planting, growing, irrigation, and/or harvesting of produce. In addition soil compaction may occur as a result of construction equipment and activities, necessitating remedial activities to restore agricultural uses.

The loss of productive farmland would result in financial impacts on farmers. Crop values have a wide variation from year to year. Because of this wide fluctuation, it is not practical to attempt to quantify a definite value per acre for farmland that may be lost as a result of the 230kV transmission line, as that value is likely to change by the time ROW easement acquisitions are pursued. When ROW easement negotiations occur, average values will be calculated.

Placement of transmission line towers may cause additional time and effort to maneuver agricultural equipment around tower structure footings. The level of farming difficulty and effort caused by presence of transmission towers depends on the crop, with generally more difficulty for crops with rows that are perpendicular or diagonal to the transmission lines, rather than parallel. Potential secondary effects include collisions with tower structures and damage to farm equipment, restrictions on nighttime operations (due to the potential for accidents), restrictions on normal crop rotations because of operational considerations, and increased difficulty in leasing fields with tower structures. Impacts related to the need for farmers to increase weed and pest control activities around tower structure bases also exist.

Impacts on flood irrigation would be minimal. Long-term 230kV transmission line effects on irrigation practices include interference with canals and ditches at field borders.

Within the Glasgow Irrigation District, a Special Use Permit would need to be obtained from the BOR if the final transmission line route would cross BOR owned lands or would modify BOR ditches and canals. If the final transmission line route crossed BOR ditches and canals for which BOR only has an easement and no modifications to the ditches or canals occur, an Acknowledgement of Easement Crossing would need to be obtained from BOR. The Vandalia South Main Canal is crossed by Link 24 from milepost 4.2 to milepost 4.3 and paralled from milepost 3.5 to milepost 3.8. Link 24 is also crossed by lateral canal V63 from milepost 1.6 to milepost 1.7.

The presence of a transmission line can be hazardous to aerial crop spraying operations and typically increases cost to farmers when they cross agricultural land. In addition to the obvious safety hazards, there is a potential for lower effectiveness of aerial spraying and higher costs for materials and aircraft operations (i.e., additional amounts of pesticide application around the transmission line).

Prime farmland if irrigated and Farmland of Statewide Importance are based on soil types. Impacts on this defined farmland is primarily from construction activities. Such impacts are considered low because of the short duration of construction activities, the restoration of agricultural lands to their pre-existing soil types and graded levels, and the resumption of agricultural activities. The provisions of the Federal Farmland Protection Act (FPPA) require evaluation of important farmland status when federal funds are used for activities that may directly or indirectly convert farmland. Agricultural land classified as Prime farmland if irrigated (Link 5, from milepost 19.3 to milepost 19.4, from milepost 19.7 to milepost 20.2, and from milepost 20.7 to milepost 21.1) is currently not irrigated. Because the 230kV transmission line has the potential to convert Farmland of Statewide Importance to non-agricultural use (Link 24, from milepost 0.6 to milepost 1.5, a Farmland Conversion Impact Rating for Corridor Type Projects Form (CPA-106) will be completed for the approved 230kV transmission line. CRP lands are crossed by Link 5 from milepost 15.0 to milepost 15.4 and from milepost 22.0 to milepost 22.5. The NRCS would determine if the 230kV transmission line would have an adverse effect on the Participants CRP acreage. If the NRCS determines that the use will have an adverse effect on CRP acreage, the affected acreage would be terminated and refunds assessed.

Cattle or other livestock would need to be removed from the most intensive construction areas. In livestock pasture and grazing areas, temporary removal of fencing and gates to provide construction vehicle access could also require restriction of livestock to other fenced areas and could temporarily reduce the amount of land available for grazing. Construction activities could also temporarily disrupt livestock access to supplementary feeding and watering stations. No livestock mortalities, however, are expected as a direct result of construction. Due to the short duration of the construction disturbance, the construction activity along the 230kV transmission line is expected to have a low and temporary adverse effect on adjacent livestock grazing. Livestock grazing could continue around the 230kV transmission line during operations.

The duration and extent of these impacts can be reduced through implementation of Mitigation Measures **S4**, **S5**, **S12**, **S18**, **S19**, **S20**, **S21**, **S22**, **S23**, **S25**, **S33**, **S34**, **S35**, **S36**, **S37**, **S38**, **S39**, and **S40**.

S4: To limit new or improved accessibility into the area, all new access undesired or not required for maintenance will be closed using the most effective and least environmentally damaging methods appropriate to that area with concurrence of the landowner or land manager.

S5: To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S12: Single-pole tubular steel structures will be utilized to minimize ground disturbance, operational conflicts, and/or visual contrast.

S18: The Project will comply with all appropriate regulations of the Federal Aviation Administration (FAA), and a Notice of Proposed Construction or Alteration form (Form 7460-1) would be required of Wind Hunter pursuant to Federal Aviation Regulations, Part 77. Final locations, structures, and structure heights, including wind turbines, transmission lines, meteorological towers, and construction equipment that might impact air navigation such as cranes used to assemble the towers, would be submitted to the FAA for the Project. The form would be sent to the manager of the FAA Regional Air Traffic Division Office having jurisdiction over the area where the planned construction would be located. If acceptable to the FAA, white lights will be utilized on turbines and towers to minimize the risk of avian collisions. Coordination with the Department of Defense will be conducted regarding the location and potential effects of the Project upon operations in military airspace. The owner/operator of private airports and airstrips potentially affected by the Project will also be contacted.

S19: Construction will be timed, whenever practical, to minimize disruption of normal seasonal activities for cropland (planting and harvesting) and non-irrigated pasture/rangeland.

S20: Coordination with landowners, lessees, and companies during final wind farm and transmission line design will be conducted, to the extent feasible, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

S21: To the extent feasible, Project facilities, including poles and access roads will be installed along the edges of borders of property. Consultation with the landowner or land management agency will be conducted to identify facility locations that create the least potential for impact to property and its uses.

S22: Farmers will be compensated for crop damage and compacted soils will be restored.

S23: On agricultural land, transmission towers, and right-of-way will be aligned with field boundaries to the greatest extent practicable and transmission towers will be placed near field boundaries, access roads and fences to reduce the impact to farm operation and agricultural production. Where this is not possible because of irregular field boundaries, the transmission towers will be placed on or perpendicular to the row crops wherever feasible, so that transmission lines do not run diagonally to the crop rows.

S25: Areas of disturbed soil will be reclaimed using weed-free grasses, forbs, and shrubs. Reclamation activities will be undertaken as early as possible on disturbed areas.

S33: Construction staging areas and pulling sites shall be located adjacent to roads where practical. Coordination with landowners will be conducted to establish construction areas (such as conductor pulling and splicing areas and construction yards) on non-agricultural or in areas with less sensitive crops, where feasible.

S34: During Project construction, it will be necessary to remove cattle from areas where blasting or heavy equipment operations are taking place. Arrangements will made with landowners and livestock owners to keep livestock out of these areas during those periods.

S35: A stipulation will be included in easement agreements with landowners along the right-of-way that landowners and/or farmers and ranchers will be reimbursed for the value of the crops lost and the cost of any delay or interruption in necessary farming or grazing practices as a result of any interrupted use of cropland or grazing land.

S36: Construction operations will avoid, to the extent feasible, disturbance of agricultural soil during the wet season (moist soil is generally more susceptible to compaction than dry soil). The use of heavy equipment on agricultural land, will be minimized, to avoid soil compaction.

S37: Placing tower structures at the edge of fields where canals or irrigation ditches are located, will be avoided.

S38: Landowners will be consulted to determine which aerial applicators cover agricultural lands within the vicinity of the wind farm and approved transmission line route. Written notification will be provided to aerial applicators when meteorological towers, wind turbines and the 230kV transmission line and tower structures will be erected. Aerial applicators will also be provided with maps clearly showing the location of the meteorological towers, wind turbines and the 230kV transmission line and tower structures. Mitigation Measure S-38 requires notification to aerial applicators of the new 230kV transmission line. However, while this measure would likely reduce the level of impact, the safety hazard to aerial applicators would remain high.

S38 requires notification to aerial applicators of new meteorological towers, wind turbines and the 230kV transmission line. However, while this measure would likely reduce the level of impact, the safety hazard to aerial applicators would remain high.

S39: During the right-of-way acquisition process, coordination with each affected landowner will be conducted in order to develop an alignment and specific tower locations, to provide clear information about the right-of-way acquisition process compensation and construction and maintenance activities, and to understand landowner plans for use of the transmission corridor area in order to minimize the impact of tower and right-of-way location.

S40: Existing roads will be used to the maximum extent possible, but only if in safe and environmentally sound locations. New access roads will be designed and constructed to the appropriate standard no higher than necessary to accommodate their intended functions (e.g., traffic volume and weight of vehicles). Abandoned roads and roads that are no longer needed will be re-contoured and re-vegetated.

5. **A Northern Border Pipeline Company 42-inch natural gas pipeline is crossed by Link 1 from milepost 0.7 to milepost 0.8 and a Williston Basin Interstate Pipeline Company 6-inch natural gas lateral (valley industrial park) is crossed by Link 5 from milepost 13.4 to milepost 13.5. Two Williston Basin Interstate Pipeline Company (10-inch and 8-inch) natural gas pipelines are crossed by Link 24 from milepost 1.7 to milepost 1.8. Link 5 also crosses a Dry Prairie Rural Water Supply water distribution line from milepost 15.4 to milepost 15.5, from milepost 23.4 to milepost 23.5, from milepost 23.8 to milepost 23.9, and from milepost 25.1 to milepost 25.2. Impacts to these** existing and proposed pipelines would be reduced through the use of Mitigation Measure **S5** and **S20**.

S5: To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S20: Coordination with landowners, lessees, and companies during final transmission line design will be conducted, to the extent feasible, to align the transmission line, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

6. **Alternative Route A crosses 6.8 miles of authorized federal leases and 4.1 miles of state leases**. Alternative Route A also crossed .0.6 miles of the plotted subdivision "Golden Meadows Estates". Impacts to federal and state oil and gas leases and to the plotted subdivisions "Golden Meadows Estates" would be reduced through the use of Mitigation Measure **S5** and **S20**.

S5: To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to

clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S20: Coordination with landowners, lessees, and companies during final transmission line design will be conducted, to the extent feasible, to align the transmission line, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

Planned Land Use

No identifiable impacts to planned land use were identified. No comprehensive plan, policy or zoning regulation would preclude the siting of the transmission line. Te aid in minimization of planned land use impacts, Mitigation Measure **S39** will be implemented.

S39: During the right-of-way acquisition process, coordination with each affected landowner will be conducted in order to develop an alignment and specific tower locations, to provide clear information about the right-of-way acquisition process compensation and construction and maintenance activities, and to understand landowner plans for use of the transmission corridor area in order to minimize the impact of tower and right-of-way location.

Parks, Recreation, and Preservation Areas

Impacts to parks, recreation, and preservation areas include the following:

7. **Short-term, direct and indirect disturbance of recreational use.** Since most of the recreational activity that would be disturbed by the transmission line is dispersed (wildlife watching, hunting and fishing) disturbance from the transmission line would be minor. Some recreational activities could be diverted during construction, but would resume once construction ended. The recreational experience of recreationists using adjacent properties during construction could also be affected. Because of the short duration of construction at any one location, these impacts would be low. Once construction is complete at any particular location, the low impacts would cease to exist.

Activities outside of the WSA boundary could impact recreational use within the WSA due to reduction of WSA qualities and the sense of solitude from human activities. Construction noise, dust, and possible access restrictions are all temporary impacts to the WSAs that could result from construction of the 230kV transmission line. Further discussion of these impacts and measures that would be taken to mitigate them can be found in Sections 3.14 *Noise*, and 3.15 *Air Quality*. Longer-term impacts could arise from the visual intrusion of the 230kV transmission line across landscapes that provide little or no visual screening, allowing them to be seen by WSA recreational visitors from certain perspectives (refer to Section 3.4 *Visual Resources* for discussion of impacts).

It is also possible construction-related truck traffic and construction activity could temporarily delay existing access from the east to the WSA and areas outside the WSA

for recreational purposes. Impacts to these roads would be short-term in nature. While travel on these roads could be delayed by construction activities, they would not be blocked or access restricted. An Access Road Use Plan would be developed to minimize impacts to public use of existing roads in the wind farm area. This plan would conform to the requirements of the BLM, State, and local agencies.

8. **Increased public access into areas containing sensitive plant and wildlife communities or cultural resources.** Construction and maintenance of the 230kV transmission line would require the improvement of existing roads and the construction of new roads into remote areas. This could increase access into areas containing sensitive plant and wildlife communities or cultural resources. To aid in minimization of this effect, Mitigation Measure **S4** will be implemented.

S4: To limit new or improved accessibility into the area, all new access undesired or not required for maintenance will be closed using the most effective and least environmentally damaging methods appropriate to that area with concurrence of the landowner or land manager.

However, public access would be restricted by gates and fences on private lands.

Residual impact levels associated with Alternative A included the following: 0.0 miles of high, 2.5 miles of moderate, 37.9 miles of low, and 0.1 miles of no-identifiable. These residual impacts were determined utilizing the Assessment Methodology outlined in Section 3.2-2.1.

Alternative Route B – Jensen Trail Route

Existing Land Use

Impacts to existing land use include the following:

1. **Dust, noise, and construction related traffic impacts near residential areas.** These impacts would be considered low because construction-related effects would be temporary and mitigation measures would be implemented as part of construction to minimize these effects. Further discussion of these impacts and measures that would be taken to mitigate them can be found in Sections 3.14 *Noise*, and 3.15 *Air Quality*.

2. **Short-term and indirect disturbance to the rural or open space character of some areas.** Because of the short duration of construction at any one location, these impacts would be low. No selectively committed mitigation measures were recommended.

3. **Short-term and direct disruption of apiary sites.** One registered general (commercial) apiary site is crossed by Link 24 from milepost 2.0 to milepost 2.6. To aid in minimization of these effects, Mitigation Measure **S53** will be implemented.

S53: Prior to construction of the transmission line, coordination with beekeepers would occur to minimize potential environmental impacts, and to mitigate general disruption caused by the construction activities.

4. **Short-term and direct ground disturbance/disruption of agricultural land (flood irrigated cropland and dryland cultivated cropland), Important Farmland (Prime farmland if irrigated and Farmland of Statewide Importance), and non-irrigated pasture/rangeland uses** leading to high, moderate, and low impacts.

Since precise locations for tower structures, pulling and tensioning sites, staging areas, and access roads have not been identified, assumptions were made about overall land disturbance, based on project description information (e.g., number of tower structures per mile, size of pulling and tensioning sites, size of staging areas, and acreage for new roads). Laydown areas for each structure would temporarily disturb approximately 89.0 acres of vegetation. Vegetation would be crushed, but no blading would occur. Pulling and tensioning sites would temporarily disturb approximately 10.5 acres per site. Vegetation would be crushed, but no blading would occur. These sites would be located at points of intersection with the total acreage disturbance potentially changing during final 230kV transmission line design. A staging area also would temporarily disturb five acres of vegetation. No specific site has been located for this area as the construction contractor will make this selection. Because these locations have not been specifically identified, it is unknown what type of vegetation would be temporarily disturbed. All areas temporarily disturbed would be allowed to revert to their previous use.

The permanent conversion of approximately 5.6 acres of agricultural land (flood irrigated cropland and dryland cultivated cropland) and 54.1 acres of non-irrigated pasture/rangeland to utility related use (i.e., 230kV transmission line) would be an unavoidable impact of VCWEP. 5.6 acres of agricultural land (flood irrigated cropland and dryland cultivated cropland) would be removed from production for the life of VCWEP. This reduction represents <1% of the total irrigated and non-irrigated harvested cropland (401,000 acres) in Valley County for 2002. 54.1 acres of non-irrigated pasture/rangeland would be removed for the life of VCWEP. The proposed reduction in these land uses would have a minimal impact on livestock grazing, given the county's abundance of grazing lands.

Depending on specific project activity, timing and duration, construction activities could disrupt a portion of the planting, growing, irrigation, and/or harvesting of produce. In addition soil compaction may occur as a result of construction equipment and activities, necessitating remedial activities to restore agricultural uses.

The loss of productive farmland would result in financial impacts on farmers. Crop values have a wide variation from year to year. Because of this wide fluctuation, it is not practical to attempt to quantify a definite value per acre for farmland that may be lost as a result of the 230kV transmission line, as that value is likely to change by the time ROW easement acquisitions are pursued. When ROW easement negotiations occur, average values will be calculated.

Placement of transmission line towers may cause additional time and effort to maneuver agricultural equipment around tower structure footings. The level of farming difficulty and effort caused by presence of transmission towers depends on the crop, with generally more difficulty for crops with rows that are perpendicular or diagonal to the transmission lines, rather than parallel. Potential secondary effects include collisions with tower structures and damage to farm equipment, restrictions on nighttime operations (due to the potential for accidents), restrictions on normal crop rotations because of operational considerations, and increased difficulty in leasing fields with tower structures. Impacts related to the need for farmers to increase weed and pest control activities around tower structure bases also exist.

Impacts on flood irrigation would be minimal. Long-term 230kV transmission line effects on irrigation practices include interference with canals and ditches at field borders. Within the Glasgow Irrigation District, a Special Use Permit would need to be obtained from the BOR if the final transmission line route would cross BOR owned lands or would modify BOR ditches and canals. If the final transmission line route crossed BOR ditches and canals for which BOR only has an easement and no modifications to the ditches or canals occur, an Acknowledgement of Easement Crossing would need to be obtained from BOR. The Vandalia South Main Canal is crossed by Link 24 from milepost 4.2 to milepost 4.3 and paralled from milepost 3.5 to milepost 3.8. Link 24 is also crossed by lateral canal V63 from milepost 1.6 to milepost 1.7.

The presence of a transmission line can be hazardous to aerial crop spraying operations and typically increases cost to farmers when they cross agricultural land. In addition to the obvious safety hazards, there is a potential for lower effectiveness of aerial spraying and higher costs for materials and aircraft operations (i.e., additional amounts of pesticide application around the transmission line).

Farmland of Statewide Importance are based on soil types. Impacts on this defined farmland is primarily from construction activities. Such impacts are considered low because of the short duration of construction activities, the restoration of agricultural lands to their pre-existing soil types and graded levels, and the resumption of agricultural activities. The provisions of the Federal Farmland Protection Act (FPPA) require evaluation of important farmland status when federal funds are used for activities that may directly or indirectly convert farmland. Because the 230kV transmission line has the potential to convert Farmland of Statewide Importance to non-agricultural use (Link 24, from milepost 0.6 to milepost 1.5, a Farmland Conversion Impact Rating for Corridor Type Projects Form (CPA-106) will be completed for the approved 230kV transmission line. CRP lands are crossed by Link 10 from milepost 13.2 to milepost 13.7, from milepost 14.2 to milepost 14.7, and from milepost 15.2 to milepost 15.7. The NRCS would determine if the 230kV transmission line would have an adverse effect on the Participants CRP acreage. If the NRCS determines that the use will have an adverse effect on CRP acreage, the affected acreage would be terminated and refunds assessed.

Cattle or other livestock would need to be removed from the most intensive construction areas. In livestock pasture and grazing areas, temporary removal of fencing and gates to provide construction vehicle access could also require restriction of livestock to other

fenced areas and could temporarily reduce the amount of land available for grazing. Construction activities could also temporarily disrupt livestock access to supplementary feeding and watering stations. No livestock mortalities, however, are expected as a direct result of construction. Due to the short duration of the construction disturbance, the construction activity along the 230kV transmission line is expected to have a low and temporary adverse effect on adjacent livestock grazing. Livestock grazing could continue around the 230kV transmission line during operations.

The duration and extent of these impacts can be reduced through implementation of Mitigation Measures **S4**, **S5**, **S12**, **S18**, **S19**, **S20**, **S21**, **S22**, **S23**, **S25**, **S33**, **S34**, **S35**, **S36**, **S37**, **S38**, **S39**, and **S40**.

S4: To limit new or improved accessibility into the area, all new access undesired or not required for maintenance will be closed using the most effective and least environmentally damaging methods appropriate to that area with concurrence of the landowner or land manager.

S5: To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S12: Single-pole tubular steel structures will be utilized to minimize ground disturbance, operational conflicts, and/or visual contrast.

S18: VCWEP will comply with all appropriate regulations of the Federal Aviation Administration (FAA), and a Notice of Proposed Construction or Alteration form (Form 7460-1) would be required of Wind Hunter pursuant to Federal Aviation Regulations, Part 77. Final locations, structures, and structure heights, including wind turbines, transmission lines, meteorological towers, and construction equipment that might impact air navigation such as cranes used to assemble the towers, would be submitted to the FAA for VCWEP. The form would be sent to the manager of the FAA Regional Air Traffic Division Office having jurisdiction over the area where the planned construction would be located. If acceptable to the FAA, white lights will be utilized on turbines and towers to minimize the risk of avian collisions. Coordination with the Department of Defense will be conducted regarding the location and potential effects of VCWEP upon operations in military airspace. The owner/operator of private airports and airstrips potentially affected by VCWEP will also be contacted.

S19: Construction will be timed, whenever practical, to minimize disruption of normal seasonal activities for cropland (planting and harvesting) and non-irrigated pasture/rangeland.

S20: Coordination with landowners, lessees, and companies during final transmission line design will be conducted, to the extent feasible, to align the transmission line, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel

operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

S21: To the extent feasible, Project facilities, including poles and access roads will be installed along the edges of borders of property. Consultation with the landowner or land management agency will be conducted to identify facility locations that create the least potential for impact to property and its uses.

S22: Farmers will be compensated for crop damage and compacted soils will be restored.

S23: On agricultural land, transmission towers, and right-of-way will be aligned with field boundaries to the greatest extent practicable and transmission towers will be placed near field boundaries, access roads and fences to reduce the impact to farm operation and agricultural production. Where this is not possible because of irregular field boundaries, the transmission towers will be placed on or perpendicular to the row crops wherever feasible, so that transmission lines do not run diagonally to the crop rows.

S25: Areas of disturbed soil will be reclaimed using weed-free grasses, forbs, and shrubs. Reclamation activities will be undertaken as early as possible on disturbed areas.

S33: Construction staging areas and pulling sites shall be located adjacent to roads where practical. Coordination with landowners will be conducted to establish construction areas (such as conductor pulling and splicing areas and construction yards) on non-agricultural or in areas with less sensitive crops, where feasible.

S34: During Project construction, it will be necessary to remove cattle from areas where blasting or heavy equipment operations are taking place. Arrangements will made with landowners and livestock owners to keep livestock out of these areas during those periods.

S35: A stipulation will be included in easement agreements with landowners along the right-of-way that landowners and/or farmers and ranchers will be reimbursed for the value of the crops lost and the cost of any delay or interruption in necessary farming or grazing practices as a result of any interrupted use of cropland or grazing land.

S36: Construction operations will avoid, to the extent feasible, disturbance of agricultural soil during the wet season (moist soil is generally more susceptible to compaction than dry soil). The use of heavy equipment on agricultural land, will be minimized, to avoid soil compaction.

S37: Placing tower structures at the edge of fields where canals or irrigation ditches are located, will be avoided.

S38: Landowners will be consulted to determine which aerial applicators cover agricultural lands within the vicinity of the wind farm and approved transmission line route. Written notification will be provided to aerial applicators when meteorological

towers, wind turbines and the 230kV transmission line and tower structures will be erected. Aerial applicators will also be provided with maps clearly showing the location of the meteorological towers, wind turbines and the 230kV transmission line and tower structures.

Mitigation Measure S-38 requires notification to aerial applicators of the new 230kV transmission line. However, while this measure would likely reduce the level of impact, the safety hazard to aerial applicators would remain high.

S39: During the right-of-way acquisition process, coordination with each affected landowner will be conducted in order to develop an alignment and specific tower locations, to provide clear information about the right-of-way acquisition process compensation and construction and maintenance activities, and to understand landowner plans for use of the transmission corridor area in order to minimize the impact of tower and right-of-way location.

S40: Existing roads will be used to the maximum extent possible, but only if in safe and environmentally sound locations. New access roads will be designed and constructed to the appropriate standard no higher than necessary to accommodate their intended functions (e.g., traffic volume and weight of vehicles). Abandoned roads and roads that are no longer needed will be re-contoured and re-vegetated.

5. **A Northern Border Pipeline Company 42-inch natural gas pipeline is crossed by Link 1 from milepost 0.7 to milepost 0.8and a Williston Basin Interstate Pipeline Company 6-inch natural gas lateral (valley industrial park) is crossed by Link 10 from milepost 8.6 to milepost 8.7. Two Williston Basin Interstate Pipeline Company (10-inch and 8-inch) natural gas pipelines are crossed by Link 24 from milepost 1.7 to 1.8.** Impacts to these pipelines would be reduced through the use of Mitigation Measure **S5** and **S20**.

S5: To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S20: Coordination with landowners, lessees, and companies during final transmission line design will be conducted, to the extent feasible, to align the transmission line, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

6. **Alternative Route B crosses 5.2 miles of authorized federal leases and 1.1 miles of pending federal leases. Alternative Route B also crosses 1.8 miles of state leases. I**mpacts to federal and state oil and gas leases would be reduced through the use of Mitigation Measure **S5** and **S20**.

S5: To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S20: Coordination with landowners, lessees, and companies during final transmission line design will be conducted, to the extent feasible, to align the transmission line, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

Planned Land Use

No identifiable impacts to planned land use were identified. No comprehensive plan, policy or zoning regulation would preclude the siting of the transmission line. Te aid in minimization of planned land use impacts, Mitigation Measure **S39** will be implemented.

S39: During the right-of-way acquisition process, coordination with each affected landowner will be conducted in order to develop an alignment and specific tower locations, to provide clear information about the right-of-way acquisition process compensation and construction and maintenance activities, and to understand landowner plans for use of the transmission corridor area in order to minimize the impact of tower and right-of-way location.

Parks, Recreation, and Preservation Areas

Impacts to parks, recreation, and preservation areas include the following:

7. **Short-term, direct and indirect disturbance of recreational use.** Since most of the recreational activity that would be disturbed by the transmission line is dispersed (wildlife watching, hunting and fishing) disturbance from the transmission line would be minor. Some recreational activities could be diverted during construction, but would resume once construction ended. The recreational experience of recreationists using adjacent properties during construction could also be affected. Because of the short duration of construction at any one location, these impacts would be low. Once construction is complete at any particular location, the low impacts would cease to exist.

Activities outside of the WSA boundary could impact recreational use within the WSA due to reduction of WSA qualities and the sense of solitude from human activities. Construction noise, dust, and possible access restrictions are all temporary impacts to the WSAs that could result from construction of the 230kV transmission line. Further discussion of these impacts and measures that would be taken to mitigate them can be found in Sections 3.14 *Noise*, and 3.15 *Air Quality*. Longer-term impacts could arise from the visual intrusion of the 230kV transmission line across landscapes that provide little or no visual screening, allowing them to be seen by WSA recreational visitors from certain perspectives (refer to Section 3.4 *Visual Resources* for discussion of impacts).

It is also possible construction-related truck traffic and construction activity could temporarily delay existing access from the east to the WSA and areas outside the WSA for recreational purposes. Impacts to these roads would be short-term in nature. While travel on these roads could be delayed by construction activities, they would not be blocked or access restricted. An Access Road Use Plan would be developed to minimize impacts to public use of existing roads in the wind farm area. This plan would conform to the requirements of the BLM, State, and local agencies.

8. **Increased public access into areas containing sensitive plant and wildlife communities or cultural resources.** Construction and maintenance of the 230kV transmission line would require the improvement of existing roads and the construction of new roads into remote areas. This could increase access into areas containing sensitive plant and wildlife communities or cultural resources. To aid in minimization of this effect, Mitigation Measure **S4** will be implemented.

S4: To limit new or improved accessibility into the area, all new access undesired or not required for maintenance will be closed using the most effective and least environmentally damaging methods appropriate to that area with concurrence of the landowner or land manager.

However, public access would be restricted by gates and fences on private lands.

Residual impact levels associated with Alternative B included the following: 0.0 miles of high, 1.9 miles of moderate, 35.8 miles of low, and 0.0 miles of no-identifiable. These residual impacts were determined utilizing the Assessment Methodology outlined in Section 3.2-2.1.

Alternative Route D – Britsch Road Route

Existing Land Use

Impacts to existing land use include the following:

1. **Dust, noise, and construction related traffic impacts near residential areas.** These impacts would be considered low because construction-related effects would be temporary and mitigation measures would be implemented as part of construction to minimize these effects. Further discussion of these impacts and measures that would be taken to mitigate them can be found in Sections 3.14 *Noise*, and 3.15 *Air Quality*.

2. **Short-term and indirect disturbance to the rural or open space character of some areas.** Because of the short duration of construction at any one location, these impacts would be low. No selectively committed mitigation measures were recommended.

3. **Short-term and direct ground disturbance/disruption of agricultural land (flood irrigated cropland and dryland cultivated cropland), Important Farmland (Prime farmland if irrigated and Farmland of Statewide**

Importance), and non-irrigated pasture/rangeland uses leading to high, moderate, and low impacts.

Since precise locations for tower structures, pulling and tensioning sites, staging areas, and access roads have not been identified, assumptions were made about overall land disturbance, based on project description information (e.g., number of tower structures per mile, size of pulling and tensioning sites, size of staging areas, and acreage for new roads). Laydown areas for each structure would temporarily disturb approximately 89.0 acres of vegetation. Vegetation would be crushed, but no blading would occur. Pulling and tensioning sites would temporarily disturb approximately 11.5 acres per site. Vegetation would be crushed, but no blading would occur. These sites would be located at points of intersection and will be determined during final 230kV transmission line design. A staging area also would temporarily disturb five acres of vegetation. No specific site has been located for this area as the construction contractor will make this selection. Because these locations have not been specifically identified, it is unknown what type of vegetation would be temporarily disturbed. All areas temporarily disturbed would be allowed to revert to their previous use.

The permanent conversion of approximately 1.3 acres of agricultural land (flood irrigated cropland and dryland cultivated cropland) and 48.7 acres of non-irrigated pasture/rangeland to utility related use (i.e., 230kV transmission line) would be an unavoidable impact of VCWEP. 1.3 acres of agricultural land (flood irrigated cropland and dryland cultivated cropland) would be removed from production for the life of VCWEP. This reduction represents <1% of the total irrigated and non-irrigated harvested cropland (401,000 acres) in Valley County for 2002. 48.7 acres of non-irrigated pasture/rangeland would be removed for the life of VCWEP. The proposed reduction in these land uses would have a minimal impact on livestock grazing, given the county's abundance of grazing lands.

Depending on specific project activity, timing and duration, construction activities could disrupt a portion of the planting, growing, irrigation, and/or harvesting of produce. In addition soil compaction may occur as a result of construction equipment and activities, necessitating remedial activities to restore agricultural uses.

The loss of productive farmland would result in financial impacts on farmers. Crop values have a wide variation from year to year. Because of this wide fluctuation, it is not practical to attempt to quantify a definite value per acre for farmland that may be lost as a result of the 230kV transmission line, as that value is likely to change by the time ROW easement acquisitions are pursued. When ROW easement negotiations occur, average values will be calculated.

Placement of transmission line towers may cause additional time and effort to maneuver agricultural equipment around tower structure footings. The level of farming difficulty and effort caused by presence of transmission towers depends on the crop, with generally more difficulty for crops with rows that are perpendicular or diagonal to the transmission lines, rather than parallel. Potential secondary effects include collisions with tower structures and damage to farm equipment, restrictions on nighttime operations (due to the

potential for accidents), restrictions on normal crop rotations because of operational considerations, and increased difficulty in leasing fields with tower structures. Impacts related to the need for farmers to increase weed and pest control activities around tower structure bases also exist.

Impacts on flood irrigation would be minimal. Long-term 230kV transmission line effects on irrigation practices include interference with canals and ditches at field borders. Within the Glasgow Irrigation District, a Special Use Permit would need to be obtained from the BOR if the final transmission line route would cross BOR owned lands or would modify BOR ditches and canals. If the final transmission line route crossed BOR ditches and canals for which BOR only has an easement and no modifications to the ditches or canals occur, an Acknowledgement of Easement Crossing would need to be obtained from BOR. The Vandalia South Main Canal is crossed by Link 16 from milepost 0.6 to milepost 0.7.

The presence of a transmission line can be hazardous to aerial crop spraying operations and typically increases cost to farmers when they cross agricultural land. In addition to the obvious safety hazards, there is a potential for lower effectiveness of aerial spraying and higher costs for materials and aircraft operations (i.e., additional amounts of pesticide application around the transmission line).

Prime farmland if irrigated and Farmland of Statewide Importance are based on soil types. Impacts on this defined farmland is primarily from construction activities. Such impacts are considered low because of the short duration of construction activities, the restoration of agricultural lands to their pre-existing soil types and graded levels, and the resumption of agricultural activities. The provisions of the Federal Farmland Protection Act (FPPA) require evaluation of important farmland status when federal funds are used for activities that may directly or indirectly convert farmland. Agricultural land classified as Prime farmland if irrigated (Link 14, from milepost 1.5 to milepost 1.9) is currently not irrigated. Because the 230kV transmission line has the potential to convert Farmland of Statewide Importance to non-agricultural use (Link 14, from milepost 4.7 to milepost 4.9 and Link 16 from milepost 0.0 to milepost 0.1, from milepost 0.2 to milepost 0.6, from milepost 1.7 to milepost 2.0, and from milepost 3.7 to milepost 3.9), a Farmland Conversion Impact Rating for Corridor Type Projects Form (CPA-106) will be completed for the approved 230kV transmission line. CRP lands are crossed by Link 14 from milepost 1.0 to milepost 1.5 and from milepost 2.8 to milepost 3.0. The NRCS would determine if the 230kV transmission line would have an adverse effect on the Participants CRP acreage. If the NRCS determines that the use will have an adverse effect on CRP acreage, the affected acreage would be terminated and refunds assessed.

Cattle or other livestock would need to be removed from the most intensive construction areas. In livestock pasture and grazing areas, temporary removal of fencing and gates to provide construction vehicle access could also require restriction of livestock to other fenced areas and could temporarily reduce the amount of land available for grazing. Construction activities could also temporarily disrupt livestock access to supplementary feeding and watering stations. No livestock mortalities, however, are expected as a direct result of construction. Due to the short duration of the construction disturbance, the

construction activity along the 230kV transmission line is expected to have a low and temporary adverse effect on adjacent livestock grazing. Livestock grazing could continue around the 230kV transmission line during operations.

The duration and extent of these impacts can be reduced through implementation of Mitigation Measures **S4**, **S5**, **S12**, **S18**, **S19**, **S20**, **S21**, **S22**, **S23**, **S25**, **S33**, **S34**, **S35**, **S36**, **S37**, **S38**, **S39**, and **S40**.

S4: To limit new or improved accessibility into the area, all new access undesired or not required for maintenance will be closed using the most effective and least environmentally damaging methods appropriate to that area with concurrence of the landowner or land manager.

S5: To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S12: Single-pole tubular steel structures will be utilized to minimize ground disturbance, operational conflicts, and/or visual contrast.

S18: VCWEP will comply with all appropriate regulations of the Federal Aviation Administration (FAA), and a Notice of Proposed Construction or Alteration form (Form 7460-1) would be required of Wind Hunter pursuant to Federal Aviation Regulations, Part 77. Final locations, structures, and structure heights, including wind turbines, transmission lines, meteorological towers, and construction equipment that might impact air navigation such as cranes used to assemble the towers, would be submitted to the FAA for VCWEP. The form would be sent to the manager of the FAA Regional Air Traffic Division Office having jurisdiction over the area where the planned construction would be located. If acceptable to the FAA, white lights will be utilized on turbines and towers to minimize the risk of avian collisions. Coordination with the Department of Defense will be conducted regarding the location and potential effects of VCWEP upon operations in military airspace. The owner/operator of private airports and airstrips potentially affected by VCWEP will also be contacted.

S19: Construction will be timed, whenever practical, to minimize disruption of normal seasonal activities for cropland (planting and harvesting) and non-irrigated pasture/rangeland.

S20: Coordination with landowners, lessees, and companies during final transmission line design will be conducted, to the extent feasible, to align the transmission line, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

S21: To the extent feasible, Project facilities, including poles and access roads will be installed along the edges of borders of property. Consultation with the landowner or land management agency will be conducted to identify facility locations that create the least potential for impact to property and its uses.

S22: Farmers will be compensated for crop damage and compacted soils will be restored.

S23: On agricultural land, transmission towers, and right-of-way will be aligned with field boundaries to the greatest extent practicable and transmission towers will be placed near field boundaries, access roads and fences to reduce the impact to farm operation and agricultural production. Where this is not possible because of irregular field boundaries, the transmission towers will be placed on or perpendicular to the row crops wherever feasible, so that transmission lines do not run diagonally to the crop rows.

S25: Areas of disturbed soil will be reclaimed using weed-free grasses, forbs, and shrubs. Reclamation activities will be undertaken as early as possible on disturbed areas.

S33: Construction staging areas and pulling sites shall be located adjacent to roads where practical. Coordination with landowners will be conducted to establish construction areas (such as conductor pulling and splicing areas and construction yards) on non-agricultural or in areas with less sensitive crops, where feasible.

S34: During Project construction, it will be necessary to remove cattle from areas where blasting or heavy equipment operations are taking place. Arrangements will made with landowners and livestock owners to keep livestock out of these areas during those periods.

S35: A stipulation will be included in easement agreements with landowners along the right-of-way that landowners and/or farmers and ranchers will be reimbursed for the value of the crops lost and the cost of any delay or interruption in necessary farming or grazing practices as a result of any interrupted use of cropland or grazing land.

S36: Construction operations will avoid, to the extent feasible, disturbance of agricultural soil during the wet season (moist soil is generally more susceptible to compaction than dry soil). The use of heavy equipment on agricultural land, will be minimized, to avoid soil compaction.

S37: Placing tower structures at the edge of fields where canals or irrigation ditches are located, will be avoided.

S38: Landowners will be consulted to determine which aerial applicators cover agricultural lands within the vicinity of the wind farm and approved transmission line route. Written notification will be provided to aerial applicators when meteorological tower structures, wind turbines and the 230kV transmission line and tower structures will be erected. Aerial applicators will also be provided with maps clearly showing the location of the meteorological towers, wind turbines and the 230kV transmission line and towers.

S38 requires notification to aerial applicators of new meteorological towers, wind turbines and the 230kV transmission line. However, while this measure would likely reduce the level of impact, the safety hazard to aerial applicators would remain high.

S39: During the right-of-way acquisition process, coordination with each affected landowner will be conducted in order to develop an alignment and specific tower locations, to provide clear information about the right-of-way acquisition process compensation and construction and maintenance activities, and to understand landowner plans for use of the transmission corridor area in order to minimize the impact of tower and right-of-way location.

S40: Existing roads will be used to the maximum extent possible, but only if in safe and environmentally sound locations. New access roads will be designed and constructed to the appropriate standard no higher than necessary to accommodate their intended functions (e.g., traffic volume and weight of vehicles). Abandoned roads and roads that are no longer needed will be re-contoured and re-vegetated.

4. **A Northern Border Pipeline Company 42-inch natural gas pipeline is crossed by Link 2 from milepost 1.5 to 1.6 and a Williston Basin Interstate Pipeline Company 10-inch natural gas pipeline by Link 16 from milepost 0.6 to 0.7**. Impacts to these pipelines would be reduced through the use of Mitigation Measure **S5** and **S20**.

S5: To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S20: Coordination with landowners, lessees, and companies during final transmission line design will be conducted, to the extent feasible, to align the transmission line, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

5. **Alternative Route D crosses two MDEQ permitted Open cut sand and gravel operations. Valley County Road Department's Ellsworth Permit #167 is crossed by Link 9 from milepost 9.6 to milepost 9.8. Fossum Ready Mix's Winder Permit #FRM-001 is crossed by Link 14 from milepost 1.5 to milepost 1.7.** Impacts to these permitted sand and gravel operations would be reduced through the use of Mitigation Measure **S5** and **S20**.

S5: To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to

clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S20: Coordination with landowners, lessees, and companies during final transmission line design will be conducted, to the extent feasible, to align the transmission line, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

6. **Alternative Route D crosses 5.2 miles of authorized federal leases and 1.1 miles of pending federal leases. Alternative D also crosses 1.8 miles of state leases.** Impacts to federal and state oil and gas leases would be reduced through the use of Mitigation Measure **S5** and **S20**.

S5: To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S20: Coordination with landowners, lessees, and companies during final transmission line design will be conducted, to the extent feasible, to align the transmission line, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

Planned Land Use

No identifiable impacts to planned land use were identified. No comprehensive plan, policy or zoning regulation would preclude the siting of the transmission line. Te aid in minimization of planned land use impacts, Mitigation Measure **S39** will be implemented.

S39: During the right-of-way acquisition process, coordination with each affected landowner will be conducted in order to develop an alignment and specific tower locations, to provide clear information about the right-of-way acquisition process compensation and construction and maintenance activities, and to understand landowner plans for use of the transmission corridor area in order to minimize the impact of tower and right-of-way location.

Parks, Recreation, and Preservation Areas

Impacts to parks, recreation, and preservation areas include the following:

7. **Short-term, direct and indirect disturbance of recreational use**. Since most of the recreational activity that would be disturbed by the transmission line is dispersed (wildlife watching, hunting and fishing) disturbance from the transmission line would be minor. Some recreational activities could be diverted

during construction, but would resume once construction ended. The recreational experience of recreationists using adjacent properties during construction could also be affected. Because of the short duration of construction at any one location, these impacts would be low. Once construction is complete at any particular location, the low impacts would cease to exist.

Activities outside of the WSA boundary could impact recreational use within the WSA due to reduction of WSA qualities and the sense of solitude from human activities. Construction noise, dust, and possible access restrictions are all temporary impacts to the WSAs that could result from construction of the 230kV transmission line. Further discussion of these impacts and measures that would be taken to mitigate them can be found in Sections 3.14 *Noise*, and 3.15 *Air Quality*. Longer-term impacts could arise from the visual intrusion of the 230kV transmission line across landscapes that provide little or no visual screening, allowing them to be seen by WSA recreational visitors from certain perspectives (refer to Section 3.4 *Visual Resources* for discussion of impacts).

It is also possible construction-related truck traffic and construction activity could temporarily delay existing access from the east to the WSA and areas outside the WSA for recreational purposes. Impacts to these roads would be short-term in nature. While travel on these roads could be delayed by construction activities, they would not be blocked or access restricted. An Access Road Use Plan would be developed to minimize impacts to public use of existing roads in the wind farm area. This plan would conform to the requirements of the BLM, State, and local agencies.

8. **Increased public access into areas containing sensitive plant and wildlife communities or cultural resources.** Construction and maintenance of the 230kV transmission line would require the improvement of existing roads and the construction of new roads into remote areas. This could increase access into areas containing sensitive plant and wildlife communities or cultural resources. To aid in minimization of this effect, Mitigation Measure **S4** will be implemented.

S4: To limit new or improved accessibility into the area, all new access undesired or not required for maintenance will be closed using the most effective and least environmentally damaging methods appropriate to that area with concurrence of the landowner or land manager.

However, public access would be restricted by gates and fences on private lands.

Residual impact levels associated with Alternative D included the following: 0.0 miles of high, 1.2 miles of moderate, 33.5 miles of low, and 0.1 miles of no-identifiable. These residual impacts were determined utilizing the Assessment Methodology outlined in Section 3.2-2.1.

Alternative Route E – West Central Route

Existing Land Use

Impacts to existing land use include the following:

1. **Dust, noise, and construction related traffic impacts near residential areas.** These impacts would be considered low because construction-related effects would be temporary and mitigation measures would be implemented as part of construction to minimize these effects. Further discussion of these impacts and measures that would be taken to mitigate them can be found in Sections 3.14 *Noise*, and 3.15 *Air Quality*.

2. **Short-term and indirect disturbance to the rural or open space character of some areas.** Because of the short duration of construction at any one location, these impacts would be low. No selectively committed mitigation measures were recommended.

3. **Short-term and direct ground disturbance/disruption of agricultural land (flood irrigated cropland and dryland cultivated cropland), Important Farmland (Prime farmland if irrigated and Farmland of Statewide Importance), and non-irrigated pasture/rangeland uses** leading to high, moderate, and low impacts.

Since precise locations for tower structures, pulling and tensioning sites, staging areas, and access roads have not been identified, assumptions were made about overall land disturbance, based on project description information (e.g., number of tower structures per mile, size of pulling and tensioning sites, size of staging areas, and acreage for new roads). Laydown areas for each structure would temporarily disturb approximately 79.4 acres of vegetation. Vegetation would be crushed, but no blading would occur. Pulling and tensioning sites would temporarily disturb approximately 0.5 acres per site. Vegetation would be crushed, but no blading would occur. These sites would be located at points of intersection and will be determined during final 230kV transmission line design. A staging area also would temporarily disturb five acres of vegetation. No specific site has been located for this area as the construction contractor will make this selection. Because these locations have not been specifically identified, it is unknown what type of vegetation would be temporarily disturbed. All areas temporarily disturbed would be allowed to revert to their previous use.

The permanent conversion of approximately 3.7 acres of agricultural land (flood irrigated cropland and dryland cultivated cropland) and 64.0 acres of non-irrigated pasture/rangeland to utility related use (i.e., 230kV transmission line) would be an unavoidable impact of VCWEP. 3.7 acres of agricultural land (flood irrigated cropland and dryland cultivated cropland) would be removed from production for the life of VCWEP. This reduction represents <1% of the total irrigated and non-irrigated harvested cropland (401,000 acres) in Valley County for 2002. 64.0 acres of non-irrigated pasture/rangeland would be removed for the life of VCWEP. The proposed reduction in

these land uses would have a minimal impact on livestock grazing, given the county's abundance of grazing lands.

Depending on specific project activity, timing and duration, construction activities could disrupt a portion of the planting, growing, irrigation, and/or harvesting of produce. In addition soil compaction may occur as a result of construction equipment and activities, necessitating remedial activities to restore agricultural uses.

The loss of productive farmland would result in financial impacts on farmers. Crop values have a wide variation from year to year. Because of this wide fluctuation, it is not practical to attempt to quantify a definite value per acre for farmland that may be lost as a result of the 230kV transmission line, as that value is likely to change by the time ROW easement acquisitions are pursued. When ROW easement negotiations occur, average values will be calculated.

Placement of transmission line towers may cause additional time and effort to maneuver agricultural equipment around tower structure footings. The level of farming difficulty and effort caused by presence of transmission towers depends on the crop, with generally more difficulty for crops with rows that are perpendicular or diagonal to the transmission lines, rather than parallel. Potential secondary effects include collisions with tower structures and damage to farm equipment, restrictions on nighttime operations (due to the potential for accidents), restrictions on normal crop rotations because of operational considerations, and increased difficulty in leasing fields with tower structures. Impacts related to the need for farmers to increase weed and pest control activities around tower structure bases also exist.

Impacts on flood irrigation would be minimal. Long-term 230kV transmission line effects on irrigation practices include interference with canals and ditches at field borders. Within the Glasgow Irrigation District, a Special Use Permit would need to be obtained from the BOR if the final transmission line route would cross BOR owned lands or would modify BOR ditches and canals. If the final transmission line route crossed BOR ditches and canals for which BOR only has an easement and no modifications to the ditches or canals occur, an Acknowledgement of Easement Crossing would need to be obtained from BOR. The Vandalia South Main Canal is crossed by Link 12 from milepost 8.9 to milepost 9.0.

The presence of a transmission line can be hazardous to aerial crop spraying operations and typically increases cost to farmers when they cross agricultural land. In addition to the obvious safety hazards, there is a potential for lower effectiveness of aerial spraying and higher costs for materials and aircraft operations (i.e., additional amounts of pesticide application around the transmission line).

Prime farmland if irrigated and Farmland of Statewide Importance are based on soil types. Impacts on this defined farmland is primarily from construction activities. Such impacts are considered low because of the short duration of construction activities, the restoration of agricultural lands to their pre-existing soil types and graded levels, and the resumption of agricultural activities. The provisions of the Federal Farmland Protection

Act (FPPA) require evaluation of important farmland status when federal funds are used for activities that may directly or indirectly convert farmland. Agricultural land classified as Prime farmland if irrigated (Link 12, from milepost 7.1 to milepost 7.3) is currently not irrigated. Because the 230kV transmission line has the potential to convert Farmland of Statewide Importance to non-agricultural use (Link 12, from milepost 7.7 to milepost 7.8, from milepost 7.9 to milepost 8.5, and from milepost 8.8 to milepost 8.9), a Farmland Conversion Impact Rating for Corridor Type Projects Form (CPA-106) will be completed for the approved 230kV transmission line. CRP lands are crossed by Link 12 from milepost 4.9 to milepost 5.8, and from milepost 6.0 to milepost 6.5. The NRCS would determine if the 230kV transmission line would have an adverse effect on the Participants CRP acreage. If the NRCS determines that the use will have an adverse effect on CRP acreage, the affected acreage would be terminated and refunds assessed.

Cattle or other livestock would need to be removed from the most intensive construction areas. In livestock pasture and grazing areas, temporary removal of fencing and gates to provide construction vehicle access could also require restriction of livestock to other fenced areas and could temporarily reduce the amount of land available for grazing. Construction activities could also temporarily disrupt livestock access to supplementary feeding and watering stations. No livestock mortalities, however, are expected as a direct result of construction. Due to the short duration of the construction disturbance, the construction activity along the 230kV transmission line is expected to have a low and temporary adverse effect on adjacent livestock grazing. Livestock grazing could continue around the 230kV transmission line during operations.

The duration and extent of these impacts can be reduced through implementation of Mitigation Measures **S4**, **S5**, **S12**, **S18**, **S19**, **S20**, **S21**, **S22**, **S23**, **S25**, **S33**, **S34**, **S35**, **S36**, **S37**, **S38**, **S39**, and **S40**.

S4: To limit new or improved accessibility into the area, all new access undesired or not required for maintenance will be closed using the most effective and least environmentally damaging methods appropriate to that area with concurrence of the landowner or land manager.

S5: To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S12: Single-pole tubular steel structures will be utilized to minimize ground disturbance, operational conflicts, and/or visual contrast.

S18: VCWEP will comply with all appropriate regulations of the Federal Aviation Administration (FAA), and a Notice of Proposed Construction or Alteration form (Form 7460-1) would be required of Wind Hunter pursuant to Federal Aviation Regulations, Part 77. Final locations, structures, and structure heights, including wind turbines, transmission lines, meteorological towers, and construction equipment that might impact

air navigation such as cranes used to assemble the towers, would be submitted to the FAA for VCWEP. The form would be sent to the manager of the FAA Regional Air Traffic Division Office having jurisdiction over the area where the planned construction would be located. If acceptable to the FAA, white lights will be utilized on turbines and towers to minimize the risk of avian collisions. Coordination with the Department of Defense will be conducted regarding the location and potential effects of VCWEP upon operations in military airspace. The owner/operator of private airports and airstrips potentially affected by VCWEP will also be contacted.

S19: Construction will be timed, whenever practical, to minimize disruption of normal seasonal activities for cropland (planting and harvesting) and non-irrigated pasture/rangeland.

S20: Coordination with landowners, lessees, and companies during final transmission line design will be conducted, to the extent feasible, to align the transmission line, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

S21: To the extent feasible, Project facilities, including poles and access roads will be installed along the edges of borders of property. Consultation with the landowner or land management agency will be conducted to identify facility locations that create the least potential for impact to property and its uses.

S22: Farmers will be compensated for crop damage and compacted soils will be restored.

S23: On agricultural land, transmission towers, and right-of-way will be aligned with field boundaries to the greatest extent practicable and transmission towers will be placed near field boundaries, access roads and fences to reduce the impact to farm operation and agricultural production. Where this is not possible because of irregular field boundaries, the transmission towers will be placed on or perpendicular to the row crops wherever feasible, so that transmission lines do not run diagonally to the crop rows.

S25: Areas of disturbed soil will be reclaimed using weed-free grasses, forbs, and shrubs. Reclamation activities will be undertaken as early as possible on disturbed areas.

S33: Construction staging areas and pulling sites shall be located adjacent to roads where practical. Coordination with landowners will be conducted to establish construction areas (such as conductor pulling and splicing areas and construction yards) on non-agricultural or in areas with less sensitive crops, where feasible.

S34: During Project construction, it will be necessary to remove cattle from areas where blasting or heavy equipment operations are taking place. Arrangements will made with landowners and livestock owners to keep livestock out of these areas during those periods.

S35: A stipulation will be included in easement agreements with landowners along the right-of-way that landowners and/or farmers and ranchers will be reimbursed for the value of the crops lost and the cost of any delay or interruption in necessary farming or grazing practices as a result of any interrupted use of cropland or grazing land.

S36: Construction operations will avoid, to the extent feasible, disturbance of agricultural soil during the wet season (moist soil is generally more susceptible to compaction than dry soil). The use of heavy equipment on agricultural land, will be minimized, to avoid soil compaction.

S37: Placing tower structures at the edge of fields where canals or irrigation ditches are located, will be avoided.

S38: Landowners will be consulted to determine which aerial applicators cover agricultural lands within the vicinity of the wind farm and approved transmission line route. Written notification will be provided to aerial applicators when meteorological towers, wind turbines and the 230kV transmission line and tower structures will be erected. Aerial applicators will also be provided with maps clearly showing the location of the meteorological towers, wind turbines and the 230kV transmission line and tower structures.

S38 requires notification to aerial applicators of new meteorological towers, wind turbines and the 230kV transmission line. However, while this measure would likely reduce the level of impact, the safety hazard to aerial applicators would remain high.

S39: During the right-of-way acquisition process, coordination with each affected landowner will be conducted in order to develop an alignment and specific tower locations, to provide clear information about the right-of-way acquisition process compensation and construction and maintenance activities, and to understand landowner plans for use of the transmission corridor area in order to minimize the impact of tower and right-of-way location.

S40: Existing roads will be used to the maximum extent possible, but only if in safe and environmentally sound locations. New access roads will be designed and constructed to the appropriate standard no higher than necessary to accommodate their intended functions (e.g., traffic volume and weight of vehicles). Abandoned roads and roads that are no longer needed will be re-contoured and re-vegetated.

4. **A Northern Border Pipeline Company 42-inch natural gas pipeline is crossed by Link 1 from milepost 0.7 to milepost 0.8and a Williston Basin Interstate Pipeline Company 6-inch natural gas lateral (valley industrial park) is crossed by Link 11 from milepost 9.8 to milepost 9.9. Two Williston Basin Interstate Pipeline Company (10-inch and 8-inch) natural gas pipelines are crossed by Link 22 from milepost 3.1 to 3.2** Impacts to these pipelines would be reduced through the use of Mitigation Measure **S5** and **S20**.

S5: To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not

limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S20: Coordination with landowners, lessees, and companies during final transmission line design will be conducted, to the extent feasible, to align the transmission line, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

5. **Alternative Route E crosses 6.9 miles of authorized federal leases and 7.4 miles of pending federal leases. Alternative E crosses 1.6 miles of state leases.** Impacts to federal and state oil and gas leases would be reduced through the use of Mitigation Measure **S5** and **S20**.

S5: To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S20: Coordination with landowners, lessees, and companies during final transmission line design will be conducted, to the extent feasible, to align the transmission line, so as to minimize potential land use conflicts with oil and gas leases, permitted sand and gravel operations, natural gas pipelines, proposed water pipelines and maximize the distance between the transmission line and agricultural operations, planned developments, canals, apiaries, and airstrips located within, adjacent to, and near the right-of-way.

Planned Land Use

No identifiable impacts to planned land use were identified. No comprehensive plan, policy or zoning regulation would preclude the siting of the transmission line. Te aid in minimization of planned land use impacts, Mitigation Measure **S39** will be implemented.

S39: During the right-of-way acquisition process, coordination with each affected landowner will be conducted in order to develop an alignment and specific tower locations, to provide clear information about the right-of-way acquisition process compensation and construction and maintenance activities, and to understand landowner plans for use of the transmission corridor area in order to minimize the impact of tower and right-of-way location.

Parks, Recreation, and Preservation Areas

Impacts to parks, recreation, and preservation areas include the following:

6. **Short-term, direct and indirect disturbance of recreational use.** Since most of the recreational activity that would be disturbed by the transmission line is dispersed (wildlife watching, hunting and fishing) disturbance from the

transmission line would be minor. Some recreational activities could be diverted during construction, but would resume once construction ended. The recreational experience of recreationists using adjacent properties during construction could also be affected. Because of the short duration of construction at any one location, these impacts would be low. Once construction is complete at any particular location, the low impacts would cease to exist.

Activities outside of the WSA boundary could impact recreational use within the WSA due to reduction of WSA qualities and the sense of solitude from human activities. Construction noise, dust, and possible access restrictions are all temporary impacts to the WSAs that could result from construction of the 230kV transmission line. Further discussion of these impacts and measures that would be taken to mitigate them can be found in Sections 3.14 *Noise*, and 3.15 *Air Quality*. Longer-term impacts could arise from the visual intrusion of the 230kV transmission line across landscapes that provide little or no visual screening, allowing them to be seen by WSA recreational visitors from certain perspectives (refer to Section 3.4 *Visual Resources* for discussion of impacts).

It is also possible construction-related truck traffic and construction activity could temporarily delay existing access from the east to the WSA and areas outside the WSA for recreational purposes. Impacts to these roads would be short-term in nature. While travel on these roads could be delayed by construction activities, they would not be blocked or access restricted. An Access Road Use Plan would be developed to minimize impacts to public use of existing roads in the wind farm area. This plan would conform to the requirements of the BLM, State, and local agencies.

7. **Increased public access into areas containing sensitive plant and wildlife communities or cultural resources.** Construction and maintenance of the 230kV transmission line would require the improvement of existing roads and the construction of new roads into remote areas. This could increase access into areas containing sensitive plant and wildlife communities or cultural resources. To aid in minimization of this effect, Mitigation Measure **S4** will be implemented.

S4: To limit new or improved accessibility into the area, all new access undesired or not required for maintenance will be closed using the most effective and least environmentally damaging methods appropriate to that area with concurrence of the landowner or land manager.

However, public access would be restricted by gates and fences on private lands.

Residual impact levels associated with Alternative E included the following: 0.0 miles of high, 0.0 miles of moderate, 32.9 miles of low, and 0.2 miles of no-identifiable. These residual impacts were determined utilizing the Assessment Methodology outlined in Section 3.2-2.1.

3.2-2.5 Antelope Creek Substation

Existing Land Use

Development of the substation site would result in the permanent conversion to industrial use of 5 acres of non-irrigated pasture/rangeland. The reduction in this land use would have a minimal impact on livestock grazing, given the county's abundance of grazing lands.

Planned Land Use

Currently, no known development plans for the site have been submitted to the Valley County Planning Office. As a result, no impacts were identified.

Parks, Recreation, and Preservation Areas

No existing or proposed parks, recreation, and preservation areas exist on or within the ½ mile study area. As a result, no impacts were identified.

3.2.2.6 No Action Alternative

Under the No Action Alternative, VCWEP would not be constructed and existing land uses in VCWEP study area would continue without the influence of the VCWEP.. However, this does not preclude other development within permitted uses in the study area as well as other conducive locations throughout the State of Montana. Other energy resources could be developed in the region to meet the need for power. These projects could have the same or greater impact to and use than this VCWEP.

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3.3. TRANSPORTATION

This section presents an assessment of potential traffic and transportation effects associated with construction and operation of VCWEP and Alternatives. It also identifies mitigation measures to limit those impacts.

Existing state transportation plans were reviewed to identify pertinent policies, impact evaluation criteria, and planned roadway improvements.

3.3.1 Affected Environment

The following subsections define the study methods, transportation setting within the VCWEP area, followed by a more detailed discussion of specific transportation uses within areas that VCWEP facilities would be located.

3.3.1.1 Study Methods

Information used in this section includes traffic data obtained from the Montana Department of Transportation (MDOT). Additional information sources include a Valley County Road Map and interviews with the Valley County Road Administrator.

Information regarding length and weight restrictions, existing road conditions, and planned improvements/maintenance in the VCWEP area was obtained from interviews with Rick Seiler, Valley County Road Administrator, and Ray Mengel, District Administrator, MDOT, Glendive District. Site visits were conducted in August and September 2004 to examine road conditions and to verify existing access roads in the VCWEP vicinity.

Project Area Overview

Existing Roadway Network

The roadway network that could potentially be affected by the VCWEP. and Alternatives includes highways and roads.

Four classifications, listed below, were used in order to describe the highways and roads in VCWEP area:

- Federal and State Highways
- Paved Roads
- Improved Roads
- Unimproved Roads

These features were identified on maps prepared by MDOT.

One Federal highway, U.S. Highway 2, runs southeast and northwest through VCWEP area. U.S. Highway 2, part of the National Highway System – Non-Interstate, is the northernmost U.S. Highway across the continental United States. U.S. Highway 2 is a popular bicycle touring route during the summer months and is listed as one of eleven selected adventure bicycling routes in the U.S. by the Adventure Bicycle Association. State highways in VCWEP area include Montana Highway 24 and Montana Secondary 246. Montana Highway 24, part of the State Primary Highway System, runs in a north and south direction while Montana Secondary 246 runs in a southeast and northwest direction. Definitions of these designated highway systems are as follows:

Federal Designated Highway Systems

Non-Interstate National Highway System – Principal arterials other than the Interstate that serve major travel destinations and transportation needs, connectors to major transportation terminals, the Strategic Highway Network and connectors, and high priority corridors identified by law.

State Designated Highway Systems

Primary Highway System – Highways that have been functionally classified by the Department as either principal or minor arterials and that have been selected by the Transportation Commission to be placed on the Primary Highway System. [MCA 60-2-125(3)]

Secondary Highway System – Highways that have been functionally classified by the Department as either minor arterials or major collectors and have been selected by the Transportation Commission, in cooperation with the boards of county commissioners, to be placed on the Secondary Highway System. [MCA 60-2-125(6)].

Paved roads include paved (bituminous or concrete) roads which occur in VCWEP area.

Improved roads include roads which consist of gravel or graded dirt.

Unimproved roads include farm roads and other roads not included in any of the above classifications.

In addition to the roads described above, there is a network of other public roads (BLM and Montana Department of Natural Resources and Conservation) that would be used during construction and operation of VCWEP. These roads include both maintained and un-maintained roads.

BLM lands have a road network consisting of designed and constructed routes and two-track roads or prairie trails. Some of these roads or trails were also created by users (ranchers, hunters, and others). These roads provide access to public lands, State, and private lands throughout the study area. Demands for use of these roads are directly related to the resources found on public lands. Roads are needed to maintain access for commercial activities (e.g., livestock grazing, minerals development), non-commercial activities and casual use (e.g., OHV use, hunting, camping, bird watching, recreational

driving) and for administrative access to manage resources. These roads are single lane and are of natural material.

Valley County has no weight restrictions on county roads, except during inclement weather. Large loads carried on the county roads are primarily hay and cattle. State highways in the vicinity of VCWEP are subject to width and length restrictions, as well as weight limitations. Annual permits are needed for large load transport on U.S. Highway 2, Montana Highway 24, and Montana Secondary 246 (exceedance of 8 ½ foot width and 75-foot length). Loads that exceed the permitted lengths require single-trip permits from MDOT.

Planned improvements (i.e., gravel) for county roads utilize a priority system. First priority is given to school bus routes followed by main arteries and subsequently other roads. General maintenance on gravel roads includes grading as necessary.

Traffic Volumes

Average daily traffic (ADT) volumes for U.S. Highway 2, Montana Highway 24, and Montana Secondary 246, were collected by MDOT in 2003 (refer to Table 3.3-1). Traffic volumes are not available for Valley County roads.

Table 3.3-1 U.S. Highway 2, Montana Highway 24, and Montana Secondary 246 Average Daily Traffic (ADT) Volumes

Roadway Section Description	Traffic Type	Section Length	ADT 2001	ADT 2002	ADT 2003	Vehicle Miles
U.S. Highway 2	All Vehicles	28.016	1185	1160	1825	51113
Junction S-537 to Glasgow City Limits	Commercial		149	149	171	4799
Montana Highway 24	All Vehicles	15.513	584	730	630	9782
Junction N-1 to Junction VIP Road	Commercial		73	73	68	1068
Junction N-1 to Opheim City Limits	All Vehicles					
	Commercial	33.449	210	224	248	8298

Roadway Section Description	Traffic Type	Section Length	ADT 2001	ADT 2002	ADT 2003	Vehicle Miles
			73	73	68	2306
Montana Secondary 246 Glasgow City Limits to Junction Local Road Near Tampico	All Vehicles	10.939	194	217	217	2374

Source: Montana Department of Transportation 2003

Construction of the VCWEP could potentially affect roadway traffic flow on public highways and roadways as the 230kV transmission line is built across each of the subject roadways. Therefore, it would be necessary for Wind Hunter to obtain encroachment permits or similar legal agreements from the public agencies responsible for each affected roadway. Such permits are needed for roads that would be crossed by the transmission line, as well as for the parallel roads where transmission line construction activities would require the use of the public right-of-way (e.g., temporary lane closures). These encroachment permits would be issued by the Montana Department of Transportation (MDOT), Glendive District, and Valley County.

Existing Rail Facilities

The Burlington Northern and Santa Fe Railway Company Railroad (Wolf Point-Havre-Shelby-Libby Main Line) crosses VCWEP area from east to west. This main line is a segment of one of Burlington Northern and Santa Fe Railway Company's principal east-west main lines, which connects the Midwest with the West Coast. The line is a major transcontinental rail freight trunk route. In addition, Amtrak's Empire Builder utilizes this route. The Amtrak Empire Builder route provides passenger train service. Running between Chicago, Illinois and Seattle, Washington, this route travels the Burlington Northern and Santa Fe Railway Hi-Line route and includes service to Glacier National Park.

Air Facility

This category includes public and private airports as identified from the U.S. Department of Transportation, Federal Aviation Administration, Billings Sectional Aeronautical Chart and the Montana Aeronautical Chart. In addition, private airstrips were inventoried. Other such air facilities may exist as part of ranching and farming operations within VCWEP area. Airports identified in VCWEP area include the public use Wokal

Field/Glasgow International Airport and the private use Glasgow Industrial Airport. The Wokal Field/Glasgow International Airport has two runways (Runway 12/30 and Runway 8/26). The dimensions of Runway 12/30 are 5,001 x 100 feet with a surface that consists of asphalt/aggregate friction seal coat. The dimensions of Runway 8/26 are 5,000 x 75 feet with a surface that consists of asphalt. The following operational statistics were obtained for this airport:

- Aircraft based on the field: 37 Aircraft operations: average 74/day
- Single engine airplanes: 31 49% transient general aviation
- Multi engine airplanes: 5 23% air taxi
- Helicopters: 1 23% local general aviation
  5% commercial
  <1% military

Big Sky Airlines operates 2 flights a day at the airport. The airport is located 1 mile northeast of Glasgow.

Glasgow Industrial Airport is also known as the Boeing Glasgow Flight Test Facility and is used for airliner flight testing. The facility is maintained and operated by Montana Aviation Research Company (MARCO), a subsidiary of the Boeing Company. The Glasgow Industrial Airport has one runway (Runway 10/28). The dimensions of Runway 10/28 are 13,500 x 300 feet with a surface that consists of concrete. The following operational statistics were obtained for this airport:

- Aircraft operations: 30/year
- 100% transient general aviation

This airport is located approximately 15 miles northeast of the City of Glasgow. Private airstrips within VCWEP area include Martin (four landing strips), Billingsley (one landing strip), and Etchart. Martin is located immediately southwest of Tampico, while Billingsley is located approximately seven miles northwest of the City of Glasgow. Etchart is located approximately two miles northwest of Tampico.

The nearest military operations areas (MOA) is the Hays MOA, located approximately 18 miles southwest of the City of Glasgow. The Hays MOA has an altitude of use of 300 feet above ground level (AGL). Altitudes indicate the floor of the MOA. Military Training Route (MTR) IR479 is located approximately 36 miles north of the City of Glasgow.

Statewide Transportation Improvement Program

The Montana Statewide Transportation Improvement Program (STIP) is produced regularly by MDOT to address Montana's transportation needs for upcoming fiscal years. VCWEP schedule shown in the STIP is tentative to the extent that projects in the

program are contingent upon funding availability, environmental review, design, and other factors. Projects included in the highways portion of the STIP are developed through MDOT District nominations which are then prioritized and ranked. The highways program is developed each year with knowledge of the anticipated level of federal and state funding for the fiscal years included in the STIP.

According the STIP 2004-2006, 2004 Aviation Projects call for land acquisition and pavement maintenance at the Wokal Field/Glasgow International Airport.

3.3.1.2 Wind Farm

Proposed Action – 500 MW Facility (Phases I, II, III, IV)

The wind farm site (Project site) is located in rural Valley County, approximately 30 miles north of the City of Glasgow. Currently,access to VCWEP site is from Britsch Road from the west and Kerr Road, from the east. The first segment of Kerr Road has been upgraded to an all-season gravel road. Kerr Road a Valley County road, is located in phases III and IV of VCWEP site and would be a designated transporter route to the site. Most of the improved public roads in the region are graded gravel county roads, with U.S. Highway 2, Montana Highway 24, and Montana Secondary 246 traversing the area. U.S. Highway 2 and Montana Highway 24 would also serve as transporter routes to VCWEP site.

Transporter routes are roads used to bring in equipment, materials, and manpower from outside of VCWEP area to VCWEP site. U.S. Highway 2 or Montana Highway 24 would provide the primary access to VCWEP site. Montana Highway 24 would provide access north to VCWEP site until it meets Kerr Road. The route would then proceed west on gravel-surfaced Kerr Road and continue on a newly constructed Valley County gravel-surfaced road, to VCWEP site. An internal road network wouldconnect the individual turbines.

A variety of transportation operations are necessary to support wind farm development. Table 3.3-2 summarizes representative transportation requirements for each type of development activity.

Table 3.3-2 Representative Transportation Requirements

Project Development Activity	Equipment/ Material	Transportation Requirements	Access Road Requirements	Special Requirements
Monitoring and Testing				
Meteorological towers		Heavy duty all-wheel-drive pickup trucks or medium-duty trucks. 1 to 2 trucks per tower.	Minimum-specification access road	None.
Construction				
Site and road Heavy earthmoving grading and equipment: bulldozers, preparation graders, excavators, front-end loaders, compactors, dump trucks		Heavy equipment typically transported to the site using combination trucks with flatbed or goose-neck trailers. Equipment requirements are site dependent. Typical construction may require 10 to 20 pieces of heavy equipment	Improved access road.	To be determined by transporter.
Road, pad, and gravel lay-down areas	Sand and	Delivered from on- or off-site sources in dump trucks. Quantity required is site dependent.	Improved access road.	To be determined by transporter
Tower foundations concrete, or aggregate, sand, cement, and water for an on-site batch plant	Premix	Premixed concrete could be delivered in approximately 10-yd3 trucks from off-site sources. Alternatively, raw material for an on-site concrete batch plant could be delivered by dump truck. Approximately 15 to 20 truck shipments per foundation	Improved access road.	To be determined by transporter.

Table 3.3-2 Representative Transportation Requirements (CONT.)

Project Development Activity	Equipment/ Material	Transportation Requirements	Access Road Requirements	Special Requirements
General	Water (potable, dust suppression, concrete batch plant)	Tens of thousand of gallons likely required per day. Water could be obtained from on-site wells or trucked from off-site sources. Off-site shipments typically in 4,000- to 5,000-gal tank trucks. Approximately 10 to 30 shipments per day.	Improved access road.	To be determined by transporter.
Wind turbine generator system components	Rotors, nacelle, Transformer, control units, tower sections	Wind turbine generator system design dependent. Depending on source, components may be transported by rail, or truck to the vicinity Components shipped to the site using combination trucks with flatbed or goose-neck trailers. Some shipments (e.g., rotors, nacelle) likely will be overweight and oversized. Typically 5 to 15 truckloads per wind turbine generator system of the site	Improved access road. Limited turning radius and grades due to size and weight. Bridges may need to be fortified and overhead obstructions (e.g., transmission lines) rerouted.	Overweight and/or oversized loads require specialized equipment and state-specific permits. Traffic management requires consideration (e.g., flaggers, escort vehicles, travel time restrictions
Wind turbine generator system assembly and installation	Cranes: 300- to 750-ton capacity main crane, 70-ton capacity assist crane, driveable assembly cranes	Required crane capacity dependent on wind turbine generator system design. A 300-ton main crane would require 15 to 20 truckloads, including several overweight oversized shipments. A 750-ton crane would require up to 50 truckloads, including overweight oversized shipments. Several smaller, drivable cranes required for main crane assembly and rotor assembly.	Same as wind turbine generator system components.	Same as wind turbine generator system components.

Table 3.3-2 Representative Transportation Requirements (CONT.)

Project Development Activity	Equipment/ Material	Transportation Requirements	Access Road Requirements	Special Requirements
Wind turbine generator system interconnections and transmission lines	Trenching or augering equipments, line trucks	Wind turbine generator system design dependent.	Improved access road.	To be determined by transporter.
Operation and Maintenance	Operation and maintenance personnel	Pickup or medium-duty trucks.	Minimum-specification access road.	None.
Decommissioning				
Foundation removal, site regarding, re contouring	Heavy earthmoving equipment: bulldozers, graders, excavators, front-end loaders, dump trucks	Heavy equipment typically transported to the site using combination trucks with flatbed or goose-neck trailers.	Improved access road.	To be determined by transporter.
Wind turbine generator system and tower Disassembly	Cranes: 300- to 750-ton capacity main crane, 70-ton capacity assist crane	Similar to assembly requirements. Required crane capacity may be less than that required for initial assembly, depending upon the method used during decommissioning.	Similar to wind turbine generator system components	Similar to wind turbine generator system components.
Equipment, debris removal	Medium- and heavy- duty trucks	Debris, dismantled equipment would be shipped for recycling, reuse, or or disposal. Level of activity would be site and design dependent.	Improved access road.	None.

The majority of transportation operations would involve material and equipment moved to the site during the construction phase. The types of heavy equipment required would include bulldozers, graders, excavators, front-end loaders, compactors, and dump trucks. Equipment would be moved to the site by flatbed combination truck and would remain on site through the duration of construction activities. Construction materials hauled to the site would include gravel, sand, and water, which are available locally. Ready-mix concrete might also be transported to VCWEP site, if available.

Some of the turbine components would be extremely long (e.g., blades) or heavy (e.g., the nacelle containing all drive-train components except the rotor). The size and weight of these components would dictate the specifications for site access roads, for required ROWs, turning radii, and fortified bridges. It is estimated that each wind turbine generator would require between 5 and 15 truck shipments of components, some of which could be oversized or overweight.

Erecting the towers and assembly of the wind turbine generators would require a main crane with a capacity likely to be between 300 and 750 tons, depending on the design. A 330-ton main crane would require 15 to 20 truckloads, including several overweight shipments. A 750-ton crane would require up to 50 truckloads, including overweight/oversized shipments. In addition, main crane assembly would require a smaller assist crane, and several assist cranes would likely be required for rotor/hub assembly. Cranes would remain on site for the duration of construction activities.

Typically, the transport company will develop a transportation plan based on specific object sizes, weights, origin, destination, and unique handling requirements.

Overweight permits usually are issued with specific dates during which transport is prohibited. These dates are state specific but tend to eliminate periods during the spring when frozen ground is thawing. Over-dimension permits are likely to have travel time limits in congested areas, limiting movement to non-rush-hours periods.

Depending on the origin and destination sites, shipments of components and main cranes could be made by truck or rail. If rail was utilized, the cargo would require unloading at the nearest transfer point (City of Glasgow) followed by overland transportation to the site by truck.

During operations, larger sites may be attended during business hours by a small maintenance crew of six individuals or fewer. Consequently, transportation activities would be limited to a small number of daily trips by pickup trucks or medium-duty vehicles. It is possible that large components may be required for equipment replacement in the event of a major mechanical breakdown. However, such shipments would be expected to be infrequent.

With some exceptions, transportation activities during site decommissioning would be similar to those during site development and construction. Heavy equipment and cranes would be required for turbine and tower dismantlement, breaking up tower foundations, and regrading and re-contouring the site to the original grade. With the possible exception

of a main crane, oversized and/or overweight shipments are not expected during decommissioning activities because the major turbine components can be disassembled, segmented, or size-reduced prior to shipment.

A general air navigation concern is associated with tall structures. Therefore, there could be siting concerns relative to the locations of airports and flight patterns and air space associated with the airports because of the turbines and meteorological tower. The FAA would have to be contacted for any proposed construction or alteration of objects that may affect navigable airspace within any of the following categories:

- Proposed objects more than 200 feet above ground level at the structure's proposed location;
- Within 20,000 feet of an airport or seaplane base that has at least one runway longer than 3,200 feet and the proposed object would exceed a slope of 100:1 horizontally from the closest point of the nearest runway;
- Within 10,000 feet of an airport or seaplane base that does not have a runway more than 3,200 feet in length, and the proposed object would exceed a 50:1 horizontal slope from the closest point of the nearest runway; and/or
- Within 5,000 feet of a heliport and the proposed object would exceed a 25:1 horizontal slope from the nearest landing and takeoff area of that heliport.

The FAA could recommend marking and/or lighting a structure that does not exceed 200 feet above ground level, or that is not within the distances from airports or heliports mentioned above, because of its particular location.

Navigation concerns also exist where tall structures are located within military airspace, referred to as military operations areas (MOAs), or military training routes (MTRs). A MOA is airspace designated for military training activities, including aerobatics, air combat tactics, formation training, and other activities. A MTR is made up of a series of linked segments of airspace within which various training activities are conducted. Although not required to, military aircraft typically fly a MTR along a defined centerline that governs the plane's height and course. The floor and ceiling for both MOA and MTR airspace are defined and, in either type of space, and floor may extend all the way down to the earth's surface. As a result, wind turbines can intrude upon these airspaces if not located properly.

Alternative A – 150 MW Facility (Phases I and II)

Alternative A is similar to the Proposed Action except there would be a lesser number (238) of turbines and access roads.

Alternative B – 300 MW Facility (Phases I, II and III)

Alternative B is similar to the Proposed Action except there would be a lesser number (134) of turbines and access roads.

Kerr Road, a Valley County maintained road, is located in phase III of VCWEP site.

3.3.1.3 230kV Transmission Line

The roadway network that could potentially be affected by the Proposed Action and Alternatives includes highways and roads that are crossed or are paralleled to the proposed and alternative transmission line corridors. There are a number of roadways that could be directly or indirectly affected by construction of the Proposed Action and Alternatives and are listed below.

Alternative Route C – East Central Route (Proposed Action)

Paved and improved roadways crossed or paralled by Alternative Route C (Proposed Action) are presented in Table 3.3-3

Table 3.3-3 Paved and Improved Roadways Crossed or Paralled by Alternative Route C (Proposed Action)

Roadway	Jurisdiction	Physical Relationship to VCWEP. or Alternatives	Link
U.S. Highway 2	Montana Department of Transportation	Parallels from milepost 14.9 to milepost 16.5 and from milepost 16.6 to 17.6 Crosses from milepost 0.0 to milepost 0.1	11 22
Montana Secondary 246	Montana Department of Transportation	Crosses from milepost 3.0 to milepost 3.2	22
Billingsley Road	Valley County	Crosses from milepost 4.9 to milepost 5.0 Parallels from milepost 5.0 to milepost 6.0	22 22
Riverside Drive	Valley County	Crosses from milepost 1.6 to milepost 1.7	22
Cut Across Road	Valley County	Crosses from milepost 16.5 to milepost 16.6	11

Alternative Route C crosses the Burlington Northern and Santa Fe Railway Railroad at Link 22 from milepost 3.1 to milepost 3.2-

Alternative Route A – Highway 24 Route

Paved and improved roadways crossed or paralled by Alternative Route A are presented in Table 3.3-4.

Table 3.3-4 Paved and Improved Roadways Crossed or Paralled by Alternative Route A

Roadway	Jurisdiction	Physical Relationship to Proposed Action or Alternatives	Link
U.S. Highway 2	Montana Department of Transportation	Crosses from milepost 1.9 to milepost 2.0	23
Montana Secondary 246	Montana Department of Transportation	Crosses from milepost 1.7 to milepost 1.8	24
Billingsley Road	Valley County	Parallels from milepost 1.8 to milepost 4.2 Crosses from milepost 4.2 to milepost 4.3	24 24
Jensen Trail	Valley County	Crosses from milepost 26.8 to milepost 26.9 Parallels from milepost 0.0 to milepost 1.2 Crosses from milepost 1.2 to milepost 1.3	5 23 23
Cut Across Road	Valley County	Crosses from milepost 22.4 to milepost 22.5	5
Shipp Road	Valley County	Crosses from milepost 15.4 to	5

		milepost 15.5	
Johnson Road	Valley County	Crosses from milepost 24.7 to milepost 24.8	5
Skylark Road	Valley County	Crosses from milepost 25.1 to milepost 25.2	5
Unnamed Road	Valley County	Crosses from milepost 4.3 to milepost 6.1	24

Alternative Route A crosses the Burlington Northern and Santa Fe Railway Railroad at Link 24 from milepost 1.7 to milepost 1.8.

Alternative Route B – Jensen Trail Route

Paved and improved roadways crossed or paralled by Alternative Route B are presented in Table 3.3-5.

Table 3.3-5 Paved and Improved Roadways Crossed or Paralled by Alternative Route B

Roadway	Jurisdiction	Physical Relationship to Proposed Action or Alternatives	Link
U.S. Highway 2	Montana Department of Transportation	Crosses from milepost 1.9 to milepost 2.0	23
Montana Secondary 246	Montana Department of Transportation	Crosses from milepost 1.7 to milepost 1.8	24
Billingsley Road	Valley County	Parallels from milepost 1.8 to milepost 4.2 Crosses from milepost 4.2 to milepost 4.3	24 24
Jensen Trail	Valley County	Parallels from milepost 10.5 to milepost 16.2 and	10

		from milepost 16.3 to milepost 17.2 Parallels from milepost 0.0 to milepost 1.0 Parallels from milepost 0.0 to milepost 1.2 Crosses from milepost 1.2 to milepost 1.3	23 23
Cut Across Road	Valley County	Crosses from milepost 16.2 to milepost 16.3	10
Unnamed Road	Valley County	Crosses from milepost 4.3 to milepost 6.1	24

Alternative Route B crosses the Burlington Northern and Santa Fe Railway Railroad at Link 24 from milepost 1.7 to milepost 1.8Alternative Route D – Britsch Road Route

Paved and improved roadways crossed or paralled by Alternative Route D are presented in Table 3.3-5.

Table 3.3-5 Paved and Improved Roadways Crossed or Paralled by Alternative Route D

Roadway	**Jurisdiction**	**Physical Relationship to Proposed Action or Alternatives**	**Link**
U.S. Highway 2	Montana Department of Transportation	Crosses from milepost 3.0 to milepost 3.1	14
Britsch Road	Valley County	Parallels from milepost 0.0 to milepost 7.7 Parallels from milepost 0.0 to milepost 0.8 Crosses from milepost 0.8 to milepost 0.9 Parallels from	2 9 9

		milepost 0.9 to milepost 6.5 Crosses from milepost 6.5 to milepost 6.6 Parallels from milepost 6.6 to milepost 10.8 Parallels from milepost 0.0 to milepost 3.0	9 9 14
Vandalia Road	Valley County	Parallels from milepost 3.1 to milepost 4.9	14
Valley View Trail	Valley County	Crosses from milepost 1.3 to milepost 1.4	16
Billingsley Road	Valley County	Crosses from milepost 1.1 to milepost 1.2 Parallels from milepost 1.2 to milepost 1.3	25 25

Alternative Route D crosses the Burlington Northern and Santa Fe Railway Railroad at Link 16 from milepost 1.6 to milepost 1.7.

Alternative Route E – West Central Route

Paved and improved roadways crossed or paralled by Alternative Route E are presented in Table 3.3-6.

Table 3.3-6 – Paved and Improved Roadways Crossed and Paralled by Alternative Route E

Roadway	Jurisdiction	Physical Relationship to Proposed Action or Alternatives	Link
U.S. Highway 2	Montana Department of Transportation	Crosses from milepost 5.3 to milepost 5.5	12
Tampico – Vandalia Road	Valley County	Crosses from milepost 0.0 to milepost 0.1	17
Caine Road	Valley County	Crosses from milepost 7.6 to	12

		milepost 7.7	
Billingsley Road	Valley County	Crosses from milepost 1.1 to milepost 1.2 Parallels from milepost 1.2 to milepost 1.3	25 25

Alternative Route E crosses the Burlington Northern and Santa Fe Railway Railroad at Link 17 from milepost 0.0 to milepost 0.1.

3.3.1.4 Antelope Creek Substation

The Antelope Creek Substation is served by Billingsley Road, a two-lane graveled and graded county road. Traffic volumes are within the capacity of this road.

3.3.2 Environmental Consequences and Mitigation Measures

This section discusses potential land use impacts that could occur as a result of the construction, operation, and maintenance of the VCWEP and Alternatives. Where transportation impacts were identified, an evaluation was conducted to determine if one or more mitigation measures to reduce impacts would be effective in avoiding or reducing (e.g., intensity and/or duration) the potential impact.

3.3-2.1 Assessment Methodology

Introduction

Impacts can be beneficial (positive) or adverse (negative), and can result from VCWEP action directly or indirectly. Impacts can be permanent, long lasting (long-term) or temporary (short-term). Long-term impacts are defined as those that would substantially remain for the life of the Vor beyond. Short-term impacts are defined as those changes to the environment during construction that generally would revert to pre-construction condition at or within a few years of the end of construction. Impacts can vary in significance from no change or only slightly discernible change, to a full modification of the environment.

Impact Types

The various types of transportation impacts that could occur were defined as follows:

- Transportation impacts associated with VCWEP would be considered **high** if modification of aircraft operations and air navigation occurred. They would also be considered **high** if damage to state highways or county roads occurred, or if normal use of the state and county roads in VCWEP vicinity were halted or

impaired for considerable periods each day during project construction or operation.

- Transportation impacts would be considered **moderate** if some minor damage to state highways or county roads occurred, or if normal use of the state and county roads in VCWEP vicinity were halted or impaired for relatively short periods during Project construction or operation.

- Transportation impacts would be considered **low** if no damage to state highways or county roads occurred, or if normal use of the state and county roads in VCWEP vicinity were temporarily halted or impaired for very brief periods during Project construction or operation.

Mitigation Measures

A variety of mitigation measures may be implemented to reduce potential impacts to transportation. In addition to generic mitigation measures, selectively committed mitigation measures were applied on a case-by case basis when appropriate. Selectively committed mitigation measures utilized to minimize potential impacts to transportation include:

S6: To reduce visual impacts, potential impacts on recreation values and safety, at highway, canyon, and trail crossings, towers will be placed at the maximum feasible distance from the crossing within limits of standard tower design.

S18: VCWEP will comply with all appropriate regulations of the Federal Aviation Administration (FAA), and a Notice of Proposed Construction or Alteration form (Form 7460-1) would be required of Wind Hunter pursuant to Federal Aviation Regulations, Part 77. Final locations, structures, and structure heights, including wind turbines, transmission lines, meteorological towers, and construction equipment that might impact air navigation such as cranes used to assemble the towers, would be submitted to the FAA for VCWEP. The form would be sent to the manager of the FAA Regional Air Traffic Division Office having jurisdiction over the area where the planned construction would be located. If acceptable to the FAA, white lights will be utilized on turbines and towers to minimize the risk of avian collisions. Coordination with the Department of Defense will be conducted regarding the location and potential effects of VCWEP upon operations in military airspace. The owner/operator of private airports and airstrips potentially affected by VCWEP will also be contacted.

S38: Landowners will be consulted to determine which aerial applicators cover agricultural lands within the vicinity of the wind farm and approved transmission line corridor. Written notification will be provided to aerial applicators when meteorological towers, wind turbines and the 230kV transmission line and towers will be erected. Aerial applicators will also be provided with maps clearly showing the location of the meteorological towers, wind turbines and the 230kV transmission line and towers.

S40: Existing roads will be used to the maximum extent possible, but only if in safe and environmentally sound locations. New access roads will be designed and constructed to

the appropriate standard no higher than necessary to accommodate their intended functions (e.g., traffic volume and weight of vehicles). Abandoned roads and roads that are no longer needed will be re-contoured and re-vegetated.

S41: Prior to the start of construction, a traffic management plan to MDOT, Glendive District and Valley County will be submitted. The plan would direct and obligate the contractor to implement procedures that would minimize traffic impacts. Routing of construction traffic will be coordinated with MDOT and the Valley County Road Administrator.

S42: Oversize or overweight vehicles will comply with applicable state and county requirements, as permitted or required by MDOT and Valley County.

S43: Notice to landowners will be provided when construction takes place to help minimize access disruptions.

S44: Proper road signs and warnings will be used.

S45: When slow or oversized wide loads are in transit to and from work areas, advance signs and traffic diversion equipment will be used to improve traffic safety. Pilot cars will be used as MDOT dictates depending on load size and weight. Permits would be obtained for these oversized or overweight as required by MDOT and Valley County.

S46: Carpooling for the construction workforce to reduce traffic volume will be encouraged.

S47: In consultation with MDOT and Valley County, detour plans and warning signs in advance of any traffic disturbances will be provided.

S48: Flaggers would be employed as necessary to direct traffic when large equipment is exiting or entering public roads to minimize risk of accidents.

S49: Project personnel and contractors would be instructed and required to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions, to ensure sage and efficient traffic flow.

S50: During construction and operation, traffic would be restricted to the roads developed for VCWEP. Use of other unimproved roads should be restricted to emergency situations.

S51: Following construction, or during construction as necessary to maintain safe driving conditions, any damage to existing roadways caused by construction vehicles would be adequately repaired. Repairs will be coordinated with MDOT or Valley County.

S52: Prior to construction of the 230kV transmission line and prior to subsequent maintenance or removal which would require excavation or earth moving activity on Burlington Northern Santa Fe Railway property, Burlington Northern Santa Fe Railway's

Communication Network Control Center will be telephoned to assist in determining if fiber optic, communications, control systems or other types of cable are buried anywhere on the premises; and if so, Wind Hunter would contact the telecommunications company(ies) involved and make arrangements with the same for protection of the fiber optic cable prior to beginning any work on Burlington Northern Santa Fe Railway property.

In addition, if the construction, operation, maintenance, repair or removal of the 230kV transmission line would at any time cause interference, including but not limited to physical interference from electromagnetic induction, electrostatic induction, or from stray or other currents, with the operation, maintenance or use by Burlington Northern Santa Fe Railway of its right-of-way, tracks, structures, pole lines, signal or communication lines, radio or other equipment, devices or other property appurtenances thereto, or of any existing lessee or licensee of Burlington Northern Santa Fe Railway, changes will immediately be made in VCWEP and such protective devices furnished to Burlington Northern Santa Fe Railway and its existing lessees or licensees as would be necessary in the judgment of representatives of Burlington Northern Santa Fe Railway to eliminate such interference. The cost of such protective devices and their installation would be borne by Wind Hunter. If any of the interference covered would be, in the judgment of Burlington Northern Santa Fe Railway, of such importance to the safety of Burlington Northern Santa Fe Railway's operations as to require it, Wind Hunter, upon notice by Burlington Northern Santa Fe Railway, would immediately take such interim protective measures as Burlington Northern Santa Fe Railway may deem advisable until the protective devices required have been installed, put in operation, tested and found to be satisfactory to correct the interference. Project design and construction would comply with all applicable regulations associated with railways in VCWEP area.

3.3.2-2 Wind Farm

Proposed Action – 500 MW Facility (Phases I, II, III, IV)

Depending on the design, some of the turbine components could be extremely long (e.g., blades) or heavy (e.g., the nacelle containing all drive-train components except the rotor) and, therefore, require permitting as oversized loads. In addition, it is likely that the main cranes required for tower and turbine assembly would require a certain number of oversized and/or overweight shipments. Similar equipment and material would require transportation during site decommissioning.

Monitoring and Testing Impacts

During site monitoring and testing, transportation activities would be largely limited to very low volumes of heavy-duty all-wheel-drive pickup trucks or medium-duty trucks. It is likely that existing access roads would suffice, thus no special requirements or substantial impacts are anticipated.

Construction Impacts

Transportation impacts associated with the 6- to 8-month Project construction period for each of phases I, II, III, and IV are anticipated to be low. Equipment and components

would be transported to VCWEP site via trucks, by a contract company or the manufacturer. The movement of equipment and materials to the site during construction would cause a relatively short-term increase in the level of service of state and local roadways during the various construction periods. Most equipment (e.g., heavy earthmoving equipment and cranes) would remain at VCWEP site for the duration of construction activities. Shipments of materials, such as gravel, concrete, and water, would not be expected to considerably affect local primary and secondary road networks.

Shipments of overweight and/or oversized loads can be expected to cause temporary disruption on the secondary and primary roads used to access a construction site. It is possible that state and local roads might require fortification of bridges and removal of obstructions to accommodate overweight or oversized shipments. Moreover, access roads must be constructed to accommodate such shipments. Because of the anticipated weight of the turbine components and electrical transformers that would be brought to the site, maximum grade becomes a critical road design parameter. While straight-line access roads would obviously minimize distance and cost, the combination of turning clearance requirements and maximum grade can be expected to result in access roads climbing a hill along a serpentine path.

During construction, parking would be located at the site of the Operations and Maintenance (O&M) facility and along the site access roads. The O&M facility site would also serve as a construction staging area. Personnel working on turbine foundations, electrical infrastructure, and turbine erection would park along turbine string roads. It is anticipated that roughly half of all construction worker vehicles would be parked at the O&M facility location, and the other half would be dispersed across the various turbine strings.

Diesel fuel is the only potentially hazardous material that would be used in any significant quantity during construction of the wind farm. During construction, fuel tanker trucks would be used for the refueling of fuel storage tanks on-site. The fuel tanker trucks will be properly licensed and professionally driven and will incorporate appropriate design features such as overflow prevention devices and fixed couplings to prevent accidental spills. Operating procedures to prevent and contain any accidental spills resulting from fuel transportation and transfer are described in Section 3.13, *Health and Safety*. Construction would not result in the generation of any hazardous wastes in quantities regulated by state or federal law.

Potentially small amounts of other hazardous materials that would be transported to the site during construction include lubricating oils, cleaners, and he herbicides. Transportation of these materials will be conducted in a manner that is protective of human health and the environment and in accordance with applicable federal and MDOT requirements. The transportation of this material would be the same for all three scenarios.

Operation and Maintenance Impacts

Transportation impacts during operation and maintenance are anticipated to be low. During operations, sites may be attended during business hours by a small maintenance

crew of six individuals or fewer. Consequently, transportation activities would be limited to a small number of daily trips by pickup trucks or medium-duty vehicles. It is possible that large components may be required for equipment replacement in the event of a major mechanical breakdown. However, such shipments would be expected to be infrequent. Transportation activities during operations would not be expected to cause noticeable impacts to state and local road networks. An indirect effect could result from increased traffic on Montana Highway 24 associated with sightseers curious about the wind Project, but this cannot be predicted.

During the operational phase, parking would be at the O&M facility parking lot. With an anticipated operations workforce of 12 to 20 people, plus occasional guests and visitors, delivery vehicles, etc., no more than 30 vehicles are expected to be parked at the facility at any one time. This would be a smaller area than that required for the construction phase. The permanent parking area at the O&M facility will be graveled to reduce dust and soil erosion.

Hazardous materials to be transported to the site during operation include lubricating and mineral oils, cleaners, and herbicides in quantities below state and federal regulatory thresholds. Transportation of these materials will be conducted in a manner that is protective of human health and the environment and in accordance with applicable federal and MDOT requirements.

No substantial quantities of industrial materials will be brought onto or removed from VCWEP site during project operations. The only materials that would be brought onto the site would be those related to maintenance and/or replacement of VCWEP facilities (e.g., nacelle or turbine components, electrical equipment). The only materials that would be removed from project facilities would be those parts or materials replaced during maintenance activities. Those materials removed or replaced would not constitute a significant amount. There would be no difference between the three scenarios.

Traffic generated by the operation of the wind farm is not anticipated to affect the accident rate or pattern on roadways that are part of the transporter routes. The wind farm would not alter public roadways except for VCWEP site access.

The installation of wind turbines on the site may impact air navigation. Potential aviation hazards would be specifically associated with the proposed turbine and meteorological towers. To provide adequate air traffic safety, the wind turbines will meet FAA safety lighting requirements. The exact number of turbines that would require lighting will be specified by the FAA after it has reviewed final project plans.

Decommissioning Impacts

With some exceptions, transportation activities during site decommissioning would be similar to those during site development and construction. Heavy equipment and cranes would be required for turbine and tower dismantlement, breaking up tower foundations, and regarding and re-contouring the site to the original grade. With the possible exception of a main crane, oversized and/or overweight shipments are not expected during decommissioning activities because the major turbine components could be

disassembled, segmented, or size-reduced prior to shipment. Thus, potential disruptions to local traffic during decommissioning would be expected to be fewer than those during original construction activities.

Other types of direct transportation impacts include the potential for motorist accidents. For VCWEP and Alternatives, the primary concern is the potential transportation-related impacts attributable to vehicle trips (both trucks and automobiles). These trips would be associated with construction, operations and maintenance, and decommissioning of the various Project elements.

Mitigation Measures

The duration and extent of wind farm impacts can be reduced through implementation of Mitigation Measures **S18**, **S38**, **S40, S41**, **S42**, **S43**, **S44**, **S45**, **S46**, **S47**, **S48**, **S49**, **S50**, and **S51**.

S18: VCWEP will comply with all appropriate regulations of the Federal Aviation Administration (FAA), and a Notice of Proposed Construction or Alteration form (Form 7460-1) would be required of Wind Hunter pursuant to Federal Aviation Regulations, Part 77. Final locations, structures, and structure heights, including wind turbines, transmission lines, meteorological towers, and construction equipment that might impact air navigation such as cranes used to assemble the towers, would be submitted to the FAA for VCWEP. The form would be sent to the manager of the FAA Regional Air Traffic Division Office having jurisdiction over the area where the planned construction would be located. If acceptable to the FAA, white lights will be utilized on turbines and towers to minimize the risk of avian collisions. Coordination with the Department of Defense will be conducted regarding the location and potential effects of VCWEP upon operations in military airspace. The owner/operator of private airports and airstrips potentially affected by VCWEP will also be contacted.

S38: Landowners will be consulted to determine which aerial applicators cover agricultural lands within the vicinity of the wind farm and approved transmission line route. Written notification will be provided to aerial applicators when meteorological towers, wind turbines and the 230kV transmission line and towers will be erected. Aerial applicators will also be provided with maps clearly showing the location of the meteorological tower structures, wind turbines and the 230kV transmission line and tower structures.

S38 requires notification to aerial applicators of new meteorological towers, wind turbines and the 230kV transmission line. However, while this measure would likely reduce the level of impact, the safety hazard to aerial applicators would remain high.

S40: Existing roads will be used to the maximum extent possible, but only if in safe and environmentally sound locations. New access roads will be designed and constructed to the appropriate standard no higher than necessary to accommodate their intended functions (e.g., traffic volume and weight of vehicles). Abandoned roads and roads that are no longer needed will be re-contoured and re-vegetated.

S41: Prior to the start of construction, a traffic management plan to MDOT, Glendive District and Valley County will be submitted. The plan would direct and obligate the contractor to implement procedures that would minimize traffic impacts. Routing of construction traffic will be coordinated with MDOT and the Valley County Road Administrator.

S42: Oversize or overweight vehicles will comply with applicable state and county requirements, as permitted or required by MDOT and Valley County.

S43: Notice to landowners will be provided when construction takes place to help minimize access disruptions.

S44: Proper road signs and warnings will be used.

S45: When slow or oversized wide loads are in transit to and from work areas, advance signs and traffic diversion equipment will be used to improve traffic safety. Pilot cars will be used as MDOT dictates depending on load size and weight. Permits would be obtained for these oversized or overweight as required by MDOT and Valley County.

S46: Carpooling for the construction workforce to reduce traffic volume will be encouraged.

S47: In consultation with MDOT and Valley County, detour plans and warning signs in adva

S48: Flaggers would be employed as necessary to direct traffic when large equipment is exiting or entering public roads to minimize risk of accidents.

S49: Project personnel and contractors would be instructed and required to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions, to ensure sage and efficient traffic flow.

S50: During construction and operation, traffic would be restricted to the roads developed for VCWEP. Use of other unimproved roads should be restricted to emergency situations.

S51: Following construction, or during construction as necessary to maintain safe driving conditions, any damage to existing roadways caused by construction vehicles would be adequately repaired. Repairs will be coordinated with MDOT or Valley County.

Alternative A – 150 MW Facility (Phases I and II)

Alternative A is similar to the Proposed Action except there would be a lesser number (238) of turbines and access roads. This would result in less movement of equipment and materials to the site during construction periods and subsequently less impacts to state and local road networks.

Mitigation Measures

The duration and extent of wind farm impacts can be reduced through implementation of Mitigation Measures **S18**, **S38**, **S40, S41**, **S42**, **S43**, **S44**, **S45**, **S46**, **S47**, **S48**, **S49**, **S50**, and **S51**.

S18: VCWEP will comply with all appropriate regulations of the Federal Aviation Administration (FAA), and a Notice of Proposed Construction or Alteration form (Form 7460-1) would be required of Wind Hunter pursuant to Federal Aviation Regulations, Part 77. Final locations, structures, and structure heights, including wind turbines, transmission lines, meteorological towers, and construction equipment that might impact air navigation such as cranes used to assemble the towers, would be submitted to the FAA for VCWEP. The form would be sent to the manager of the FAA Regional Air Traffic Division Office having jurisdiction over the area where the planned construction would be located. If acceptable to the FAA, white lights will be utilized on turbines and towers to minimize the risk of avian collisions. Coordination with the Department of Defense will be conducted regarding the location and potential effects of VCWEP upon operations in military airspace. The owner/operator of private airports and airstrips potentially affected by VCWEP will also be contacted.

S38: Landowners will be consulted to determine which aerial applicators cover agricultural lands within the vicinity of the wind farm and approved transmission line route. Written notification will be provided to aerial applicators when meteorological towers, wind turbines and the 230kV transmission line and towers will be erected. Aerial applicators will also be provided with maps clearly showing the location of the meteorological tower structures, wind turbines and the 230kV transmission line and tower structures.

S38 requires notification to aerial applicators of new meteorological towers, wind turbines and the 230kV transmission line. However, while this measure would likely reduce the level of impact, the safety hazard to aerial applicators would remain high.

S40: Existing roads will be used to the maximum extent possible, but only if in safe and environmentally sound locations. New access roads will be designed and constructed to the appropriate standard no higher than necessary to accommodate their intended functions (e.g., traffic volume and weight of vehicles). Abandoned roads and roads that are no longer needed will be re-contoured and re-vegetated.

S41: Prior to the start of construction, a traffic management plan to MDOT, Glendive District and Valley County will be submitted. The plan would direct and obligate the contractor to implement procedures that would minimize traffic impacts. Routing of construction traffic will be coordinated with MDOT and the Valley County Road Administrator.

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S43: Notice to landowners will be provided when construction takes place to help minimize access disruptions.

S44: Proper road signs and warnings will be used.

S45: When slow or oversized wide loads are in transit to and from work areas, advance signs and traffic diversion equipment will be used to improve traffic safety. Pilot cars will be used as MDOT dictates depending on load size and weight. Permits would be obtained for these oversized or overweight as required by MDOT and Valley County.

S46: Carpooling for the construction workforce to reduce traffic volume will be encouraged.

S47: In consultation with MDOT and Valley County, detour plans and warning signs in advance of any traffic disturbances will be provided.

S48: Flaggers would be employed as necessary to direct traffic when large equipment is exi

S49: Project personnel and contractors would be instructed and required to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions, to ensure sage and efficient traffic flow.

S50: During construction and operation, traffic would be restricted to the roads developed for VCWEP. Use of other unimproved roads should be restricted to emergency situations.

S51: Following construction, or during construction as necessary to maintain safe driving conditions, any damage to existing roadways caused by construction vehicles would be adequately repaired. Repairs will be coordinated with MDOT or Valley County.

Alternative B – 300 MW Facility (Phases I, II and III)

Alternative B is similar to the Proposed Action except there would be a lesser number (134) of turbines and access roads. This would result in less movement of equipment and materials to the site during construction periods and subsequently less impacts to state and local road networks.

Mitigation Measures

The duration and extent of wind farm impacts can be reduced through implementation of Mitigation Measures **S18**, **S38**, **S40, S41**, **S42**, **S43**, **S44**, **S45**, **S46**, **S47**, **S48**, **S49**, **S50**, and **S51**.

S18: VCWEP will comply with all appropriate regulations of the Federal Aviation Administration (FAA), and a Notice of Proposed Construction or Alteration form (Form 7460-1) would be required of Wind Hunter pursuant to Federal Aviation Regulations, Part 77. Final locations, structures, and structure heights, including wind turbines, transmission lines, meteorological towers, and construction equipment that might impact

air navigation such as cranes used to assemble the towers, would be submitted to the FAA for VCWEP. The form would be sent to the manager of the FAA Regional Air Traffic Division Office having jurisdiction over the area where the planned construction would be located. If acceptable to the FAA, white lights will be utilized on turbines and towers to minimize the risk of avian collisions. Coordination with the Department of Defense will be conducted regarding the location and potential effects of VCWEP upon operations in military airspace. The owner/operator of private airports and airstrips potentially affected by VCWEP will also be contacted.

S38: Landowners will be consulted to determine which aerial applicators cover agricultural lands within the vicinity of the wind farm and approved transmission line route. Written notification will be provided to aerial applicators when meteorological towers, wind turbines and the 230kV transmission line and towers will be erected. Aerial applicators will also be provided with maps clearly showing the location of the meteorological tower structures, wind turbines and the 230kV transmission line and tower structures.

S38 requires notification to aerial applicators of new meteorological towers, wind turbines and the 230kV transmission line. However, while this measure would likely reduce the level of impact, the safety hazard to aerial applicators would remain high.

S40: Existing roads will be used to the maximum extent possible, but only if in safe and environmentally sound locations. New access roads will be designed and constructed to the appropriate standard no higher than necessary to accommodate their intended functions (e.g., traffic volume and weight of vehicles). Abandoned roads and roads that are no longer needed will be re-contoured and re-vegetated.

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S43: Notice to landowners will be provided when construction takes place to help minimize access disruptions.

S44: Proper road signs and warnings will be used.

S45: When slow or oversized wide loads are in transit to and from work areas, advance signs and traffic diversion equipment will be used to improve traffic safety. Pilot cars will be used as MDOT dictates depending on load size and weight. Permits would be obtained for these oversized or overweight as required by MDOT and Valley County.

S46: Carpooling for the construction workforce to reduce traffic volume will be encouraged.

S47: In consultation with MDOT and Valley County, detour plans and warning signs in advance of any traffic disturbances will be provided.

S48: Flaggers would be employed as necessary to direct traffic when large equipment is exiting or entering public roads to minimize risk of accidents.

S49: Project personnel and contractors would be instructed and required to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions, to ensure sage and efficient traffic flow.

S50: During construction and operation, traffic would be restricted to the roads developed for VCWEP. Use of other unimproved roads should be restricted to emergency situations.

S51: Following construction, or during construction as necessary to maintain safe driving conditions, any damage to existing roadways caused by construction vehicles would be adequately repaired. Repairs will be coordinated with MDOT or Valley County.

3.3.2-3 230kV Transmission Line

A transmission line is inherently more likely to affect transportation facilities (roadways during construction than during operation, because there is typically only a minimal amount of surface activity required to operate a transmission line after construction is completed. The following section presents potential impacts associated with the Proposed Action and Alternatives, followed by a description of the mitigation measures that would be used to alleviate the adverse impacts.

Project Impacts

Direct and indirect impacts could include increases in traffic, detours along some roads, and disrupted access to driveways. Construction of the transmission line is not expected to cause major traffic delays or road closures. Minor traffic delays or interference with the highway system would most likely result from construction activities. Transmission line construction techniques should not require temporary closure of main highways. Users of smaller roads may experience minor delays. Wind Hunter would work closely with MDOT and Valley County so that crossings are properly posted and detours provided where necessary.

Impacts associated with VCWEP would be short term and related to the movement of personnel and equipment during construction of the transmission line. Traffic associated with operations would be a limited number of daily vehicle trips during routine inspection and maintenance activities. Transmission line inspection and maintenance traffic would occur infrequently, and would not involve large numbers of vehicles or workers.

VCWEP would utilize public rights-of-way (roads, streets, or highways) in some locations. According to Montana Code Annotated 2003 69-4-101, use of public right-of-

way for utility lines and facilities allows for this. This use is allowed where the location of such facilities does not endanger the public.

The specific impacts and mitigation measures discussed below have been identified for VCWEP. Although specific roadways used and the number of construction vehicle trips may vary slightly for VCWEP, the impacts and mitigation measures identified below also apply to the routing alignment options unless otherwise noted.

1) **Increased Traffic Levels**. Construction of VCWEP would cause increased traffic levels on roadways used to transport equipment, materials, and personnel to construction areas. Peak-level construction traffic could increase the number of vehicle trips per day on roadways used for personnel access and equipment/materials delivery to worksites. Depending on location, construction personnel would likely access worksites using primary roadways in VCWEP area including U.S. Highway 2, Montana Highway 24, Montana Secondary 246 and secondary roadways. From these roadways, construction traffic would use either existing or newly constructed access roads to access construction areas. Because of the limited traffic volumes on all roadways and the low number of construction-related trips that would be necessary each day, traffic associated with construction would not be substantial. Personnel trips and equipment movement necessary for operation of the transmission line would be minimal and transmission line monitoring would be limited to one or two vehicles at any one time. As such, impacts are not considered to be high, and no mitigation is proposed.

2) **Proximity to Public Roadways.** There are two ways that transmission line construction activities could affect the roadway network. Construction would either have to cross a roadway or it would run parallel to a roadway within or adjacent to the public right-of-way. Transmission line stringing activities over federal, state, and county roads could require the temporary closure of traffic lanes, causing traffic congestion and a potential increase in traffic accidents.

3) **Physical Damage to Roads**. Construction traffic, especially vehicles used for equipment and materials movement, could exceed the design weight capacities on local roadways, resulting in damage to these roadways during construction.

4) **Proximity to Rail Facilities.** Transmission line construction activities could affect rail facilities. Construction would either have to cross a railroad or it would run parallel to a railroad.

5) **Adverse Affects of Aviation Activities** VCWEP could affect aviation activities.

Mitigation Measures

The duration and extent of wind farm impacts can be reduced through implementation of Mitigation Measures **S18**, **S38**, **S40, S41**, **S42**, **S43**, **S44**, **S45**, **S46**, **S47**, **S48**, **S49**, **S50**, and **S51**, and **S52**.

S18: VCWEP will comply with all appropriate regulations of the Federal Aviation Administration (FAA), and a Notice of Proposed Construction or Alteration form (Form 7460-1) would be required of Wind Hunter pursuant to Federal Aviation Regulations, Part 77. Final locations, structures, and structure heights, including wind turbines, transmission lines, meteorological towers, and construction equipment that might impact air navigation such as cranes used to assemble the towers, would be submitted to the FAA for VCWEP. The form would be sent to the manager of the FAA Regional Air Traffic Division Office having jurisdiction over the area where the planned construction would be located. If acceptable to the FAA, white lights will be utilized on turbines and towers to minimize the risk of avian collisions. Coordination with the Department of Defense will be conducted regarding the location and potential effects of VCWEP upon operations in military airspace. The owner/operator of private airports and airstrips potentially affected by VCWEP will also be contacted.

S38: Landowners will be consulted to determine which aerial applicators cover agricultural lands within the vicinity of the wind farm and approved transmission line route. Written notification will be provided to aerial applicators when meteorological towers, wind turbines and the 230kV transmission line and towers will be erected. Aerial applicators will also be provided with maps clearly showing the location of the meteorological tower structures, wind turbines and the 230kV transmission line and tower structures.

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S42: Oversize or overweight vehicles will comply with applicable state and county requirements, as permitted or required by MDOT and Valley County.

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S44: Proper road signs and warnings will be used.

S45: When slow or oversized wide loads are in transit to and from work areas, advance signs and traffic diversion equipment will be used to improve traffic safety. Pilot cars will

be used as MDOT dictates depending on load size and weight. Permits would be obtained for these oversized or overweight as required by MDOT and Valley County.

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S50: During construction and operation, traffic would be restricted to the roads developed for VCWEP. Use of other unimproved roads should be restricted to emergency situations.

S51: Following construction, or during construction as necessary to maintain safe driving conditions, any damage to existing roadways caused by construction vehicles would be adequately repaired. Repairs will be coordinated with MDOT or Valley County.

S52: Prior to construction of the 230kV transmission line and prior to subsequent maintenance or removal which would require excavation or earth moving activity on Burlington Northern Santa Fe Railway property, Burlington Northern Santa Fe Railway's Communication Network Control Center will be telephoned to assist in determining if fiber optic, communications, control systems or other types of cable are buried anywhere on the premises; and if so, Wind Hunter would contact the telecommunications company(ies) involved and make arrangements with the same for protection of the fiber optic cable prior to beginning any work on Burlington Northern Santa Fe Railway property.

In addition, if the construction, operation, maintenance, repair or removal of the 230kV transmission line would at any time cause interference, including but not limited to physical interference from electromagnetic induction, electrostatic induction, or from stray or other currents, with the operation, maintenance or use by Burlington Northern Santa Fe Railway of its right-of-way, tracks, structures, pole lines, signal or communication lines, radio or other equipment, devices or other property appurtenances thereto, or of any existing lessee or licensee of Burlington Northern Santa Fe Railway, changes will immediately be made in VCWEP and such protective devices furnished to Burlington Northern Santa Fe Railway and its existing lessees or licensees as would be necessary in the judgment of representatives of Burlington Northern Santa Fe Railway to eliminate such interference. The cost of such protective devices and their installation would be borne by Wind Hunter. If any of the interference covered would be, in the judgment of Burlington Northern Santa Fe Railway, of such importance to the safety of

Burlington Northern Santa Fe Railway's operations as to require it, Wind Hunter, upon notice by Burlington Northern Santa Fe Railway, would immediately take such interim protective measures as Burlington Northern Santa Fe Railway may deem advisable until the protective devices required have been installed, put in operation, tested and found to be satisfactory to correct the interference. Project design and construction would comply with all applicable regulations associated with railways in VCWEP area.

In addition, if the construction, operation, maintenance, repair or removal of the 230kV transmission line would at any time cause interference, including but not limited to physical interference from electromagnetic induction, electrostatic induction, or from stray or other currents, with the operation, maintenance or use by Burlington Northern Santa Fe Railway of its right-of-way, tracks, structures, pole lines, signal or communication lines, radio or other equipment, devices or other property appurtenances thereto, or of any existing lessee or licensee of Burlington Northern Santa Fe Railway, changes will immediately be made in VCWEP and such protective devices furnished to Burlington Northern Santa Fe Railway and its existing lessees or licensees as would be necessary in the judgment of representatives of Burlington Northern Santa Fe Railway to eliminate such interference. The cost of such protective devices and their installation would be borne by Wind Hunter. If any of the interference covered would be, in the judgment of Burlington Northern Santa Fe Railway, of such importance to the safety of Burlington Northern Santa Fe Railway's operations as to require it, Wind Hunter, upon notice by Burlington Northern Santa Fe Railway, would immediately take such interim protective measures as Burlington Northern Santa Fe Railway may deem advisable until the protective devices required have been installed, put in operation, tested and found to be satisfactory to correct the interference. Project design and construction would comply with all applicable regulations associated with railways in VCWEP area.

3.3.2.4 Antelope Creek Substation

Construction activities would temporarily generate a small increase in vehicular movement over the 6 to 8 month construction period, and may alter circulation patterns and increase traffic hazards on local roads for a short period of time.

3.3.2.5 No Action Alternative

Under the No Action Alternative, transportation in VCWEP vicinity would continue without influence of the VCWEP.. Roads that would have been improved for VCWEP would be left unimproved.

Under the No Action Alternative, VCWEP would not be constructed or operated.

If the VCWEP. were not built, additional renewable and non-renewable energy facilities may have to be constructed to meet regional power needs. Impacts to traffic and transportation would depend on the specific location of such projects and current transportation services available in the vicinity of the site

3.4. VISUAL RESOURCES

3.4.1 Affected Environment

Several regulatory guidelines exist for evaluating visual resources and assessing potential visual impacts of the Valley Country Wind Energy Project (VCWEP). For the 230kV transmission line, the Montana Major Facility Siting Act (MFSA) states that visually sensitive areas, which are identified as those areas of highest visual quality and lowest visual compatibility with proposed applicable projects, must be inventoried within 3 miles of the proposed 230 kV transmission line route alternatives. Key observation points must be identified and the criteria used for identification outlined. Sensitive viewers and criteria used in the development of identified sensitive viewers, along with duration of view, must be identified. Mitigation measures and the opportunities covering the possible effectiveness of vegetative and topographic screening, and methods used to categorize and describe impacts to sensitive viewers for each alternative route must also be addressed. In accordance with these regulations, a ranking of alternative routes for the transmission lines will be presented.

The Bureau of Land Management's (BLM) Draft Programmatic Environmental Impact Statement on Wind Energy Development (BLM 2004) also guided the assessment of visual impacts for VCWEP. The programmatic was developed to assess the environmental, economic, and social impacts associated with wind energy development on BLM lands, and to evaluate a number of alternatives to determine the best management approach to mitigating potential impacts and facilitating wind energy development. With regards to visual impacts, potential issues and mitigation measures are identified, and include issues involved in site monitoring, construction, operation, and decommissioning.

Because a significant amount of BLM lands are within VCWEP study area, the Visual Resource Management (VRM) system (BLM 1984) utilized by the BLM guided the visual analysis process, and provides a framework to comply with MFSA. The VRM methodology was used as a guideline for the "natural" landscapes, or those not dominated by land uses and development. A similar methodology was used for urban areas and developed landscapes.

The major project components that may affect visual quality include approximately thirty-five miles of 65' - 75' high 230 kV transmission line structures, wind turbines (wind farm area) with total heights ranging from 260' to 330' (215'-260' hub height), and the Antelope Creek substation facility, a two acre facility (See Chapter 2 of this document for a complete project overview discussion). For each project component, existing landscape character, nearby sensitive viewers, visibility thresholds, and BLM Visual Recourse Management (VRM) Classes in the affected environment will be identified for use in assessing the environmental consequences of VCWEP.

3.4.1.1 Overall Study Methods

Visual impact and aesthetic quality evaluation involves a process of defining and inventorying existing visual (natural and cultural) resources, identification, description

and assessment of VCWEP on visual resources, and project effects appraisal. The study of existing landscape character, potentially sensitive viewers and viewpoints, and the analysis of project visibility are critical aspects of visual impact assessment. This section describes the general methods involved on the study of existing visual environmental conditions in common to all portions of VCWEP.

The sequence of tasks used to study the affected environment for all portions of the study area:

- Inventory of existing regional landform, vegetation and water features (physiography)
- Development of Landscape Rating Units
- Inventory of Scenic Quality and Visual Integrity within Landscape Rating Units
- Visual Sensitivity Analysis
- Visibility and Distance Zone Mapping
- Visual Contrast analysis
- Impact Assessment
- Mitigation Planning
- These components and their associated methodology are described in this section.
- Physiography

The analysis of scenic quality began with a review of existing topographic maps, aerial photographs, and existing literature to provide base mapping for subsequent meetings and discussions with BLM personnel and field reconnaissance surveys. Site visits for acquisition of additional data, and the confirmation existing data, and photographic documentation provided critical foundational support for the study, also.

From field observation, topographic maps, and aerial photography, an examination of dominant landforms, topography, and vegetation cover were compared to regional physiographic regions outlined in Physiography of the Western United States (Fenneman 1931). "Landscape Character Types" were defined and established, and are detailed units refined from the regional physiographic province and section classifications as outlined in Fenneman.

The purpose of defining Landscape Character Types is so that they may be further divided into smaller units of similar physiographic, visual, and cultural characteristics. These homogeneous landscape units were evaluated for "Scenic Quality" using BLM based criteria in typically natural landscapes. Likewise, culturally dominated landscape

units were evaluated for "Visual Integrity" using similar criteria (See "Rating Unit Development" section below).

A field investigation was conducted during October 2004 for the study area. This field investigation consisted of verification checks of existing landscape character types, final delineation of rating units, and confirmation sensitive viewpoints. In addition, likely key observation points were selected, photographed, and documented for subsequent photo simulations to convey typical likely impacts for representative areas in selected landscape rating units.

Rating Unit Development

In order to evaluate potential impacts of VCWEP alternatives equally, it was assumed that all landscapes have some inherent scenic value. Scenic quality is a measure of harmony, contrast, and variety within a landscape as seen as an overall impression after driving or walking though and area of land or water (Smardon 1986). Natural landscapes with greater diversity of features typically are considered to have greater aesthetic appeal (i.e., higher scenic quality). Scenic quality was developed by rating the homogeneous landscape rating units (i.e. Scenic Quality Rating Units) mapped from the divisions of landscape character types.

Landform, water, color, influence of adjacent scenery, scarcity of features and cultural modifications are the key elements used in rating scenic quality, and were observed and documented based on the criteria outlined in Table 3.4-1. Also, vegetation cover, exposed soil color, and any atypical features, such as an abundance of rock outcroppings or unique water features were also observed and noted. These features would later be evaluated in terms of contributing or minimizing the scenic quality of the landscape. Ratings of Class A, B, or C were assigned, and are summarized in Table 3.4-5. An example of a field inventory rating sheets is included in Appendix A of this Technical Report. For natural Scenic Quality Rating Units, a score 25 or more will give a Class A rating, scores between 18 and 24 will result in a Class B rating, and a score below 17 will result in a Class C rating.

Because agricultural lands, urban and developed lands are not addressed by the BLM systems, these areas were evaluated using Visual Integrity criteria developed for VCWEP. Visual Integrity is a measure of the scenic values of developed landscapes the degree to which the area is perceived to be "complete" or unified, and the measure of other factors that include visual complexity, uniqueness, and vividness. Additional criteria include perception based factors such as sense of neighborhood and place coupled with degrees of modification, and how well the area blends in with the surrounding landscape. The highest visual integrity ratings are typically given to those developed landscapes that have moderate complexity, a high degree of unity and coherence, are vivid and memorable, and have a strong sense of place. As with natural Scenic Quality, evaluation criteria such as landform, vegetation, and soil color are scored and used in the rating of units (See Table 3.4-3 Table 3.4-4). For cultural landscapes, scores above 27 will result in a Class A rating, scores between 20 and 26 will result in a Class B rating, and scores below 19 will result in Class C ratings. An example of a field inventory rating sheets is included in Appendix C of this Technical Report.

Table 3.4-1 Scenic Quality Criteria

Landform	Topography becomes more interesting as it gets steeper, more massive, or more severely or universally sculptured. Outstanding landforms may be monumental, such as in the Grand Canyon in Arizona or the Rocky Mountains of the Western United States. Alternatively, landforms may be intricate and subtle such as certain badlands, pinnacles, arches, and other formations.
Vegetation	Primary consideration is given to the variety of patterns, forms and textures created by plant life. Short - lived displays should be considered when they are known to be recurring or spectacular such as the color change from green to red - orange to gold displayed by contiguous groves of western aspen trees or eastern maple trees. Smaller scale vegetation features may add striking and intriguing detail to the landscape.
Water	Water can add movement, serenity, and strong lighting contrasts to a scene. The degree to which water features have the capacity to unify, diversify, or dominate the scene is the primary consideration.
Color	Overall colors are observed for the basic components of the landscape such as soil, rocks, and vegetation as they appear during seasons or periods of high use. Key factors to use when rating "color" are variety, contrast, and harmony.
Adjacent Scenery	What is under consideration is the degree to which scenery outside the unit being rated enhances the overall impression of the scenery within the unit. The distance over which adjacent scenery will influence a unit will normally range from *zero* to *five* miles, depending upon the relief of the topography, upon vegetation cover, upon sun angles, and viewer orientation. This component is generally applied to units that would normally rate very low in score, but the influence of the adjacent unit enhances the visual quality thereby raising the rating score.
Scarcity	This component provides an opportunity to elevate the importance of one or of all scenic features within one physiographic region that appear to be unique or relatively rare within the surroundings.

Table 3.4-1 Scenic Quality Criteria (Cont.)	
Intactness	What is recorded for this component is evidence of discordant elements or deviations from the existing landscape character - thereby altering, diminishing or minimizing the indigenous aesthetic appeal for which the said landscape would primarily have been valued as a scenic resource. This component is also used to describe the condition of the ecosystem.
Cultural Modifications	Of primary concern are the impacts of man - made changes on the visual quality of the characteristic landscape. Cultural modifications to landform, water, and vegetation as well as the addition of structures to the landscape may all detract from the scenery by presenting negative intrusions to the viewer. Conversely, these additions or modifications to the landscape might actually complement or improve the scenic quality of a unit.
Ephemeral & Non - Visual Conditions	This component considers short - lived but recurrent visual effects such as wildlife sightings and non - visual effects such as the sound of running water which are experientially related to the landscape being viewed.

Table 3.4-2 Scenic Quality Inventory and Evaluation Chart

Key Factors	Rating Criteria and Score		
Landforms	High vertical relief as expressed in prominent cliffs, spires, or massive rock outcrops; or severe surface variation or highly eroded formations including major badlands or dune systems; or detail features dominant and exceptionally striking and intriguing such as glaciers.	Steep canyons, mesas, buttes, cinder cones, and drumlins; or interesting Eros ional patterns or variety in size and shape of landforms; or detail features which are interesting though not dominant or exceptional.	Low rolling hills, foothills, or flat valley bottoms; or few or no interesting landscape features.
Landform Score	5	3	1
Vegetation	A variety of vegetative types as expressed in interesting forms, texture, and patterns.	Some variety of vegetation, but only one or two major types.	Little or no variety or contrast in vegetation
Vegetation Score	5	3	1
Water	Clear and clean appearing, still or cascading white water, any of which are a dominant factor in the landscape.	Flowing, or still, but not dominant in the landscape.	Absent, or presents, but not noticeable
Water Score	5	3	0
Color	Rich color combinations, variety or vivid color; or pleasing contrasts in the soil, rock, vegetation, water or snowfields.	Some intensity or variety in colors and contrast of soil, rock, and vegetation, but not a dominant scenic element.	Subtle color variations, contrast, or interest; generally mute tones.
Color Score	5	3	1
Adjacent Scenery	Adjacent scenery greatly enhances visual quality.	Adjacent scenery moderately enhances overall visual quality.	Adjacent scenery has little or no influence on over all visual quality.

Table 3.4-2 Scenic Quality Inventory and Evaluation Chart (Cont.)			
Adjacent Scenery Score	5	3	0
Scarcity	One of a kind; or unusually memorable, or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing, etc.	Distinctive, though somewhat similar to others within the region.	Interesting within its setting, but fairly common within the region.
Scarcity Score	5	3	0
Intactness	Entire character not compromised by external intrusions.	Some deviations from existing character.	Many discordant elements present. Aesthetic appeal is compromised
Intactness Score	5	3	1
Cultural Modifications	Modifications add favorably to visual variety while promoting visual harmony.	Modifications add little or no visual variety to the area, and introduce few discordant elements.	Modifications add variety but are very discordant and promote strong disharmony.
Cultural Modifications Score	2	0	- 4
Ephemeral & Non - Visual Conditions	Frequent wildlife sightings, many natural sounds present.	Occasional wildlife sighting and natural sounds present.	Both wildlife and natural sounds are not present. Some distant urban noise.
Ephemeral & Non - Visual Score	5	3	1

Table 3.4-3 Visual Integrity Rating Criteria

Landscape Pattern	An interrelationship of land uses and their typical visual appearance is the primary focus. The secondary focus of landscape pattern is the spatial relationships between structural and functional elements of the land. Any type of landscape at any scale can be described as a mosaic: a background of matrix and patches connected by corridors. For instance, a matrix can be uniform to fragmented, continuous to perforated, and aggregated to dispersed. Patches can vary from large to small, elongated to round, and convoluted to smooth. Corridors vary from wide to narrow, and meandering to straight. The edges that separate these spatial elements also vary widely in shape and dimension.
Vegetation	Primary consideration is given to the variety of patterns, forms and textures created by plant life. Short - lived displays should be considered when they are known to be recurring or spectacular such as the color change from green to red - orange to gold displayed by contiguous groves of western aspen trees or eastern maple trees. Smaller scale vegetation features may add striking and intriguing detail to the landscape.
Water	Water can add movement, serenity, and strong lighting contrasts to a scene. The degree to which water features have the capacity to unify, diversify, or dominate the scene is the primary consideration.
Color	Overall colors are observed for the basic components of the landscape such as soil, rocks, and vegetation as they appear during seasons or periods of high use. Key factors to use when rating "color" are variety, contrast, and harmony.
Adjacent Scenery	What is under consideration is the degree to which scenery outside the unit being rated enhances the overall impression of the scenery within the unit. The distance over which adjacent scenery will influence a unit will normally range from *zero* to *five* miles, depending upon the relief of the topography, upon vegetation cover, upon sun angles, and viewer orientation.. This component is generally applied to units that would normally rate very low in score, but the influence of the adjacent unit enhances the visual quality thereby raising the rating score.
Scarcity	This component provides an opportunity to elevate the importance of one or of all visual integrity features within one physiographic region that appear to be unique or relatively rare within the surroundings.

Table 3.4-3 Visual Integrity Rating Criteria (Cont.)	
Intactness	What is recorded for this component is evidence of discordant elements or deviations from the existing landscape character - thereby altering, diminishing or minimizing the indigenous aesthetic appeal for which the said landscape would primarily have been valued as a scenic resource. This component is also used to describe the condition of the ecosystem.
Architectural Elements	Architectural elements describe the form, structure, and interrelationships among the building - block elements of the system. The condition of the building system is also considered.
Ephemeral & Non - Visual Conditions	This component considers short - lived but recurrent visual effects, e.g., intense human activity centers, and non - visual effects such as the sound of running water which are experientially related to the landscape being viewed.

Table 3.4-4 Visual Integrity Inventory and Evaluation Chart			
Key Factors	**Rating Criteria and Score**		
Land Use / Development Pattern	High vertical relief as expressed in prominent cliffs, spires, or massive rock outcrops; or severe surface variation or highly eroded formations including major badlands or dune systems; or detail features dominant and exceptionally striking and intriguing such as glaciers.	Steep canyons, mesas, buttes, cinder cones, and drumlins; or interesting Eros ional patterns or variety in size and shape of landforms; or detail features which are interesting though not dominant or exceptional.	Low rolling hills, foothills, or flat valley bottoms; or few or no interesting landscape features.
Landform Score	5	3	1
Vegetation	A variety of vegetative types as expressed in interesting forms, texture, and patterns.	Some variety of vegetation, but only one or two major types.	Little or no variety or contrast in vegetation
Vegetation Score	5	3	1
Water	Clear and clean appearing, still or cascading white water, any of which are a dominant factor in the landscape.	Flowing, or still, but not dominant in the landscape.	Absent, or present, but not noticeable
Water Score	5	3	0
Color	Rich color combinations, variety or vivid color; or pleasing contrasts in the soil, rock, vegetation, water or snowfields.	Some intensity or variety in colors and contrast of soil, rock, and vegetation, but not a dominant scenic element.	Subtle color variations, contrast, or interest; generally mute tones.
Color Score	5	3	1
Adjacent Scenery	Adjacent scenery greatly enhances visual quality.	Adjacent scenery moderately enhances overall visual quality.	Adjacent scenery has little or no influence on over all visual quality.

Table 3.4-4 Visual Integrity Inventory and Evaluation Chart (Cont.)			
Adjacent Scenery Score	5	3	0
Scarcity	One of a kind; or unusually memorable, or very rare within region.	Distinctive, though somewhat similar to other areas or neighborhoods within the region.	Interesting within its setting, but fairly common within the region.
Scarcity Score	5	3	1
Intactness	Entire character uncompromised by external intrusions.	Some deviations from existing character.	Many discordant elements present. Aesthetic appeal is compromised
Intactness Score	5	3	0
Architectural & Landscape Elements	Architecture, landscaping, development, and land uses add favorably to visual variety while promoting visual harmony.	Land uses and developed areas add little or no visual variety to the area, and introduce some discordant elements.	Land uses and developed areas are discordant and promote strong disharmony.
Architectural & Landscape Elements Score	5	3	1
Ephemeral & Non - Visual Conditions	Sights and sounds of the community or area add to the character of the area.	Sights and sounds somewhat detract from the character of the area.	Sights and sounds detract strongly and promote disharmony.
Ephemeral & Non - Visual Conditions Score	5	3	1

Table 3.4-5 Scenic Quality / Visual Integrity Definitions

Scenic Quality	Visual Integrity
Class A or Distinctive - Outstanding areas where characteristic features of landform, rock, water, and vegetation are distinctive or unique in the context of the surrounding areas. These features exhibit considerable variety in form, line, color, and texture and have strong positive attributes of unity and intactness. A score of 25 points or more, as tallied on an individual field inventory sheet, resulted in a distinctive rating.	**Class A or Unique / Cohesive -** Developed areas where the landscape appears intact, interesting, and cohesive. The characteristic elements of line, form, color, and texture hold the developed features and landscape together into distinctive areas, landscapes, or neighborhoods. Colors and textures are often seen repeated in these landscapes. Developments and land uses do not contrast with each other or with the landscape.
Class B or Above Average - Above average areas in which features provide variety in form, line, color, and texture. And although the landscape elements may not be rare in the region, they provide sufficient visual diversity to be considered moderately distinctive. These features exhibit more common variety in form, line, color, texture, and have positive, yet more common attributes of unity and intactness. The score of 18 to 24 points, as tallied from an individual field inventory sheet, resulted in an Above Average rating.	**Class B or Average / Rural Landscape -** Developed areas where the landscape is less unique, interesting, and cohesive. Patterns of land use and materials used in structures are varied and different colors. The sense of a cohesive place or neighborhood is not as strong in these landscapes. Colors and textures are not often seen repeated in these areas.
Class C or Common - Common to minimal areas are those where characteristic features have moderate to little variety in form, line, color, and texture in relation to the surrounding region. The score of 17 points or less, as tallied from an individual field inventory sheet, resulted in a Common rating.	**Class C or Representative - Developed** areas that appear heavily altered, do not form a sense of place or neighborhood, and are not visually cohesive. The elements of line, form, color, and texture are not often repeated in a cohesive manner. Developments and land uses are diverse and contrast with each other and with the landscape.

Sensitive Viewers

Visual sensitivity is a measure of viewer concern for change to the landscape. Sensitive Viewers and Viewpoints Potentially critical viewpoints that may have visibility of VCWEP were identified and inventoried based on established criteria. Typically, these include recreation areas, travel routes, and residences, and vary with the cultural context

of VCWEP. All roads, recreational areas, occupied residences, and similar areas where identified and assessed from land use data and site reconnaissance.

Three components comprise the visual sensitivity inventory: views from sensitive points, visual sensitivity, and seen areas/visibility thresholds. Visual sensitivity is evaluated and documented based on previous studies evaluating public concerns, previous studies involving user group surveys and studies. The visual sensitivity criteria used for VCWEPs aesthetic impact analysis are shown on Table 3.4-6

Final visual sensitivity is derived from the comparison of user attitude, view duration, and use volume, and assigned a final sensitivity level that is subsequently used in the visual analysis and initial impact level (See Table 3.4-7).

Distance Zone Determination

Distance zones were established based upon perception thresholds, the scale and nature of the objects being viewed, and the viewing environment. The perception of form, texture, color and other visual elements in the landscape is a function of changing distance from a viewpoint. In general, landscape elements tend to become less obvious and detailed at greater distances. Elements of form and line become more dominant than color or texture at longer viewing distances. Distance thresholds or zones are set by the BLM in the established VRM methodology as follows:

- Foreground – The limit of a viewed area in which details are perceived and obvious.
- Textural and other aesthetic qualities of vegetation are normally perceived within this zone (0 to ¼ - ½ mile).
- Middle ground – The zone in which details of foliage and fine textures cease to be perceptible. Vegetative patterns begin to appear as outlines or patterns (¼ - ½ to 3 - 5 miles).
- Background – That portion of the landscape where texture and color are weak and landforms become the most dominant element (3 - 5 to 15 miles).
- Seldom Seen – Those areas of the landscape where topographic relief or vegetation screen viewpoints or when viewing distances are beyond 15 miles.)

For this project, a review of previous studies in similar geographical, topographical, and environmental settings was performed, and relevant visibility thresholds were established for project components and environmental were established. The criteria for establishment, and the zones used are outlined for the individual project components.

Table 3.4-6 Visual Sensitivity Criteria

User Attitude	Duration of View	Use Volume	Visual Sensitivity Level
High	High	Low	High
High	Moderate	Low	High
Moderate	High	Low	Moderate
Moderate	Moderate	Low	Moderate
Moderate	Low	High	Moderate
Moderate	Low	Moderate	Moderate

Table 3.4-7 Visual Sensitivity Matrix

Criteria	High	Moderate	Low
Use Volume	High Level of Use	Moderate Level of use	Low level of use
User Attitude	remaining High Expectations for Maintaining scenic quality/visual integrity (i.e. residences)	Users are concerned for scenic quality/visual integrity but are not the primary focus of their experiences (i.e. dispersed recreation areas and general travel routes)	Areas where the public has low expectations for maintaining scenic integrity. Generally commercial or industrial areas where human caused modifications already exist in the landscape
Duration of View	Fixed or continuous views – Long	Intermediate views (i.e. open highway views)	Brief or intermittent views (i.e. highway views in rolling landscapes) - Short

VRM Classes

Visual resource management classes are deslivered as shown in "Final Judith Valley Phillips RMP/EIS" (BLM-1992), for the scattered parcels within the study corridors. These classes define the acceptable degree of visual change allowed in the natural landscape. The BLM derive visual management objectives for their lands by combining scenic quality (e.g., landscape aesthetics), visual sensitivity, and visibility from sensitive viewpoints.

Visual Resource Management classes on BLM lands were derived from existing delineated classes produced by the BLM, and digitized onto base maps using GIS.. The BLM has four VRM classes to manage visual resources on public lands. Class I is a special designation applied to existing wilderness areas, some natural areas, and other areas where the management policy or legislative mandate is to restrict visual changes to the natural landscape. Class II management lands are applied to areas where contrasts in the landscape should not attract attention, and management activities should not be evident in the characteristic landscape. Class III lands allow for a moderate, subordinate level of change and contrast. Class IV designation allows for contrasts to dominate the landscape as long as basic features inherent in the landscape are emulated.

3.4.1.2 Study Area Overview

This section describes the existing affected environment study results applicable over the entire project. Section 3.4.1.3 through 3.4.1.5 describes results applicable to individual elements of VCWEP (wind farm, transmission lines, and substation).

Landscape Character Types and Regional Setting

The VCWEP Study Area lies within the glaciated Missouri Plateau section of the Great Plains physiographic province in the Interior Plains. This section of the Missouri Plateau is distinct in that valley deposition and old plateau smoothing as the result of glaciation was a major influence on landform development, generally characterized by the dominance of rolling, terrace - like plains, and includes surface features such as broadly terraced river valleys and large interstream uplands affected by varying degrees of erosion that includes highly dissected badlands. The landscape has been modified by glaciation through the smoothing of hills and the filling drainage valleys by eroded depositional material (Fennemen 1931).

The dissected badlands generally have highly erodable soils, sparsely vegetated and steep hillsides, and deeply incised drainages. The erosive forces of glacial outwash cut out somewhat deeply eroded drainages, or “coulees”, from glacial till, and occasionally exposed dark gray Bearpaw Shale formed by ancient inland seas 71 million years ago. The Milk River floodplain was formed by the historical path of the Missouri River, and is therefore too small for the present day river. Other important features of the landscape include prairie potholes (BOR, nd.).

Three general landform types were identified within the VCWEP Study Area. These Landscape Character Types include:

- Rolling Plains
- River Floodplain, and
- Badlands

Rolling Plains This Landscape Character Type is the most abundant throughout the study area. It is generally a low relief terrain bisected by lower laying “coulees”, or drainages crossing the landscape providing topographic relief for by glacial processes. These

coulees may have more diverse vegetation, with wetland woody overstory and understory shrubs and trees occasionally present, with a more diverse herbaceous community. Formed by glacial melt water outwash streams, and presently typically containing intermittent streams, these bottomlands are geomorphiclly connected to the Milk River floodplain. Native vegetation in the Rolling Plains Landscape Character Type is limited to low growing, short grass prairie herbaceous vegetation such as bluebunch wheatgrass, needlegrass, prairie sandreed, and blue grama. Cultural influences are fairly limited, and generally consist of power line distribution poles, fencelines, and two-track jeep trails (See Figure 3.4.1).

River Floodplain - The River Floodplain Character Type is confined to the broad valley carved out by the Milk River where topographical relief is lowest. This wide floodplain, carved by the historical flow of the Missouri River during the Bull Lake Ice Age 70,000 - 130,000 years ago, is too wide for the present day Milk River (BOR). Vegetation is similar in the more natural areas to the Coulee Riparian areas, but the topography is broad and flat, without the spatial definition or sense of enclosure of those areas. Cultural influences are more dominant in the type of landscape character type due to the relatively productive farmland, readily available water, and historically significant transportation corridor (See Figure 3.4-2).

Badlands - This Landscape Character Type is typically found in and near the Bitter Creek Wilderness Study Area (BCWSA), and is distinct from the Rolling Plains Unit in that there is more verticality dramatic topography, with steep domes and buttes often present. Erosive forces acting on vulnerable soil texture provide a somewhat dramatic tapestry of exposed soils and vegetation patches of varying textures and colors (See Figure 3.4-3). Typically, the presence of cultural influences is fairly limited, often limited to jeep trails alone.

Cultural modifications are generally concentrated towards the south end of VCWEP, and include the town of Glasgow, dispersed rural residences and agricultural facilities, agricultural lands, an airstrip, back country jeep trails, and several highways and other roads. The concentration of dwellings generally decreases as a function of distance from the village. There are two major travel routes located within the study area. US Route 2 is the primary east - west corridor and is on the southern portion of the study area, and Montana State Route 24 bounds the eastern most portion of VCWEP area, and serves as the primary north - south road. Minor roads include Britsch Road, Kerr Road, Vandelia Road, Riverside Drive, and Jensen Trail. Grazing and agricultural activities occur throughout much of the study area, with agricultural activities concentrated adjacent to the major and minor roads, and in the Milk River floodplain.

Figure 3.4-1-Rolling Plains Landscape Character Type

Rating units

As discussed in Section 3.4.1.1, two methods (Scenic Quality and Visual Integrity) were used to rate scenic quality in the study area. Within the delineated landscape character types, the following units were derived based on cultural modification, landform, vegetation, and general character. The study area has been evaluated based on each rating unit, and determined to be similar enough to be rated as a whole. For example, the differences from one unit of "Rolling Plain" to another are not significant, and therefore they were rated as a single "unit". Similarly, homogeneity between "Natural Coulee" units are delineated separately, but rated as a whole (See Map 11). The Rating Units used for this study are as follows:

Natural Rolling Plains –

This unit is derived from the Prairie Physiographic Landscape Character Type, and consists of low, open rolling hills having only slight relief. Vegetation consists mainly of a fairly uniform ground cover of prairie grasses such as blue grama *(Bouteloua gracilis)*, thickspike wheatgrass *(Elymus lanceolatu)*, needle-and-thread *(Hesperostipa comata)*, and green needlegrass *(Nassella viridula)*. These grasses provide a fine greenish-yellow colored texture to the landscape. There is generally not much diversity in landscape colors or textures, and linear elements are typically confined to the strong horizontal ridgeline that distinctly separates sky from landform. Some lower laying areas and

Figure 3.4-2-River Floodplain Landscape Character Type

shrubland with species such as Wyoming big sagebrush *(Artemisia tridentata ssp. Wyomingensis)* and silver buffaloberry *(Sheperdia argentea)* occasionally providing a of a fairly uniform ground cover of prairie grasses such as blue grama *(Bouteloua gracilis*), thickspike wheatgrass *(Elymus lanceolatu)*, needle-and-thread *(Hesperostipa comata)*, and green needlegrass *(Nassella viridula)*. These grasses provide a fine greenish-yellow colored texture to the landscape. There is generally not much diversity in landscape colors or textures, and linear elements are typically confined to the strong horizontal ridgeline that distinctly separates sky from landform. Some lower laying areas and shrubland with species such as wyoming big sagebrush (*Artemisia tridentata ssp. Wyomingensis*) and silver buffaloberry (*Sheperdia argentea*) occasionally providing a wider range of textures and colors in some isolated areas. This unit is fairly common to the region, and is generally unspoiled by incongruous intrusions. Cultural features are generally limited to fence lines, two-track and paved roadways and trails, culverts, and occasional cattle ponds that are typically less than a few acres in size. Occasional wildlife may add to the visual quality of the unit. There is no active agriculture going on in this unit, but grazing occurs to varying degrees. Shading of hillsides occasionally adds some visual variety. Some individual of clumps of boulders are regularly found along the main roads, as are stone property corner monuments, adding positively to the visual diversity of the unit. Uniformity, monotony, and simplicity are the dominant attributes to this unit.

Figure 3.4.3-Badlands Landscape Character Type

Natural Coulee –

This unit is located in the northern extremes of the Milk River perennial and intermittent tributary stream riparian zones. The landform structure is typified by flat bottomed valleys enclosed by somewhat steep hillsides. A somewhat strong, horizontal ridge line contrasts with the verticality of tree trunks. Landscape elements are more varied, with open water in streams occasionally being present. The relative abundance of trees and understory shrubs such as boxelder *(Acer negundo)*, silver sagebrush *(Artemisia cana*), redosier dogwood *(Cornus sericea)*, chokecherry *(Prunus virginiana)*, wood's rose *(Rosa woodsii)*, willow *(Salix spp.)*, silver buffaloberry *(Sheperdia argentea)*, and western Snowberry *(Symphorocarpos occidentalis)* add a somewhat course texture to the overall landscape. These randomly patterned clumps of trees and sparse clumps of lower growing shrubs provide some variety and diversity in landscape colors and textures. Colors are varying from earth tone browns, tans, and grays and to yellows dark greens. There is a balance of textures ranging from the coarseness provided by tree trunks, limbs, and foliage, through the moderately fine understory shrubs, to the finer ground cover vegetation. Cultural modifications are almost exclusively limited to two-track trails, and are not often apparent.

Badlands –

This rating unit is typically found inside the BCWSA, and is has a more dramatic general character associated with it. Landform is more defined, with eroded terrain exposing

underlying soils, with buttes and pinnacles providing more variation in topography. Eroded rivulets add intricate texture to the landscape. The steep hillsides also provide more opportunity for shade and shadows. Vegetation is irregular and patchy, often absent, and the variety of colors from soils and vegetation add interest. Typical species associated with this unit are longleaf sagewort *(Artemisia longifolia)*, thickspike wheatgrass *(Elymus lanceolatus),* northern porcupine grass *(Hesperostipa curtiseta)*, creeping juniper *(Juniperus horizontalis)*, and green needlegrass *(Nassella viridula).* This unit is fairly uncommon to the region. Cultural modifications are almost exclusively limited to two-track trails where topography allows, and are not often apparent.

Rural Developed Plains –

Located in the rural outlaying areas, this unit is typically agricultural in nature, with architectural elements limed to occasional rural homes, silos, or isolated commercial and institutional buildings. The low, open landscape is similar to the rolling plains unit, but often with a more course texture, and large, regular patches of yellow, tan, or exposed brown soil patches due to dominance of cultivated crops. Existing roadways, fence lines, agricultural field interfaces, and power transmission poles and lines provide additional linear elements. Architectural elements are typically clustered, in larger, blocky masses. There is generally little harmony in architectural features, elements, and colors.

Rural Developed Coulee –

These areas are located in the bottomlands of the Milk River tributary streams where the landscape is defined by fairly steep ravine slopes enclosing a valley, and where cultural activities dominate, typically agriculture. The unit is similar to the Natural Couleee, and therefore is similar in spatial enclosure and dominant landform conditions. Trees are present to a varying degree, and add coarseness in texture and linear elements to the unit. The understory is most often cleared out allowing for grazing. Architectural elements are typically variable, diverse, and ununified. Color structure is large and blocky, with fairly uniform large blocks of uniform hay fields or cultivated cover. Hay rolls often are present, regularly punctuating the fields with circular elements that add interest and continuity to the landscape, when they are present after harvest.

Agricultural Floodplain -

This rating unit is an open, flat Milk River floodplain area that is typically dominated by agricultural activities, roadways, railroad corridors, and scattered residential and agriculturally related structures. These elements often provide a strong linear quality to the landscape, especially along Tampico Road. There is little harmony in architectural features, elements, and colors, and more highly developed areas and land uses may have little relationship to each other. As with the Rural Plains unit, there are many large, uniform patches of various colors and textures, and this unit has almost no vertical relief. This unit includes the Milk River Gallery Forest, a thin, fairly contiguous ribbon of 100 foot tall cottonwood trees and shrub dominated terraces, though some fragmentation has occurred due to agricultural activities. The understory layer is variable depending on moisture regime and grazing activities. Compared to the width of the overall floodplain, from 3-5 miles, this riparian area is relatively narrow.

Rural Village–

This unit occurs where there is a significant cultural visual influence in the form of architectural elements such as residential and commercial clusters. There are varying degrees of commercial development, and structures such as barns and silos may be present. There is little harmony in architectural features, elements, and colors, and more highly developed areas and land uses may have little relationship to each other. Isolated residential communities are included here, and are often in a high state of disrepair. These units include the outskirts of Glasgow, the St. Marie and Glasgow Air Force Base area, and isolated clusters of residential structures in outlying areas.

Final ratings for the landscape units are provided in Tables 3.4-8, Table 3.4-9, and Map 11.

Sensitive Viewers and Viewpoints

Dispersed outdoor recreation is the predominant type of recreation within the VCWEP area and surrounding region. Dispersed recreational use in the VCWEP area nd vicinity includes: hunting, fishing, hiking, wildlife observation, photography, backpacking, horseback riding, skiing, snowmobiling, mountain biking, picnicking, sightseeing, OHV use, rock hounding, and camping in the Bitter Creek WSA.

One interpretive point (Buffalo Country) is situated within the study area. This site incorporates a roadside pull-off with an interpretive sign that describes a place and event of historical interest. The site, maintained by MDOT's Glendive District, is located along the south side of U.S. Highway 2, approximately 5.8 miles northwest of the City of Glasgow

Table 3.4-8 Scenic Quality Rating Unit Ratings Summary

SQRU #	Name	Landform	Vegetation	Water	Color	Adjacent Scenery	Scarcity	Intactness	Cultural Modifications	Ephemeral & Non - Visual Conditions	Scenic Quality Classification A = 25 or more B = 18 – 24 C = 17 or less Total
01	Natural Rolling Plains	1	1	2	1	0	1	4	2	2	14
02	Natural Coulee	2	4	0	2	0	3	5	0	3	19
03	Badlands	3	3	0	3	0	3	5	5	1	23

Table 3.4-9 Visual Integrity Rating Unit Ratings Summary

VIRU #	Name	Landscape Pattern	Vegetation	Water	Color	Adjacent Scenery	Scarcity	Intactness	Architectural Elements	Ephemeral & Non Visual Conditions	Visual Integrity Classification A = 27 or more B = 20 – 26 C = 19 or less Total
04	Rural Developed Plains	1	2	0	2	0	1	3	2	3	14
05	Rural Developed Coulee	2	3	2	3	0	4	2	1	4	21
06	Agricultural Floodplain	2	2	2	2	2	1	2	2	4	19

Within VCWEP area, there were several sensitive viewpoints, viewers, and view corridors that were identified to be of concern based on the sensitivity analysis. These Sensitive Viewpoints, or receptors, are as follows:

- Views from residences and in small communities dispersed in agricultural lands throughout western Valley County, St. Marie, Opheim, and in the vicinity of Glasgow.
- Views from travel routes frequented by the majority of through traffic such as roads and highways used primarily by origin/destination travelers and Recreation Destination roads highways. Included here are U.S. Highway 2, Montana Highway 24, and Recreation Destination routes to and from Glasgow Base Ponds Fishing Access Site, Faarasen Park, and the Bitter Creek Wildlife Viewing Area.
- Views from significant recreation and preservation areas such as existing significant recreation site, rest areas, parks, fishing ponds, and picnicking areas were determined to be of significance. These include the Bitter Creek Wildlife Viewing Area, Faraasen Park, the "Buffalo Country" Interpretive Site on U.S. Highway 2, Glasgow Base Ponds Fishing Access Site, and the Vandalia (Glasgow) Rest Area on U.S. Highway 2.

Faraasen Park has development plans that include a parking lot, an interpretive nature trail and improved wildlife habitat and riparian areas. The Bitter Creek WSA has been selected for a wildlife viewing zone under the Watchable Wildlife program.

As a result of the visual sensitivity analysis, two levels of sensitivity were determined (see Table 3.4-10 & Map 12). High overall sensitivity levels were determined for in 5 categories:

- All occupied residences,

- Faraasen Park,
- BCWSA Destination Route and Overlook, and
- Buffalo Country Interpretive Site.

Moderate sensitivity levels were determined for:

- Montana Highway 24,
- U.S. Highway 2,
- Glasgow Base Ponds Fishing Access Site and destination route, and
- Faraasen Park destination route.

VRM Classes

A large portion of lands within the study are publicly owned under the jurisdiction of the state of Montana, the Federal government (Bureau of Land Management), or Valley County. Privately owned parcels are scattered in the northern extremes of VCWEP, but are most heavily concentrated along Rt. 2, Rt. 24, and near the Town of Glasgow. Visual Management Classes as established by the BLM in VCWEP study area include Class II, III and IV lands. Class II lands are primarily in the BCWSA, though some are located in the Milk River Floodplain.

Table 3.4-10 Visual Sensitivity Analysis Results

	User Attitude	**View Duration**	**Use Volume**	**Overall Sensitivity (from Table 3.4-7)**
Viewpoints				
Residences	High	High	Low	**High**
Highways				
Montana Highway 24	Moderate	Low	Moderate	**Moderate**
US Highway 2	Moderate	Low	High	**Moderate**
Parks & Recreation				
Faraasen Park	High	Moderate	Low	**High**
Base Ponds Fishing Site	Moderate	Moderate	Low	**Moderate**
Bitter Creek Wildlife Viewing Area	High	Moderate	Low	**High**
"Buffalo" Historic Marker	High/Mod	Moderate	Low	**High**
Vandalia (Glasgow) Rest Area	Moderate	High	Low	**Moderate**
Recreation Destination Routes				

To Bitter Creek Wildlife Viewing Area	High	Moderate	Low	**High**
To Faraasen Park	Moderate	Moderate	Low	**Moderate**
To Base Ponds Fishing Site	Moderate	Moderate	Low	**Moderate**

3.4.1.3 Wind Farm

There are four proposed phases for the wind farm.

- Phase I – 50 MW No Action
- Phase II – Alternative A 100 MW Area
- Phase III – Alternative B 150 MW Area
- Phase IV – Alternative C 200 MW Area

For the purposes of visual impact assessment and description of the affected environment, these phases are substantially similar, from a visual standpoint, but will be treated separately in the analyses. Landscape Character, existing BLM VRM land classification, and a general description of the scope of work involved in the phase that may affect visual quality is presented.

Study Methods

Visual Influence

Studies performed in the United Kingdom suggest a large area of visual influence for wind turbines. Sinclair (2001) provides a basis for determining the potential visual impacts and area of study for wind energy projects. Based on numerous field observations, the result of the studies was the development of the Sinclair - Thomas Matrix. The matrix provides a guide to predict visual impacts and a potential "zone of visual influence" of 72-74 meter (overall) wind turbines. Descriptions and visibility zones for the study are broken down as follows:

Table 3.4-11 Sinclair-Thomas Matrix – Potential Wind Farm Visual Impact for 72-77 meter (Overall) Wind Turbines

Band	Descriptor	Approx. Dist. Range.
A	Dominant impact due to large scale, movement proximity, and number	0-3 km (0-1.9 mi)
B	Major impact due to proximity; capable of dominating the landscape	3-6 km (1.9-3.7 mi)
C	Clearly visible with moderate impact: potentially intrusive	6-10 km (3.7-6.2 mi)
D	Clearly visible with moderate impact: becoming less distinct	10-14 km (6.2-8.7 mi)

E	Less distinct: size much reduced but movement still discernable	14-18 km (8.7-11.2 mi)
F	Low Impact, movement noticeable in good light; becoming a component in the overall landscape	18-23 km (11.2-14.3 mi)
G	Becoming Indistinct with negligible impact on the wider Landscape	23-30 km (14.3-18.6 mi)
H	Noticeable in Good Light, but negligible impact	30-35 km (18.6-21.7 mi)
I	Negligible or no Impact	35 km+ (21.7 mi+)

Source: Sinclair 2001

Sinclair suggests that an appropriate radius for zone of visual influence analysis should be at the junction of bands "F" and "G", in this case the recommended distance is 23 km (14.3 miles).

The analysis of potential visual impacts associated with this project was based on turbine hub heights of about 79 meters; however, the Sinclair study uses overall turbine height (hub plus rotor). The zone of visual influence established for this project was 18 miles from the proposed turbines for each Alternative. Within this zone of visual influence, potential sensitive viewers were identified, and preliminary potential impacts assessed based on sensitivity level and zone of influence.

Taking bands A though H for this study, five levels of visual influence were used based on Sinclair to assign potential impacts on identified sensitive viewers.

- Proximate - (0 - 1.5 mile)
- High - (1.5 - 4.0 mile)
- Moderate – (4.0 - 10.0 miles)
- Low - (10.0 - 18.0 miles)
- None – (18.0+ miles)

A computer analysis was conducted of the wind farm using Geographic Information Systems (GIS) to determine the extent and degree of visual influence in VCWEP study area. Using the visibility thresholds previously established, and assuming visibility from the hub (79 meter) of all towers with each phase, sensitive viewers were identified for each Alternative assuming a 5.5 foot viewing height within an 18 mile radius of VCWEP. A similar method was used in the inventory of scenic quality, with the Scenic Quality/Visual Integrity Classes mapped within the 18 mile zone.

The number of Highly Sensitive and Moderately Sensitive viewpoints, number of residential viewers, linear mileage of Highly Sensitive and Moderately Sensitive Road Viewers, and the acreage Scenic Quality Classes was inventoried for to provide a comprehensive data set indicating overall visual influence, and for the refinement of the analysis when assessing VCWEP's impacts (See Table 3.4-12).

After delineation of visual influence zones, a viewshed analysis was performed using the same distance zones from potentially highly impacted sensitive viewpoints for purposes of impact mapping and final analysis.

Table 3.4-12 - Wind Farm Visibility Summary

		Total Analysis Area (ac.) (Potential Area Affected)	# of High/Moderate Sensitivity Viewpoints			Scenic Quality Classes (Acres)			Sensitive Route Mileage		VRM Class Acreage		
			# Residences H	# Recreation Receptors H	# Recreation Receptors M	B	C	Total Area Affected	H	M	II	III	IV
Alternative A (Phases I & II)		**772564**						**363449**					
Visibility Zone	Proximate	18263	0	1	0	106	16510	16616	1.7	0.0	2848	0	8116
	High	44474	0	0	0	1407	28500	29907	3.2	0.0	10680	0	1174
	Moderate	208250	9	0	0	5532	114959	120491	5.5	6.0	26570	0	28402
	Low	501577	231	0	1	4954	191481	196436	8.3	9.3	13858	0	41671
Alternative B (Phases I, II, & III)		**839506**						**421166**					
Visibility Zone	Proximate	28767	0	1	0	397	26810	27208	1.7	0.0	4180	0	14408
	High	53236	0	0	0	2057	41846	43903	3.2	0.0	12051	0	17390
	Moderate	228702	15	0	0	7500	128970	136470	5.5	8.3	28348	0	27724
	Low	528802	321	0	1	6155	207430	213586	8.3	8.7	13065	0	43808
Alternative C (Phases I, II, III, & IV)		**923972**						**483219**					
Visibility Zone	Proximate	45242	0	1	0	3696	40196	43892	3.3	0.0	4180	0	23255
	High	63517	0	0	0	2685	50916	53601	3.7	0.0	12058	0	19033
	Moderate	25346	17	0	0	7992	137244	145236	4.1	9.3	28984	0	25935
	Low	561751	349	0	1	5936	234554	240489	8.4	14.5	13820	21	45507

Existing Conditions

Landscape Character Types

Phase I – 50 MW Area - This 1,094 acre site is situated within the 16.7 square mile Proposed Action along the middle section northwest side adjacent to the BCWSA. This phase will involve the construction of 33 turbines located along 3 main strings. Phase I will also include the construction of the following:

- 2.0 mile long, twenty-four foot wide permanent access road covering 5.8 acres with 60' of right-of-way covering 8.7 acres being temporarily disturbed;
- 1 acre collector substation temporarily disturbing 1.0 additional acre;
- 2,000 square foot Operations building with two acres of parking and outside storage temporarily disturbing 2.0 additional acres;
- Collector system comprised of 3.5 miles of underground and 1.3 miles of overhead transmission covering approximately 7.0 acres;
- 4.8 miles of eighteen foot wide internal wind farm roads with 3' of additional disturbance on either side; and
- Material staging temporarily disturbing 33.0 acres.

The landscape character in this Phase is predominantly agricultural in nature, with cultivated fields and grazing land dominating the landscape. Vegetation consists of prairie grasses and some cropland. Several livestock ponds wetlands are present, and a small drainage is located near the southern boundary of this phase. The topography is fairly flat on the north side of VCWEP, with the turbine strings spreading across the south end of the site, crossing Britsch Road, and continuing along a ridge line to the south. Two-hundred sixty-one acres of BLM Class IV lands are located in this phase.

Phase II – 100 MW Area – This 2,800 acre Phase II consists of an additional 5 strings of 63 turbines located in the central northwest section of VCWEP for a total of 96 turbines over 3,894 acres. Phase II is located in the west-central portion of VCWEP area, includes Kerr Cow Camp, and is comprised of an additional 20.8 acres of permanent and 7.0 acres of temporary roads, as well as 66.0 acres of temporary material staging and a collector system of 14.0 acres. These additional towers are located on fairly flat land in a mix of agricultural fields and grassland. There is an agricultural pond located north of the existing road southeast of the existing 40 meter MET tower and with a few deciduous trees adjacent to the water's edge. Phase II includes 1,050 acres of BLM Class IV land in addition to the 261 acres of Phase I for a total of 1,311 acres.

The zone of visual influence for Phases I-II encompasses approximately 363,449 acres of a potential 772,564 acres within the 18 mile radius analysis area, or approximately 47%. See Table 3.4-12 for a complete breakdown of the affected environment that includes data on analysis areas, sensitive viewpoints, scenic quality areas, sensitive recreation destination routes and travel corridors, and VRM Class acreage potentially affected by the wind farm turbines.

Of the 59,660 acres encompassing the BCWSA, 39,759 acres will have visibility of the wind farm for this Alternative, 17,704 acres in the Proximate and High visibility zones.

Phase III – 150 MW Area: This 5,520 acre Phase located at the northern boundary of VCWEP would bring the total project acreage to 9,414 acres, includes the entire northern border of the study area, and contains 10 main strings consisting of 104 turbines located in gently rolling grassy and limited agricultural landscape. There are also several livestock ponds and wetlands, and the phase borders the BCWSA on the northern edge. There is a fairly large drainage on the northwest corner of the phase draining into the BCWSA that has some eroded, exposed soils and patches of shrubs adding variable colors and textures. The total number of turbines up to this phase would be 200. This Phase includes an additional 31.2 acres of permanent and 10.5 acres of temporary internal roads, 99.0 acres of temporary materials staging, and 20.9 acres utilized by the collection system. BLM Class IV lands for this phase amount to 2,307 acres for a total of 3,618 acres up to this phase (See Table 3.4-12).

Of the 59,660 acres encompassing the BCWSA, 45,464 acres will have visibility of the wind farm for this Alternative, 24,615 acres in the Proximate and High visibility zones. The zone of visual influence for Phases I-III encompasses approximately 421,166 acres of a potential 839,506 acres within the 18 mile radius analysis area, or approximately 50%.

Phase IV- 200 MW Area: The 16.7 square mile Proposed Action contains all other phases in addition to 134 towers along 15 strings on 10,706 acres. This Phase includes an additional 14.0 acres of temporary and 41.6 acres of permanent internal roads, 132.0 acres of temporary material staging, and 27.9 acres utilized by the collector system. The final build-out, including this phase consists of:

- Internal roads covering approximately 139.0 acres.
- Collector System covering 69.8 acres
- 334 Wind Turbines
- 2.0 mile long, twenty-four foot wide permanent access road covering 5.8 acres with 60’ of right-of-way covering 8.7 acres being temporarily disturbed;
- 2,000 square foot Operations building with two acres of parking and outside storage temporarily disturbing 2.0 additional acres;

The landscape character is natural gently rolling plains and culturally dominated agricultural development. The site is located on a broad plateau that includes some small drainages and coulees. The vegetation is predominantly a uniform ground cover of short- and mid- prairie grasses that are fine in texture with some highlights of green, yellow and earth toned forbs herbaceous vegetation, and golden - light brown in color, with occasional low growing shrubs, badlands and riparian vegetation forming irregular clumps, with some areas under cultivation. An existing 40 meter MET tower and a microwave tower provide distinctive vertical elements that contrasts with the open, virtually treeless existing landscape. There is also an existing compressor station

associated with the Northern Border Pipeline Company's underground gas pipeline located near the microwave tower. There also is an existing impoundment, and cultivated fields provide some large, uniform patches of texture and color. BLM Class IV lands in this phase amount to 7,661 acres for a total of 11,279 acres over all phases (See Table 3.4-12).

The zone of visual influence for Phases I-IV encompasses approximately 483,219 acres of a potential 923,972 acres within the 18 mile radius analysis area, or approximately 52%. See Table 3.4-12 for a complete breakdown of the affected environment that includes data on analysis areas, sensitive viewpoints, scenic quality areas, sensitive recreation destination routes and travel corridors, and VRM Class acreage potentially affected by the wind farm turbines.

Of the 59,660 acres encompassing the BCWSA, 45,837 acres will have visibility of the wind farm for this Alternative, 25,431 acres in the Proximate and High visibility zones.

Sensitive Viewpoints

The BLM Wind Energy Draft Programmatic Environmental Impact Statement recognizes that aesthetic impacts are among the most important impacts associated with wind energy development, and are one of the greatest sources of objection to wind energy development (BLM 2004). Some of the major public concerns about wind energy development identified by the BLM include:

- Scenic quality impacts from roadless areas, wilderness areas, and recreation areas.
- Consideration of impacts to viewsheds and landscapes associated with National Historic Trails and other historically significant transportation corridors and cultural landscapes when sighting and designing wind energy projects
- Concern about the BLM clearly defining what constitutes a significant impact to visual resources.
- Impacts on homes
- The impacts of tower lighting and vistas, especially during in the nighttime hours.
- The visual impact of the location of the turbines in relationship to each other
- The visual impacts of abandoned wind turbines should also be addressed

The agencies have expressed some concern about the visibility of the wind farm and the transmission interconnection from sensitive viewpoints nearby, including the adjacent Bittercreek Wilderness Study Area, residences, recreation areas, and recreation-destination roads, as well as scenic quality impacts to the existing remote an intact grassland prairie landscape.

Sensitive receptors identified within the 18 mile zone of visual influence for the wind farm include:

- BCWSA Scenic Overlook
- Recreation Destination Route (Britsch Road to the Bitter Creek Wildlife Viewing Area)
- Residences in St. Marie and Opheim and Dispersed throughout the study area
- Glasgow Base Ponds Fishing Access Site
- Vandalia (Glasgow) Rest Area (US Highway 2)
- Montana Highway 24
- U.S. Highway 2

Of the 366 residences in the zone of visual influence, 137 units are located in St. Marie, and will have obstructed views of VCWEP, and therefore, will not be potentially impacted by any of VCWEPs phases (See Table 3.4-12 Wind Farm Visibility Summary).

Analysis of the affected environment as previously presented in this chapter indicates that the sensitive viewers most likely to be highly impacted by the construction and operation of the wind farm are:

- BCWSA Scenic Overlook
- Recreation Destination Route (Britsch Road to the Bitter Creek Wildlife Viewing Area)

3.4.1.4 230kV Transmission Line

Study Methods

Distance Zones

For the transmission line portion of this study, various distance zone threshold were used to determine potential viewing conditions based on previous studies (Jones and Jones,1976) and previous work done in similar environmental settings:

- Immediate Foreground - 0 to 500’
- Foreground - 0 - ½ mile
- Middle ground – ½ - 1 mile
- Background/Seldom Seen - 1 - 3 mile

Sensitive Viewers and Viewpoints

A three mile wide corridor was studied along the proposed transmission line alternatives for potential sensitive viewpoints. Sensitive viewers and viewpoint identified near the proposed transmission line corridors include:

- Recreation Destination Routes
- State and County travel routes
- Residences
- Recreation areas

The Alternative Routes were studied for sensitive viewer visibility based on the previously mentioned distance zones for use in impact analysis using ArcView GIS software. Proposed towers were modeled based on design specifications, and analyzed assuming 5.5 foot viewing condition. The result was a comprehensive breakdown that included the following data for each 1/10th mile increment:

- Type of viewer (residence, recreation, travel route, etc.)
- Sensitivity Level (High or Moderate)
- Viewing Condition (Immediate Foreground, Foreground, etc.)

The data used to quantify worst case viewing condition for subsequent impact assessment.

Existing Conditions-Alternative Route Overview

Because some alternative share the same links, each alternative is independently summarized, and conditions for each link subsequently described separately

Alternative A – Highway 24

This alternative uses the existing Highway 24 transmission line corridor. Highest visibility for sensitive viewers for this Alternative are for Highway 24 users, Glasgow Base Pond users, and the concentration of residences near Skylark Road and the Jensen Trail/U.S. Highway 2 intersection. Residences in St. Marie will have blocked views of VCWEP due to unoccupied structures in the foreground and middleground distance zones. See links 1, 3, 5, 23, and 24 below for a more detailed description of visual resources.

Alternative B – Jensen Trail

This Alternative utilizes Jensen Trail, a low use existing back-country gravel road that has a low concentration of residential viewers, some existing single pole distribution lines, and few nearby sensitive recreational viewing points. As with Alternative A, the highest project visibility is for Highway 24 users, Glasgow Base Pond users, and the concentration of residences near Skylark Road and the Jensen Trail/U.S. Highway 2 intersection. See links 1, 3, 6, 10, 18, 23, and 24 below for a more detailed description of visual resources.

Alternative C - East Central - Proposed Action

The Proposed Action, Alternative C, is located largely in the back country, where the number of nearby sensitive viewers is comparably low. The extreme northern portions of

the route, as with Alternatives A and B, are within three mile of sensitive viewers near the Bitter Creek Wildlife Viewing Area and associated destination route. Nearby residential viewers are limited to a few near U.S. Highway 2 and Cut Across Road, and several located on Riverside Drive. Faraacon Park and Riverside Drive (as Recreation Destination Route) were identified as nearby sensitive viewing locations. links See 1, 3, 6, 11, 20, and 22 below for a more detailed description of visual resources.

Alternative D - Britsch Road

Alternative D has the lowest overall potential for residential viewer impacts, being located in the least populated portion of the study area. The aggregate mileage near sensitive recreation viewers is greatest for this alternative. See links 2, 9, 14, 16, 25 below for a more detailed description of visual resources.

Alternative E - West Central

Alternative E has relatively few nearby sensitive viewers that include U.S. Highway 2 road viewers and residences near Tampico Road and Riverside Drive. See links 1, 4, 8, 12, 17, and 25 below for a more detailed description of visual resources.

Existing Conditions By Link

Existing landscape character, scenic quality, sensitive viewpoints and viewers, and viewing conditions are outlined below for the transmission line for each link, and summarized for each 1/10th mile increment below. Foreground and Immediate Foreground viewing conditions are noted because of the potential for high initial impact levels. Complete data for viewing conditions of all highly and moderately sensitive viewers are presented in Appendix C-6: "230 kV Transmission Line Impact Table".

Link 1 (Alternatives A, B, C, & E)–Sensitive viewpoints near Link 1 include the Bitter Creek Wildlife Viewing Area (high sensitivity) and Britsch Road (high sensitivity Recreation Destination Route) leading to it. There are no Foreground or Immediate Foreground viewing conditions for Link 1. The existing landscape character is typically Rural Developed Plains (Scenic Quality Class C).

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: None
- Recreational Viewers: No Foreground or Immediate Foreground Views
- Road Viewers: No Foreground or Immediate Foreground Views

Link 2 (Alternative D) – Link 2 roughly parallels, is to the south of, and is offset form Britsch Road about 500-600'. Sensitive viewpoints near Link 2 include the Bitter Creek Wildlife Viewing Area (high sensitivity) and Britsch Road (high sensitivity Recreation Destination Route) leading to it, though sensitive recreational viewers are generally oriented away from VCWEP. The existing landscape character from mile post 0.0 though 1.1 is Rural Developed Plains (Scenic Quality Class C), with the remainder of the link

being in Natural Rolling Plains (Scenic Quality Class C). BLM Class IV lands are crossed from mile post 0.9-2.1, and from 2.7 to the end of Link 2.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: None
- High Sensitivity Recreational Viewers: (mile post) 2.0 - 3.1 (viewer orientation away from project)
- High Sensitivity Road Viewers: 2.0 - 7.7

Link 3 (Alternatives A, B, & C) – Sensitive viewpoints near Link 1 include the Bitter Creek Wildlife Viewing Area (high sensitivity) and Britsch Road (high sensitivity Recreation Destination Route) leading to it. There are no Foreground and Immediate Foreground viewing conditions occurring along this link for recreational or road viewers, and no visibility form any residence. The existing landscape character is typically Rural Developed Plains (Scenic Quality/Visual Integrity Class C), or Natural Rolling Plains (Scenic Quality Class C). From mile post 2.7 though 2.9, this link drops into a Scenic Quality Class B Natural Coulee. BLM VRM Class IV lands are crosses from mile post 0.0 through 0.6.

Link 4 (Alternative E) – Sensitive viewpoints near the 4.4 mile Link 4 include the Bitter Creek Wildlife Viewing Area (high sensitivity) and Britsch Road (high sensitivity Recreation Destination Route). There are no Foreground and Immediate Foreground viewing conditions occurring for road or recreation viewers, and no visibility from residences along this link. The existing landscape character is typically Rural Developed Plains (Scenic Quality/Visual Integrity Class C), or Natural Rolling Plains (Scenic Quality Class C). A Class B Natural Coulee is crossed form 2.9 though 4.4. BLM Class IV lands are crossed from mile post 0.0 though 2.5, and 3.2 through 4.4.

Link 5 (Alternatives A) – Sensitive viewpoints for this 27 mile link include Rt. 24 (moderate sensitivity), Glasgow Base Fishing Ponds (moderate sensitivity), residential viewers from at the south portion of VCWEP near St. Marie and Glasgow. However, most of the viewers form St. Marie will have obstructed views, because occupied residences are internal to the development, and unoccupied structures will typically block any views of the transmission line from this area. Of those that may have potential views of the transmission line, all will view it in a background condition. Link 5 has moderately sensitive road, moderately sensitive recreation, and highly sensitive residential Foreground and Immediate Foreground Views. The landscape character is typically Rural Developed Plains (Scenic Quality/Visual Integrity Class C), or Natural Rolling Plains (Scenic Quality Class C). From mile post 23.9 through 25.3, the link crosses a Rural Developed Coulee (Scenic Quality/Visual Integrity Class B), Milk River riparian woodlands are crossed from mile marker 23.9 through 24.1, and 24.7 through 24.9. BLM VRM Class IV lands are crossed from mile post 15.4 through 17.0, 17.2-18.8, 19.9-21.0, 23.6-23.8, and 25.2-26.3.

Foreground or Immediate Foreground Viewers-

Residential Viewers: No Foreground or Immediate Foreground Views

Moderately Sensitive Recreational Viewers: 9.9 - 10.9

Moderately Sensitive Road Viewers: 10.0 - 10.9, 12.7 - 12.8, 13.1 - 13.3, 13.5 - 13.7, 18.3 - 18.4, 18.7 - 18.9, 19.2 - 19.4, 19.7 - 19.9, 20.0 - 20.3, 20.4 - 20.7, 20.9 - 22.2, 22.4 - 23.1

Link 6 (Alternatives B & C) - There were no nearby sensitive viewpoints identified for this link. Scenic Quality for this link is generally rated as Scenic Quality/Visual Integrity Class C Natural Rolling Plains, with Class B ratings in Natural Coulee areas occurring from 2.5 - 3.3 and 4.6-5.1. Class IV BLM lands between mile post 0.9 and 1.5.

Link 7 (Not Considered) - Sensitive viewpoints near Link 7 include the Bitter Creek Wildlife Viewing Area Recreation Destination Routes (Britsch Road). Foreground and Immediate Foreground viewing conditions occur for high sensitivity sensitive road viewers. The general Landscape Character is generally Scenic Quality Class C Natural Rolling Plains, with Class B Natural Coulee being crossed from mile post 0.0 through 1.0. This entire link crosses BLM Class IV lands.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: None
- Recreational Viewers: None
- High Sensitivity Road Viewers: 2.7-3.5

Link 8 (Alternative E)- Sensitive Viewpoints near this link include the Bitter Creek Wildlife Viewing Area and Britsch Road. There are no nearby sensitive recreation or residential viewers for Link 8. The general Landscape Character is Class C Natural Rolling Plains. Link 8 crosses Natural Coulee areas from 0.0 through 1.2, 2.6-2.9, 5.3-5.6, 7.2-7.6, and from 8.0 to the intersection of Links 12/13. Most of this link, except from mile post 2.9 to 3.4, is in VRM Class IV lands.

Link 9 (Alternative D) - Nearby Sensitive Viewpoints include Brisch Road and Residences near mile markers 4.0 and 9.0. All of Link 9 is in Britsch Road Foreground and Immediate Foreground viewing conditions. The landscape character is predominantly Natural Rolling Plains (Class C), with mile post 1.0 through 1.4 traversing Class B Badlands. BLM VRM Class IV lands are crossed between mile post 0.7 and 5.8, 5.9-6.1, and 9.7-10.8.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: No Foreground or Immediate Foreground Views
- Recreational Viewers: None
- High Sensitivity Road Viewers: 0.0 - 10.8

Link 10 (Alternative B) - Nearby Sensitive Viewers include residences and Rt. 24 viewers. Foreground and Immediate Foreground viewing conditions occur for Residential Viewers only along Link 10. Link 10 begins at mile post 0.0 in Natural Rolling Plains (Class C), and at 8.7 crosses Class B Natural Coulee though 9.0. The remaining segment of the link is in Class C Rural Developed Plains, with the exception of mile post 9.0 through 11.0, which is in Class C Rural Developed Plains. BLM Class IV lands are crossed between mile post 5.7 and 6.3, 8.1-10.3, 12.7-13.3, and 13.7-14.3.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: 9.9-10.6, 15.9-16.4, and 16.8-17.2
- Recreational Viewers: None
- Road Viewers: No Foreground or Immediate Foreground Views

Link 11 (Alternative C) - Nearby sensitive viewers include are from U.S. Highway 2 and adjacent residences. Foreground and Immediate Foreground viewing conditions occur for residential, road and recreational viewers. The Buffalo Country Interpretive Site viewers are oriented away from the transmission line near mile post 16.1-16.2. The landscape character begins as Natural Rolling Plains (Scenic Quality C). At mile post 7.5 through 8.1, the link drops into a Natural Coulee (Scenic Quality B), and from 8.1 through 10.4 is in Class C Natural Rolling Plains. From mile post 10.4 through 17.6, the link is contained within Class C Rural Developed Plains. At mile 15.0, this link begins to follow the U.S. Highway 2 corridor where cultural modifications are more prevalent. BLM Class IV lands are crossed form mile post 4.1 through 11.4, 12.0-14.8, and 15.3-16.9.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: 15.1-15.2,
- High Sensitivity Recreational Viewers: 15.6-16.7 (viewer orientation away from project)
- Moderate Sensitivity Road Viewers: 14.3-17.6

Link 12 (Alternatives E) – Nearby sensitive viewpoints include U.S. Highway 2 and residences along the Milk River. Foreground and Immediate Foreground viewing conditions occur for residential viewers in the Milk River floodplain near Tampico Road and road views along Tampico Road and U.S. Highway 2 along this link. The landscape character of the link begins with Natural Rolling Plains (Scenic Quality C) from mile post 0.0 though 1.6, crosses a Class C Natural Coulee to 1.7, and enters Class C Rural Developed Plains to mile post 3.9. From 3.9 to 4.4, the link crosses Class B Rural Developed Coulee, and enters Class C Rural Developed Plains from 4.4 though 7.1. crossing U.S. Highway 2 at 5.4, and Class C Rural Developed Plains (7.2-7.5, 9.1-9.5) or Class C Agricultural Floodplain (7.1-7.2, 7.5-9.1) until it tee's into Link 15 at Tampico Road. Near this intersection, the existing landscape character is more heavily developed with the railroad and existing transmission lines running along Tampico Road. BLM Class IV lands are crossed from mile post 0.0 through 2.4.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: 7.2-8.2
- Recreational Viewers: No Foreground or Immediate Foreground Views
- Moderate Sensitivity Road Viewers: 4.8-6.0

Link 13 (Not Considered) - Nearby sensitive viewpoints affected by Link 13 includes Britsch Road (Recreation Destination route) and a nearby residence on the west side of the road. Foreground and Immediate Foreground viewing conditions occur for sensitive route viewers. The beginning (0.0-1.0) and end (2.1-3.8) sections of Link 13 are located in Class C Natural Rolling Plains; at mile posts 1.0-1.2 and 1.9-2.1 the link crosses Rural Developed Coulee (Scenic Quality Class B), with the area in between (1.2-1.9) being Rural Developed Plains. BLM VRM Class IV lands are crossed from 0.0 through 1.0, 1.9-2.6, and 3.1-3.7.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: No Foreground or Immediate Foreground Views
- Recreational Viewers: None
- High Sensitivity Road Viewers: 3.1-3.7

Link 14 (Alternative D) - Nearby sensitive viewers for Link 14 include those along Britsch Road (highly sensitive) and U.S. Highway 2 (moderately sensitive). Foreground and Immediate Foreground viewing conditions occur for Recreation Destination route viewers (Britsch Road) and for U.S. Highway 2 travel corridor. This link begins three miles north of U.S. Highway 2 in Class C Natural Rolling Plains (to mile post 0.9), enters Rural Developed Plains at mile post 0.9, crosses U.S. Highway 2 at mile post 3.0, and continues down Vandalia Road and drops into Class C Agricultural Flood Plains at mile post 3.1. BLM Class IV lands are crossed from mile post 0.0 through 0.1.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: 4.4-4.7
- Recreational Viewers: None
- High Sensitivity Road Viewers: 0.0-3.6
- Moderate Sensitivity Road Viewers: 2.5-3.6

Link 15 (Not Considered) – Nearby sensitive viewers for Link 15 include residences along Tampico Road and in Vandalia, with Foreground and Immediate Foreground viewing conditions occurring. This link begins in Class C Agricultural Floodplains just north of the Milk River and Tampico, crosses riparian woodland and the river at 0.5 through 0.8, and continues in Class C Agricultural Floodplain from 1.6 to the intersection of Link 12/17 along the north side of the railroad and Tampico Road corridor.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: 0.3-0.4, 0.5-1.4, and 2.7-3.9
- Recreational Viewers: None
- Road Viewers: None

Link 16 (Alternative D) –Nearby sensitive viewers for Link 16 include residential viewers located in Vandalia and near the existing Richardson Coulee Substation. Foreground and Immediate Foreground viewing conditions occur for nearby residential viewers. Link 16 begins in Class C Agricultural Floodplains to mile post 0.6, where Natural Rolling Plains are crossed from 0.7 through 1.3. From 1.3 through 2.0, Class C Rural Developed Plains are crossed. From mile post 2.0 through 9.8, the landscape is dominated by Natural Rolling Plains. The link traverses a Class B Developed Coulee from mile post 9.8 though 10.4. From 10.4 to the intersection of Links 16/17/25 is contained within the Class C Agricultural Floodplain. BLM VRM Class II lands are crossed from mile post 0.1 through 0.5, 0.7-1.4, and 3.3-4.8. BLM Class IV lands are crossed between mile post 4.8 and 8.9.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: 0.3-1.0 and 1.2-2.4
- Recreational Viewers: None
- Road Viewers: No Foreground or Immediate Foreground Views

Link 17 (Alternative E) - Foreground and Immediate Foreground viewing conditions occur along Link 17 for nearby residences south of Tampico and west of Billingsley Road. The link crosses either Class C Rural Developed Plains (6.3-7.4), Class B Rural Developed Coulee (7.4-7.8), or Class C Natural Rolling Plains (3.8-6.3). BLM Class II lands are crossed from mile post 3.1 though 4.2.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: 6.9-7.1
- Recreational Viewers: None
- Road Viewers: None

Link 18 (Alternative B) - Foreground and Immediate Foreground viewing conditions occur for nearby residences along Jensen Trail and Skylark Road for this link. Link 18 traverses Class C Rural Developed Plains along its' entire route.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: 0.0-0.5
- Recreational Viewers: None

- Road Viewers: No Foreground or Immediate Foreground Views

Link 19 (Not Considered)- Foreground and Immediate Foreground viewing conditions occur for moderately sensitive road viewers from U.S. Highway 2, and nearby residences on U.S. Highway 2 and Jensen Road. This link is contained entirely within Class C Rural Developed Plains.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: 0.0-0.3
- Recreational Viewers: No Foreground or Immediate Foreground Views
- Moderately Sensitive Road Viewers: 1.5-1.9

Link 20 (Alternative C) – Foreground and Immediate Foreground viewing conditions occur for moderately sensitive viewers along U.S. Highway 2 in Class C Rural Developed Plains.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: No Foreground or Immediate Foreground Views
- Recreational Viewers: No Foreground or Immediate Foreground Views
- Moderately Sensitive Road Viewers: 0.0-0.3

Link 21 (Not Considered) - Foreground and Immediate Foreground viewing conditions occur for nearby residential viewers and travelers along U.S. Highway 2. Link 21 starts in Class C Rural Developed Plains at mile post 0.0, and transitions to Agricultural Floodplain as it crosses U.S. Highway 2 at mile post 1.6.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: 0.4-0.6 and 0.7-2.2
- Recreational Viewers: No Foreground or Immediate Foreground Views
- Moderately Sensitive Road Viewers: 0.0-2.2

Link 22 (Alternative C) - Foreground and Immediate Foreground viewing conditions occur for nearby residences on Riverside Drive and U.S. Highway 2, Recreation Destination (Faarasen Park) and U.S. Highway 2 travelers. This link crosses either Agricultural Floodplains (0.3-0.5, 1.1-1.3, and 1.6-5.4) or Rural Developed Plains (0.0-0.3, 0.5-1.1, 1.3-1.6, and 5.4-6.5).

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: 0.7-2.1, 2.6-4.1, 4.6-5.9, and 6.2-6.4
- Recreational Viewers: No Foreground or Immediate Foreground Views
- Moderately Sensitive Road Viewers: 0.0-2.2

Link 23 (Alternatives A & B)- Foreground and Immediate Foreground viewing conditions occur for nearby residential viewers on Jensen Trail and U.S. Highway 2, and moderately sensitive viewers along U.S. Highway 2. This link starts in the rolling upland Class C Rural Developed Plains to mile post 1.5, and drops into Class C Agricultural Floodplain from mile post 1.5 to the intersection of Links 21/23/24 at 2.0.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: 0.7-2.0
- Recreational Viewers: None
- Moderately Sensitive Road Viewers: 1.2-2.0

Link 24 (Alternatives A & B)- Foreground and Immediate Foreground viewing conditions occur for nearby residential viewers along U.S. Highway 2 and Billingsley Road. This Link starts in Class C Agricultural Floodplain to mile post 4.2, where it transitions to Class C Rural Developed Plains at mile post 4.2.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: 0.0-0.4, 1.7-2.7, 2.8-4.6, and 6.4-6.6
- Recreational Viewers: None
- Moderately Sensitive Road Viewers: 0.0-0.6

Link 25 (Alternatives D & E) - Foreground and Immediate Foreground viewing conditions occur for nearby residential viewers off Billingsley Road. This link is located in Class C Agricultural Floodplain.

- Foreground or Immediate Foreground Viewers-
- Residential Viewers: 0.7-1.4
- Recreational Viewers: None
- Road Viewers: None

3.4.1.5 Antelope Creek Substation

Study Methods

Distance Zone Determination

For the substation portion of this study, various distance zone thresholds were used to determine potential viewing conditions:

- Proximate - (0 – 500’)
- High - (0 – ½ mile)
- Moderate – (1/2 – 1 mile)

- Low - (1- 3 miles)
- None – (3 + miles)

A computer analysis was conducted of the wind farm using Geographic Information Systems (GIS) to determine the area of visual influence in VCWEP study area. Viewing conditions were analyzed within a 3 mile radius of VCWEP. Using the zones of visual influence (Proximate, High, Moderate, and Low), sensitive viewers and viewpoints were identified assuming a 5.5 foot viewing height. A similar method was used in the inventory scenic quality, with the Scenic Quality/Visual Integrity Classes mapped within the 3 mile zone of visual influence.

The number of Highly Sensitive and Moderately Sensitive viewpoints, number of residential viewers, linear mileage of Highly Sensitive and Moderately Sensitive Road Viewers, and the acreage Scenic Quality Classes was inventoried for use in the final analysis.

Existing Conditions

Landscape Character Types

The Antelope Creek Substation is located in the Rural Development Plains rating unit. (See Section 3.4.1.2).Vegetation includes sagebrush-western wheatgrass, and the existing landscape is fairly developed with existing transmission lines and a substation facility along a gravel road. The surrounding landscape is agricultural with several nearby residences.

Sensitive Viewpoints

Viewpoints identified along in the area of the proposed Antelope Creek Substation within a 3-mile radius include 24 residences, with the breakdown as follows:

- Proximate Visual Influence Zone – 1 residence
- High Visual Influence Zone – 1 residence
- Moderate Visual Influence Zone – 3 residences
- Low Visual Influence Zone – 19 residences

There were no other nearby sensitive viewers.

The total landscape area that the proposed substation influences (within 3 miles) is approximately 14,556 acres.

Class III and Class IV BLM lands were determined to be within 3 miles of the proposed Antelope Creek Substation. The breakdown for BLM lands in various visibility zones near the substation are as follows:

<u>Class II BLM Lands –</u>
Moderate Visibility Zone: 5.23 acres

Low Visibility Zone: 1013.77 acres

Class IV BLM Lands –
Low Visibility Zone: 87.69 acres

3.4.2 Environmental Consequences and Mitigation Measures

3.4.2.1 Overall Assessment Methodology

Visual impacts are expected to occur when changes in the landscape are noticeable to viewers looking from residences, sensitive travel routes, and parks and recreation areas. Potential impacts to views are the most significant when there are high sensitivity levels are coupled with close views and highly contrasting project elements. Visual resource impacts would result to some degree from project construction, operation, and maintenance of the Wind Farm, 230kV Transmission Line, and Antelope Creek Substation.

The assessment methodology used for all portions of VCWEP uses data from visual resource inventory outlined in Section 3.4.1. All assessment methodologies are based on guidelines established in the BLM's Visual Resources Management 8400 Series (BLM 1984) and previous transmission line, wind farm, and substation assessments that have been completed for other projects.

In all methodologies, the analysis was assisted by the use of Environmental Systems Research Institutes (ERSI) ArcView GIS software to model seen areas and viewsheds, derive maps and data tables of impacted areas, and otherwise document and provide an analysis tool to assess project visual impacts. Other resource studies and data contributed in the development of visual impact models. For example, to determine project visibility from sensitive viewpoints, viewshed mapping was derived using a GIS model that determined visibility from selected viewpoints over terrain modeled from USGS digital elevational data. Likewise, soils and biological (vegetation) resources data were also utilized in the visual impact assessment.

Along The Milk River, existing cottonwood stands were identified and included in the visual analyses. Existing groves were identified from aerial photographs and digitized into GIS. Polygons were then created and projected one-hundred feet from existing grade elevation along the river corridor, potentially blocking views from sensitive viewpoints.

The impact analysis for each of these project elements produce qualitative levels of high, moderate, or low impacts, defined as follows:

High Impact - A high level of impact would result if the construction, operation, maintenance, or abandonment of the VCWEP. would potentially cause substantial adverse change to visual resources.

Moderate Impact - A moderate level of impact would result if the construction, operation, maintenance, or abandonment of the VCWEP. would potentially cause some adverse change to visual resources.

Low Impact - A low level of impact would result if the construction, operation, maintenance, or abandonment of the VCWEP. would potentially cause a small adverse change to visual resources.

After the impact intensity, duration, and locations were identified, mitigation measures were developed for the purposes of reducing either the intensity or duration of impacts. Mitigation for the VCWEP included two types of programs: Generic and selective. Generic mitigation consists of measures or techniques to which Wind Hunter will commit to on a nonspecific, or project-wide basis as part of its VCWEP. plan. Selective mitigation measure will be applied on a case-by-case basis as needed where high and moderate initial impacts to visual resources are determined.

The sequence of tasks used to study the visual impacts for all portions of the study area include:

- Visual Contrast analysis
- Impact Assessment
- Mitigation Planning

Other methods for assessing visual impacts vary with the nature of VCWEP component, and are addressed separately in this section.

Key Observation Points

Visual simulations are used in a variety of ways in visual impact analysis (Smardon 1986), these include:

- As a design tool for project development;
- As a analytical tool for project reviewers such as clients, regulatory agencies, and environmental consultants;
- As an information devise for presentations to the public and interested parties;
- As a stimulus for eliciting certain responses towards VCWEP from the public, key informant, or other groups; and
- As documentary evidence in environmental reports and legal testimony.

To show expected changes to the visual environment associated VCWEP, two key observation points for this project were selected. One observation point shows the

proposed wind towers from the BCWSA, and the other show a typical transmission line condition. These sites were chosen based on criteria outlined in the wind farm and transmission line impact assessment sections (Sections 3.4.2.2 and 3.4.2.3).

Digital imaging, geographical information systems, computer aided design, and global positioning system software assisted in the development of photosimulations. The software used in photosimualtion include:

- Adobe Photoshop CE – Used for photo manipulation and merging,
- Bentley Microstation v8.5 – Used for construction of transmission line and wind tower models, photomatching, and rendering,
- Bentley Inroads v8.5 – Used for Digital Terrain Mapping (DTM) and modeling, and
- ArcView – Used for geographic information project data mapping

The process of photosimualtion began with taking field photographs, documenting viewpoint locations (coordinates), and matching those photographs with project terrain models developed using Microstation. Computer models of the transmission lines and wind towers were developed from manufacturer and design specifications, and introduced into the terrain model based on preliminary facility layouts developed in ArcView. The final image is a composite of the 3-dimentional structure modeling and the original photograph. The process ensured that spatial relationships, perspective, proportions and similar visual attributes were accurate and matched existing landscape conditions.

3.4.2.2 Wind Farm

Assessment Methodology

A computer analysis was conducted of the wind farm using Geographic Information Systems (GIS) to determine the area of visual influence in VCWEP study area. Using the visual influence zones (Proximate, High, Moderate, and Low) outlined in Section 3.4.1.3.1 and assuming visibility of the towers with each phase at proposed (maximum) hub height of 79 meters (260 feet), sensitive viewers were identified within an 18 mile radius of VCWEP, and potential impacts analyzed for each Alternative (See Map 13). The result of the analysis showed that very few sensitive receptors are located in potentially highly impacting visual influence zones.

The analysis was refined to focus in on the highest likely impacted viewers from the closest viewpoints though viewshed mapping. Views of visual changes associated with wind farm in the landscape can be described in terms of distance zones that define the level of visual perception that can be expected. To determine initial impact levels, visibility and distance zones established in Section 3.4-1.3 were compared to high sensitivity viewpoints identified in the proximate and high zones of visual influence.

The driving factor in assessing the impacts of the wind farm on sensitive viewers is the scale and structure contrast of the turbine and massing of the strings. It was assumed that there would be a high overall contrast due to the turbine numbers and size, and lack of significant existing development, and therefore, structure contrast would be the dominant visually contrasting element (vs. vegetation or landform). After determining the final visual contrast (strong), the potential for visual impacts for three types of visual resources were assessed:

- Impacts to Recreational Areas
- Impacts to Travel Routes (Recreation Destination and corridors)
- Impacts to Scenic Quality

Potential impacts, based on Table 3.4-13, were recorded into a data table (Table 3.4-14) for each Alternative. Scenic Quality impacts were determined based on strong visual contrast and Table 3.4-21.

Potential impacts to scenic quality are based on the change in quality and quantity of the visual resources inherent in the landscape without regard to how it is seen from viewpoints.

Table 3.4-13 Viewer Wind Farm Initial Impact Matrix

		Impact Level
Visibility Threshold	Immediate Foreground-0 to 1.5 miles	High
	Forground-1.5 to 4 miles	High
	Middleground-4.0 to 10 miles	Moderate
	Background-10.0 to 18.0 miles	Low
	Seldom Seen-Beyond 18 miles	No Impact

Impacts

Key Observation Photosimulation Point

One Key Observation Point, Viewpoint 1 (VP 1, See Appendices C-2 & C-3), was chosen for development of computer visual simulations of the wind farm. The simulation was prepared to show the difference between the pre-existing visual conditions of VCWEP and visual conditions of VCWEP after Phase I completion from the BCWSA. The final location of the photosimulation was determined using the following criteria:

- The viewpoint was to be inside the boundaries of the BCWSA

- The location should be from an accessible location likely to be used by the potential viewers
- The location should be from an area that portrays typical conditions after project construction in the high visual influence zone.

The photosimulation location is approximately 2.5 miles west of Britsch Road along the two-track jeep trail that follows the Northern Boarder Natural Gas Pipeline (northwest corner of the southwest corner of Section 7, Township 33 North, Range 38 East, Montana Principal Meridian). A series of photographs looking from the northeast to the southeast were taken and combined to create a single panoramic view encompassing all of Phase I. This photomontage represents a single point of view, but the panorama developed is the result of a merging and flattening of images to simulate a single landscape view. The photosimulation and location map are shown in Appendix C.-2 & C-3

Overall Visual Impacts

There are a variety of potential visual impacts related to activities during the construction, operation, and maintenance of the wind farm. These may have an impact on sensitive viewers or Scenic Quality, and include:

- Construction of new roads and upgrading roads for access
- Ground disturbance at structure sites
- Structure assembly and erection
- Construction and related traffic
- Auxiliary Installations Aesthetic Impacts
- Construction of additional meteorological (MET) towers
- Soil exposure and dust
- Glare of reflected sunlight
- Light Impacts associated with Site and Air Traffic Safety
- “Shadow-flicker” on nearby Residences
- Multiple and overlapping blade rotation causing disconcerting visual patterns
- Site impacts as previously described in the upgrade and replacement of structures
- Site impacts as previously described in the decommissioning of VCWEP
- Transmission structure contrast and impacts on “natural” landscapes, or Scenic Quality impacts

The wind turbine towers would be approximately 215 to 260 feet (65-80 meters) tall at the turbine nacelle (referred to as the “hub height”). With the nacelle and blades mounted, the total height of the wind turbine (“tip height”) would be approximately 330 to 360 feet (100-110 meters) high with a blade in the vertical position, turning at 10 to 23

revolutions per minute (RPM). The tower would be a tubular conical steel structure manufactured in multiple sections depending on tower height and approximately 12 to 16 feet in diameter at the base.

Wind Hunter also proposes to erect up to 3 permanent MET towers in VCWEP area. The permanent meteorological towers installed for VCWEP would be approximately as tall as the turbine tower hub height (215 to 260 feet) and would consist of a central lattice structure supported by three to four sets of guy wires that extend up to 100 to 200 feet from the base of each tower on a 16-foot-by-16-foot base. The towers may alternatively be of a free standing design. Meteorological towers greater than 200 feet in height would also require lighting in compliance with the Federal Aviation Administration (FAA) aircraft safety lighting requirements.

The(FAA) requires lighting for wind turbines, also, and will be designed based on final wind turbine and transmission line tower locations and heights. The FAA will review the plans, and determine the potential for marking and lighting requirements. As with the MET towers, the FAA will require that structures over 200 feet high must have warning lights.

In compliance with the FAA's aircraft safety lighting requirements, project turbines, and MET towers greater than 200 feet tall, would be marked with lights that flash white during the day (at 20,000 candela) and red at night (at 2,000 candela). The lights would be designed to concentrate the beam in the horizontal plane, minimizing light diffusion downward toward the ground and upward toward the sky. After it has reviewed final project plans the FAA would specify the exact number of turbines that would required lighting. Under current FAA regulations, the navigation lights would need to be mounted on the first and last turbine of each string and every 1,000 to 1,400 feet in between. White daytime lights will create only moderate impacts on nearby sensitive viewers (from the BCWSA).

Night-time red flashing lights would likely cause a greater impact to viewers. Though VCWEP is mostly in background view for most sensitive viewers, the lack of any existing lights in VCWEP area will provide a high contrast to the existing night sky. The only nearby sensitive receptors highly impacted by the red flashing lights are the BCWSA and destination route, neither of which is likely to be used during the night.

Shadow-flicker caused by moving rotors on nearby objects and the ground, and is related to the rotor speed. Shadow flicker is not caused by viewing the sun through moving rotor blades. The affects of shadow flicker, measured by the frequency that shadows pass over the same location, has been previously identified as of possible concern to nearby residences and people with epilepsy, and is only applicable to those receptors within the shadow of the rotors at low solar angles. The critical frequency for epileptic reaction is 2.5 Hz, or approximately 50 revolutions per minute (rpm) (SWREA 2003); the wind turbine speed of 10-23 rpm for the VCWEP. is not enough to be of concern to epileptics, and sensitive receptors are likely to be far enough away that the impacts, if at all present, would be very low. According to The American Wind Energy Association (AWEA

2004), shadow flicker is not a problem during the majority of the year at U.S. latitudes, except in Alaska.

Light and glare from the wind turbines and associated facilities may be produced as a result of project construction. Increased light levels produced by facility security lighting may be a factor due to the contrast created against the nighttime sky. Glare produced by various surfaces has the potential to affect the visual environment to varying degrees based on finishing material and surface treatment. These impacts would be applicable to all Alternatives.

In all alternatives, the effects on sensitive receptors will be very limited. The highest impacts will be from the Bitter Creek Wildlife Viewing Area and Destination Route, where passive recreational users will experience the towers as close as 3550 feet (0.67 mile). At this range, the towers would be a dominant part of the landscape when viewers are oriented in that direction. One mitigating factor is that those traveling into the BCWSA from Britsch Road on the two-track roads will generally have the towers at their backs, and the focus users will be directed towards the more visually interesting and more scenic "badlands".

Overall residential impacts will be low throughout VCWEP. The distance of most residences is at least 4 miles, with the bulk being beyond 10 miles. In St. Marie, many of those residences identified within the zone of visual influence and potentially experiencing some level of impacts have blocked views from other (uninhabited) buildings.

The effects landscape sound on landscape quality has been previously discussed, and the sonic impacts associated with moving turbines are covered in Section 3.14.

For each Alternative, the acreage of High and Moderate impacts and preliminary layout turbine impacts are summarized as follows:

Table 3.4-14 Wind Farm Impact Table

Alternative	# Turbines -High Impact	# Turbines - Moderate Impact
A (Phases I & II)	92	4
B (Phases I, II, & III)	107	93
Proposed Action-C (Phases I, II, III, IV)	174	160

Proposed Action –500 MW Facility (All Phases)

Total ground disturbance for the construction of 334 wind turbines on 20,120 acres is approximately 616.8 acres, of which 105.0 acres are permanent and 511.8 acres are temporary. Approximately 11,279 acres of Class IV VRM lands are contained within the Proposed Action.

The presence of two existing MET and microwave towers, provides the only strong vertical elements nearby, and the addition of 334 towers that are substantially larger and add the element of movement to the nature of the viewed landscape will significantly increase and overshadow any contrasting affects those towers currently make on the visual environment.

Proximate and high visibility levels for nearby sensitive viewers in this Alternative include the Bitter Creek Wildlife Viewing Area and the Recreation Destination Route (Britsch Road). Moderate and low visibility would occur for outlaying residences, Glasgow Base Ponds Fishing Access Site, and along Montana Highway 24.

There are no residences in the Proximate, High, or Moderate Zones of Visual Influence. Highly impacted recreational viewers include the Bitter Creek Wildlife Viewing Area and 7.0 miles of Recreation Destination route. A total of 174 wind turbines will highly impact nearby sensitive viewers for this Alternative, and moderate impacts will result from 160 towers. Moderate Scenic Quality impacts would result from this alternative, (See Figure 3.4-4)

Alternative A- 150 MW (Phases I and II)

This Alternative disturbs approximately 185.0 acres of land, and includes 31.5 acres permanently disrupted and 153.5 acres temporarily disturbed. This alternative impacts approximately 1311 acres of Class IV BLM lands.

Proximate and high visibility levels for nearby sensitive viewers in this phase include the Bitter Creek Wildlife Viewing Area and the Recreation Destination Route (Britsch Road). Moderate and low visibility would occur for outlaying residences, Glasgow Base Ponds Fishing Access Site, and along Montana Highway 24.

A total of 240 residences are within the zone of visual influence for the wind farm study area. Of these, the majority (231) are in the low visibility zone. Nine are in the moderate visibility zone. The moderately sensitive Glasgow Base Fishing Access Site is located in the Low Visibility zone. Initial impact levels for sensitive viewers of the Proposed Action are summarized in Table 3.4-14.

For this Phase, initial impacts to residences are very limited. Highly impacted recreational viewers include the Bitter Creek Wildlife Viewing Area and Recreation Destination route. There are no high impact levels to sensitive road viewers for this alternative. A total of 92 wind turbines will highly impact nearby sensitive viewers for this Alternative, and moderate impacts will result from 4 towers. Moderate Scenic Quality impacts would result from this alternative.

Figure 3.4-4 Wind Farm Impacts

Alternative B- 300 MW (Phases I, II & III)

This Alternative disturbs approximately 370.1 acres. Of this, 63.0 acres are permanent and 307.1 acres are temporary. Alternative B contains approximately 3618 acres of Class IV BLM lands.

Proximate and high visibility levels for nearby sensitive viewers in this phase include the Bitter Creek Wildlife Viewing Area and the Recreation Destination Route (Britsch Road). Moderate and low visibility would occur for outlaying residences, Glasgow Base Ponds Fishing Access Site, and along Montana Highway 24. Initial impact levels for sensitive viewers of the Proposed Action are summarized in Table 3.4-14.

For this Phase, initial impacts to residences are very limited. Highly impacted recreational viewers include the Bitter Creek Wildlife Viewing Area and Recreation Destination route. A total of 107 wind turbines will highly impact nearby sensitive viewers for this Alternative, and moderate impacts will result from 93 towers. There are no high impact levels to sensitive road viewers for this alternative. Moderate Scenic Quality impacts would result from this alternative.

Selective Mitigation Measures

Of the potential impacts previously detailed, selectively committed mitigation measures will help in reducing the visual impacts. Many of the impacts, however, such as scenic quality impacts and FAA nighttime lighting, are unavoidable and no mitigation method will significantly reduce them. Those that can be addressed are:

- Glare of reflected sunlight by painting the turbines and accessory structures non-reflective, neutral gray or earthtone color to be visually less obtrusive. No uncoated galvanized metallic surfaces will be used so as to prevent surface oxidation and stronger visual contrast (#15).

- Site safety lighting would be mitigated by the use of nighttime and motion sensor lights. Sensors and switches would be used to keep lights off when not required. Emergency lighting with back-up power is included to allow personnel to perform manual operations during an outage of normal power sources (#16).

- For site disturbance, exposed soils will be reclaimed using weed-free native grasses, forbs, and shrubs. Reclamation activities will be undertaken as early as possible on disturbed areas (#25)

3.4.2.3 230 kV Transmission Line

Assessment Methodology

The proposed transmission line alternatives would be constructed to connect the wind farm to the existing transmission line facilities. A number of assumptions are used for the assessment of visual impacts associated with the construction of the transmission line portion of VCWEP. Ground Disturbance Levels address construction factors such as the

level of new road construction, associated spur roads mileage, and land slope. These ground disturbance assumptions reflect the expected extent of new construction, and are as follows:

Level 1 Agricultural lands; no access roads needed

Level 2 Use Existing Improved Roads; no improvements needed
Assumes 0.3 miles of new spur roads per mile of transmission, and ground disturbance of 0.7 acres per mile

Level 3 Use Existing Unimproved Roads (2-track); may require blading or culvert installation in some areas
Assumes 0.6 miles of new spur roads per mile of transmission, and ground disturbance of 1.4 acres per mile

Level 4 New Access Roads required in flat to gently sloping terrain (0-5% slopes)
Assumes 1.0 to 1.5 miles of new spur roads per mile of transmission, and ground disturbance of 3.3 acres per mile

Level 5 New Access Roads required in sloping terrain (5-35% slopes)
Assumes 1.5 to 2.5 miles of new spur roads per mile of transmission, and ground disturbance of 5.5 acres per mile

The process of assessing the visual impacts of the transmission line involved a series of steps utilizing previously acquired from the study of the affected environment and ground disturbance level. The development of an impact model is based on VCWEP scope, typical construction, methods and a number of assumptions as outlined.

The impact model utilized three contrast levels to provide a final contrast level that was then used to determine initial impact levels. Impacts on residential, recreation, and road viewers were dependent on sensitivity level (moderate or high), final contrast levels, and viewing condition (foreground, middleground, background). Scenic quality impacts were based on Scenic Quality/Visual Integrity Class (B or C) and overall contrast level. Mitigation measures and impact modifiers (viewer orientation, use level, development level) were evaluated for potential effectiveness, and a final residual impact level was assigned. Residual impact levels were tabulated for each link used for the alternative, and total cumulative mileage for each impact level was calculated. Those alternatives with the lowest total mileage of high residual impacts and highest mileage of low impacts were determined to have the lowest overall impact.

Visual contrast is a measure of the degree of physical change in the landscape. Contrast, the measure of actual visual change, does not consider how this change is seen from sensitive viewpoints. How the visual change is seen from sensitive viewpoints determines the potential viewer impacts.

Visual contrast is made up of three separate contrast models:

- Landform contrast
- Vegetation contrast
- Structure contrast

Landform contrast is the change in landform patterns, soil exposure, erosion scars, slumping, and other disturbances that would result in a noticeable and uncharacteristic change in the existing natural or cultural landscape. Overall landform contrast was determined by comparing ground disturbance levels with the potential for soil erosion. (See Table 3.4-15).

Vegetation contrast was evaluated by comparing the nature and level of ground disturbance with the type of vegetation encountered in the impact areas. Two vegetation components were examined for potential contrasts: Riparian Overstory and Grassland/Agricultural. For transmission lines, a single level of contrast was assigned in riparian forest areas regardless of the ground disturbance level. Strong vegetation contrast was assumed due to the fact that wherever proposed transmission lines though existing woodlands, the entire overstory will be removed resulting in a strong level of contrast. Grassland and agricultural vegetation contrast will have a broader range of contrast levels due to potential vegetation recoverability and compatibility with the transmission line (See Table 3.4-16).

Structure contrast is assigned based on the presence and visual form of any existing transmission lines within VCWEP area. High structure contrast is the result of an introduction of any transmission line structure where there is none currently present. Lower levels of structure contrast are assigned where there are existing transmission lines, distribution lines, cellular towers, or other similar structures. (See Table 3.4-17).

An overall level of visual contrast is determined by combining the three levels of contrast to assign a final high, moderate, or low level of contrast (See Table 3.4-18 "Overall Contrast Matrix"). The following describes some of the conditions associated with each visual contrast level:

Strong Visual Contrast

- Contrast caused by construction of new access roads in steep terrain where soils are potentially erosive;
- The removal dense Riparian vegetation for right-of-way clearing, tower sites, or access roads; or
- A landscape with no existing transmission lines.

Moderate Visual Contrast

- Contrasts caused by blading of existing access roads in areas of moderate soil erosion potential;
- Removal of grassland or agricultural vegetation for right-of-way clearing; or
- A landscape where some existing but different style transmission line facilities would be nearby or paralleled.

Weak Visual Contrast

- Contrasts caused by the use of unimproved existing roads where to improvements are needed and there is limited new spur road construction in areas where soils have low erosion potential;

- Minimal removal of vegetation; or
- A landscape where existing similar transmission line facilities would be nearby or paralleled.

Table 3.4-15 Landform Contrast Matrix

		Ground Disturbance Level				
		5	**4**	**3**	**2**	**1**
Soil Contrast	Potentially Erosive Soils	S	S	M	W	W
	Moderate Erosion Potential	S	M	M	W	W
	Low Erosion Potential	M	M	W	W	W

Legend S = Strong
M = Moderate
W = Weak

Table 3.4-16 Vegetation Contrast Matrix

		Ground Disturbance Level				
		5	**4**	**3**	**2**	**1**
Vegetation Component	Riparian Overstory	S				
	Grasslands & Agriculture	S	M	M	W	W

Legend S = Strong
M = Moderate
W = Weak

Table 3.4-17 Structure Contrast 230kV Transmission Line

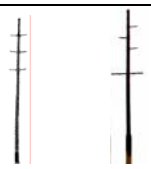
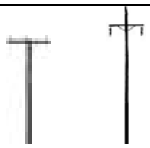
		Proposed Structures	
Existing Structures			
No Structures		Strong	Strong
69 kV Single Steel or Wood - Pole		Moderate	Weak
Single Wood - Pole		Moderate	Moderate
69 kV H - Frame Wood Pole		Weak	Weak
230kV Wood Frame		Weak	Weak
Other Structures: • Wood - Pole Distribution		Moderate	Moderate

Table 3.4-18 Overall Contrast Matrix

		Vegetation Contrast								
		S			**M**			**W**		
Landform Contrast	**S**	S	S	S	S	S	M	S	M	M
	M	S	M	M	M	M	M	M	M	W
	W	S	M	M	M	M	W	M	M	W
		S	**M**	**W**	**S**	**M**	**W**	**S**	**M**	**W**
Structure Contrast										

Legend S = Strong
M = Moderate
W = Weak

Photosimulation Point

One Key Observation point, Viewpoint 2 (VP 2), was chosen for development of computer visual simulations of the 230kV Transmission Line. The simulation was prepared to show the difference between the pre-existing visual conditions of VCWEP and visual conditions of VCWEP after project completion at typical high use roadway crossing. The final location of the photosimulation was determined using the following criteria:

- The viewpoint was to be at a transmission line roadway crossing
- The roadway should be a relatively high use volume
- The viewpoint would show typical landscape conditions for roadway crossing

The photosimulation is located northwest of the Jensen Trail/U.S. 2 intersection to the northwest of the City of Glasgow. It is looking northwest, and shows typical crossing conditions; in this case for links 23 and 24, Alternatives A and B. The main intent for this simulation is to show the effects of mitigation measures, such as locating structures away from the roadway at sensitive crossings.

The process of producing visual simulations for the transmission lines was similar to that of the wind farm, with GPS, GIS, terrain modeling, and digital image processesing computer programs assisting in providing a framework for overlaying proposed conditions onto existing photographs of the VCWEP.. See Section 3.4.2.1.

The photosimulation and location map are shown in Appendices C-2 & C-4.

Impacts

After determining the final visual contrast, the potential for visual impacts for four types of visual resources were assessed:

- Impacts to Residences

- Impacts to Recreational Areas
- Impacts to Travel Routes (Recreation Destination and corridors)
- Impacts to Scenic Quality

High and moderate levels of sensitivity, derived from use level, viewer attitude, and duration of view, were evaluated. Views of visual changes associated with transmission lines in the landscape can be described in terms of distance zones that define the level of visual perception that can be expected. To determine sensitive viewer initial impact levels, contrast levels were overlaid with the visibility and distance zones established in Section 3.4.1.4.1 from moderate and high sensitivity viewpoints (See Tables 3.4.19 and 3.4.20, and Map 12).

Potential impacts were recorded into a data table for each impact level change along the length of each link. The highest potential impact out of the four types was recorded. Each potential impact was described and assigned a Project Protocol to reduce the impacts and obtain a residual impact level. Other variables such as viewer orientation, project location in relation to the viewer (above or below), and overall level of development were evaluated to obtain the residual impact level (See Appendix A).

Table 3.4-19 Highly Sensitive Viewer Impact Matrix

		Visual Contrast		
		Strong	**Moderate**	**Weak**
Distance/Visibility Threshold	0 to 500’ (IFG)	H	H	H
	0 to 0.5 mile (FG)	H	H	M
	0.5 to 1.0 miles (MG)	M	M	L
	Beyond 1.0 mile (BG)	L	L	L

Legend H = High
M = Moderate
L = Low

Table 3.4-20 Moderately Sensitive Viewer Impact Matrix

		Visual Contrast		
		Strong	**Moderate**	**Weak**
Distance/Visibility Threshold	0 to 500' (IFG)	H	H	M
	0 to 0.5 mile (FG)	H	M	M
	0.5 to 1.0 miles (MG)	M	L	L
	Beyond 1.0 mile (BG)	L	L	L

Legend H = High
M = Moderate
L = Low

Table 3.4-21Scenic Quality Impact Matrix

		Visual Contrast		
		Strong	**Moderate**	**Weak**
Scenic Quality	B	M	M	L
	C	M	L	L

Legend S = Strong
M = Moderate
W = Weak

Potential impacts to scenic quality are based on the change in quality and quantity of the visual resources inherent in the landscape without regard to how it is seen from viewpoints. As outlined in Section 3.4.1.2, landscapes were defined as Class B or Class C Scenic Quality and Visual Integrity. Scenic Quality Classes were compared to overall contrast levels and a final initial impact level was determined (See Table 3.4-21).

There are a variety of potential visual impacts related to activities during the construction, operation, and maintenance of the transmission lines. These may have an impact on sensitive viewers or Scenic Quality, and include:

- Construction of new roads and upgrading roads for access
- Ground disturbance at transmission structure sites
- Transmission structure assembly and erection
- Construction and related traffic
- Soil exposure and dust

- Transmission structure contrast and impacts on "natural" landscapes, or Scenic Quality impacts

Of these, the effects of structure contrast and modification of "natural" landscapes and scenic quality are expected to be most significant.

Alternative Route Overview

Alternative A – Highway 24 (Links 1, 3, 5, 23, 24)

The cumulative residual impact levels for this 40.5 mile alternative indicate a relatively high level of overall residual visual impacts compared to the other alternatives. The total mileage was as follows:

- High - 6.0 miles
- Moderate - 12.2 miles
- Low - 22.3 miles

Impacts to sensitive viewers and viewpoints for this Alternative include the Bitter Creek Wildlife Viewing Area (high sensitivity), Britsch Road (high sensitivity Recreation Destination Route), Rt. 24 and U.S. Highway 2 (moderate sensitivity), Glasgow Base Fishing Ponds (moderate sensitivity), residential viewers from at the south portion of VCWEP near St. Marie and Glasgow, Billingsley Road, Jensen Trail and U.S. Highway 2 (See Appendix A).

Alternative B – Jensen Trail (Links 1, 3, 6, 10, 18, 23, 24)

The cumulative residual impact levels for this alternative indicate a relatively low overall residual visual impact level compared to the other alternatives. For this 37.1 mile Alternative, the breakdown of impact levels were as follows:

- High - 3.0 miles
- Moderate - 11.6 miles
- Low - 22.5 miles

Impacts to sensitive viewers and viewpoints for this Alternative include the Bitter Creek Wildlife Viewing Area (high sensitivity) and Britsch Road (high sensitivity Recreation Destination Route), high sensitivity residences along Jensen Trail, Skylark Road, U.S. Highway 2 and Billingsley Road, and Rt. 24 and U.S. Highway 2 viewers (See Appendix A Impact Tables).

Alternative C - East Central - Proposed Action (Links 1, 3, 6, 11, 20, 22)

The cumulative residual impact levels for this alternative indicate a moderate overall residual visual impact level compared to the other alternatives. The breakdown of impact levels for this 34.8 mile Alternative were as follows:

- High - 4.5 miles
- Moderate - 8.1 miles
- Low - 22.2 miles

Impacts to sensitive viewers and viewpoints for this Alternative include high sensitivity Bitter Creek Wildlife Viewing Area and Britsch Road (Recreation Destination Route), viewers from U.S. Highway 2 and adjacent residences, and nearby residences on Riverside Drive and US (See Appendix A Impact Tables).

Alternative D - Britsch Road (Links 2, 9, 14, 16, 25)

The cumulative residual impact levels for this alternative indicate a relatively high overall residual visual impact level compared to the other alternatives. The total mileage was as follows:

- High - 18.9 miles
- Moderate - 4.5 miles
- Low - 13.7 miles

Impacts to sensitive viewers and viewpoints for this Alternative include the Bitter Creek Wildlife Viewing Area and Britsch Road (high sensitivity Recreation Destination Route) and nearby residences, for U.S. Highway 2 travel corridor, residential viewers located in Vandalia and residential viewers off Billingsley Road (See Appendix A Impact Tables).

Alternative E - West Central (Links 1, 4, 8, 12, 17, 25)

The cumulative residual impact levels for this alternative indicate a relatively low overall residual visual impact level compared to the other alternatives. This is the environmentally preferred Alternative with regards to visual impacts. The total mileage was as follows:

- High - 0.2 miles
- Moderate - 12.1 miles
- Low - 20.8 miles

Impacts to sensitive viewers and viewpoints for this Alternative include Bitter Creek Wildlife Viewing Area and Britsch Road (high sensitivity Recreation Destination Route), road views on Tampico Road and U.S. Highway 2, and residences along the Milk River, south of Tampico and west of Billingsley Road (See Appendix A).

Selective Mitigation Measures

Specific selectively committed mitigation measures attempt to reduce visual contrast by siting structures away from crossing as far as possible, using wood poles, and single steel poles to reduce the right-of-way width when crossing riparian woodlands.

Potential mitigation measures to further reduce or eliminate impacts to visual resources include altering the appearance of some project structures to allow for less visual intrusion and minimizing ground disturbance during construction that would create noticeable changes to the landscape, for this component of VCWEP selective mitigation measeures 1, 3, 5, 6, 12, 13, 14 were used. A complete list of mitigation measures is presented in Chapter 2.

Mitigation measures were chosen where moderate or high initial impact levels along the links where determined from contrast levels and visibility. Initial impact levels were adjusted from High to Moderate, or Moderate to Low where mitigation measure were applied and the following conditions were present:

- Existing development/RR/transmission lines or Moderate/Low Structure Contrast Levels
- Superior transmission line position from viewers
- Viewers were oriented away from Transmission Line
- Moderate/low structure contrast
- Mitigation measures applied in Middleground to Background Views
- Only Scenic Quality Impacts contributed to Initial Impact Level and mitigation Measure were applied

3.4.2.4 Antelope Creek Substation

Assessment Methodology

During the construction of the substation, viewers would observe site grading and related construction activities, which would include the removal of approximately five acres of grasses and other vegetation. The impacts would last for the duration of construction, which is estimated to be about 2 months.

The size of the site would be relatively small compared to existing and on-going land use activities such as agriculture. When completed, the facility will be similar in appearance to the existing Richardson Coulee Substation, and compatible with it in form, line, color and texture.

Other impacts during construction would be those brought about by the presence of earthwork equipment, construction trailers and cranes.

Nearby sensitive viewers mapped in the inventory phase of VCWEP within a three mile radius of the substation, and analyzed for potential impacts.

Three contrast levels were determined to provide a final contrast level that was then used for a final initial impact level. Impacts on residential, recreation, and road viewers were dependent on sensitivity level (moderate or high), final contrast levels, and viewing condition (foreground, middleground, background). Scenic quality impacts were based on

Scenic Quality/Visual Integrity Class (B or C) and overall contrast level. Mitigation measures and impact modifiers (viewer orientation, use level, development level) were evaluated for potential effectiveness, and a final residual impact level was assigned.

Visual Contrast

Visual contrast for the Antelope Creek Substation is made up of three separate contrast models:

- Vegetation contrast
- Structure contrast
- Landform

Vegetation, structure, and landform contrasts were compared to at the existing site to determine potential visual impacts. The construction of a new substation adjacent to the existing substation will provide high vegetation contrast due the removal of all vegetation (5 acres), but low structure contrast because existing facilities are already in place, and is overall visually similar. Using Table 3.4-18 , the overall contrast level will be moderate.

Overall contrast was then compared to sensitive viewer locations in relation to distance zone, and given a final initial impact level for Highly and Moderately sensitive viewers and Scenic Quality (See Tables 3.4.19, 21).

When completed, the facility would be similar in form, color, and scale to the existing Richardson Coulee Substation to the immediate west. The structure contrast level would be low. Because all of the existing vegetation will be removed, vegetation contrast will be high. The existing landform is generally flat, as will the proposed substation, and therefore, landform contrast will be low. There will be a strong level of vegetation contrast due to the removal of all existing ground cover and the construction of the substation gravel pad. Weak landform contrast levels are expected because of the flatness of the site and the low potential for erosion. Also, weak structure contrast is expected due to the exiting substation and transmission line facilities already in place.

Impacts

The potential visual impacts of the VCWEP. to visual resources within the study area could result from a variety of activities during the construction, operation, and maintenance of the substation. These would include:

- Site clearing and earth work that results in exposed soils and vegetation removal
- The presence of construction equipment such as cranes, earthwork equipment, and concrete mixer trucks
- The presence of construction trailers

After determining the final visual contrast, the potential for visual impacts for two types of visual resources were assessed:

- Impacts to Residences
- Impacts to Scenic Quality

The initial impact levels for residential viewers (the only nearby sensitive viewers) was moderate due to the location and distance of those sensitive viewpoints.

High initial Impacts were determined for two residences that have foreground or immediate foreground views of the substation. Moderate impact levels were determined for 3 residences that have the substation in middleground view, and low impact levels for 19 residences that have the substation in background views. There were no impacts to other sensitive viewers.

Existing landscape modifications such as transmission lines, Richardson Coulee Substation, and gravel roads, and the application of selective mitigation measures will result in a low final impact level for VCWEP.

Selective Mitigation Measures

Mitigation measures for this portion of VCWEP include the use of non-reflective, earthtone paint (#16) will be used to mitigate the effects of the substation. There will be no uncoated galvanized metallic surfaces on any portion of this project.

3.4.2.4 No Action Alternative

There would be no impacts to visual resources with the No Action Alternative.

Under the No-Action Alternative, visual impacts would be low to non-identifiable. No transmission lines, wind turbines or substation would be visible from local residential viewing points, sensitive recreation areas, or motorists traveling along U.S. Highway 2 or Montana State Highway 2.

3.5 SOCIOECONOMICS AND PUBLIC SERVICES

This section presents an analysis of demographic conditions in Valley County and the City of Glasgow. The demographic profile characterizes population, race, housing units and households, employment and wages, and income and poverty. Demographic and economic conditions in the State of Montana are provided for comparison. Local government (county, city, and school district) revenue is included in the affected environment inventory.

The employment, wages, and tax impacts of each construction phase and the operation and maintenance of VCWEP are presented and analyzed. This section also evaluates the current level of existing public services, including law enforcement, fire protection, water and sewer, solid waste, education, and private health sector and emergency medical services. The construction and operational impacts of the wind farm transmission line and substations on those services is provided,

3.5.1 AFFECTED ENVIRONMENT

3.5.1.1 Study Methods

Secondary data were used to compile the demographic profile. The data source for population, housing, and income information was the U. S. Department of Commerce, Bureau of the Census (U.S. Census Bureau, 2000). Employment and wage data were taken from the U. S. Department of Commerce Bureau of Economic Analysis (Bureau of Economic Analysis, 2004). Additional employment data were provided by the Montana Department of Labor and Industry (Montana Department of Labor and Industry, 2004).

The employment and economic impacts of the four construction and operation and maintenance phases of the wind farm were determined by using the IMpact for PLANning (IMPLAN) Model (Minnesota IMPLAN Group, 2001). This model commonly is used in a project socioeconomic analysis to assist federal agencies in land and resource management planning. A description of the IMPLAN model is presented in 3.2.2 Environmental Consequences. Construction labor force mix, construction labor resource loading, and capital construction costs were estimated using available information from other recent wind projects, turbine vendors, and engineering estimates.

Information related to public services was obtained by personal interview. Service providers were contacted and asked to describe their current facility, level of service, and capacity. They also were asked if those facilities and services could accommodate additional permanent employment, population, and temporary construction employment due to construction and operation of the wind farm.

3.5.1.2 Study Area Overview

Valley County is the area which will be affected by construction and operation of the VCWEP. The City of Glasgow also will be affected because it is the largest city near the VCWEP located 30 miles southeast of VCWEP. Because of the scope and scale of VCWEP, the northeastern portion of Montana will to some extent be affected by development of the proposed VCWEP, because roads, highways, retail establishments, and labor forces beyond Valley County will be impacted to some degree. However, focusing the impact analysis exclusively on Valley County directs attention to the environment that would be most affected by the VCWEP..

Population

Valley County's population declined seven & from 1990 to 2000 (Table 3.5-1). Its population decreased by 564 persons for a total of 7,675 persons in 2000. The City of Glasgow's population also decreased, loosing nearly 10% of its residents, or 319 persons from 1990 to 2000. Glasgow's population was 3,253 by 2000. By contrast, the State of Montana's population increased by 13% in the 1990 to 2000 decade. Its population increased by more than 100,000 persons and reached a 2000 total of 902,195. Population increased in the United States by about 10% from 1990 to 2000.

Table 3.5-1. 1990 to 2000 Montana, Valley County, and Glasgow Population

Area	1990	2000	# change	% change
Valley County	8,239	7,675	-564	-7%
Glasgow	3,572	3,253	-319	-9%
Montana	799,065	902,195	103,130	13%

Sources: Intermountain Demographics U. S. Census Bureau, 2000

The 1990 to 2000 trends for the county, city, and state continued into 2003, the most current year for census population estimates (U. S. Census Bureau, 2002). Valley County's 2003 population decreased an additional 326 person to reach 7,349, a decline of four percent. Glasgow' population also decreased by four percent a loss of 131 residents. It's 2003 population estimate was 3,122. The state's population increased by about two percent and reached a total population of 917,621 in 2003. The state's population increased by 15,428 persons since the census was taken in 2000 (U. S. Census Bureau, 2003).

Valley County's population is an aging population. According to the U. S. Census Bureau its median age increased from 27.3 years old in 1990 to 41.7 years old by 2000.

Glasgow's 2000 median age was similar to the county at 42.1 years old. Its median age increased from 38.5 years old in 1990. Persons in the State of Montana were generally younger. The median age in the state was 37.5 years old in 2000 up from 33.8 years old in 1990.

Race and Hispanic Origin

Valley County's population was primarily White, with that race accounting for about 90% of total population in both 1990 and 2000 (Table 3.5-2). American Indians were the next largest racial category and represented about 10% of the population in both years. Total population in both those races declined from 1990 to 2000. The "other" racial category had the largest population increase in the decade, gaining 139 persons. Valley County demographic characteristics were similar in the City of Glasgow.

Table 3.5-2 1990 to 2000 Valley County Race and Hispanic Origin

Race	1990	2000	# Change	% Change
White	7,423	6,765	-658	-9%
Black	9	10	1	11%
Indian	770	723	-47	-6%
Asian	19	20	1	5%

Other	18	157	139	772%
Total	**8,239**	**7,675**	**-564**	**-7%**
Hispanic Origin	**62**	**60**	**-2**	**-3%**

Sources: Intermountain DemographicsU. S. Census Bureau, 2000

Housing Units and Households

Valley County's housing stock declined from 5,304 housing units in 1990 to 4,847 units by 2000, a loss of 457 housing units (Table 3.5-3). This loss represented nearly a 10% decline in total housing units. The largest concentration of housing declines was in vacant units (a reduction of 339 units) and in rental units where the number of units decreased by 175. The number of owner-occupied units increased by about two percent over the decade.

Table 3.5-3 1990 to 2000 Valley County Housing Characteristics

Housing Characteristic	1990	2000	# Change	% Change
Total Housing Units	5,304	4,847	-457	-9%
Occupied Units (Households)	3,268	3,150	-118	-4%
Owner-Occupied	2,332	2,389	57	2%
Renter Occupied	936	761	-175	-19%
Vacant Units	2,036	1,697	-339	-17%
Seasonal Units	263	376	113	43%

Sources: Intermountain DemographicsU. S. Census Bureau, 2000

Most of the loss in housing units is attributable to the removal of vacant modular housing units at St Marie, the site of the former Glasgow Air Force Base. Those units were sold and relocated. In Frazer, several homes were destroyed by fire. Housing programs undertaken to remove substandard units were undertaken in Homedale, Nashua, and Glasgow (personal communication, Rick Seiler, Valley County, November 12, 2004).

The number of households, or occupied housing units, declined by 118 or a four percent loss during the 1990 to 2000 decade. The decline in households closely corresponded to the county's seven percent population loss during the same period of time.

The City of Glasgow also experienced a reduction in its housing stock from 1990 to 2000 (Table 3-5.4). In this case the total housing unit inventory was reduced by 140 units, an eight percent loss. The greatest decrease in housing units was a 25% loss in the number

of rental units which was reduced by 145. A slight loss of units (-5) was seen in the supply of vacant units. The number of households in Glasgow decreased by nine percent and equaled the city's population loss for the same time.

Table 3-5.4 1990 to 2000 Glasgow Housing Characteristics

Housing Characteristic	1990	2000	# Change	% Change
Total Housing Units	1,749	1,609	-140	-8%
Occupied Units (Households)	1,530	1,395	-135	-9%
Owner-Occupied	955	965	10	1%
Renter Occupied	575	430	-145	-25%
Vacant Units	219	214	-5	-2%
Seasonal Units	9	35	26	-

Sources: Intermountain Demographics U. S. Census Bureau, 2000

Removing substandard housing also was the cause of the decline of total housing units in the City of Glasgow. A community wide effort was undertaken to remove those types of units on the north and south sides of Glasgow during the 1990 to 2000 decade (personal communication, Larry Mires, Two Rivers Economic Development, November 9, 2004).

Employment and Wages

Valley County's total employment increased by 229 employees, a five percent gain from 1990 to 2000 (Table 3.5-5). The largest employment gain was in the services sector where 229 employees were added. Retail trade recorded the second largest increase, increasing by 43 employees. Services, with 1,169 employees, and farming, with 849 employees, had the largest concentration of employees in the county.

The highest level of earnings was in the government sector at $25.9 million in 2000, followed by the services sector at $22.3 million. Those two sectors also provided the highest levels of earnings in 1990. The largest increase in earnings was seen in the farm sector where earnings increased by $13.9 million during the decade.

Valley County's 1990 to 2000 employment increase of five percent was significantly below the State of Montana's 28% increase in employment for the same time frame. Services and retail sales contained the greatest number of employees in the state. Those sectors also had the greatest employment gains from 1990 to 2000. Employment losses were recorded in agricultural services (-1), transportation/public utilities (-64) and government (-46).

Table 3.5-5 1990 to 2000 Valley County Full and Part-Time Employment

Sector	1990	2000	# Change	% Change
Farming	808	849	41	5%
Agricultural Services	95	94	-1	-1%
Mining	6	39	33	550%
Construction	196	209	13	7%
Manufacturing	81	108	27	33%
Transportation/Utilities	282	218	-64	-23%
Wholesale Trade	177	169	-8	-5%
Retail Trade	730	773	43	6%
Financial	253	265	12	5%
Services	990	1,169	179	18%
Government	809	763	-46	-6%
Total	**4,427**	**4,656**	**229**	**5%**

Sources: Intermountain Demographics U. S. Census Bureau, 2003

Total full and part-time employment in Valley County declined by 83 jobs for an employment total of 4,573 in 2002: a loss of two percent. Employment in Montana increased by three percent in the same time period.

The county's unemployment rate was 3.2% in August, 2004 (Montana Department of Labor and Industry, 2004). Its average annual unemployment rate was 3.5%. During the late 1990's and in the earlier part of 2000, the unemployment rate was above four percent Major private sector employers in the county are Albertson's, Cottonwood Inn, First Community Bank, Frances Mahon Deaconess Hospital, Glasgow Clinic, Gordon's Warehouse, Hi-Line Home Programs, Milk River Inc., Pamida, and Valley View Home.

Construction employment in Valley County has declined marginally since 2001, with an estimated 80 full time construction workers involved in General Construction (-30), Special Trades (-20), and Heavy construction (-30). An additional 100 primarily part time workers reported some earnings from construction work in 2002. The estimated 180 Valley County residents employed in construction work, from part time, temporary work to full time permanent employment, earned wages totaling $5,172 million in 2002. Averaged to an annual wage of $9,733, the industry is dominated by part time and temporary workers.

Income and Poverty

Per capita income is the total income in an area from all sources divided by the total population for that same area. Per capita income in Valley County was the same as the City of Glasgow, at $16,246 in 2000 (Table 3.5-6). The county and city's 2000 per capita income was 95% of the state per capita income. Valley County's 1990 change in per capita income was greater than 50% and exceeded the national rate of inflation for the 1990 to 2000 time period. Montana's per capita income was slightly greater in 1990, and increased at about the same rate as the county and city for the ten year period.

Table 3.5-6 1990 to 2000 Valley County, Glasgow, and Montana and Per Capita Income

Area	1990	2000	$ Change	% Change
Valley County	$10,529	$16,246	$5,717	54%
Glasgow	$10,740	$16,246	$5,506	51%
Montana	$11,213	$17,151	$5,938	53%

Sources: Intermountain Demographics U. S. Census Bureau, 2000

Another indication of an area's economic status is the distribution of household income, or the number of households in particular income ranges. Household income distribution changes from 1990 to 2000 in Valley County generally were positive from 1990 to 2000 (Table 3.5-7). The number of households in the lowest income category (Under $10,000) declined by 45% from 1990 to 2000. The number of households in the next two lowest income categories also declined. Positive increases were seen in the higher income groups, with the largest gain in the $60,000 to $75,000 income range. Two negative income indicators were that the number of households in the $40,000 to $50,000 income range declined and that the $10,000 to $20,000 income range contained the greatest number of county households in 1990 and 2000.

Table 3.5-7 1990 to 2000 Valley County Household Income Distribution

Income Range	1990 Households	2000 Households	# Change	% Change
Under $10,000	745	410	-335	-45%
$10,000 - $20,000	737	581	-156	-21%
$20,000 - $30,000	653	528	-125	-19%
$30,000 - $40,000	411	454	43	10%
$40,000 - $50,000	379	337	-42	-11%
$50,000 - $60,000	130	264	134	103%
$60,000 - $75,000	118	289	171	145%
$75,000 - $100,000	56	148	92	164%
$100,000 - $150,000	24	77	53	221%
Over $150,000	6	55	49	817%
Total	**3,259**	**3,143**	**-116**	**-4%**

Sources: Intermountain Demographics U. S. Census Bureau, 2000

Changes in the City of Glasgow's household income distribution mirrored those for the county. However, Glasgow's largest household gain occurred in the $75,000 to $100,000 income range. The same general income trends were seen in the State of Montana.

A comparison of Valley County, the City of Glasgow, and the State of Montana median household income levels indicate that the 1990 to 2000 trends were relatively similar Table 3.5-8). County and state median household incomes increased by 42 and 44% respectively. The city's gain was slightly greater, at 47%, for the decade.

Valley County's median household income was about 95% of the state's median in both 1990 and 2000. Glasgow's median household income was slightly more than 90% of the state's median in both 1990 and 2000.

Table 3.5-8: 1990 to 2000 Valley County, Glasgow, & Montana Income Characteristics

	1990	2000	$ Change	% Change
Median Household Income				
Valley County	$21,781	$30,979	$9,198	42%
Glasgow	$20,766	$30,491	$9,725	47%
Montana	$22,988	$33,024	$10,036	44%

Sources: Intermountain Demographics U. S. Census Bureau

According to the 2000 U. S. Census, about nine% of all Glasgow residents had incomes below the poverty level. Nearly 14% of all Valley County residents had incomes below the poverty level, while 15% on all Montana residents had incomes below that level of income. The census bureau "…uses a set of money income thresholds that vary by family size and composition to determine who is poor. The official poverty definition counts money from before taxes and excludes capital gains and non-cash benefits, such as public housing, Medicaid, and food stamps" (U. S. Census Bureau, 2000)

Local Government Revenue and Expenditures

Valley County

For the 2003 to 2004 fiscal year Valley County's total budget was $6,797,254. The total county budgets consisted of a county wide budget of about $3.9 million, a road budget of about $1.2 million, a special district or use budget of $1.6 million, and $74,500 for rural fire control. The largest individual cost center in the county's overall budget was $2.9 million for the general fund. Property tax collection was $2.8 million in the 2003 to 2004 fiscal year and represented 41% of total revenue. Other sources of revenue included non-tax revenues, cash available, and cash reserves.

City of Glasgow

The City of Glasgow's 2004 to 2005 fiscal year budget is $4,445,834. The largest revenue source in that budget is $1,157,005, 26% of total revenue, is from the general fund. The general fund consists of revenue from taxes, licenses and permits, intergovernmental revenue, services, and fines and forfeitures. The next largest revenue sources are water sales and sewer fees which account for 15% and 8% of the total revenue respectively. The general fund at $1,253,125 is the largest single expenditure in the city's budget. The general fund includes expenditures for city administrative services, law enforcement, fire protection and control, and parks and recreation.

Glasgow School District #1A

Glasgow School District #1A's budget for fiscal year 2003 to 2004 was $6,877,220. Slightly more than 60% of the district's revenue ($3,891,909) came from the general fund

which is a combination of property taxes, personal taxes, state funding, and various tax levies. The next highest revenue source was miscellaneous federal funds ($712,891) which accounted for more than 10% of the district's revenue that fiscal year. The largest expenditure in the district's 2003 to 2004 fiscal year budget also was the general fund ($3,974,558) which accounted for about 60% of all district expenditures. Most of the general fund is used for teacher and administrative salaries. Some teacher salaries are partially funded by other accounts including miscellaneous federal funds.

3.5.2 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

3.5.2.1 Project Phasing, Construction Costs, and Labor Force Estimates

The Valley County Wind Energy Project consists of four phases. Phase I of VCWEP involves three interrelated construction efforts over a 14-month period scheduled to begin in July of 2005: building the Antelope Creek Substation ($7.7 million), building the 30 mile long 230kV Transmission Line ($8.8 million), and installing 33 wind turbines, each capable of generating 1.5 MW of electrical energy ($54.8 million). Once installed and operational, the Substation and Transmission Line will be in place to serve the subsequent expansion phases. Between 112 to 131 construction personnel or 66 Full-Time Equivalent (FTE) workers will be employed in Phase I.

An additional 66 wind turbines are scheduled for installation in Phase II of VCWEP, slated to occur over a 14 month period beginning July of 2009 and at a projected cost of $106 million, and involving between 140 and 147 construction personnel. Construction activity is expected to involve 81 local FTE workers at salaries totaling $2.8 million in 2009 dollars.

Phase III of VCWEP is expected to span a 14 month construction period beginning in July of 2012, with an additional 100 Wind Turbines installed at a 2005 cost of $159 million. The labor force associated with this installation is estimated at between 248 and 253 workers, with 144 FTE construction workers supplied by the Valley County labor force.

Beginning in July of 2016, a fourth construction phase is expected to put an additional 134 Wind Turbines into operation, at an installation cost estimated at $203 million using 2010 dollars. It is likely that by 2016 the actual dollar values will be considerably higher than the 2010 figures used here, but calculations beyond 2010 are not able to be reliably estimated at the time of this assessment (2004). The labor force associated with Phase IV construction is estimated at between 267 and 272 construction workers, of which approximately 155 will come from the local labor force.

3.5.2.2 Assessment Methodology

This section describes the methodology used to assess the economic impacts of the VCWEP. on the local area, which is Valley County including the City of Glasgow. The most common approach to assessing the economic impact of a proposed activity involves the use of mathematical coefficients that describe the linkages among the various

industries within an affected impact area. Taken together, these coefficients comprise an Input-Output (I-O) Model of a local economy. There are several providers of computer software programs dealing with Input-Output Models, each with relative strengths and weaknesses.

IMPLAN, developed originally by the United States Forest Service, is the model selected for the present analysis. Its advantages include fuller specification of agricultural industry linkages, timely revisions of the I-O coefficients, a positive track record of usage in the Intermountain West, and a flexible Windows-based software program designed by IMPLAN for IMPLAN. Specifically, the IMPLAN Professional 2.0 software with 2001 data pertaining to Valley County is utilized for this report (Minnesota IMPLAN Group, 2001).

Throughout this section impacts are expressed in dollars current to the time frame of the particular construction phase, or in terms of FTE jobs. In turn, the dollar impacts may refer to employee wages or to tax revenues. The employment and economic impacts are further refined as Direct, Indirect, and Induced impacts, with the sum of the three component impacts referred to as the Total Impact for a given activity.

The estimated wages and FTE jobs of local resident workers connected to each phase of the construction and to facility operation serve as inputs to the I-O model and thereby constitute Direct Impacts. Indirect Impacts are measured by applying the respective inputs to the multipliers provided by the IMPLAN model. Indirect Impacts refer to the number of jobs or amount wages or taxes resulting from the increase in local business activity caused by the direct infusion of jobs and wages during a particular phase of construction or during facility operation. Induced Impacts refer to the number of jobs or amount of wages or taxes resulting from the increase in local business activity caused by the household spending of the workers directly involved in the particular construction phase or facility operation. The Total Impact of each construction phase and of facility operation is then calculated as the sum of the Direct, Indirect, and Induced effects.

The VCWEP. involves a 13 year calendar of activity beginning with the start of Phase I construction in July of 2005, and culminating in full operation of all four construction phases in early 2018. While the employment impacts associated with construction, operation and maintenance remain fairly constant and based on current industry experience, the dollar values associated with both the cost of standard equipment and the amount of wages paid for given work will escalate with inflation in each successive year of operation. To maintain a balance between making accurate comparisons of dollars expended in differing years (by using constant dollar), and making reasonable estimates as to what the actual amount of dollars might be in the future (by using inflated dollars), the tables of impacts used in this report utilize 2005 (Phase I), 2009 (Phase II), 2010 (Phase III), and 2010 (Phase IV) dollars for the four construction phases, respectively, and 2010 dollars for the Operations and Maintenance phase. Application of inflation assumptions beyond the year 2010 is problematic at best, so no attempt is made to generate dollar values for 2012-2013 (Phase III), 2016-2017 (Phase IV), or 2018 (the year in which full operation is anticipated).

Prevailing industry practices and previous experience with wind farm development provide a basis for estimating the number and type of workers involved throughout the construction and operation phases of the VCWEP.. Nevertheless, the number of personnel associated with a particular phase of activity is most reliably indicated as a range, with minimum and maximum numbers of workers estimated. The anticipated range of personnel associated with the four construction phases of VCWEP is provided below (Table 3.5-9).

Table 3.5-9 Estimates of Labor Personnel Associated With Project Construction

Personnel	Phase I	Phase II	Phase III	Phase IV
Minimum	112	140	248	267
Maximum	131	147	253	272
EIS Assumption	115	140	248	267
Post-Phase O&M	5	8	12	16

Source: Zelus & Associates

For purposes of this report the lower end of each range was utilized in the economic impact model, allowing for upward modifications and enhancements to the resulting analysis as future realities might support. Utilizing lower-end personnel estimates effectively eliminates the likelihood that the true economic impacts of the VCWEP. can realistically fall below the levels reported.

Employment is cast in terms of FTE jobs throughout this report. This usage has several implications for interpretation of model results. First, the number of jobs reported for each construction phase has been adjusted to reflect a 14 month construction period in each case. Thus, if the reader is more interested in obtaining annualized employment impacts, an appropriate estimate would be 12/14 (twelve fourteenths) of stated phase employment; second, employment volume will vary considerably within a given 14 month period of construction; and third, the mix of full time and part time employment represented in a single FTE job will vary considerably as Direct, Indirect, and Induced impacts are considered. For example, the finding that four FTE jobs are created in the Valley County economy as the result of spending on the part of construction workers should be interpreted as affecting up to 20 or 30 different employees whose working hours and wages are incremented only marginally through overtime opportunities, rather than as resulting in the creation of four new, full time jobs.

The local impact for all four phases of construction activity will vary to the extent that local labor is utilized, and the figures reported here may be adjusted to reflect evolving scenarios. This report assumes that 50% of the construction labor will involve workers residing in Valley County. If project contracting results in a different proportion of local workers being utilized (for example, 25% as opposed to the assumed 50%), then all figures reported here should be reduced by one-half. Conversely, if contracting

arrangements result in 100% of the contract labor being recruited from the local labor force, then the figures reported here should be doubled.

The labor impacts due to the Operation and Maintenance (O&M) of the facility have been estimated an annual impacts immediately following installation of turbines planned for that phase. Table 3.5-9 reflects the estimate of 3, 5, 12, and 16 FTE employees associated with the O&M of the facility after each of the four phases of construction, respectively.

Direct tax impacts of the proposed construction activity include state and federal income taxes as well as the employer and employee Federal Insurance Contribution Act (FICA) contributions on wages earned by the workers, the property taxes paid by the assumed 50% of the construction labor force that resides in Valley County, the property taxes paid by the operator on taxable business property, and both the federal and state corporate income taxes paid on the taxable revenues of the operation during these phases of construction.

The amount of business property and corporate income subject to tax by the State of Montana and its local government entities is subject to negotiation as well as involving a complex set of regulations. This analysis applies current (2003-2004) property tax levies to the installed cost of the number of wind turbines built during each phase of VCWEP, and disaggregates those potential taxes to the county, school district, and City of Glasgow levels, and makes no adjustments as to what constitutes taxable business property. With respect to corporate income taxes, the anticipated gross revenues resulting from operation of the wind turbines installed during a particular phase, without depreciation allowances, are used to generate potential taxes. In both of the above cases (business property and corporate income) the tax impacts reported here are to be viewed cautiously and interpreted only as maximum feasible figures, and not as realistic estimates of the actual tax liability.

3.5.2.3 Construction Impacts

Population and Housing

Construction of the Antelope Creek Interconnect Substation, 230 kV transmission line, and installation of 33 turbines at the wind farm is to be completed in first fourteen month phase. Subsequent phases (II through IV) will involve installation of additional wind turbines. In each phase, construction employment begins with a small crew, progresses toward peak employment near the middle of each phase and tapers off into a small clean up crew at the conclusion of each phase. The highest level of peak employment is 160 employees in the third and fourth phases of the entire project. Peak employment is projected to last approximately one month in each phase. It is assumed that one half of the labor force will be hired locally, leaving a peak impact of about 80 employees. Because of the short project duration (14 months) and monthly fluctuations in number and types of employees, it is expected that non-local construction employees will temporarily locate to the county and not bring their families with them. The population impact of VCWEP on the study area is an influx of temporary construction employees. A

peak population gain of about 80 persons is expected at two points in the third and fourth phases of the four phase construction process.

Temporary construction workers will require short term housing accommodations. There currently are eight motels in Glasgow with a combined total of 238 rooms. There also is a hotel containing an additional 66 rooms. Glasgow also has four recreational vehicle parks, three of which can accommodate large mobile homes. Additional temporary housing could be provided at St. Marie, the former Glasgow Air Force Base. There are between 200 and 300 vacant four-plexes and a 100 room barracks that could be made available for occupancy on short notice (personal communication, Larry Mires, Two Rivers Economic Development, November 9, 2004)

Employment, Income, and Taxes

Phase I Construction Impacts

Between 112 and 131 FTE workers are expected to be involved in activities including engineering and design, road and foundation preparation, substation and transmission line construction, wind turbine assembly and erection, facility commissioning and site cleanup (Table 3.5-10). The local labor force is expected to provide 66 construction and special trades workers at wages of $1.9 million over the 14-month Phase I Construction period, averaging $28,800 per employee. The impacts of this employment and wages on the Valley County economy are summarized in the following table.

Table 3.5-10 Phase I Construction Impacts

Impact	FTE Jobs	Wages	Taxes
Direct	66	$1,898,232	$123,349
Indirect	9	$212,845	$54,581
Induced	15	$369,064	$139,963
Total	**90**	**$2,480,141**	**$317,893**

Source: Zelus & Associates

Wages totaling $1.9 million will stimulate local consumer spending that results in another 15 Induced FTE jobs being added to the Valley County economy, with most of that impact registered in the retail trade and services sectors as extended-hours employment for existing employees. Those induced effects are represented by wages totaling $369,064. Additionally, the 66 local construction jobs will be part of a larger Indirect Effect of the Phase I construction activity, as nine FTE jobs with $212,845 in wages are stimulated primarily in the transportation and warehousing sectors of the local economy. The Total impact of Phase I construction is expected to represent an infusion of 90 FTE jobs and wages totaling $2.8 million on the local economy.

The impact of these additional wages includes increases in federal, state and local tax collections as well as the increases in consumer spending noted above. Phase I construction activity will stimulate an additional $123,349 in Federal income tax and social insurance (FICA) contributions, and Montana personal income taxes of $54,581. Assuming that all 66 construction employees are homeowners, their $139,963 in annual state and local property taxes can be at least partially credited to the VCWEP. activity.

The amount of corporate income tax and business property tax due to the State of Montana and its local governments are subject to a complex set of regulations and circumstances, and cannot be estimated reliably. Potentially significant impacts are involved, however, and should not be discounted. For example, projected gross revenues from wind farm activity utilizing Phase I capacity would result in $597,178 in Montana Corporate income tax if no depreciation or other allowances are considered. In a similarly unlikely scenario, if the entire installed cost of the 33 Wind Turbines erected in Phase I is subject to Montana property tax, $721,063 in property tax revenue would be collected and distributed across local taxing jurisdictions. Proportionate to 2003-2004 property tax levies, the Glasgow School District ($283,486) and City of Glasgow ($220,218) would receive about 70% of all property tax collections, the remaining $217,360 benefiting countywide agencies and services.

Phase II Construction Impacts

The installation of 66 Wind Turbines in Phase II is expected to have an Indirect impact of 14 FTE jobs and aggregate wages of $314,537 among those local business establishments that provide raw materials, equipment, or services used during the construction phase. The wages earned by the estimated 81 local construction workers will stimulate an Induced impact of 23 FTE jobs with associated wages totaling $545,396 as their household spending generates the need for additional workers to meet the increased demand placed on for example local gas stations, restaurants, banks, and movie theatres.

Table 3.5-11 Phase II Construction Impacts

Impact	FTE Jobs	Wages	Taxes
Direct	81	$2,805,165	$182,283
Indirect	14	$314,537	$80,659
Induced	23	$545,396	$147,470
Total	**118**	**$3,665,097**	**$410,412**

Source: Zelus & Associates

A potential tax of $3.0 million includes an estimated $1.4 million in property taxes and $1.2 million in Montana corporate income taxes associated with the Phase II construction. As discussed elsewhere, those two estimates are to be interpreted as high-end maximums that do not take into account the anticipated depreciation allowances and negotiations that will actually take place.

Taxes associated with the Total wage impact of $3 million are more reliably calculated at $182,283 in federal FICA and withholding equivalents, $80,659 in Montana personal income taxes, and an estimated $147,470 in combined property taxes paid by the 81 construction workers who are all assumed to own or rent houses locally. Prorating that property tax revenue to the major taxing jurisdictions involved, Phase II construction is expected to account for $57,978 in property tax revenue to the Glasgow School District, $45,039 to the City of Glasgow, and $34,454 to Valley County taxing authorities.

Phase III Construction Impacts

Wages earned by these 144 FTE construction workers are expected to total $5.2 million in 2010 dollars (Table 3.5-12). The Direct impacts of project construction are expected to generate Indirect effects that stimulate 20 additional FTE local jobs and $580,988 in associated wages. The local spending of $5.2 million in wages is expected to have the Induced impact of 33 FTE jobs and wages totaling $1.0 million. The combined or Total impact of Phase III construction is estimated at 197 FTE jobs with wages exceeding $6.7 million.

Table 3.5-12 Phase III Construction Impacts

Impact	FTE Jobs	Wages	Taxes
Direct	144	$5,181,470	$325,104
Indirect	20	$580,988	$148,986
Induced	33	$1,007,409	$261,233
Total	**197**	**$6,769,868**	**$735,324**

Source: Zelus & Associates

The taxes associated with the Phase III Total wage impact of $4.7 million are calculated at $325,104 in federal FICA and withholding equivalents, $148,986 in Montana personal income taxes, and an estimated $261,233 in combined property taxes paid by the 144 construction workers who are all assumed to own homes locally. Prorating that property tax revenue to the major taxing jurisdictions involved, Phase III construction is expected to account for $102,704 in property tax revenue to the Glasgow School District, $79,783 to the City of Glasgow, and $78,747 to Valley County taxing authorities.

Phase IV Construction Impacts

The Total wage impact is estimated at nearly $7.3 million and 212 FTE jobs within the local economy (Table 3.5-13). The scope of Phase IV construction is considerably larger than the previous expansions and may be above the current capacity of the local force to provide workers. For these reasons the actual local impact may be lower than the estimates provided here.

Table 3.5-13 Phase IV Construction Impacts

Impact	FTE Jobs	Wages	Taxes
Direct	155	$5,583,698	$350,341
Indirect	21	$626,089	$160,552
Induced	33	$1,085,612	$281,512
Total	**212**	**$7,295,399**	**$792,405**

Source: Zelus & Associates

Nevertheless, Phase IV construction will have significant impacts on the Valley County economy. The above table specifies that in addition to the 155 local construction workers involved, an additional 57 FTE jobs would be generated as a result of the indirect and induced stimuli provided by the Direct impact of $5.5 million in local wages.

While tax regulations and rates may change by 2016, Phase IV activity is anticipated to generate a combined $792,405 impact on federal, state and local taxing jurisdictions. About half of that amount is represented by the $350,341 in federal withholding and social security contributions made by the estimated 212 FTE Direct, Indirect, and Induced employees involved in Phase IV construction. Similarly, about $160,552 in Montana personal income taxes can be credited to those employees. Finally, another $281,512 in property taxes can be attributed to the 155 construction workers assumed to be homeowners in the area. Prorated according to 2003-2004 tax levies, the $281,512 in property taxes would be credited to the Glasgow School District ($110,676), City of Glasgow ($85,976), and Valley County taxing authorities ($84,860).

Operation and Maintenance Impacts

Population and Housing

The operation and maintenance phase of the wind farm begins in November, 2006 with the completion of Phase I construction. At that time, five permanent employees including three managers and two technicians will be hired. The three managers will be brought in from outside Valley County. Those three managerial positions remain in place for the duration of the wind farm operation. Only the number of technicians increases as each successive phase is completed. It is assumed that one-half of the wind farm technicians will be local hires. When operations and maintenance begins, one technician will be hired locally and one will be hired from outside the area. At the end of Phase I construction, four positions will be hired from out of the area and one technician will be hired locally.

An additional three technicians will be hired at the completion of the second phase in of the wind farm in November, 2010. Two of those technicians will be local hires. One additional technician will be hired from outside the area. Total employment will reach eight employees.

When Phase III is completed in November, 2013, the total operations and maintenance workforce expands to 12 persons. Four new technicians will be added, with two of those positions coming from outside the local area.

At the end of Phase IV construction in November, 2017, the total operations and maintenance staff reaches 16 employees. Again, four new technicians will be added, with out of area hires accounting for two positions. Total employment is three managers and From 2006 to 2017, a total of 16 out of area employees will be needed to operate and maintain the windfarm. Total population moving to the local area resulting from that employment gain would be between 35 and 41 persons, depending on household size. An additional 17 housing units would be required to house that additional population. The 2000 Census reported a total of more than 1,300 year-round vacant housing units in the county, with about 180 of those vacant units located in the City of Glasgow.

Employment, Income, and Taxes

When Phase I construction is completed in the fall of 2006 the Operation and Maintenance of the VCWEP will begin. The annual impacts associated with the ongoing operation of the facility are estimated in the following table (Table 3.5-14)

Table 3.5-14 Annual Facility Operations and Maintenance

Phase	FTE Jobs	Wages	Taxes
Phase I			
Direct	4	$505,110	$79,377
Indirect	4	$107,253	$13,795
Induced	5	$125,560	$8,427
Total	**13**	**$737,923**	**$101,598**
Phase II			
Direct	5	$631,387	$99,221
Indirect	5	$134,066	$17,243
Induced	7	$156,950	$10,534
Total	**17**	**$922,403**	**$126,997**
Phase III			
Direct	8	$1,010,220	$158,753
Indirect	8	$214,506	$27,589
Induced	11	$251,120	$16,854
Total	**26**	**$1,475,845**	**$203,196**
Phase IV			
Direct	10	$1,262,774	$198,441
Indirect	10	$268,133	$34,486
Induced	13	$313,899	$21,067
Total	**33**	**$1,844,806**	**$253,995**

Source: Zelus & Associates

Approximately 16 full time managers and technical personnel are expected to be needed to operate and maintain the facility after Phase IV installation is completed in 2017, ten

of whom are assumed to be resident to the local community. Given the comparatively specialized skills involved, it is likely that all ten of those workers will have relocated from outside of the area to work at the facility.

The O&M impacts occurring after Phases I, II, and III also are estimated in Table 3.5-14. For example, after the 33 turbines, Transmission line, and Substation installed during Phase I construction are fully operational, a local Direct impact of four FTE technical and managerial workers is projected to occur. Wages of $505,110 for these four workers will stimulate Indirect and Induced wage impacts of $232,000 as discretionary spending benefits local merchants and businesses. After Phase IV is complete, an additional 134 turbines will be brought online, with the O&M impact associated with that incremental activity totaling 33 FTE workers and involving $1.8 million in wages from Direct, Indirect, and Induced labor effects.

The 16 workers will earn an aggregated salary of at least $2 million, and stimulate an equal number of FTE jobs in the local economy due to the way in which the day to day operation of the facility utilizes local industry and labor. While the wages associated with the jobs generated by Indirect impacts average about $26,800 per worker on an FTE basis, the realistic scenario is that the majority of the wages will enable overtime and extended hours for existing workers in impacted sectors such as transportation and warehousing.

Induced impacts from the local spending associated with the wages of the facility managers and technical personnel total $502,239, a proportionately greater impact than that associated with the households of construction workers. New housing construction and impacts on public school, safety and health services are assumed to be at work with respect to the household spending of operating personnel, and so the resulting indirect effects are higher than they would be if no population relocation is assumed.

The tax impact associated with facility operation is dependent upon the property valuation and profitability of the company during its initial years of operation, and the negotiations between the company and the State of Montana regarding tax incentives. For these reasons estimates of corporate income and property taxes are not provided here.

Taxes associated with the Total wage impact of O&M workers can be estimated on an annual basis, and in terms of the scope of the construction activity recently completed. For example, after Phase I, $101,598 in federal, state and property taxes are attributed to the Direct, Indirect, and Induced labor impacts of the four full time workers associated with post-Phase I O&M. Similarly, the ten workers associated with post-Phase IV O&M generate $253,995 in taxes through the Total impacts on their $1.2 million in Direct salaries.

As a percent of income O&M taxes are greater than the taxes paid by the construction employees referred to in Phases I through IV due to the higher tax brackets of the operating personnel.

3.5.2.4 Combined Construction and Operations and Maintenance Impacts

Over the course of four phases of construction a total wage impact of $20.2 million and 618 FTE employees in the Valley County economy can be credited to the proposed wind power project (Table 3.5-15). The operating impacts will generate another 89 FTE jobs and $4.9 million in wages annually. Not counting the considerable property taxes and corporate income taxes that have been omitted from these calculations, the tax impact of the $25.1 million in local wages is estimated at $3.0 million for four selected annual periods spanning the four phases of construction and post-installation facility operation.

Table 3.5-15 Combined Total Impacts

	Construction Impacts			O & M Impacts (Annual)		
Phase	**FTE Jobs**	**Wages**	**Employee Taxes**	**FTE Jobs**	**Wages**	**Employee Taxes**
Phase I	90	$2,480,141	$317,893	13	$737,923	$101,598
Phase II	118	$3,665,097	$410,412	17	$922,403	$126,997
Phase III	197	$6,769,868	$735,324	26	$1,475,845	$203,196
Phase IV	212	$7,295,399	$792,405	33	$1,844,806	$253,995
Total	**618**	**$20,210,505**	**$2,256,034**	**89**	**$4,980,977**	**$685,786**

Source: Zelus & Associates

With respect to the employment impacts occurring across several phases and over several years, it is incorrect to conclude that the total employment impact of 707 FTE workers will involve 707 separate individuals. Rather, the Direct impacts associated with the four construction phases are likely to employ a core of workers who persist through several phases of construction. On the other hand, the number of individuals involved in the Induced and Indirect employment impacts will most certainly tally five to eight times the number of FTE jobs indicated, owing to the way in which such impacts involve extended hours for existing employees and temporary hours for part time employees. Given the relatively low population of Valley County, the modest employment impacts estimated above will likely involve to some degree at least a third and up to one half of all Valley County construction and skilled trade workers.

Finally, an examination of Table 3.5-15 reveals that while the O&M labor impact is only about 15% of the associated construction impact for a given phase, the economic impact

of the wages and taxes associated with the more highly paid operating personnel is about 25 & of the value of the wages and taxes associated with the more numerous but lower paid construction workers.

3.5.2.5 .Rents and Royalties

Federal

Methods to calculate payments to the federal government from the generation of electricity at the wind farm were based on BLM's Interim Wind Energy Development Policy. In that policy statement, "Rent for commercial wind energy development right-of-way grants will consist of two components: 1) an annual minimum rent and 2) an annual production rent once VCWEP is in commercial production. The rent for any calendar year shall not be less than the minimum rent."

Annual Minimum Rent

"Minimum Rent: The annual minimum rent for a commercial wind energy development right-of-way on public land will be $2,365 per megawatt and is based on the total anticipated installed capacity of the wind energy project on public land based on the approved Plan of Development (POD), capacity factor of 30%, a royalty of 3 &, and an average purchase price of $0.03 per kilowatt hour. These factors only apply to the calculation of the minimum rent and do not establish any basis for the calculation of actual production rental fees during commercial wind energy operations. The minimum rent is a fixed Bureau wide rent based on the following formula:

Annual minimum rent = (Anticipated total installed capacity in kilowatt as identified in the approved POD) x (30% capacity factor) x (3% royalty) x $0.03 average price per kilowatt hour)"

The annual minimum rent is phased in with 25% of the total rent fee in the first year, 50% of the total minimum rent fee in the second year, and 100% of the total minimum rent fee in the third year of Operation. "The full annual minimum rental fee will apply at any time prior to 3 years, upon the start of the commercial operations of VCWEP. The minimum rental fee is paid annually, in advance, on a calendar year consistent with regulations."

Annual minimum rent attributable to each phase of the wind farm was estimated using the Interim Wind Energy Development Policy and a conceptual site plan showing the proposed location of individual turbines by phase. Individual turbines on the wind farm will be located on a combination of BLM, State of Montana, and private land. In the conceptual plan, turbines for each phase were sited with the number of turbines determined by land ownership. In Phase I, eight of the 33 total wind farm turbines (24%) were located on BLM land. It was assumed that electrical production would be constant among the turbines and that 24% of total electrical production would be produced by the turbines on BLM land. The conceptual plan was used to site turbines in each of the four phases to determine future levels of annual minimum rent. All future annual minimum

rent payments were calculated in current (2004) dollars. Any change in BLM's formula to calculate annual minimum rent would impact future rent payments.

The annual minimum rent from Phase I electrical production is expected to begin in 2006 with a payment of $7,025 and increase to $28,099 in third year of Phase I production. Annual minimum rent payments from Phase II begin in 2010 at $22,409 and increase to $89,878 by 2012. Phase III annual minimum rent begins in 2013 at $31,043 and reaches $124,173 by 2015. Annual minimum rent from the fourth and final phase of the wind farm begins at $70,956 in 2017 and is $283,824 by 2019.

Annual minimum rent from each phase of the wind farm is cumulative. Rent from preceding phases continues to be paid as each succeeding phase comes into operation. The initial annual minimum rent payment is $7,025 beginning in 2006. Total annual minimum rent reaches $50,568 when Phase II is completed, $149,020 when Phase III becomes operational, and $313,106 when Phase IV begins production. Cumulative annual minimum rent reaches $525,974 by 2019 when rent from the fourth phase reaches 100% in its third year of operation.

Production Rent

The second component of the rental is a production rent. "In addition to the minimum rent, a wind energy production rent fee will be required as part of the development right-of-way grant and will apply for any operations greater than the annual minimum rent. The wind energy production rental fee formula will be determined by the authorized officer at the time of the issuance of the right-of-way grant using comparative market surveys, appraisals, or other reasonable methods. The site-specific appraisal will use a percent of gross proceeds methodology based on actual sales of electricity and market supported rates. Gross proceeds will include any revenue from the sale of wind energy production from public land, including revenue from the sale of production credits (Renewable Energy Credits)" (BLM, 2004, "Interim Wind Energy Development Policy, Washington, D. C.).

The annual production rent is paid beginning once the facility is in commercial operation. The formula to determine the production rent is a part of the development right-of-way grant and is determined at the time the right-of-way grant is issued. No analysis of the annual production rent is included in this section because the wind farm projects are not in operation.

State of Montana

Wind Farm Revenue

Revenue would accrue to the State of Montana from the wind farm turbines located on state land and from that portion of state land traversed by the transmission line. Initially the state would receive $1.50 per acre for each acre of state land included in the wind farm. Montana also would receive $1,000 for each turbine located on state land. Once the facility is in production the state receives a royalty of 2.5% of gross revenue on the number of turbines located on state land or $1,200, whichever is greater. The royalty is

paid annually (personal communication, Hoyt Richards, Department of Natural Resources and Conservation, November 23, 2004).

At this time the exact amount of State of Montana acreage needed for the wind farm operation has not been determined. That precise amount of acreage will be determined as final site plans are approved. However, the conceptual plan does contain the number of turbines to be located on state land by phase of the operation. In Phase I, the state will receive $6,000 for turbines located on state land. No turbines are scheduled for development in Phase II and no revenue would accrue to the state. In Phase III the state will receive a one-time payment of $21,000. The Phase IV one-time payment for turbines is estimated at $14,000.

Annual royalty payments to the State of Montana will begin in 2007 when Phase I has been completed. Total anticipated royalties to the state are estimated at $39,709 annually from that phase of the wind farm operation. None of the wind turbines in Phase II will be located on state land: no royalty payments are received from that phase of the wind farm. Royalties from completion of Phase III will amount to $133,700 annually and will begin in 2014. Phase IV royalties begin in 2018 at an estimated total of $89,133 annually.

Cumulative annual royalty payments begin at $39,079 with the completion of Phase I, reach $172,779 at the completion of Phase III, and level out at $261,912 with the completion of Phase IV. Royalty payments remain at that amount for the life of the facility.

Royalty payments were based on gross revenue projections of the wind farm. Gross revenue for each phase was based on the estimated kilowatts produced per year from each phase, a payment rate per kilowatt hour, the number of hours per year the turbines will be in use, and a capacity factor for each turbine. The gross revenue for each phase was allocated by the number of wind turbines and land ownership. In the Montana case, gross revenue was factored by the percentage of turbines located on State of Montana land. All royalty payments were calculated at a 2.5% rate of gross revenue. Any change in the method to calculate royalties by the State of Montana would affect future royalty payments. All royalty payments were calculated in current (2004) dollars.

Conveyance

A second source of revenue to the State of Montana would be for use of its land in the transmission line corridor. The State has three options to collect revenue for that conveyance land: a lease arrangement, a land use license, or an easement. A leasing arrangement would be based on the minimal appraised value of the land or a negotiated value. A land use license could be imposed. An easement is a one time fee or an annual rental rate. An easement also can be a negotiated value for the acreage under the transmission line. Final lease, land use license fees, or easement rental is subject to the number of acres in conveyance land and negotiations between Wind Hunter and the State of Montana.

Private Landowners

A portion of the wind farm will be located on private land. Current plans call for annual leasing of those properties. The amount of private land to be leased is dependent on the final siting for each phase of the wind farm. Final leasing arrangements will depend on negotiations with affected property owners. Leasing of private land for the wind farm would provide additional income to those property owners. In a report analyzing the detailed economic impact of wind farms, it was stated that, "Of all local groups that benefit from wind energy development, rural land owners could reap the greatest rewards" (Agricultural Utilization Research Institute, 1996).

Decommissioning

The wind farm is not expected to be decommissioned. The economic life of the turbines at the wind farm is 20 years. When the economic life of the turbines in each phase is reached, the turbines will be replaced. A slight positive impact to the local economy will occur as construction crews temporarily move to the area and local labor is used to replace the turbines. Permanent employment at the wind farm will be ongoing.

3.5.3 Public Services

Valley County and the City of Glasgow public services will be impacted by construction and operation of the wind farm, substation, and transmission lines. This section discusses the impact of those facilities on law enforcement, fire protection, water and sewer provision, solid waste, education, hospital services, and emergency medial services.

Service providers were interviewed and asked whether or not they have the capacity or would be able to accommodate the impact of the proposed facility. All service providers indicated that they would be able to accommodate the construction and operation and maintenance phases of the facility. Their responses fell into two general categories. The first was that Glasgow and Valley County had serviced higher levels of population and had been able to serve that higher level of population without negatively impacting their level of service. The second general response was that service providers were used to flucations in the work force because of other large construction projects. The providers were used to those types of impacts and have dealt with them in the past.

3.5.3.1 Law Enforcement

The Glasgow Police Department is responsible for law enforcement within the city limits of Glasgow. The department has seven police officers and one administrative person. Four vehicles are available for patrol. The department is supported by the Valley County Sheriff's Department. Two to three Federal Bureau of Investigation agents and two Montana State Highway Patrol officers also are stationed in Glasgow.

The department does not expect future permanent employees and the resulting resident population to cause an impact on department operations. An additional influx of temporary employees also would not cause an increase in the department's workload. The department has experienced that type of impact before and has adjusted to it with

previous construction projects in Valley County (personal communication Captain Bruce Barstead, Glasgow Police Department, November 18, 2004).

The Valley County Sheriff's Department is responsible for law enforcement in the unincorporated county. It has a staff of seven with five road deputies. The amount of increased traffic at the construction sites due to workers commuting and delivery of construction materials would increase the department's workload. The department is used to that type of impact and has dealt with fluctuations in the county's workforce. They have seen these types of changes before and have been able to respond to them. Additional traffic would not pose a problem to the department (personal communication, Vernon Buerkle, Valley County Sheriff's Department, November 12, 2004).

3.5.3.2 Fire Protection

The Glasgow Volunteer Fire Department provides fire protection and suppression within the City of Glasgow. The department consists of 26 active members. The department has four pumper vehicles and one ladder truck located at two fire stations in the city. Average response time to a call is about four minutes. The city of Glasgow is described as a fire safe community, with 12 calls so far in 2004, down from the number of calls in 2003. The department would be able to provide fire protection for temporary workers and additional full-time residents due to the impact of the windfarm construction and maintenance without causing an additional burden to the department (personal communication, Jeff Konodel, Glasgow Volunteer Fire Department, November 16, 2004).

The windfarm will be served by the LongRun Fire District. The district is responsible for responding to all fire calls in unincorporated Valley County. The department consists of 35 to 40 volunteer fire fighters. District personnel are trained to respond to wildland and structural fires. Fire halls, with active fire engines, are located at Glasgow, Fort Peck, Hinsdale, Nashua, Opheim, The Pines, and Richland. An additional fire hall is located at Luster, but a fire engine is not at that site. The fire department has mutual aid agreements with BLM and Roosevelt County. The department also has a HAZMAT team.

The department will be able to assume the extra fire protection duties associated with the wind farm. The department stated that "it will do what it takes to get the job done." Department personnel stated that they would want a tour of the substation facility and a listing of phone numbers for substation maintenance personnel. The department also stated that it would like additional training, but that training is not necessary to provide coverage for the wind farm. Response time to thewind farm would vary between 35 and 45 minutes to one hour (personal communication, Dan Carney, LongRun Fire Department, November 12, 2004).

3.5.3.3 Water and Sewer

Water and sewer service within the City of Glasgow is provided by the city. Water and sewer facilities are sized to accommodate a larger population. Water and sewer facilities were built with a capacity for about 7,000 residents, the City's peak number of residents in the 1970's. Both water and sewer facilities have been maintained at that level of

capacity. Water usage averages about 700,000 gallons per day with a summer peak of about 2 million gallons per day. The water system is capable of pumping an additional 3 million gallons of water per day. A recent upgrade in the sewer system was made to divert storm water from the sewage treatment plant thereby upgrading capacity at that facility.

Water and sewer infrastructure is in place for a larger population. Both systems have excess capacity and could handle the demand from temporary construction workers and permanent employees (personal communication, John Bengosha, City of Glasgow Public Works Department, November 15, 2004).

3.5.3.4 Solid Waste

Valley County Refuse District #1 is responsible for the county's 160 acre solid waste landfill. The district is responsible disposing of solid waste for cities and unincorporated areas of Valley County. It also is accepting solid waste from adjacent counties and the Fort Peck Reservation. The refuse district also has trash container sites located throughout the county. A private contractor is responsible for picking up solid waste and hauling it to the landfill.

Additional solid waste is expected to be generated during the construction and operational phases of the windfarm and residential sources from the temporary construction workers and permanent substation employees. The landfill is capable of handling solid waste generated from both sources (personal communication, Kari Knierim, Valley County Refuse District #1, November 9, 2004). The county land fill has an expected life capacity of more than 100 years (personal communication, Dan Carney, Valley County Refuse District #1 Commissioner, November 12, 2004).

3.5.3.5 Education

The wind farm project and the City of Glasgow are located in the Glasgow School District #1A. The district currently maintains a preschool for grades 1 through 3, an elementary school for grades 4 through 6, and a high school for the 7th through 12th grades. The 2004-2005 school year enrollment was 780 students as of September, 2004. Enrollment has been steady for the last several years after experiencing declines in preceding years.

The impact of the wind farm on school district enrollment is expected to be minimal. The highest level of hiring by the windfarm will be temporary construction workers who are not expected to move to the area or to bring their families with them. Local hiring will not impact enrollment as local workers either do not have school aged children or already have children enrolled in the school system. About four to 16 new employees will be hired at the wind farm over the four phases of development and will move to the area permanently. Those employees may or may not have school aged children. The school district currently has the capacity to accept new students, in part because it has had higher levels of enrollment in the past and was capable of handling those levels of enrollment (personal communication, Kelly Doornek, Glasgow School District #1A, November 9, 2004).

3.5.3.5 Hospital Services

Frances Mahon Deaconess Hospital is located in Glasgow and provides medical services for all of northeastern Montana. It is a 25 bed critical access facility which provides primary and some secondary and tertiary medical for the region. The hospital has three family doctors, 1.6 internists, an obstetrics/gynecology doctor, and two mid level medical practitioners. Physicians at the hospital can perform general orthopedic, and ear, nose, and throat surgery. The facility has Magnetic Resonance Imaging (MRI) and Computerized Axial Tomography (CAT) scan facilities, a radiology department, and laboratory.

The hospital has been able to maintain the same level of services and number of doctors it had when the city and county populations were higher in the late 1970's. The facility is capable of serving a much larger population and would be able to accommodate population increases due to wind farm workers moving to the area with their families and temporary construction workers (personal communication, Randy Holom, Frances Mahon Deaconess Hospital, November 17, 2004).

3.5.3.6 Emergency Medical Services

Frances Mahon Deaconess Hospital also provides emergency medial services for all of Valley. The emergency medical service is headquartered at the hospital. There are ambulances located in Glasgow, Fort Peck, Hinsdale, Luster, Ophiem, Nashau, and St. Maries. Nearly 75 volunteer emergency service personnel and two respiratory technicians are available to respond to requests for medial assistance. The hospital also has two fixed wing life aircraft, with accompanying crews, for life support transport.

The level of staffing and number of ambulances is adequate to support the construction impact and ongoing operation and maintenance of the wind farm. No additional training would be necessary for existing personnel. The emergency services department was able to handle the number of calls generated when the county had a population of 10,000, compared to the current population of 7,349 persons. Emergency medical personnel indicated that some type of industrial first aid kit be provided at the wind farm in order to begin pretreatment procedures (personal communication, Clay Berger, Frances Mahon Deaconess Hospital, November 15, 2004).

3.6. ENVIRONMENTAL JUSTICE

3.6.1 Regulatory Framework

Executive Order 12898 (EO 12898), issued on February 11, 1994 by President Clinton, *Federal Actions to Address Environmental Justice in Minority Population and Low Income Populations*, was implemented to specifically address human health and environmental conditions in disadvantaged populations. The order recognizes and addresses, in an accompanying memorandum to department and agency heads issued with EO 12898, National Environmental Policy Act (NEPA) procedures for identifying and addressing Environmental Justice concerns, and makes it clear that the provisions

contained within it apply fully to programs involving Native Americans (CEQ 1997). A fundamental provision within the order states that all federal agencies must address and identify, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies and activities on minority and low-income populations in the United States. With regards to enforcement of EO 12898, the Council on Environmental Quality (CEQ) has oversight of the Federal government's compliance with EO 12898 and NEPA.

The CEQ, in consultation with the EPA and other affected agencies, has developed procedures so that Environmental Justice concerns are adequately addressed when developing programs or activities. In December of 1997, the CEQ issued *Environmental Justice: Guidance Under the National Environmental Policy Act* (CEQ 1997), a document that provides general principles for considering Environmental Justice in specific phases of the NEPA process.

The Bureau of Land Management's *Draft Programmatic Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western United States* (BLM 2004) used the CEQ guidelines in the analysis of potential impacts on Environmental Justice among 11 states, and specifically states in the document that potential impacts should be addressed at the local level.

3.6.2 Affected Environment

3.6.2.1 Study Methods

According to the CEQ (1997), there is not a standard formula for how Environmental Justice concerns should be addressed or identified. However, the use of demographic data available from the Bureau of Census (BOC), and consideration of distinctive cultural practices such as possible subsistence on fish, vegetation, or wildlife is suggested. The CEQ provides Environmental Justice assessment guidelines in a three-part process:

- Description of the geographic distribution of low-income and minority populations in the affected area;
- Assessment of whether construction and operation impacts would produce high and adverse impacts; and
- Determination of whether the impacts would disproportionately impact low-income or minority populations if the impacts identified are high and adverse.

Existing socioeconomic data, including low income and minority population groups based on demographic data from the 2000 Census is presented in Section 3.5 Socioeconomics and Public Services. The following definitions of individuals were used to define low income and minority populations. The definitions were taken from the BLM's *Draft Programmatic Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western United States* (BLM 2004).

- **Minority**. Persons are included in the minority category if they classify themselves as belonging to any of the following racial groups: Hispanic, Black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or "Other Race".

- **Low-Income**. Low-income individuals are defined as individuals who fall below the poverty line. The poverty line takes into account family size and age of individuals in the family. In 1999, for example, the poverty line for a family of five with three children below the age of 18 was $19,882. For any given family below the poverty line, all family members are considered as being below the poverty line for the purposes of analysis.

The analysis area for Environmental Justice effects includes all of Valley County. Demographic data for the State of Montana was used for comparison with Valley County demographic data.

3.6.2.2 Project Area Overview

Minority Population

Table 3.5-2 "1990 to 2000 Valley County Race and Hispanic Origin" summarizes the ethnic composition of VCWEP area. Based on census data, the Valley County minority population (Black, Indian, Asian, and Hispanic) in the year 2000 was 813, or 10.6% of the total Valley County population of 7,675. The Statewide minority population was 82,002 or 9.1% of the total Montana population of 902,195 (BOC 2000). Whites comprise 88.1% of the Valley County population compared to 90.6% or 817,229 persons for the state. Those classifying themselves as "Other" in Valley County comprise about 0.3% of the population and 0.6% for the state. Valley County has a slightly higher proportion of minorities than the State of Montana as a percentage of total County population.

Low-Income Population

According to poverty statistics for 2000, the State of Montana had a low-income population of 117,677, or 13.3% of the total state population, while Valley County had a low-income population of 1,132, or 15.2% of the total Valley County population.

Median and average incomes for Valley County are somewhat lower than the state as a whole. Economic data indicate Valley County has a per capita income of $16,246 compared to State of Montana per capita income of $17,151 for the year 2000, or 5.2% below the state average. Likewise the median income levels were also somewhat lower than the state in the year 2000 with $30,979 for Valley County, compared to $33,024 for the State of Montana.

3.6.3 Environmental Consequences and Mitigation Measures

3.6.3.1 Assessment Methodology

For this analysis, the BLM (2004) criteria for the identification of minority and low-income populations were also used.

- A minority population exists where the percent age of minority persons for the given geographic unit is more than 20%age points higher than the &age of minority persons for the referenced geographic unit, or where a minority population exists in any geographic unit where the number of minority persons exceeds 50% of the total population.

- A low-income population exists where the percentage of low-income persons for any given geographic unit is more than 20 percentage points higher than the percentage of low-income persons for the reference geographic unit, or where the number of low-income persons in the geographic unit exceeds 50% of the total population.

3.6.3.2 Impacts

Valley County has similar low-income and minority populations compared to the state as a whole. The county has a minority population approximately 2.6 percentage points higher than the state. This is well below the 20-percentage point difference needed to identify Valley County as a minority population. Also Valley County's minority population is 10.6% of the total county population which is below the 50% threshold. Valley County had a low-income population approximately 1.9% higher than the state, but this too is well below the 20 point difference needed to identify Valley County as a low-income population. Also Valley County's low-income population as a percentage of total county population is 15.2%, well below the 50% threshold.

Most of VCWEP area and surrounding area is sparsely inhabited. Project environmental effects would affect the area's population equally, without regards to ethnicity or income. Based on CEQ guidelines and Valley County population data presented in Section 3.6.2.1 and 3.6.3.1, there are no high and adverse impacts that would result from construction and operation of VCWEP and no minority or low-income populations would be disproportionately affected from construction and operation of VCWEP. Therefore no further environmental justice analysis is required...

In consideration of impacts that may affect a cultural, historical, or protected resource of value to an Indian Tribe or minority population, even when the population is not concentrated in the vicinity, Section 3.12 "Cultural Resources" states that no traditional cultural properties or Executive Order 13007 (Indian Sacred Sites) are currently identified within VCWEP area or any of the alternatives. However, information on TCP's and sacred sites is obtained primarily through tribal consultation. The BLM and Western will be initiating consultation with concerned Tribes on a government-to-government

basis to solicit information about sacred sites and other TCP's that could potentially be impacted by the Proposed Action and alternatives.

3.6.3.3 No Action Alternative

No environmental justice impacts are associated with the No Action Alternative.

3.7. BIOLOGICAL RESOURCES

3.7.1 Affected Environment

This section presents general information on existing biological resources within the study area. For the purpose of evaluating biological resources, the general study area encompasses approximately 460 square miles and contains all project-related activities and adjacent areas. Detailed information is presented for the proposed wind farm and substation sites as well as the alternative transmission line routes. The resources addressed in this section include plants and vegetative communities, aquatic habitats and fisheries, terrestrial habitats and wildlife, and special status species (i.e., endangered) and important habitats. Information in this section provides the basis for the impact analyses presented in section 3.7.2 (Environmental Consequences and Mitigation Measures). The applicable Federal and State laws, regulations, and administrative designations relative to plant and wildlife species and their habitats are summarized below.

Federal Statutes

Endangered Species Act (7 U.S.C. 136; 16 U.S.C. 460 et seq.)

The Endangered Species Act (ESA) provides for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The Act is implemented by 2 federal agencies, the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries), which have the ability to officially list plant and animal species as "endangered" or "threatened." An endangered species is one that is "in danger of extinction" throughout all or a significant portion of its range, while a threatened species is one that is "likely to become endangered" within the foreseeable future (16 U.S.C. § 1532). Section 7 of the ESA imposes an affirmative duty on federal agencies to ensure that their actions (including permitting) are not likely to jeopardize the continued existence of a listed species or result in the destruction or modification of their habitat. Section 7 requires an analysis of the potential effects of a VCWEP. on threatened or endangered species. When a project may affect a threatened or endangered species or their habitat(s), the sponsoring agency must consult with either USFWS or NOAA Fisheries.

Invasive Species (Executive Order 13112)

Executive Order 13112 requires that each federal agency prevent the introduction and spread of invasive species; detect and respond rapidly to control such species; monitor invasive species populations; and provide for restoration of native species and habitat conditions in ecosystems that have been invaded (USFR 1999). An "invasive species" is

defined as a species that is non-native to the ecosystem under consideration and whose introduction does or is likely to cause economic or environmental harm or harm to human health. In addition, this order requires that a federal agency "…not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm cause by invasive species; and that all feasible and prudent measures to minimize risk or harm will be taken in conjunction with the actions."

Migratory Bird Treaty Act (16 U.S.C. 703)

The Migratory Bird Treaty Act (MBTA), originally passed in 1918, implements the United States' commitment to four bilateral international conventions (Great Britain, Mexico, Japan, and Russia) for the protection of migratory birds. The MBTA makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird, except under the terms of a valid permit issued by the USFWS. Permits may be issued to qualified applicants for falconry, raptor propagation, scientific collecting, education, rehabilitation, and taxidermy. The MBTA currently protects more than 800 migratory bird species.

The Bald and Golden Eagle Protection Act (16 CFR 668)

The Bald and Golden Eagle Protection Act (BGEPA) prohibits any form of possession or taking of both bald and golden eagles. The statute imposes criminal and civil sanctions as well as an enhanced penalty provision for subsequent offenses. Further, the BGEPA provides for the forfeiture of anything used to acquire eagles in violation of the statute. The use of eagles or eagle parts for exhibition, scientific, and Indian religious purposes are exempt from BGEPA prohibitions.

State Statutes

Montana Code Annotated Title 80 – Agriculture

The Montana Department of Agriculture (MDA) administers several laws relating to weed management. The Montana Weed Control Act (MCA §80-7-701) provides technical assistance and embargoes for weed management in Montana. Local county government has the responsibility for implementation and enforcement of weed management in Montana. The Montana County Noxious Weed Control Act (MCA §7-22-2101 to 2153) provides for weed management at the county level. The law requires counties to develop a long-term management plan for the control of noxious weeds in their county.

Montana Code Annotated Title 87—Fish and Wildlife

The Montana Department of Fish, Wildlife & Parks (MFWP) is responsible for management of "all the wildlife, fish, game, game and nongame birds, waterfowl, and the game and fur-bearing animals of the state" (MCA §87-1-201). Birds, fish, and mammals classified as "game species" are protected under MCA §87-3. MFWP lists and protects

species categorized as endangered and threatened pursuant to "The Nongame and Endangered Species Conservation Act" (MCA §87-5-101). Montana statutes also provide for the specific protection of falcons, hawks, eagles, ospreys, and owls under regulations in MCA §87-5-201.

Migratory Bird Treaty Act (16 U.S.C. 703)

The Migratory Bird Treaty Act (MBTA), originally passed in 1918, implements the United States' commitment to four bilateral international conventions (Great Britain, Mexico, Japan, and Russia) for the protection of migratory birds. The MBTA makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird, except under the terms of a valid permit issued by the USFWS. Permits may be issued to qualified applicants for falconry, raptor propagation, scientific collecting, education, rehabilitation, and taxidermy. The MBTA currently protects more than 800 migratory bird species.

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Policies and Administrative Designations

BLM Sensitive Species

Bureau of Land Management (BLM) Special Status Species Management 6840 establishes policy for the management and conservation of sensitive plant and animal species, and the ecosystems upon which they depend. Policy 6840 gives the State Director the responsibility of designating BLM sensitive species, and periodically reviewing and revising the list in cooperation with State wildlife agencies and Natural Heritage Programs. The 2004 Montana/Dakotas BLM list includes 74 sensitive species (USDI 2004*a*). The Instruction Memorandum transmitted with the species list directs the BLM field offices to evaluate the sensitive and federally listed species in project planning and analysis.

Montana Species of Concern

In conjunction with the Montana Natural Heritage Program (MNHP), MFWP has developed a list of animal Species of Concern for the State (MNHP 2003, 2004*a*). Species of Concern are native species that breed in the State and that are considered to be "at risk" due to declining populations, threats to their habitats, and/or restricted distribution. The 2004 Species of Concern list includes 119 vertebrate and 58 invertebrate species (MNHP 2004*a*). A significant number of these vertebrate species are also included in the regional BLM sensitive species list. In addition, MNHP has identified 330 vascular plant Species of Concern (MNHP 2003). Species of Concern are native

species that are considered "at risk" due to extremely limited and potentially declining populations and/or habitats, and are vulnerable to global extinction or state extirpation (MNHP 2003).

3.7.1.1 Study Methods

Data on biological resources in the study area were obtained from a variety of sources, including literature review, reports from the MNHP, species recovery and management plans, technical reports, and peer-reviewed journal articles. Information and species lists were obtained through meetings and correspondence with personnel from the USFWS, BLM, and MFWP. In particular, local wildlife biologists with the BLM and MFWP provided valuable information and mapping of sensitive species and important habitats within the study area. The MNHP furnished data on the occurrence of special status plant and wildlife species in the area.

Field investigations were conducted in September and October 2004 to evaluate biological resources in the vicinity of the proposed wind farm and substation, and along the alternative transmission line routes. Information on vegetative communities, wildlife habitats, and actual/potential species occurrence was obtained through these field investigations. In accordance with USFWS guidelines, a Potential Impact Index (PII) was completed to evaluate the physiographic characteristics of the proposed wind farm and the potential risk to avifauna (Appendix D). The PII provides an initial site evaluation, and the resulting site suitability index aids the development of project-specific bird survey and monitoring protocols. A supplemental Phase I report was prepared to provide more detail on wildlife resources within the study area (Appendix D). Bird point count surveys and raptor surveys were conducted in October 2004 to help assess utilization of the study area by both resident and migrant passerine and raptor species. The potential for occurrence of plant and wildlife species not observed during field investigations was assessed based upon evaluation of species distribution and habitat use, and information from previous research studies and biological reports.

3.7.1.2 Ecological Overview

Introduction

The VCWEP. is located within the Northwestern Glaciated Plains ecoregion of the Great Plains physiographic province (Omernik 1987). The Northwestern Glaciated Plains ecoregion is a transitional region between the flatter and moister Northern Glaciated Plains and the irregular and dryer Northwestern Great Plains. The western and southwestern boundaries of this ecoregion generally correspond to the limits of continental glaciation (EPA 2004). The ecoregion is generally characterized by level to gently rolling glacial till plains at elevations ranging between 2,500 and 5,000 feet MSL. The climate is cold continental with a growing season of approximately 115 days. The primary native vegetative community in the Northwestern Glaciated Plains ecoregion is grama-needlegrass-wheatgrass short grass prairie (Kuchler 1964). As wind redistributes and compacts snow to lee positions and swales and creates mesic micro sites, snow affects the distribution of plant communities in this ecoregion (Jones 2003).

For the purposes of describing and analyzing biological resources, the study area was divided into 3 relatively distinct portions: northern, central, and southern. The northern portion of study area extends northward from the township boundary (T32N) to the northern border of the wind farm along boundary of the Bitter Creek Wilderness Study Area (BCWSA; Figure 3.7-1). This area contains extensive upland plateaus interspersed by swales, coulees, and the upper reaches of small, ephemeral drainages. The coulees and streams generally trend north to south towards the Milk River, and include (from east to west) Dry Fork Creek, Buggy Creek, Canyon Creek, and the West Fork Canyon Creek (Map 8). The proposed wind farm is located within the northern area, which is undeveloped and supports relatively little agriculture.

The central portion of study area is located between T32N and US Highway 2 to the south (Figure 3.7-1). This area contains relatively flat terrain and rolling hills, and is somewhat lower in elevation compared to the northern plateaus. A series of coulees and small, ephemeral streams bisect this area, including (from east to west) Cherry Creek, West Fork Cherry Creek, Spring Creek, Wolf Creek, Buggy Creek, Bear Creek, Brush Fork Bear Creek, and Alkali Creek. This area supports a limited amount of residential development and agricultural (wheat) land uses.

The southern portion of the study area extends from US Highway 2 south to the Billingsley Road area (Figure 3.7-1). This area contains relatively flat terrain and rolling hills, and includes the Milk River valley. This portion of the study area supports the most development, and native vegetative communities have been significantly fragmented by agricultural land uses. Most of the Milk River valley has been converted into agricultural land uses, principally production of wheat and hay. The rolling hills in extreme southwest portion of the study area do not support crop production. Antelope Creek is the principle drainage in the southern portion of the study area.

Vegetation

Upland Communities

The landscape in the northern and central portions of the study area is dominated by native short- and mid-grass prairie communities intermixed with small patches (<0.1 acre) of badland, shrubland, and riparian vegetation. Upland habitats on these plateaus are predominantly native grama-needlegrass-wheatgrass grassland associations with little sagebrush. Short- and mid-grass prairie associations have developed in response to highly variable precipitation patterns. Shorter grasses, such as blue grama, are relatively drought tolerant and increase percentage cover during dryer periods while mid-grasses, such as western wheatgrass, require more favorable moisture conditions and increase percentage cover during wetter periods (Cooper et al. 2001). As a result, short-grass species dominate the top of plateaus and ridges while mid-grass species have higher relative abundance in drainages and swale bottoms.

The predominant native grass species on upland areas include western wheatgrass (*Pascopyrum smithii*), thickspike wheatgrass (*Elymus lanceolatus*), needle-and-thread (*Hesperostipa comata*), and blue grama (*Bouteloua gracilis*). Some swales and protected

north-facing slopes support northern porcupine grass (*Hesperostipa curtiseta*). The most mesic sites also support green needlegrass (*Nassella viridula*). Needle-and-thread-blue grama communities dominate those areas that have experienced relatively intensive grazing.

The native grassland communities in this portion of the study area are relatively undisturbed and intact. The predominant land use is ranching, and these grasslands are subjected to low-moderate intensities of cattle grazing. The area is undeveloped with the exception of the Northern Border Compressor Station, a few wheat fields, and several unimproved roads. As a result of climate and land ownership/land use patterns, this area has been identified as "one of the most extensive naturally functioning glaciated plains grasslands in North America (Cooper et al. 2001). A biological survey completed by the MNHP identified an extensive tract of northern porcupine grass-thickspike wheatgrass in the Dry Fork Creek area (Cooper et al. 2001). This community is located on State lands and is considered by the authors to represent one of the highest quality stands in the region. Wetlands associated with this community also support a large population of chaffweed (*Centunculus minimus*), which is currently designated as a species of concern by MNHP.

The northern and northwestern boundaries of the study area are adjacent to the BCWSA, which is approximately 300 feet lower in elevation than the wind farm plateau and separated by a variable but sometimes distinct rim. The BCWSA is characterized by rugged eroded breaks with highly dissected terrain. As a result of geologic characteristics (soil types, bentonite, shale substrate, etc.), the BCWSA badlands have "eroded shale-ridge systems and slope outwash that support distinctive communities dominated by specialized, drought- and/or salt-tolerant shrubs and herbs" (Cooper et al. 2001). Characteristic plant species in this badlands habitat include longleaf sagewort (*Artemisia longifolia*) and creeping juniper (*Juniperus horizontalis*). Unique community types include thickspike wheatgrass-green needlegrass and porcupine grass-thickspike wheatgrass. A small area of badlands habitat extends slightly into the western edge of the study area along Britsch Road near Lime Creek and Horse Coulee.

Shrublands are comparatively rare and cover a very small portion of the study area. These communities tend to be small (<0.1 acres) and isolated, and are generally located in badlands, upland draws, and riparian zones. Badlands support limited shrub communities, with creeping juniper being the dominant species in a true badlands habitat. The primary upland shrub community throughout the northern portion of the study area is silver buffaloberry (*Shepherdia argentea*), which occurs as small, isolated patches in protected draws, drainage heads, and swale bottoms. While some mall, sparse stands of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) occur in this portion of the study area, silver sagebrush (*Artemesia cana*) communities are more common. Silver sagebrush occurs in relatively mesic sites, and is generally found as stringers on the upper floodplain terraces of the larger creeks in the area, particularly Buggy Creek.

The only sagebrush steppe habitat occurs on uplands in the extreme southwestern portion of the study area (south of Vandalia and west of the Richardson Coulee substation). The

Figure 3.7-1 Biological Resources Study Area Map

principle vegetative community in this area is Wyoming big sagebrush-western wheatgrass. Other important perennial grasses are needle-and-thread and blue grama (Heitschmidt et al. 1995). This is the only portion of the study area that supports an extensive sagebrush community. Native grasslands in the southern portion of the study area have been highly reduced and fragmented by agricultural land uses.

Riparian Communities

Riparian communities within the study area are generally restricted to coulee bottoms and along the small, ephemeral tributaries of the Milk River that bisect the area. The character of these riparian zones is directly related to soil moisture as determined by drainage basin size and dimensions, the annual flooding regime, and the proximity to the head of the drainage. These drainages experience significant seasonal and annual hydrologic variability, resulting in relatively undeveloped floodplains in most of the study area. Riparian habitats are better developed and more complex in the larger drainages and as one moves south towards the Milk River. The coulees and smaller streams are relatively xeric and do not support substantial riparian vegetation. Generally, riparian zones within the study area consist of herbaceous (*Carex* spp.) and willow (*Salix* spp.) communities in the wettest zones, which transition to western snowberry (*Symphorocarpos occidentalis*), Wood's rose (*Rosa woodsii*), and silver sagebrush-western wheatgrass communities on the upper floodplain terraces. The largest drainages support narrow, discontinuous patches of cottonwood forest interspersed by broader terraces supporting silver sagebrush-western wheatgrass.

The northern portion of the study area contains small coulees and the heads of drainages, which are generally not inundated for significant periods of time. The relatively xeric conditions in these areas do not support the development of riparian communities. As a result, the northern portion of the study area contains limited riparian habitats. The portion of Dry Fork Creek within the study area does not support a true riparian community, although this drainage does contain wetland habitats (Cooper et al. 2001).

Buggy Creek is the largest drainage and supports the best-developed riparian zone north of the Milk River. The northernmost riparian habitat along Buggy Creek is located approximately one mile southeast of the Northern Border Compressor Station. This riparian community consists of a narrow band (approximately 20 feet wide) of herbaceous vegetation (*Carex* spp.) immediately adjacent to the creek. At this location, the Buggy Creek basin is relatively broad and shallow. The basin narrows approximately 2 miles south of the Northern Border Compressor Station, where there is a transition from herbaceous riparian vegetation to a riparian shrub (*Salix* spp.) community. The Buggy Creek drainage narrows more approximately 3 miles south of the Northern Border Compressor Station, where the riparian zone transitions to cottonwood (*Populus deltoides*) forest. The downstream floodplains along Buggy Creek contain a mosaic of cottonwood forest, shrub, and herbaceous riparian communities including more developed stringers of riparian cottonwood forest in the central and southern portions of the study area. Western snowberry, Wood's rose, and wild current (*Ribes* spp.) are the dominant understory species in these cottonwood stands, indicating that grazing has reduced vegetative diversity of the riparian habitats (Cooper et al. 2001). Throughout the

Buggy Creek drainage, silver sagebrush occurs on alluvial terraces and in drier positions within the riparian zone. Small, narrow bands of cottonwood forest also occur along Canyon Creek and along the southern portions of Cherry Creek (along Skylark Road) and Alkali Creek (north of US Highway 2). Antelope Creek, located in the southwest corner of the study area, supports a relatively well-developed forest/shrub riparian community.

Milk River Gallery Forest

The Milk River supports the most significant forested riparian habitats in the study area. Riparian habitats along the Milk River include oxbow marshes and shrub-dominated terraces, but the defining feature is the cottonwood gallery forest that lines the river. Despite the fact that these riparian cottonwood forests have been reduced and fragmented by conversion of the floodplain to irrigated agriculture and pasture (Jones 2003), they remain as the only significant forested habitat within the study area. While the width of the cottonwood gallery forest varies between 30 and 500 feet.

Mature cottonwood trees (>100 feet tall) dominate the Milk River riparian community. Mesic floodplains support a diverse understory that includes boxelder (*Acer negundo*), peachleaf willow (*Salix amygdaloides*), redosier dogwood (*Cornus sericea*), yellow willow (*Salix lutea*), and chokecherry (*Prunus virginiana*). Xeric floodplain terraces support a less diverse shrub layer dominated by western snowberry and Wood's rose, or lack a shrub component altogether. The native grasses that once characterized these stands have been largely replaced by exotic species and grazing has greatly altered the shrub composition in these communities (Jones 2003). River terraces that are no longer subjected to seasonal flooding often support a silver sagebrush-western wheatgrass community. Recent studies indicate that the quantity and quality of the cottonwood gallery forest along the Milk River is declining due to the interruption of natural flood regimes below Fresno Dam (Jones 2003). The lack of flood disturbance has changed the ecological dynamics by suppressing cottonwood regeneration and facilitating the colonization of invasive species such as Russian olive (*Elaeagnus angustifolia*).

A list of plant species that occur in the study area was compiled from a variety of sources, including MNHP and several reports (MNHP 2004*b* and 2004*c*; Cooper et al. 2001; Jones 2003). This list is presented in Table 3.7-1. This table is not intended to be an exhaustive list, but is included to provide some insight into characteristic communities that occur within the study area.

Table 3.7-1. Plant Species in Study Area

Common Name	Scientific Name	Location
Short- and Mid-grass Prairie		
Blue Grama	*Bouteloua gracilis*	Northern, Central
Thickspike Wheatgrass	*Elymus lanceolatus*	Northern, Central
Needle-and-thread	*Hesperostipa comata*	Northern, Central
Northern Porcupine Grass	*Hesperostipa curtiseta*	Northern, Central
Green Needlegrass	*Nassella viridula*	Northern, Central
Western Wheatgrass	*Pascopyrum smithii*	Northern, Central
Badlands		
Longleaf Sagewort	*Artemisia longifolia*	Northern
Thickspike Wheatgrass	*Elymus lanceolatus*	Northern
Northern Porcupine Grass	*Hesperostipa curtiseta*	Northern
Creeping Juniper	*Juniperus horizontalis*	Northern
Green Needlegrass	*Nassella viridula*	Northern
Shrublands		
Wyoming Big Sagebrush	*Artemisia tridentata* ssp. *wyomingensis*	Southern, Central
Blue Grama	*Bouteloua gracilis*	Southern
Needle-and-thread	*Hesperostipa comata*	Southern
Western Wheatgrass	*Pascopyrum smithii*	Southern
Silver Buffaloberry	*Sheperdia argentea*	Northern, Central
Riparian		
Boxelder	*Acer negundo*	Southern
Silver Sagebrush	*Artemisia cana*	Central, Southern
Sedge	*Carex* spp.	Northern, Central, Southern
Redosier Dogwood	*Cornus sericea*	Southern
Western Wheatgrass	*Pascopyrum smithii*	Central, Southern
Cottonwood	*Populus deltoides*	Northern, Central, Southern
Chokecherry	*Prunus virginiana*	Southern
Wild Current	*Ribes* spp.	Central, Southern
Wood's Rose	*Rosa woodsii*	Central, Southern
Peachleaf Willow	*Salix amygdaloides*	Southern
Willow	*Salix* spp.	Northern, Central, Southern
Silver Buffaloberry	*Sheperdia argentea*	Southern
Western Snowberry	*Symphorocarpos occidentalis*	Central, Southern

Source: Cooper et al. 2001; MNHP 2004b, 2004c; Jones 2003

Noxious Weeds and Invasive Plants

An "invasive species" is defined as a species that is non-native to the ecosystem under consideration and whose introduction does or is likely to cause economic or environmental harm or harm to human health (USFR 1999). In Montana, a "noxious weed" is defined as any exotic plant species established or that may be introduced which may render the land unfit for agriculture, forestry, livestock, wildlife, or other beneficial uses or that may harm native plant communities (MCA §7-22-2101 to 2153). In addition, these species have a statewide designation as a noxious weed (MCA §7-22-2101 to 2153). Invasive plants include not only noxious weeds, but other plants that are not native to this country (USDI 2004*b*). The native plant communities within the study area are relatively undisturbed and intact, particularly in the northern and central portions of the study area. This has minimized opportunities for establishment of invasive, non-native plant species and of which occur at relatively low levels compared with other landscapes in the region (Cooper et al. 2001). Several patches of spotted knapweed (*Centaurea maculosa*) have been found near US Highway 2 (Map 7; Cooper et al. 2001; Montana Natural Resource Information System 2004). Leafy spurge (*Euphorbia esula*) is broadly distributed in the BCWSA (Cooper et al. 2001), but has a scattered distribution in the study area proper (Montana Natural Resource Information System 2004). Two additional noxious weeds, Canada thistle (*Cirsium arvense*) and field bindweed (*Convolvulus arvensis*) are located in the study area but do not pose a significant threat to native communities at this time (Cooper et al. 2001). Canada thistle was found in the Dry Fork Creek watershed (Cooper et al. 2001). Several invasive species, which are not currently designated as noxious weeds, may pose a significant threat to native grassland communities. In the study area, MNHP identified quackgrass (*Agropyron repens*), smooth brome (*Bromus inermus*), Japanese brome (*Bromus japonicus*), and Canada thistle (*Cirsium arvense*). In the study area, these species are fairly limited in patch size and distribution (Cooper et al. 2001). In Buggy Creek, quackgrass was found along the waterway, while smooth brome and Kentucky bluegrass (*Poa pratensis*) occur in the riparian zone and upland swales. Russian olive has become well established in the southern portion of the study area, particularly in areas with residential development and along the Milk River.

Fish and Wildlife

Introduction

The large expanse of native grassland prairie that occurs in the northern and central portions of the study area is relatively intact, and provide habitat for a diversity of native wildlife species, including numerous obligate grassland birds. In the southern portion of the study area, human development and conversion to agricultural cropland have fragmented the native grassland communities and reduced the quality of these areas as habitat for grassland species. The Milk River represents the most significant fishery in the study area, and the associated cottonwood gallery forest is the only sizeable woodland in the area. The extent of a shrub-steppe community (Wyoming big sagebrush-western wheatgrass) is limited to the uplands in the southwest corner of the study area.

A list of wildlife species observed during field investigations conducted in September and October 2004 is presented in Table 3.7-2. This table is not intended to be an exhaustive list of every species that occurs in the area, but rather to provide insight into current habitat conditions and general taxonomic groups that occur within the study area. The following provides a discussion of the various wildlife species that occur in the study area.

Table 3.7-2. Species Observed in Study Area During Field Investigations

Common Name	Scientific Name	Location[1]
Reptiles and Amphibians		
Gopher snake	*Pituophis melanoleucus*	Southern
Northern leopard frog	*Rana pipiens*	Central
Painted turtle	*Chrysemys picta*	Southern
Common garter snake	*Thamnophis sirtalis*	Southern
Mammals		
Badger	*Taxidea taxus*	West-central
Mountain cottontail	*Sylvilagus nutalli*	Throughout
White-tailed jackrabbit	*Lepus townsendii*	Throughout
Franklin's ground squirrel	*Spermophilus franklinii*	Northern
Raccoon	*Procyon lotor*	Southern
Red fox	*Vulpes vulpes*	Central and Southern
Coyote	*Canis latrans*	Throughout
American pronghorn	*Antelocapra americana*	Throughout
White-tail deer	*Odocoileus virginianus*	Southern
Mule deer	*Odocoileus hemionus*	Throughout
Birds		
Golden eagle	*Aquila chrysaetos*	Northwestern
Prairie falcon	*Falco mexicanus*	Northern
Northern harrier	*Circus cyaneus*	North and Central
Swainson's hawk	*Buteo swainsoni*	North
Ferruginous hawk	*Buteo regalis*	North
Ring-necked pheasant	*Phasianus colchicus*	South
Sharp-tailed grouse	*Tympanuchus phasianellus*	North and Central
Greater sage-grouse	*Centrocercus urophasianus*	Central
Horned lark	*Eremophila alpestris*	Throughout
Loggerhead shrike	*Lanius ludovicianus*	Throughout
Sage sparrow	*Amphispiza belli*	South
Brewer's sparrow	*Spizella breweri*	North and Central

[1] Portion of study area in which species was observed

Fish

Aquatic habitats in the study area include small reservoirs and stock ponds, Wards Reservoir, Glasgow Base Pond, ephemeral streams, and the Milk River. A number of small, shallow, man-made reservoirs and stock ponds are found throughout the study area. These water bodies are water sources for livestock and, as a result of continual disturbance, most support little or no aquatic/emergent vegetation. Some of the larger reservoirs and stock ponds do support a narrow band of emergent wetland vegetation, including cattail (*Typha* spp.) and rushes (*Juncus* spp.). While several of these small reservoirs and stock ponds have been stocked, they do not represent significant fishery resources.

Wards Reservoir is located along Kerr Road in the northern portion of the study area. This relatively shallow reservoir supports a narrow band of wetland vegetation along the perimeter, and is managed by Ducks Unlimited as waterfowl habitat. Fathead minnows *(Pimephales promelas*) are the predominant fish species in this reservoir (Bill Wiedenheft, MFWP, personal communication). Fathead minnows are very tolerant of the high turbidity, high temperature, and low dissolved oxygen conditions that typify the creeks and ponds in the study area.

Glasgow Base Pond, located adjacent to Highway 24 approximately 20 miles north of Glasgow on, is managed by MFWP as a Fishing Access Site. The pond is relatively deep and supports a well-developed emergent wetland community. It is annually stocked with rainbow trout (*Oncorhynchus mykiss*) and yellow perch (*Perca flavescens*) by MFWP, although it receives relatively light fishing pressure (Bill Wiedenheft, MFWP, personal communication).

Several small, ephemeral tributaries of the Milk River bisect the study area, including Cherry Creek, Buggy Creek, Bear Creek, and Antelope Creek. Cherry Creek is approximately 38 miles long and runs north to south along the eastern edge of the study area. Buggy Creek is approximately 41 miles long and runs north to south through the middle of the study area. Bear Creek is approximately 22 miles long and runs north to south along the western edge of the study area. Antelope Creek is approximately 26 miles long and runs west to east along the southern edge of the study area. Peak flows in these tributaries occurs during spring runoff and significant precipitation events. Most of these creeks have no flow and a few small pools for most of the year, and support limited fish populations due to their ephemeral nature (Table 3.7-3). Large fish species are relatively rare and are generally restricted to the confluence with the Milk River. The redbelly dace x finescale dace occurs in Cherry Creek and is classified as a sensitive species by the BLM (see Special Status Species). Given the absence of any game species, all of these creeks receive extremely light fishing pressure (Bill Wiedenheft, MFWP, personal communication).

Table 3.7-3. Fish Species Occurring in the Milk River Tributaries.

Common Name	Scientific Name	Cherry Creek	Buggy Creek	Bear Creek	Antelope Creek
Brook stickleback	*Culaea inconstans*	X			X
Common carp	*Cyprinus carpio*	X			X
Fathead minnow	*Pimephales promelas*	X	X	X	X
Lake chub	*Couesius plumbeus*	X	X	X	X
Longnose dace	*Rhinichthys cataractae*	X			X
Northern pike	*Esox lucius*	X			
Northern redbelly dace	*Phoxinus eos*	X			X
Redbelly dace x Finescale dace	*Phoxinus eos x Phoxinus neogaeus*	X			
White sucker	*Catostomus commersoni*	X			X

Sources: MFWP 2004*a*, 2004*b*, 2004*c*, 2004*d*

The Milk River represents the most significant fishery in the study area, which contains river miles 68–112. The river supports twenty-eight native species and thirteen introduced species (Table 3.7-4; Stash et al. 2001). Fish diversity and abundance generally increases as one moves downriver towards the confluence with the Missouri River. Within the study area, the Milk River is a slow, meandering stream that experiences significant seasonal variability in flows due to runoff and irrigation diversions. Dams have altered the hydrological and geomorphological characteristics of the river by reducing peak flows and sediment loads, and thereby increasing channel incision and reducing channel migration (Friedman et al. 1998; Jones 2003). As a result of current conditions, this segment of the river supports fish species that are tolerant of relatively high temperatures, high sediment loads, and low oxygen conditions. A number of native species have been eliminated or greatly reduced in abundance as a result of hydrological changes. The Milk River receives relatively light fishing pressure in the vicinity of the study area, with most angling activity concentrated immediately downstream of the Vandalia Dam (Bill Wiedenheft, MFWP, personal communication).

Table 3.7-4. Fish Species that Occur in the Milk River

Common Name	Scientific Name
Bigmouth buffalo	*Ictiobus cyprinellus*
Black bullhead	*Ameiurus melas*
Black crappie	*Pomoxis nigromaculatus*
Blue sucker	*Cycleptus elong*
Bluegill	*Lepomis macrochirus*
Brassy minnow	*Hybognathus hankinsoni*
Brook stickleback	*Culaea inconstans*
Brown trout	*Salmo trutta*
Burbot	*Lota lota*
Channel catfish	*Ictalurus punctatus*
Common carp	*Cyprinus carpio*
Creek chub	*Semolitus atromaculatus*
Emerald shiner	*Notropis atherinoides*
Fathead minnow	*Pimephales promelas*
Flathead chub	*Hybopsis gracilis*
Freshwater drum	*Aplodinotus grunniens*
Goldeye	*Hiodon alosoides*
Iowa darter	*Etheostoma exile*
Lake chub	*Couesius plumbeus*
Lake whitefish	*Coregonus clupeaformis*
Longnose dace	*Rhinichthys cataractae*
Longnose sucker	*Catostomus catostomus*
Mountain sucker	*Catostomus platyrhynchus*
Northern pike	*Esox lucius*
Northern redbelly dace	*Phoxinus eos*
Paddlefish	*Polyodon spathula*
Pearl dace	*Semotilus margarita*
Rainbow trout	*Oncorhynchus mykiss*
River carpsucker	*Carpoides carpio*
Sauger	*Stizostedion canadense*
Shorthead redhorse	*Moxostoma macrolepidotum*
Shovelnose sturgeon	*Scaphirhynchus platorynchus*
Smallmouth bass	*Micropterus dolomieu*
Smallmouth buffalo	*Ictiobus bubalus*
Spottail shiner	*Notropis hudsonius*
Stonecat	*Noturus flavus*
Walleye	*Stizostedion vitreum*
White crappie	*Pomoxis annularis*
White sucker	*Catostomus commersoni*
Yellow Perch	*Perca flavescens*

Source: MFWP 2004*e*

Reptiles and Amphibians

The upland, riparian, and aquatic communities provide habitat for a variety of reptile and amphibian species. Five amphibian and 7 reptile species have been documented in the vicinity of the study area (Cooper et al. 2001). Species distribution information suggests that 2 additional reptile species may occur in the study area (MNHP 2004*d)*. Table 3.7-5 presents a list of reptiles and amphibians that are likely occur in the study area based upon observations during field investigations for this study, previous MNHP field studies, and the MNHP database. Five of these species, including the Great Plains toad, greater short-horned lizard, plains spadefoot, northern leopard frog, and western hognose snake, are classified as sensitive species by BLM (see Special Status Species). The species listed in Table 3.7-5 occupy a broad range of habitat types, ranging from ponds to mesic grasslands to xeric uplands, and may occur in appropriate habitats throughout the study area. There are no known critical breeding habitats or hibernacula for any reptile or amphibian species in the area.

Table 3.7-5. Reptile and Amphibian Species Likely to Occur in the Study Area

Common Name	Scientific Name	Habitat	Source[1]			
			1	2	3	4
Reptiles						
Tiger salamander	*Ambystoma tigrinum*	Breed in ponds and streams; burrow in prairie or agricultural habitats.				X
Greater short-horned lizard	*Phrynosoma hernandesi*	Sparse, short grass and sagebrush habitats with exposed soils or rock.			X	X
Painted turtle	*Chrysemys picta*	Lakes and ponds with shallow water, soft substrate, and logs/rocks for basking.	X	X		X
Western hognose snake	*Heterodon nasicus*	Arid sagebrush and grassland habitats, floodplains with gravelly or sandy soils.				X
Gopher snake	*Pituophis catenifer*	Arid sagebrush and grassland habitats.	X			X
Plains garter snake	*Thamnophis radix*	Numerous, including short-grass prairie near water (ponds and coulees).		X		X
Common garter snake	*Thamnophis sirtalis*	Numerous, prefer moist habitats along streams and ponds.	X			X
Racer	*Coluber constrictor*	Open habitats, particularly common in short-grass prairie.		X		X
Western rattlesnake	*Crotalus viridis*	Open, arid habitats with south-facing slopes and rock outcrops.		X		X
Amphibians						
Great plains toad	*Bufo cognatus*	Pools, stock ponds and stream valleys in sagebrush and grassland habitats.		X		X
Woodhouse's toad	*Bufo woodhousii*	Floodplains and mesic grasslands with permanent and slow streams.				X
Plains spadefoot	*Spea bombifrons*	Sandy and gravelly soils near permanent or temporary bodies of water.				X
Western chorus Frog	*Pseudacris triseriata*	Mesic grasslands and marshes near ponds and small lakes.		X		X
Northern leopard frog	*Rana pipiens*	Ponds, creeks, marshes, and wet meadows.	X	X	X	X

[1]Sources: 1 Observed during field investigations 2 Cooper et al. 2001 3 MNHPDatabase
4 Montana Animal Field Guide indicates study area within species distributes

Mammals

The mammal species that occur in the study area reflect the local habitat types. Table 3.7-6 identifies mammals observed during field investigations. Species of concern are addressed in the Special Status Species section discussed below. Grassland species include mule deer, American pronghorn, badger, ground squirrel, coyote, lagomorphs (cottontail and jackrabbit), and a variety of small rodents. These species are relatively common in grassland and sagebrush steppe habitats in northeastern Montana. Badgers occur at low densities in grasslands in the northern and central portions of the study area. The Franklin's ground squirrel (*Spermophilus richardsonii*) occurs in relatively low densities, with no large colonies within the study area. The black-tailed prairie dog (*Cynomys ludovicianus*) does not occur in the study area. The nearest occupied black-tailed prairie dog town is located in the BCWSA approximately 5 miles west of the study area. Riparian habitats support additional mammal species, including raccoons, red fox, and a variety of small rodents. Beaver (*Castor canadensis)*, muskrat (*Ondatra zibethicus)*, and mink (*Mustela vison)* occur along the Milk River. White-tailed deer (*Odocoileus virginianus*) are generally restricted to riparian habitats within the Milk River valley.

Table 3.7-6. Mammal Species Observed in the Study Area

Common Name	Scientific Name
American pronghorn	*Antelocapra americana*
Badger	*Taxidea taxus*
Coyote	*Canis latrans*
Franklin's groundsquirrel	*Spermophilus richardsonii*
Mountain cottontail	*Sylvilagus nutalli*
Mule deer	*Odocoileus hemionus*
Muskrat	*Ondatra zibethicus*
Raccoon	*Procyon lotor*
Red fox	*Vulpes vulpes*
White-tailed jackrabbit	*Lepus townsendii*
White-tailed deer	*Odocoileus virginianus*

American pronghorn occur in relatively low densities throughout the study area, including grasslands in the northern and central portions of the study area and sagebrush steppe and agricultural croplands in the southern portion. Pronghorn were observed in these areas during field investigations. The local pronghorn population tends to fluctuate with environmental conditions, and is currently relatively small as a result of the recent drought and severe winter conditions (Pat Gunderson, MFWP, personal communication). The break habitats along the northern edge of the Milk River valley between Hinsdale and Glasgow are provide winter range for pronghorn that migrate through the Rock Creek drainage (Pat Gunderson, MFWP, personal communication). MFWP estimates that approximately 500 individual pronghorn have wintered in this area in recent years (Pat Gunderson, MFWP, personal communication).

Mule deer occur in low to moderate densities in upland breaks and draws throughout the study area. A recent MFWP study of the mule deer populations in the BCWSA and

adjacent portions of the study area identified mule deer winter range in the central portion of the study area (Map 8). While the winter distribution of this population is determined by local climatic conditions (i.e., snow accumulation), mule deer winter in the Canyon Creek and Buggy Creek drainages and in severe winters move southward along these drainages as winter conditions worsen (Pat Gunderson, MFWP, personal communication). The portion of the BCWSA adjacent to the proposed wind farm has also been identified as important year-round habitat for a large mule deer population (Pat Gunderson, MFWP, personal communication).

Little information exists on the presence and abundance of bat species in the study area. Based upon range and distribution information, a total of 8 bat species potentially occur in the study area (Table 3.7-7). The study area is located at or just outside the distributional limits of 3 species: Townsend's big-eared bat, western small-footed myotis, and long-legged myotis (Bat Conservation International 2004). Four species are common and 4 are considered to be relatively rare. Two species, the Townsend's big-eared bat and the long-eared myotis, are classified as sensitive by the BLM (see Special Status Species). All 8 species are insectivorous, and may utilize local grasslands and riparian areas as foraging habitat.

Table 3.7-7. Bat Species that May Occur in the Study Area[1]

Common Name	Scientific Name	Roosting Habitat[2]	Status[3]	Migration[4]
Townsend's big-eared bat	*Corynorhinus townsendii*	Caves, abandoned mines	U	Year-round resident
Big brown bat	*Eptesicus fuscus*	Tree cavities, buildings	C	Not known
Silver-haired bat	*Lasionycteris noctivagans*	Tree cavities in mature coniferous/mixed forest	C	Not known
Hoary bat	*Lasiurus cinereus*	Trees	C	Migratory
Western small-footed myotis	*Myotis ciliolabrum*	Caves, abandoned mines, Rock crevices	U	Not known
Long-eared myotis	*Myotis evotis*	Tree cavities and exfoliating bark in mature conifers	U	Not known
Little brown myotis	*Myotis lucifugus*	Buildings, trees, rock crevices	C	Not known
Long-legged myotis	*Myotis volans*	Trees, buildings, rock crevices	U	Likely migratory

Source:
[1] Based upon MNHP distribution data
[2] Primary hibernacula and roost habitats used by the species (Bat Conservation International 2004)
[3] General abundance/distribution in North America: C=common, U=uncommon (Bat Conservation International 2004)
[4] Current knowledge of migration status (MNHP 2004*e*)

Bat species that may occur in the study area generally fall into three categories with regards to roosting habitat (Table 3.7-7). Two species (Townsend's big-eared bat and western small-footed myotis) roost in caves, abandoned mines, and rock crevices. Three species (silver-haired bat, hoary bat, and long-eared myotis) roost in tree cavities and under exfoliating bark, particularly in mature coniferous or mixed coniferous-deciduous woodlands. The remaining 3 species (big brown bat, little brown myotis, and long-legged myotis) are generalists and utilize a variety of roosting habitats, including trees, rock crevices, buildings, and bridges.

As a result of local geologic and physiographic conditions, there are no caves, abandoned mines, or rock faces/crevices in the study area. Accordingly, Townsend's big-eared bat and western small-footed myotis are unlikely to roost in the study area. Since the study area is at the extreme distributional limits for these species and suitable roosting habitat does not exist in the area, the potential for occurrence of these species is relatively low. The cottonwood gallery forests along Buggy Creek and the Milk River represents potential roosting habitat for those species that roost in tree cavities and exfoliating bark. These species may occur in low densities given the limited availability of forested habitats within the study area. The habitat generalists are likely to be the most abundant bat species in the study area given their capacity to utilize both natural and man-made structures for day and night roosts. No roosts or hibernacula are known to occur in the vicinity of the study area.

Little information exists regarding the seasonal migration patterns of these bat species in Montana (Table 3.7-7). The Townsend's big-eared bat is considered a year-round resident, although only one hibernaculum has been located in northeastern Montana. The hoary bat is a migratory summer resident in Montana, but the timing and characteristics of the species' migration remain unknown. The long-legged bat is likely migratory, although one hibernacula has been located in Montana. Given the absence of features that bats utilize as hibernacula (caves, abandoned mines, and rock crevices), it is unlikely that any bats winter in the study area. Generalist species could utilize human structures (i.e., houses, barns, etc.) in the vicinity of Glasgow as hibernacula. There are no known migratory routes or movement corridors between day roosts and foraging habitats in the study area. Based upon the local physiography and the absence of any large hibernacula or roosting complexes, it is unlikely that bats utilize the study area as a major migratory corridor.

Birds

The vegetative communities within study area provide habitat for a number of migratory and resident bird species. These species can be generally be classified as upland game birds, grassland birds, waterfowl and shore birds, and raptors. The Milk River cottonwood gallery forest represents the only large tract of relatively contiguous forest in the study area and provides potential habitat for bird species that utilize forested and riparian habitats. The extensive prairie grasslands provide potential habitat for a number of obligate grassland species. A list of bird species identified during point counts conducted by BLM is presented in Table 3.7-8 (John Carlson, BLM, personal communication).

Table 3.7-8. Bird Species Known to Occur in the Vicinity of the Study Area

Common Name	Scientific Name
American avocet	*Recurvirostra americana*
American crow	*Corvus brachyrhynchos*
American goldfinch	*Carduelis tristis*
American kestrel	*Falco sparverius*
American robin	*Turdus migratorius*
American wigeon	*Anas americana*
Baird's sandpiper	*Calidris bairdii*
Baird's sparrow	*Ammodramus bairdii*
Barn swallow	*Hirundo rustica*
Black-billed magpie	*Pica pica*
Blue-winged teal	*Anas discors*
Bobolink	*Dolichonyx oryzivorus*
Brewer's blackbird	*Euphagus cyanocephalus*
Brewer's sparrow	*Spizella breweri*
Brown-headed cowbird	*Molothrus ater*
California gull	*Larus californicus*
Canada goose	*Branta canadensis*
Chestnut-collared longspur	*Calcarius ornatus*
Clay-colored sparrow	*Spizella pallida*
Cliff swallow	*Petrochelidon pyrrhonota*
Common nighthawk	*Chordeiles minor*
Common snipe	*Gallinago gallinago*
Common tern	*Sterna hirundo*
Double-crested cormorant	*Phalacrocorax auritus*
Eastern kingbird	*Tyrannus tyrannus*
European starling	*Sturnus vulgaris*
Ferruginous hawk	*Buteo regalis*
Franklin's gull	*Larus pipixcan*
Gadwall	*Anas strepera*
Grasshopper sparrow	*Ammodramus savannarum*
Great Blue Heron	*Ardea herodias*
Green-winged teal	*Anas crecca*
Horned lark	*Eremophila alpestris*
Killdeer	*Charadrius vociferus*
Lapland longspur	*Calcarius lapponicus*
Lark bunting	*Calamospiza melanocorys*
Lark sparrow	*Chondestes grammacus*
Lesser scaup	*Aythya affinis*
Loggerhead shrike	*Lanius ludovicianus*
Long-billed curlew	*Numenius longirostris*
Mallard	*Anas platyrhnchos*
Marbled godwit	*Limosa fedoa*
McCown's longspur	*Calcarius mccownii*
Merlin	*Falco columbarius*
Northern harrier	*Circus cyaneus*

Table 3.7-8. Bird Species Known to Occur in the Vicinity of the Study Area (Cont.)	
Common Name	**Scientific Name**
Northern pintail	*Anas acuta*
Northern shoveler	*Anas clypeata*
Prairie falcon	*Falco mexicanus*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Ring-billed gull	*Larus delawarensis*
Ring-necked pheasant	*Phasianus colchicus*
Greater sage-grouse	*Centrocercus urophasianus*
Savannah sparrow	*Passerculus sandwichensis*
Sharp-tailed grouse	*Tympanuchus phasianellus*
Song sparrow	*Melospiza melodia*
Sprague's pipit	*Anthus spragueii*
Swainson's hawk	*Buteo swainsoni*
Tree swallow	*Tachycineta bicolor*
Upland sandpiper	*Bartramia longicauda*
Vesper sparrow	*Pooecetes gramineus*
Warbling vireo	*Vireo gilvus*
Western kingbird	*Tyrannus verticalis*
Western meadowlark	*Sturnella neglecta*
Willet	*Catoptrophorus semipalmatus*
Wilson's phalarope	*Phalaropus tricolor*
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*

Source: John Carlson, Wildlife Biologist, BLM-Glasgow Field Office, personal communication.

Upland game birds

Upland game bird species (Galliformes) known to occur in the study area include the ring-necked pheasant, the greater sage-grouse, and the sharp-tailed grouse. Ring-necked pheasant habitat consists of a mosaic of open grasslands, cropland, and brushy cover. Extensive tracts of prairie grassland do not provide good pheasant habitat (Mussehl and Howell 1971). The species primarily occurs in the Milk River valley, which contains the appropriate mosaic of habitat. Pheasants were observed in the vicinity of the Milk River during field investigations

Despite the fact that both grouse species are classified as sensitive by the BLM, they are currently considered game species by MFWP and are subject to a legal harvest season. The Special Status Species section provides detailed information on the ecology and habitat requirements of the greater sage-grouse and the sharp-tailed grouse. Generally, the greater sage-grouse is a sagebrush obligate that relies on big sagebrush habitats in all seasons. The Milk River valley represents the northernmost extent of big sagebrush in eastern Montana, and the distribution of sage-grouse in the study area reflects this. The portion of the study area north of the Milk River does not contain any large stands of big sagebrush, and sage-grouse habitat is limited to relatively small, isolated stringers of silver sagebrush. The species occurs in relatively low densities in this area as a result of limited available habitat, and three greater sage-grouse leks have been identified by MFWP north of the Milk River (Map 8). The sagebrush steppe habitat south of the Milk

River represents the highest quality potential habitat for sage-grouse in the study area. Several greater sage-grouse leks have been identified by MFWP in this relatively intact sagebrush steppe habitat (Map 8).

Sharp-tailed grouse inhabit grasslands interspersed with woody draws and shrub coulees. The northern and central portions of the study area contain relatively high quality year-round habitat for sharp-tailed grouse, which occur in relatively high densities in these areas. The southern portion of the study area contains lower quality sharp-tailed grouse habitat as a result of habitat loss and fragmentation associated with agricultural activities. The species occurs in relatively low densities in this area. Numerous sharp-tailed grouse leks have been identified in the study area by MFWP (Map 8).

Grassland birds

The extensive native mixed-grass prairie in the northern and central portions of the study area represents relatively high quality habitat for a number obligate grassland bird species (Table 3.7-8). These intact mid- and short-grass prairie communities have been subjected to light-moderate grazing intensities and represent relatively high quality wildlife habitat. Several of the obligate grassland species listed in Table 3.7-8 are classified as sensitive by the BLM (see Special Status Species). The quality and relative intactness of the grassland prairie habitats is generally highest in the northern portion of the study area and declines as one moves south towards the Milk River due to increasing agricultural and residential land uses. The habitats in the vicinity of the Milk River have been greatly disturbed and fragmented, and do not represent high quality habitat for obligate grassland species. The sagebrush steppe vegetation in the southwestern portion of the study area provides habitat for a number of bird species that rely on sagebrush-grassland communities.

Waterfowl and shore birds

A number of waterfowl species are known to occur in the study area (Table 3.7-8). Canada geese and a variety of ducks were observed during field investigations, and breeding bird surveys have documented 9 waterfowl species in the study area (John Carlson, BLM, personal communication). Waterfowl habitat within the study area includes wetlands, reservoirs, stock ponds, and the Milk River. Wetlands, reservoirs, and stock ponds in the study area tend to be small and isolated. Since most stock ponds and reservoirs lack emergent and/or wetland vegetation, nesting habitat is limited. Surface waters that possess potential nesting habitat include the Glasgow Base Pond, Wards Reservoir, and a few of the larger, undisturbed stock ponds. The Milk River also provides waterfowl habitat, although hydrological changes and channel incision have reduced the availability of quality nesting habitat along the river. Riparian communities along the ephemeral streams that bisect the study area do not provide quality waterfowl habitat. The wetlands, reservoirs, stock ponds, and the Milk River do provide stopover habitat for migrating waterfowl.

Nine species of shore birds are known to occur and nest in the study area (Table 3.7-8). Four of these, the long-billed curlew, marbled godwit, willet, and Wilson's phalarope, are classified as sensitive by the BLM (see Special Status Species). These species nest in

native grassland prairie habitats in proximity to mesic grasslands or shallow wetlands. Habitat for these species occurs primarily in the northern and central portions of the study area where native prairie grasslands are interspersed with small ponds, wetlands, and riparian areas. Habitat for other shore bird species includes the wetlands, reservoirs, and stock ponds that are dispersed throughout the study area. The small size and lack of emergent wetland vegetation in most of the water bodies reduces their quality as shore bird habitat. The Milk River and adjacent areas also represent potential shore bird habitat in the study area.

Raptors

A number of raptor species are known to occur to in the study area, and have been observed during breeding bird surveys and field investigations conducted for this project (Table 3.7-8). The native prairie grasslands and adjacent BCWSA badlands represent potential foraging habitat for a number of raptors, including the northern harrier, American kestrel, Swainson's hawk, ferruginous hawk, and golden eagle. While these species are present in the study area during breeding season, potential nesting sites are limited to small shrubs in draws and coulees and riparian cottonwood trees. The bluffs in the BCWSA adjacent to the wind farm area may also provide nesting habitat for several species, although there are no known active nests in this area. One inactive raptor nest was located in an isolated juniper tree along the BCWSA boundary during field investigations (Western EcoSystems Technology, Inc. 2004). Although intensive raptor nest surveys have not been conducted, the study area is not likely to support high densities of breeding raptors due to the relatively low availability of suitable above-ground nesting habitats (Western EcoSystems Technology, Inc. 2004). Raptors that may occur in the study area during the non-breeding season include the rough-legged hawk, red-tailed hawk, Cooper's hawk, sharp-shinned hawk, bald eagle, and prairie falcon. The cottonwood gallery forest along the Milk River is used by bald eagles during the winter, however they are not known to nest in the study area (MNHP 2004*f*).

Given the absence of defined ridges and rim edges in the study area, raptor distribution and habitat use is not significantly influenced by topographic conditions (Western EcoSystems Technology, Inc. 2004). The landscape in northern and central portions of the study area is dominated by plateaus and gently rolling hills bisected by relatively small drainages. There are no prominent ridges or canyon rims that would create updrafts and result in concentrated raptor use, although the gentle ridges may influence local raptor travel. Relatively steep terrain along portions of the BCWSA boundary north and west of the wind farm area could potentially to create updrafts used by soaring raptors. Golden eagles were observed foraging in this area during field investigations. Researchers in Wyoming concluded that raptor activities were concentrated within 50 meters of rim edges where updrafts occurred (Johnson et al. 2000).

Potential raptor prey sources include colonial rodents, lagomorphs, waterfowl, and carrion. Although prey populations in the study area have not been assessed, prey densities are generally low. There are no prairie dog or ground squirrel colonies within the area, although individual ground squirrels are found throughout the northern and central portions. Rabbits and hares occur throughout the study area and, while these

populations are subject to significant annual fluctuations, field investigations indicated that current lagomorph densities are relatively low. There are no waterfowl concentration areas, and ducks and geese generally occur at low densities during seasonal migrations. Carrion is available on ungulate winter ranges where bald eagles and other scavengers are attracted to the area by over winter mortalities (Pat Gunderson, MFWP, personal communication). Dead livestock may also provide carrion for scavenging raptors.

Migrations

The study area contains rolling hills, gentle ridges, and plateaus bisected by small drainages. There are no obvious "funnels," such as prominent ridgelines or mountain gaps that could potentially serve as a large scale or regional migratory pathway. The relatively small ridges within VCWEP area may serve as local pathways for birds passing through the study area as part of large, broad front migration (Western EcoSystems Technology, Inc. 2004). A limited amount of stopover habitat for migrating waterfowl is available within the study area, but the area is not likely to attract waterfowl given the proximity of major water bodies such as the Missouri River and Fort Peck reservoir. Riparian habitats provide stopover habitat for neotropical migrants. While raptor migration surveys have not been completed in the study area, local physiographic conditions are do not likely to direct migrating raptors into the study area.

Special Status Species

Vegetation

A list of special status plant species that are known to occur, or have the potential to occur in the study area are listed in Table 3.7-9. In the study area, chaffweed (*Centunculus minimus*) has recently been found approximately 28 miles north of Glasgow, in the Dry Fork Creek landscape (Map 7; Cooper et al. 2001; MNHP 2004*g*). Another Species of Concern, bractless mentzelia (*Mentzelia nuda*), has been detected approximately 10 miles west of Wolf Point in the eastern part of Valley County (MNHP 2004*g*). Hot spring phacelia (*Phacelia thermalis*) was found near Larb Creek on the western border of Valley and Phillips Counties, and five-leaf cinquefoil (*Potentilla quinquefolia*) was observed 6 miles west of Opheim in 1983 (MNHP 2004*g*). Poison suckleya (*Suckleya suckleyana*) was observed in the Milk River Valley near the Glasgow area in 1900 (Cooper et al. 2001; MNHP 2004*g*). Currently, Valley County does not contain any rare bryophytes and a county distribution for rare lichen species is not yet available (MNHP 2003).

Table 3.7-9. Botanical Species of Concern that May Occur Within the Study Area

Common Name	Species	MNHP	BLM	Habitat
Chaffweed	*Centunculus minimum*	S2	W	Vernally wet, sparsely vegetated soil around ponds and along rivers and streams in the valleys and on the plains. Associated with western wheatgrass and least spikerush.
Bractless Mentzelia	*Mentzelia nuda*	S1	W	Sandy or gravelly soil of open hills and roadsides on the plains.
Hot Spring Phacelia	*Phacelia thermalis*	S1	W	Sparsely vegetated soils in grasslands and open woodlands
Five-leaf Cinquefoil	*Potentilla quinquefolia*	S2	S	Dry, gravelly soil of exposed ridges and slopes in the montane to alpine zones.
Poison Suckleya	*Suckleya suckleyana*	S1	-	Drying mud along shallow ponds and streams, and in disturbed, often alkaline soil on the plains.

Ranking Codes:
MNHP
S1: At high risk because of extremely limited and potentially declining population numbers and/or habitat, making it highly vulnerable to extirpation in Montana.
S2: At risk because of very limited and potentially declining population numbers and/or habitat, making it vulnerable to extirpation in Montana.
BLM
Sensitive (S) species are proven imperiled in at least part of their ranges and are documented to occur on BLM lands.
Watch (W) species are either known to be imperiled and suspected to occur on BLM lands, suspected to be imperiled and documented on BLM lands, or needing further study for other reasons.
Sources: Cooper et al. 2001; MNHP 2004g

Fish and Wildlife

A list of special status species that could potentially occur in the study area is presented in Table 3.7-10. Federally listed species were identified through correspondence with the U.S. Fish and Wildlife Service, BLM sensitive species were identified through correspondence with the BLM-Glasgow Field Office, and State Species of Concern were identified through correspondence with MFWP-Glasgow Field Office and the MNHP. The USFWS identified 6 species that are currently listed as either threatened or endangered. One species, the greater sage-grouse, is currently undergoing a status review to determine whether it warrants federal listing. The BLM-Glasgow Field Office identified a total of 31 species that the agency classifies as “sensitive” and that may occur in the study area. The State species of concern list is extremely similar to the BLM list (Table 3.7-10).

Table 3.7-10. Special Status Wildlife Species that May Occur in the Study Area

		Status[1]		
Common Name	**Scientific Name**	**USFWS**	**BLM**	**MNHP**
Amphibians and Reptiles				
Great Plains toad	*Bufo cognatus*	--	X	X
Greater short-horned lizard	*Phrynosoma hernandesi*	--	X	X
Northern leopard frog	*Rana pipiens*	--	X	X
Plains spadefoot	*Spea bombifrons*	--	X	X
Western hognosed snake	*Heterodon nasicus*	--	X	X
Fish				
Pallid sturgeon	*Scaphirhynchus albus*	E		X
Blue sucker	*Cycleptus elongatus*	--	X	X
Northern redbelly dace x Finescale dace	*Phoxinus eos x Phoxinus neogaeus*	--	X	X
Sauger	*Stizostedion canadense*	--	X	X
Mammals				
Black-footed ferret	*Mustela nigripes*	E/XN	--	--
Long-eared myotis	*Myotis evotis*	--	X	--
Townsend's big-eared bat	*Corynorhinus townsendii*	--	X	X
Swift fox	*Vulpes velox*	--	X	X
Birds				
Interior least tern	*Sterna antillarum athalassos*	E	--	X
Whooping crane	*Grus americana*	E	--	X
Bald eagle	*Haliaeetus leucocephalus*	T	--	X
Piping plover	***Charadrius melodus***	T	--	--
Mountain plover	*Charadrius montanus*	--	X	X
Greater sage-grouse	*Centrocercus urophasianus*	--	X	X
Black tern	*Chilodonias niger*	--	X	X
Burrowing owl	*Athene/Speotyto cunicularia*	--	X	X
Ferruginous hawk	*Buteo regalis*	--	X	X
Golden eagle	*Aquila chrysaetos*	--	X	--
Loggerhead shrike	*Lanius ludovicianus*	--	X	X
Long-billed curlew	*Numenius americanus*	--	X	X
Chestnut-collared longspur	*Calcarius ornatus*	--	X	X
McCown's longspur	*Calcarius mccownii*	--	X	X
Marbled godwit	*Limosa fedoa*	--	X	--
Baird's sparrow	*Ammodramus bairdii*	--	X	X
Brewer's sparrow	*Spizella breweri*	--	X	X
Sprague's pipit	*Anthus spragueii*	--	X	X
Swainson's hawk	*Buteo swainsonii*	--	X	X
Willet	*Cataptrophorus semipalmatus*	--	X	--
Wilson's phalarope	*Phalaropus tricolor*	--	X	
Red-headed woodpecker	*Melanerpes erythrocephalus*	--	X	X
Sharp-tailed grouse	*Tympanuchus phasianellus*	--	--	X

[1] USFWS: E=Endangered, T=Threatened; C=Candidate; E/XN=Endangered/Non-essential Experimental
BLM: Montana/Dakotas Sensitive Species list
MNHP: Species of Concern list

Federal Listed Species

Pallid Sturgeon (Endangered)

The pallid sturgeon is one of the rarest fishes in North America (Kallemeyn 1983). The species was listed as endangered in 1990 and a species recovery plan was completed in 1993 (Dryer and Sandvol 1993). The species is native to the major rivers in eastern Montana, and currently inhabits the Missouri River from the Montana/North Dakota state line to Fort Peck Dam and upstream of Fort Peck Reservoir to Stafford Ferry (Montana Chapter of the American Fisheries Society 2004). Pallid sturgeon habitat includes large, turbid, relatively warm, free-flowing rivers. Dams are the primary cause of the species decline, and they have reduced habitat diversity and river productivity, blocked spawning migrations, and destroyed spawning habitats, isolated populations, and altered flow, turbidity, and temperature regimes (Dryer and Sandvol 1993). Pallid sturgeon populations in Montana are considered to be senescent with no evidence of recruitment in recent years. Current recovery efforts include stocking to preserve the genetic pool and augment populations (Montana Chapter of the American Fisheries Society 2004).

Anecdotal evidence suggests that the pallid sturgeon historically utilized the lower portions of the Milk River for spawning, with historic reports of sturgeon as far upstream as Glasgow (Matt Baxter, MFWP, personal communication). However, hydrographic changes have adversely affected spawning habitat in the Milk River and current research indicates that pallid sturgeon use of the Milk River is restricted to the immediate vicinity of the confluence with the Missouri River (Matt Baxter, MFWP, personal communication). The pallid sturgeon does not occur in the portion of the river that traverses the study area.

Black-footed Ferret (Endangered/Non-essential Experimental)

The U.S. Fish and Wildlife Service listed the black-footed ferret as an endangered species in 1967. The ferret is a grassland prairie species, and was once found throughout the Great Plains from Texas to Saskatchewan, Canada. The species historical range extended from the Rocky Mountains east through the Dakotas and south through Arizona. Black-footed ferrets are obligate associates of prairie dogs (*Cynomys* spp.), upon which they depend for food and shelter. Large, productive prairie dog towns (>5,000 acres) are required to support viable black-footed ferret populations. The ferret's decline coincided with the reduction of prairie dog numbers and distribution throughout the short and mid-grass prairies of North America. The species as believed to be extinct in the wild until a dog in Meeteetse, Wyoming killed one in 1981. In October 1985, six black-footed ferrets were captured in order to start a captive breeding population. The last known 18 wild black-footed ferrets were captured and placed in captive breeding facilities in 1987.

The reintroduction of black-footed ferrets into the wild began in 1991 with releases in the Shirley Basin, Wyoming. Subsequent ferret releases of were completed in 1994 at the Charles M. Russell National Wildlife Refuge in Montana and the Conata Basin/Badlands area in South Dakota. Reintroduced black-footed ferrets have been designated "non-

essential experimental" populations under the Endangered Species Act. The Charles M. Russell National Wildlife Refuge supports the only known black-footed ferret population in Montana. The Refuge is located approximately 75 miles southwest of the study area. The Charles M. Russell National Wildlife Refuge population rose steadily until the late 1990's when it experienced a crash and declined from approximately 80 individuals to 7 individuals (Mike Hedrick, Charles M. Russell National Wildlife Refuge manager, personal communication). This population is slowly recovering, and approximately 24 individuals were counted during the fall 2004 census. While there has been some dispersal to prairie dog towns adjacent to the Refuge, these individuals have not established any viable populations (Mike Hedrick, Charles M. Russell National Wildlife Refuge manager, personal communication). Efforts by the BLM to reintroduce the species in Phillips County have not been successful. The black-footed ferret does not occur in the study area. Since this area does not support any prairie dog towns, it does not represent potential suitable habitat for the black-footed ferret.

Interior Least Tern (Endangered)

The interior population of least tern was listed as endangered in 1985, and a recovery plan was completed in 1990 (U.S. Fish and Wildlife Service 1990). The species nests on unvegetated, gravel and sand-pebble substrates along the Yellowstone and Missouri rivers (MFWP 2004*f*). The species breeds along the lower portions of the Missouri River below Fort Peck Dam, on the beaches of Fort Peck Reservoir, and along the Yellowstone River below Glendive. The primary food source for interior least terns are small cyprinids, but occassionally consume crustaceans and insects. This migratory species generally arrives in Montana in mid-May and departs by mid-August. Population declines have resulted from reduced nesting habitat and prey availability associated with the construction of dams and alteration of river hydrography (Figg 1993).

There have been very few observations of this species outside the primary habitat along the Missouri River. There are no historical reports or records of the species occurring in the study area, with the nearest observation approximately 20 miles to the southeast. Suitable nesting and foraging habitats are not present in the study area, and the interior least tern is not likely to occur in the area.

Whooping Crane (Endangered)

The whooping crane was listed as endangered in 1970 and a recovery plan was completed in 1994 (USFWS 1994). The primary cause for the species decline is habitat destruction. Whooping cranes stopover in northeastern Montana during their 2,600-mile migration between summer breeding grounds in Wood Buffalo National Park (Northwest Territories) and wintering grounds in Aransas National Wildlife Refuge (Texas). Medicine Lake National Wildlife Refuge is located along the migration route and has been occasionally utilized as a stopover area. The most recent observation at Medicine Lake occurred in October 2003. Whooping cranes were also observed at Red Rock Lakes National Wildlife Refuge as a result of reintroductions at Grays Lake National Wildlife Refuge in Idaho. The Grays Lake flock is no longer extant, and the last observation at Red Rock Lakes occurred in 2002. During migration, whooping cranes typically forage in stubble fields and wet meadows in proximity to safe roosting sites.

The species does not breed or nest in Montana (Johnsgard 1986). During migration, whooping cranes generally fly at high altitudes between 1,000 and 5,000 feet above ground level (Western EcoSystems Technology, Inc. 2004).

Observations of whooping cranes in Montana have been limited outside the 2 refuges. Sightings in the vicinity of the study area have included one individual near Whitewater in March 1990, 2 individuals near Fort Peck in 1994, and one individual southwest of Glasgow in April 2003. There have been no recorded sightings within or in proximity of the study area, and no whooping cranes were observed during field investigations. Potential foraging and roosting habitats are limited in the study area. While the study area lacks suitable habitat and is at the edge of the primary migratory corridor, previous sightings in the general region suggest that whooping cranes could occasionally fly over the study area during seasonal migrations. The probability of occurrence in the study area is low.

Bald Eagle (Threatened)

The bald eagle was listed as threatened in 1978. The bald eagle is a resident species throughout Montana, with residents remaining in the vicinity of breeding areas throughout the year. Some individuals migrate to lower elevations or areas with relatively high food concentrations during winter periods (Montana Bald Eagle Working Group 1994). Bald eagles migrate along north-south mountain chains, such as the Bridger Mountains, and are known to congregate at kokanee (Oncorhynchus nerka) spawning grounds (Montana Bald Eagle Working Group 1994). Nesting activity is concentrated in the western third of the state, although breeding pairs also occur along major rivers and lakes in the central and eastern Montana. In eastern Montana, year-round habitat includes large water bodies and ungulate winter ranges (USDI 1986). Nest sites are generally located in large trees adjacent to lakes, reservoirs, and rivers. Eagles feed primarily upon fish, although in the Intermountain west the species also forage on carrion on big game winter ranges.

Bald eagles are transient, seasonal (winter) occupants in the Glasgow area. The largest concentrations of eagles occur along the Missouri River below the Fort Peck dam, where up to 60 eagles have been observed feeding on ducks and small fish flushed through the turbines (MNHP 2004f). In the study area, bald eagles do occur in the Milk River cottonwood gallery forest and on mule deer winter range during winter months (John Carlson, BLM, personal communication; Pat Gunderson, MFWP, personal communication). Bald eagles are not known to nest in the study area. Several eagles were observed migrating through the area during field investigations (Western EcoSystems Technology, Inc. 2004).

Piping Plover (Threatened)

The piping plover was listed pursuant to the ESA in 1985. At this time, the Great Lakes population (Illinois, Indiana, Michigan, northeastern Minnesota, New York, Ohio, Pennsylvania, Wisconsin, and Ontario) was listed as endangered, while populations along the Atlantic coast (Quebec, Newfoundland, Maritime Provinces, and States from Maine to Florida) and northern Great Plains (Iowa, northwestern Minnesota, Montana,

Nebraska, North Dakota, South Dakota, Alberta, Manitoba, and Saskatchewan) were listed as threatened. The piping plover generally prefers bare sand, gravel, or cobble beaches for breeding and nesting habitat. Breeding and nesting sites are located on river sandbars and islands, inland lakes, and reservoir and alkali lake shorelines. In the northern Great Plains, piping plovers nest on riverine sandbars and on wide, flat, open, sandy, and sparsely-vegetated beaches along inland lakes and reservoirs. They also nest on gravel pits along rivers and on the salt-encrusted bare areas of interior alkali wetlands and lakes. In 2002, the USFWS designated critical habitat for the northern Great Plains population of piping plover. This designation included 183,422 acres of habitat and 1,207.5 river miles in Minnesota, Montana, North Dakota, South Dakota, and Nebraska. Designated critical habitat included prairie alkali wetlands and surrounding shoreline, river channels and associated sandbars and islands, and sparsely vegetated shorelines and inlands on reservoirs and lakes.

In Montana, piping plovers inhabit open shorelines of freshwater or alkaline lakes, reservoirs, rivers, or wetlands. The species is known to breed in Medicine Lake National Wildlife Refuge, Sheridan County, the Missouri River below Fort Peck Dam, Fort Peck Reservoir, Nelson Reservoir, Bowdoin National Wildlife Refuge, and Alkali Lake. Approximately 77,370 acres of Fort Peck Reservoir, located entirely within the Charles M. Russell National Wildlife Refuge, has been designated as critical habitat. The plover usually arrives in Montana in early May and leaves by late August. The species diet includes worms, fly larvae, beetles, crustaceans, mollusks, and other invertebrates. The piping plover is not known to occur in the study area. Given the absence of foraging and nesting habitat, there is no potential suitable habitat for the piping plover in the study area.

BLM Sensitive Species

Great Plains Toad

The Great Plains toad inhabits prairie grasslands. This species is primarily nocturnal, spending the day burrowed in the soil, under rocks, or in thick grass. They dig deep under ground burrows in the fall in which they over winter. The Great Plains toad breeds after heavy rains between May and July in vernal pools, flooded ditches, small reservoirs, and stock ponds. No Great Plains toads were observed during limited field investigations, although potential habitat exists in the northern and central portions of the study area.

Plains Spadefoot

The plains spadefoot inhabits short-grass prairies with loose, soft sandy or gravelly soils in the vicinity of permanent or temporary water bodies. This species is inactive for much of each year, remaining in underground burrows. Adults emerge from their burrows following heavy rains and migrate to ephemeral pools, water tanks, stock ponds, and seeps to breed. During breeding, they may move 60 to 150 meters each night. In Montana, the plains spadefoot is most active between May and August. No plains spadefoot were observed during limited field investigations, although potential habitat exists in the northern and central portions of the study area.

Northern Leopard Frog

The northern leopard frog utilizes a variety of habitats, including ponds, reservoirs, lakes, creeks, intermittent stream pools, springs, and wetlands. The species requires a mosaic of habitats to meet various life stage requirements. In summer, adults and juveniles commonly feed in open wet meadows and along the margins of water bodies. Breeding peaks when water temperatures reach about 10ºC, and eggs are laid in water bodies in early April. In Montana, northern leopard frogs are active day and night between March and October. Northern leopard frogs were observed during field investigations, and potential habitat exists throughout the study area.

Greater Short-Horned Lizard

The greater short-horned lizard inhabits semi-arid, short-grass prairie, sagebrush, and open rocky or sandy plains. The species requires fine, loose soils, and is often found under or around sagebrush plants. Greater short-horned lizards are diurnal and active during the warmer daylight hours. They emerge from hibernation in late March, and are active in the northern parts of the range from mid-April to mid-September. No greater short-horned lizards were observed during limited field investigations, although potential habitat exists in the northern and central portions of the study area.

Western Hognose Snake

The western hognose snake occurs in arid sagebrush-grassland habitats, particularly those with gravelly or sandy soils. The species is considered a specialist predator on toads, but will also eat small mammals, birds, eggs, frogs, salamanders, and other snakes. Western hognose snakes are diurnal, and their active period extends from mid-May through the end of September. No western hognose snakes were observed during limited field investigations, although potential habitat exists throughout the study area.

Blue Sucker

The blue sucker inhabits the Missouri as far upriver as Great Falls. The blue sucker is adapted for the swift currents of large rivers, where they feed on insects. In the spring, blue suckers migrate upriver and congregate in the major tributaries, including the Milk River, for spawning. Blue sucker larvae and young-of-the-year have been collected from the lower Milk River. Due to the species preference for swift water habitats, the Milk River does not provide year-round habitat for blue suckers but the species may occur in the segment of the Milk River that traverses the study area.

Northern Redbelly Dace x Finescale Dace

This is a hybrid of the northern redbelly dace and the finescale dace. Northern redbelly dace prefer quiet waters in beaver ponds, bogs, and clear streams, while the finescale dace also occurs in larger lakes. The hybrid appears to have greater physiological tolerance and can survive in lower-oxygen environments compared to the 2 dace species. Studies in Montana have indicated that the hybrid is relatively rare and the MNHP has one recorded observation of the northern redbelly x finescale dace in the study area (MNHP 2004*h*). This observation occurred in the Cherry Creek drainage a few miles

north of the City of Glasgow. The hybrid is not known to occur in any other water bodies in the study area.

Sauger

The current distribution of the sauger in Montana includes the main stem of the Missouri River and portions of several tributaries including the Marias, Musselshell, and Milk Rivers. The sauger is physiologically adapted for turbid environments and the species typically inhabits large turbid rivers and shallow lakes. Sauger spawn in large tributaries, and juveniles rear in off-channel habitats during spring and summer before shifting to main channel habitats in autumn. Sauger do occur in the Milk River in the vicinity of study area, and are a highly sought game species in the area (Bill Wiedenheft, MFWP, personal communication).

Long-Eared Myotis

The long-eared myotis is primarily associated with coniferous forests across western North America. In the Great Plains region, the species occurs primarily in wooded riparian habitats. Maternity roosting habitats include buildings, rock crevices, and hollow trees, and hibernacula include caves and abandoned mines. The species forages over wooded riparian areas, waterways, and coniferous forests. Although one long-eared myotis hibernaculum (2 individuals) was discovered in Richland County, the species is considered to be migratory in Montana. The study area is located at the limits of the species distribution (MNHP 2004*e*), however no information is available regarding the status of the long-eared myotis in the study area. There are no large caves or abandoned mines in the area that could provide bat hibernacula. However, the species may forage and roost along the Milk River riparian corridor.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is a cave dwelling species that occurs in a variety of habitats, particularly shrub-steppe or forest edges. Primary habitats include coniferous forest (Douglas-fir, lodgepole pine, and ponderosa pine), juniper-sagebrush scrub, and cottonwood gallery forests. In the spring and summer, females form maternity colonies in mines, caves, or buildings, while males roost individually. The species is also known to roost in buildings, bridges, rock crevices, and hollow trees. In winter, these bats hibernate in caves and abandoned mines. Townsend's big-eared bats generally do not hibernate in association with other bat species. The species preys primarily on small moths, but will also feed on a variety of flying insects. While the distribution of Townsend's big-eared bat in Montana is largely unknown, the study area is at the limit of or outside the species range (Bat Conservation International 2004). The nearest verified Townsend’s big-eared bat observation occurred in several caves in the Little Rocky Mountains approximately 100 miles southwest of the study area (Hendricks 1998). There are no large caves or abandoned mines in the study area that could provide bat hibernacula. Based upon the species distribution and roost/hibernacula habitat requirements, there is a low potential for the species to occur in the study area.

Swift Fox

The swift fox was removed from the federal candidate list in 2001. The species inhabits relatively flat, open short- and mid-grass prairies with minimal shrub cover. Suitable swift fox habitat in Montana is generally defined as large blocks of prairie grasslands (>10,000 acres) with flat topography and less than 50% of the area disturbed by agriculture (Giddings and Knowles 1995). After being extirpated from Montana, the swift fox recolonized eastern Montana in the mid-1990's through dispersal from southern Canada. An estimated 350-500 swift foxes currently inhabit prairie grasslands in north-central Montana.

Surveys conducted by MFWP in 2003 documented swift fox in the Thoeny Road area approximately 20 miles north of the study area. No swift fox have been documented in the study area nor were any observed during field investigations for this project. Limited surveys failed to detect any sign or evidence of swift fox in the study area. The grassland plateaus in the northern portion of the study area represent suitable swift fox habitat, although the rolling hills and drainage basins create topographic relief that limits the extent of potential habitat in the study area. The BCWSA landscape may reduce immigration from known occupied habitats to the west and north. While the northern portion of the study area does contain potential swift fox habitat, it does not appear that the species currently occupies the area.

Mountain Plover

The mountain plover was proposed for listing as a threatened species in 1999, but was withdrawn from candidate status in 2003. In Montana, the mountain plover is a seasonal resident species that historically ranged over the eastern two-thirds of the state. Primary habitat requirements include flat terrain with sparse short-grass prairie or shrub-steppe vegetation. Nests are constructed on barren ground with little or no vegetation, often in heavily grazed short-grass prairie and on prairie dog towns. Mountain plovers do not occupy sites with irregular or rolling terrain, dense vegetation, or wet soils (USFWS 2002).

The largest concentration of breeding mountain plovers in Montana occurs in Phillips, Blaine, and northern Fergus and Petroleum counties (FaunaWest 1995). The only known breeding habitat in Valley County is located in the vicinity of Little Beaver Creek, approximately 20 miles southeast of Glasgow (FaunaWest 1995). There are no recorded observations of mountain plover within or in the vicinity of the study area. No mountain plovers were observed during field investigations, although specific surveys were not conducted. The study area possesses little potential nesting habitat for mountain plovers. There are no prairie dog towns in the area and the native grasslands possess relatively dense vegetative cover. The absence of any sparsely vegetated or barren areas limits the suitability of the study area as mountain plover habitat, and the probability of occurrence is low.

Greater Sage-Grouse

The USFWS is currently conducting a status review to determine whether the greater sage-grouse warrants federal listing. The greater sage-grouse is a sagebrush obligate species, with sagebrush being a critically important source of food and cover (Connelly et

al. 2004). Sage-grouse typically inhabit large expanses of sagebrush. Winter habitat typically consists of big sagebrush communities with exposed, windswept ridges, draws, and swales that afford access to food and cover. Low sagebrush and silver sagebrush communities may also be used during winter. Summer habitats include riparian areas and mesic grasslands that contain an abundance of forbs and insects. Autumn habitats include sagebrush, upland meadows, riparian areas, alfalfa fields, and irrigated pastures.

Sage-grouse are polygynistic, with males performing elaborate displays for females on leks. In Montana, male sage-grouse begin displaying in March with peak hen attendance occurring in early April (Eng 1963; Jenni and Hartzler 1978). Leks are situated in open, barren areas (i.e., ridges, knolls, roads, and lakebeds) and are typically adjacent to relatively dense sagebrush stands that provide escape, thermal and feeding cover, and potential nesting habitat (sagebrush with a native grass-forb understory). Nests consist of a ground depression sparsely lined with vegetation and feathers and are usually located under large sagebrush plants. After hatching, females move their broods to sagebrush-grassland habitats.

The Milk River Valley in Phillips County represents the northernmost extent of big sagebrush and the occurrence of sage-grouse in the study area reflects the distribution of big sagebrush (Montana Sage-grouse Work Group 2004). Sage-grouse are known to occur throughout the study area, and were observed during field investigations. The study area north of the Milk River does not contain any large stands of big sagebrush, and sage-grouse habitat is limited to relatively small, isolated patches of silver sagebrush. Accordingly, sage-grouse occur in low densities in the northern and central portions of the study area. The sagebrush steppe habitat in the southwestern corner of the study area supports big sagebrush, and represents the highest quality sage-grouse habitat in the area. Lek surveys conducted by MFWP reflect the species association with big sagebrush. A total of 8 leks have been located in the study area, 5 of which are located in the southwestern corner (Map 8).

Black Tern

The black tern is a migratory summer resident that nests in shallow, freshwater wetlands that have 25-75% emergent vegetation cover. Black terns prefer wetland complexes greater than 20 ha, and nesting sites are usually hidden in emergent vegetation such as rushes, reeds, cattails, and sedges. Most breeding colonies in Montana occur in dense stands of bulrush or cattail with water depths between 0.5 and 1.0 meter. Black terns generally arrive in May and depart in August. Records indicate that transient black terns have been observed in the Glasgow area, but there is no evidence of breeding in this area (MNHP 2004*i*). There are no large wetland complexes with extensive emergent vegetation in the study area, and no black terns were observed during field investigations. Given the absence of suitable habitat, the black tern is not likely to nest or forage in the study area.

Burrowing Owl

The ground-dwelling burrowing owl inhabits open prairie grasslands, where they occupy abandoned burrows dug by ground squirrels (*Spermophilus* spp.), prairie dogs (*Cynomys*

spp.), and badgers. Black-tailed prairie dog and Richardson's ground squirrel (*Spermophilus richardsonii*) colonies provide the primary habitat for burrowing owls in Montana. Existing burrows are enlarged by the owls, which spend a great deal time on the ground or on low perches such as fence posts. They are active both during the day and at night. The burrowing owl is migratory in the northern portion of its range, and is generally present in Montana between April and September. The species feeds primarily on insects. Records indicate that breeding burrowing owls have been observed in the Glasgow area (MNHP 2004*j*). There are no prairie dog or ground squirrel colonies in the study area, although individual ground squirrels occur throughout the area. No burrowing owls were observed during field investigations, however the species has been observed in the study area (John Carlson, BLM, personal communication). The burrowing owl may be present in very low densities in the study area given the limited number of available animal burrows.

Ferruginous Hawk

The ferruginous hawk inhabits mixed-grass prairie, sagebrush-grassland, and sagebrush steppe habitats. The species is migratory and is generally present in Montana between April and August (MNHP 2004*k*). Ferruginous hawks build large stick nests in trees, cliff ledges, power poles, artificial platforms, and occasionally on the ground. Ground nests in northern Montana are typically located in rolling grassland habitats, but they do not nest in areas converted to agriculture. The ferruginous hawk preys primarily upon small mammals, such as rabbits, prairie dogs, and ground squirrels, but also consumes birds, reptiles, amphibians, and insects. Transient ferruginous hawks are known to occur in the study area, with the best potential habitat located in the northern and central portions. The ferruginous hawk is not known to nest in the study area.

Golden Eagle

Golden eagles occur in a variety of open and semi-open habitats in Montana, including shrublands, grasslands, sagebrush steppe, and coniferous forests. They are year-round residents in northeastern Montana. Golden eagles breed from March through August, and nests are constructed on cliffs, in large trees, and occasionally on power poles. The species forages in grassland prairies and open woodlands for jackrabbits, prairie dogs, ground squirrels, waterfowl, and grouse. Golden eagles also feed on carrion and often forage for carrion on big game winter ranges. Golden eagles are known to occur in the study area, with the best potential habitat located in the northern and central portions. The golden eagle is not known to nest in the study area.

Loggerhead Shrike

The loggerhead shrike prefers open habitats characterized by grasses and forbs interspersed with bare ground and shrubs or low trees. They occur grassland prairies with scattered trees, riparian areas or woody draws, shelterbelts, sagebrush steppe, and badland shrub communities. Scattered shrubs or trees are used for nesting sites, and fences and utility wires are used as hunting perches. The loggerhead shrike is an opportunistic predator that feeds on a variety of insects, reptiles, amphibians, mammals, and birds. No loggerhead shrikes were observed during field investigations, but the species is known to occur in the area. Potential habitat occurs throughout the study area.

Long-Billed Curlew

The long-billed curlew is a migratory summer resident that breeds and nests in Montana. The species inhabits short-grass prairie communities, with grassland structure being more important than species composition, and appears to require large blocks of grasslands with diverse foraging habitats. The long-billed curlew nests in well-drained native grasslands, sagebrush, and agricultural lands with a gently rolling topography. While wet habitats are not necessary for nesting, proximity to water has been shown to influence nest success. Curlews forage on terrestrial insects, particularly beetles and grasshoppers, but may also occasionally eat toads, spiders, and berries. The species migrates from coastal habitats in California, Texas, and Mexico, to Montana where they are typically present between May and August. No long-billed curlews were observed during field investigations, but the species is known to occur in the study area. The best potential habitat is located in the northern and central portions.

Chestnut-Collared Longspur

The chestnut-collared longspur inhabits native mixed-grass prairie habitats. They prefer sparse grasslands with bare ground and will avoid tall, dense vegetation and shrublands. Chestnut-collared longspurs nest in shallow ground depressions with some preference for relatively mesic sites. Nests are constructed of dried grass and are usually well concealed under a large clump of grass. The species diet includes insects and seeds. This seasonal migrant generally arrives in Montana in April and leaves in September. The chestnut-collared longspur prefers relatively mesic, more densely vegetated areas compared to the McCown's longspur and horned lark. No chestnut-collared longspurs were observed during field investigations, but the species is known to occur in the study area. The best potential habitat is located in the northern and central portions.

McCown's Longspur

The McCown's longspur is characteristic summer resident of short-grass prairie communities. They prefer native short-grass prairie habitats with little litter and vegetation cover. Nesting habitats are dominated by blue grama and buffalo grass. McCown's Longspurs build nests from coarse grasses and lichens in shallow ground depressions. The species diet includes insects and seeds. The McCown's longspur is a seasonal migrant that generally arrives in Montana in April and departs in September. The McCown's longspur prefers more xeric habitats with shorter vegetation than the chestnut-collared longspur. No McCown's longspurs were observed during field investigations, but the species is known to occur in the study area. The best potential habitat is located in the northern and central portions.

Marbled Godwit

The marbled godwit inhabits native grassland prairie habitats interspersed with a mosaic of wetlands. The marbled godwit breeds on grassy plains, wet meadows, and prairie sloughs, usually near rivers or streams. Nest sites are typically located in a dry spot within short-grass prairie wetlands, and are constructed of beaten-down grass or a grass hollow in sparse cover. The species diet consists of insects, particularly grasshoppers. This migratory species usually arrives in Montana in May and departs September. No

marbled godwits were observed during field investigations, which were conducted after the fall migration period. The species is known to occur in the study area, with the best potential habitat located in the northern and central portions.

Baird's Sparrow

The Baird's sparrow nests in native prairie grasslands, with habitat structure being more important than plant species composition. They prefer grasslands that are not grazed or lightly grazed with moderate to dense litter and low shrub cover. Baird's sparrows forage on the ground for seeds and insects, including spiders and grasshoppers. Nests are constructed in either tufts of grass held up by a shrub, underneath an overhanging tuft of grass or, most commonly, in a depression in the ground with no overhead concealment. This migratory species generally arrives in Montana in May and departs in August. No Baird's sparrows were observed during field investigations, which were conducted after the fall migration period. The species is known to occur in the study area, with the best potential habitat located in the northern and central portions.

Brewer's Sparrow

The Brewer's sparrow occupies sagebrush habitats, and is considered to be a sagebrush obligate. While the species has been found closely associated with short-grass prairie, sagebrush, or other shrub-steppe vegetation, it has also been found to prefer dense sagebrush stands, negatively correlation with grass cover. Brewer's sparrows build nests near the ground in large sagebrush plants (>16 inches tall). Brewer's sparrows forage in sagebrush habitat, although wetlands and shrubby ravines may also be important insect foraging areas during the nesting season. They feed on insects as well as grass seeds. This migratory species generally arrives in Montana in May and departs in August. No Brewer's sparrows were observed during field investigations, which were conducted after the fall migration period. The species has been documented in the study area (John Carlson, BLM, personal communication), and the best potential habitat occurs in the southern portion of the study area.

Sprague's Pipit

The Sprague's pipit prefers native prairie grasslands with moderate vegetation density, grass height, and plant species composition. Studies indicate that the species is most abundant in large grassland areas and may be area sensitive. Nests are constructed of woven dead grass in ground depressions and are concealed in clumps of grass. The Sprague's pipit is a ground forager that eats a variety of seeds and insects, including grasshoppers, crickets, ants, and caterpillars. This migratory species generally arrives in Montana in May and departs in August. No Sprague's pipits were observed during field investigations, which were conducted after the fall migration period. The species has been documented in the study area (John Carlson, BLM, personal communication), and the best potential habitat occurs in the northern and central portions of the study area.

Swainson's Hawk

The Swainson's hawk utilizes a variety of open habitats, including prairie grasslands, sagebrush, shrub-steppe, farmlands, and deserts. Within these habitats, the species

requires scattered, isolated patches of trees for nesting. Nests are constructed of sticks and lined with greenery, and are usually located in trees and shrubs in wooded draws and along drainages, shelterbelts, and wetlands. Swainson's hawks occasionally nest on artificial nest platforms, telephone poles, and on the ground. They prey primarily upon small mammals, birds, and reptiles during the breeding season, and insects during the non-breeding season. They forage from either a perch or on the ground, and the species is known to hunt cooperatively. This migratory species generally arrives in Montana in April and departs in September. No Swainson's hawks were observed during field investigations, which were conducted near the end of the fall migration period. The species has been documented in the study area (John Carlson, BLM, personal communication), and the best potential habitat occurs in the northern and central portions of the study area.

Willet

The willet, like the marbled godwit, requires a mosaic of wetland habitats interspersed with short- and mixed-grass prairie for nesting and brood rearing. Willets nest near open water in marshes and wet meadows, and forage in the shallow water of ponds and playas. Nests are built among dense, short grasses on the ground and are usually well hidden. Broods require taller, denser vegetation than that found at the nest site for protection. Willets feed primarily by probing for aquatic invertebrates in soft, moist substrates, but also forage for insects in upland habitats. This migratory species generally arrives in Montana in May and departs in September. No willets were observed during field investigations, which were conducted near the end of the fall migration period. The species has been documented in the study area (John Carlson, BLM, personal communication), and the best potential habitat occurs in the northern and central portions of the study area.

Wilson's Phalarope

The Wilson's phalarope inhabits freshwater wetlands that contain open water, emergent vegetation, and open shoreline. Nesting habitat varies widely and includes wetlands, wet meadows, upland grasslands, and road rights-of-way. They typically nest in low-prairie and wet-meadow zones along the periphery of lakes and wetlands, but nest sites are occasionally constructed in upland habitat within 100 meters of water. The Wilson's phalarope feeds primarily on aquatic insects and crustaceans. This migratory species generally arrives in Montana in May and departs in September. No Wilson's phalaropes were observed during field investigations, which were conducted near the end of the fall migration period. The species has been documented in the study area (John Carlson, BLM, personal communication), and the best potential habitat occurs in the northern and central portions of the study area.

Red-Headed Woodpecker

The red-headed woodpecker inhabits open forests and woodlots with relatively low tree densities. They prefer areas with open canopies that contain snags for nest sites and lush herbaceous ground cover for foraging. In Montana, the species typically inhabits riparian forests along major rivers. Nests are typically constructed in the trunk or limb of an isolated snag. The red-headed woodpecker is an opportunistic forager that generally

consumes insects during the summer and acorns and other nuts during the winter. The species is a year-round resident in Montana, which represents the western extent of its distribution. No red-headed woodpeckers were observed during field investigations, and there are no recorded observations of the species in the study area. The nearest documented red-headed woodpecker observation occurred near Fort Peck. The Milk River cottonwood riparian forest represents the only potential suitable habitat in the study area.

Sharp-Tailed Grouse

Sharp-tailed grouse utilize grasslands interspersed with woody draws and shrub coulees, which provide the various seasonal habitat requirements this species. Sharp-tailed grouse migrate short distances from wintering grounds to leks. Males appear on leks in March and females arrive in April. Optimal nesting habitat includes relatively tall, dense grassland vegetation where nests are constructed under shrubs or tall grass. The sharp-tailed grouse diet includes seeds, leaves, grains, berries, and flowers, as well as insects during the summer. Sharp-tailed grouse were observed during field investigations and are known to occur throughout the study area in all seasons. MFWP has identified several leks in the northern and central portions of the study area (Map 8), which contain the best potential sharp-tailed grouse habitat.

3.7.1.3 Wind Farm

Project Area Overview

The proposed wind farm area consists of a large plateau that is bisected by several coulees and small drainages (Map 8). The northern and western portions of the wind farm are located adjacent to the BCWSA, which sits approximately 300 feet lower in elevation and is separated by variable, but sometimes rugged, eroded breaks. Vegetative communities within the wind farm area include extensive native short- and mid-grass prairie intermixed with small patches of badland, shrubland, and riparian vegetation (Table 3.7-1). There are also several small areas of active agriculture in the northern portion of the wind farm. The area contains a number of small stock ponds and wetlands, as well as the heads of small drainages. Native prairie grassland species include western wheatgrass, thickspike wheatgrass, needle-and-thread, and blue grama. Mesic swales and north-facing slopes also support northern porcupine grass and green needlegrass. Upland areas that have been subjected to grazing support needle-and-thread and blue grama communities. Silver buffaloberry is the primary shrub species in the upland draws, which also include common chokecherry, skunkbush, Wood's rose, and western snowberry. Leafy spurge, which is classified as a noxious weed in Montana, is known to occur along the western edge of the wind farm area (USDA 2004). There are heavy infestations of leafy spurge in the adjacent BCWSA (Cooper et al. 2001).

The wind farm area supports a variety of wildlife species that inhabit native grassland prairie communities. A number of obligate grassland bird species, including sharp-tailed grouse, occur in this area. Several large and small mammal species (i.e., mule deer, pronghorn, Franklin's ground squirrel, jackrabbit, etc.) inhabit the area, as do terrestrial reptiles and amphibians. A number of the species that occur in the wind farm area are

classified as sensitive by the BLM (Table 3.7-11). Numerous raptors are known to forage in the wind farm area, and may utilize updrafts along the edge of the BCWSA. There are no known raptor nests in the wind farm area, and local physiographic characteristics do not create a migratory corridor of continental or regional significance (Western EcoSystems Technology, Inc. 2004). A list of raptor species known to utilize the wind farm area is presented in Table 3.7-12.

Table 3.7-11. Special Status Species that Occur in the Wind Farm Area

Common Name	Scientific Name
Amphibians and Reptiles	
Great Plains toad	*Bufo cognatus*
Greater short-horned lizard	*Phrynosoma hernandesi*
Northern leopard frog	*Rana pipiens*
Plains spadefoot	*Spea bombifrons*
Western hognose snake	*Heterodon nasicus*
Birds	
Bald eagle	*Haliaeetus leucocephalus*
Golden eagle	*Aquila chrysaetos*
Swainson's hawk	*Buteo swainsonii*
Ferruginous hawk	*Buteo regalis*
Burrowing owl	*Athene cunicularia*
Sharp-tailed grouse	*Tympanuchus phasianellus*
Loggerhead shrike	*Lanius ludovicianus*
Long-billed curlew	*Numenius americanus*
Chestnut-collared longspur	*Calcarius ornatus*
McCown's longspur	*Calcarius mccownii*
Marbled godwit	*Limosa fedoa*
Baird's sparrow	*Ammodramus bairdii*
Brewer's sparrow	*Spizella breweri*
Sprague's pipit	*Anthus spragueii*
Willet	*Cataptrophorus semipalmatus*
Wilson's phalarope	*Phalaropus tricolor*

Table 3.7-12. Raptor Species Known Occur in the Wind Farm Area

Common Name	Scientific Name
Bald eagle	*Haliaeetus leucocephalus*
Golden eagle	*Aquila chrysaetos*
Swainson's hawk	*Buteo swainsonii*
Ferruginous hawk	*Buteo regalis*
American kestrel	*Falco sparverius*
Northern harrier	*Circus cyaneus*
Red-tailed hawk	*Buteo jamaicensis*
Turkey vulture	*Cathartes aura*
Great-horned owl	*Bubo virginianus*
Burrowing owl	*Athene cunicularia*
Rough-legged hawk	*Buteo lagopus*

Cooper's hawk	*Accipiter cooperi*
Sharp-shinned hawk	*Accipiter striatus*

In accordance with USFWS guidance, a Potential Impact Index (PII) was prepared for the wind farm and is included in Appendix D. The PII provides information on specific wind resource areas and ranks the relative risk that a wind farm poses to wildlife based upon physical features, ecological characteristics, and species occurrence. The wind farm score was 131, which ranks in the middle of 27 wind resource areas that have been evaluated in Montana (range = 62-242).

Phase I

Phase I encompasses approximately 1,100 acres along the extreme western border of the wind farm area. This phase is situated on an expansive upland plateau immediately adjacent to the BCWSA. Vegetation in Phase I is predominantly native short- and mid-grass prairie (881 acres), with a limited amount of cropland (213 acres). Small livestock ponds and wetlands occur throughout Phase I and a small drainage is located in the southern portion of this phase. This drainage does not contain any riparian vegetation. Leafy spurge is present in the northern and central portions of Phase I (USDA 2004).

The Phase I area provides potential wildlife habitat for a diversity of grassland bird and mammal species. All raptor species listed in Table 3.7-11 are likely to utilize this area. Special status wildlife species known occur in the area are identified in Table 3.7-12. The southern portion of Phase I (415 acres) is located within mule deer winter range. This Phase contains little potential suitable greater sage-grouse habitat. Several sharp-tailed grouse leks have been identified within or in the vicinity of this phase, which contains relatively high quality habitat for this species.

Phase II

Phase II is located in the west-central portion of the wind farm and contains Kerr Cow Camp. This phase encompasses approximately 2,800 acres and is situated on a large upland plateau that gently slopes to the east. Vegetation in Phase II is predominantly native short- and mid-grass prairie (2,268 acres), with a limited amount of cropland (532 acres). Small livestock ponds and wetlands occur throughout Phase II. This Phase also includes a broad, shallow valley that represents the extreme upper reach of the Buggy Creek watershed. This valley is somewhat more mesic than the surrounding upland areas and contains snowberry shrublands. There are a few small, isolated upland draws in the eastern portion of this phase that support small patches (< 0.1 acres) of upland shrubs. No noxious weeds are known to occur in the Phase II area (USDA 2004).

The habitats in the Phase II area are extremely similar to those that occur in the Phase I area. Phase II also provides potential wildlife habitat for a diversity of grassland birds, upland mammals, and raptors. Special status species identified in Table 3.7-12 also occur in this area. The southern portion of Phase II (690 acres) is located within mule deer winter range. This Phase contains little potential suitable greater sage-grouse habitat.

Several sharp-tailed grouse leks have been identified within or in the vicinity of this phase, which contains relatively high quality habitat for this species.

Phase III

Phase III is comprised of 2 separate areas encompassing a total of 5,520 acres. Vegetation in this phase is predominantly native short- and mid-grass prairie (5,163 acres), with a limited amount of cropland (357 acres). Small livestock ponds and wetlands occur in both sections of Phase III. The northern section of Phase III is located along the northern edge of the wind farm area and bounds the BCWSA on the north and west. This section is situated on an expansive upland plateau interspersed with small swales. The northwest corner of this section contains a relatively large draw with variable eroded breaks that slopes into the BCWSA. This draw and associated breaks support small patches of upland shrub communities. The southern section of phase III is a relatively small area located on a plateau near the center of the wind farm. This section contains mixed-grass prairie, a small amount of agriculture, and 2 small stock ponds. The extreme eastern edge of this section encompasses a series of draws that slope to the east into the Buggy Creek drainage. These draws support several patches of upland shrubland, which cumulatively total approximately 2 acres. No noxious weeds are known to occur in this portion of Phase III (USDA 2004).

Phase III provides potential wildlife habitat for a diversity of grassland birds, upland mammals, and raptors. The special status species identified in Table 3.7-12 likely occur in this phase. The large draw and associated breaks located in northern section of Phase III represent mule deer winter range (820 acres). Most of the southern section of this phase is also considered mule deer winter range (290 acres). This Phase contains little potential suitable greater sage-grouse habitat. Several sharp-tailed grouse leks have been identified within or in the vicinity of the northern section of Phase III. There are no known leks in the southern section.

Phase IV

Phase IV encompasses approximately 10,706 acres along the eastern and southern limits of the wind farm. The Northern Border Compressor Station and microwave tower are located in this phase. Phase IV includes several upland plateaus that are bisected by small coulees and broad, shallow drainages. This phase encompasses approximately 4.7 miles of the upper reaches of Buggy Creek and the headwaters of Canyon Creek. Numerous small livestock ponds and wetlands occur throughout this phase.

Vegetation in Phase IV is predominantly native short- and mid-grass prairie interspersed with small patches of upland shrub and riparian communities. Upland shrub communities occur in the draws along the Buggy Creek and Canyon Creek drainages. The most significant riparian zone occurs along Buggy Creek, which transitions from relatively xeric snowberry communities to herbaceous vegetation (0.4 linear miles) to shrub vegetation (0.5 linear miles), to cottonwood gallery forest (0.2 linear miles) as one moves south along the drainage. Silver sagebrush-western wheatgrass communities occur on terraces immediately above the riparian zones. The only known noxious weed

in Phase IV is leafy spurge, which occurs in the southwest corner of this phase (USDA 2004).

Phase IV provides potential habitat for a diversity of wildlife species, including grassland birds, upland mammals, and raptors. The special status species identified in Table 3.7-12 also likely occur in this area. The southern portion of this phase (6,600 acres) is located within mule deer winter range. This Phase contains potential suitable greater sage-grouse habitat, particularly silver sage communities along the Buggy Creek and Canyon Creek drainages. Several sharp-tailed grouse leks have been identified in extreme southern portion of Phase IV. Relatively high quality sharp-tailed grouse habitat occurs throughout this phase.

3.7.1.4 230kV Transmission Line

Alternative A

Vegetation

The Alternative A corridor is dominated by native short- and mid-grass prairie communities (67.5%) interspersed with patches of agriculture (26.5%), upland shrubs (0.5%), sagebrush steppe (0.4%), and riparian vegetation (5.2%; Table 3.7-13). With the exception of small pockets of agriculture, riparian, and upland shrub communities, the northern and central portions of this corridor are primarily composed of mixed-grass prairie (Link 1 MP 0.7-1.0 to Link 5 MP 19.1). This alternative crosses the Buggy Creek drainage approximately 2 miles south of the Northern Border Compressor Station (Link 3 MP 2.6-3.0). At this crossing location, the drainage is relatively broad with a narrow band (approximately 20 feet wide) of herbaceous/shrub riparian vegetation. The corridor crosses Foss Coulee in this area (Link 5 MP 19.1-19.8, 20.3-20.4, 21.1-21.4), which is a relatively small and narrow drainage that does not support a riparian community. This alternative crosses through some small, narrow bands of cottonwood riparian forest along Cherry Creek in the vicinity of Skylark Road (Link 5 MP 23.9-24.1, 24.7-24.9). The cottonwood forest is interspersed by irrigated agricultural lands and small wetland areas. The transmission line route traverses small tracts of grassland and agricultural fields until crossing the Milk River (Link 24 MP 0.7-0.8, 1.0-1.1). At this point, the alternative passes through approximately 300 linear feet of cottonwood gallery forest. The remainder of the corridor traverses primarily agricultural lands with the exception of a small area of sagebrush steppe vegetation (Link 24 MP 6.5-6.6; 0.64 miles) adjacent to the proposed Antelope Creek Substation. No noxious weeds are known to occur in the vicinity of the Alternative A corridor.

Table 3.7-13. Vegetation Communities along Transmission Line Alternatives (linear miles)

	Alternative				
Community Type	**A**	**B**	**C**	**D**	**E**
Mixed-Grass Prairie	27.3	23.4	26.6	21.5	18.1
Riparian – Cottonwood	0.6	0.2	0.2	0.4	0.6
Riparian – Shrub/Herbaceous	1.5	0.9	1.4	0.6	1.4
Upland Shrub	0.2	0.2	0.2	0	0.1
Sagebrush steppe	0.1	0.1	0.6	8.7	6.5
Badlands	0	0	0	0.5	0
Agriculture	10.7	12.3	5.8	5.3	6.3
Water	0.1	0	0	0.1	0.1

Sources: Cooper et al. 2001; Field Investigations 2004; Jones 2003; MNHP 2004g.

Chaffweed, a BLM Watch Species, was discovered on state lands in the Dry Fork Creek area in 2000 (Map 7). This community is located on the north side of Dry Fork Creek and is northeast of the transmission line corridor. Information obtained from the MNHP indicates that approximately 10 miles of this route (Link 3 MP 3.7-3.8; Link 5 MP 5.0-15) may potentially cross through an extensive tract of northern porcupine grass-thickspike wheatgrass, a community that is considered important by the MNHP. A historical observation of poison suckleya, a Montana Species of Concern, was documented in the Milk River valley near Glasgow in 1900. No plant surveys have been conducted along the Alternative A corridor.

Wildlife

Potential special status species likely to occur within the alternative transmission line corridors are identified in Table 3.7-14. There are no existing roads along the northern portion of this Alternative. At Link 5 MP 10.1, the route joins and parallels an existing transmission line for approximately for 12.9 miles. The southern portion of the Alternative would utilize approximately 3.9 miles of existing graded roads on Jensen Trail and Billingsley Road (Table 3.7-15).

Table 3.7-14. Special Status Species Likely to Occur Within the Alternative Transmission Line Corridors and Substation Site

		Alternative					
Common Name	**Scientific Name**	**Substation**	**A**	**B**	**C**	**D**	**E**
Amphibians and Reptiles							
Great Plains toad	*Bufo cognatus*		X	X	X	X	X
Greater short-horned lizard	*Phrynosoma hernandesi*	X	X	X	X	X	X
Northern leopard frog	*Rana pipiens*		X	X	X	X	X
Plains spadefoot	*Spea bombifrons*		X	X	X	X	X
Western hognose snake	*Heterodon nasicus*	X	X	X	X	X	X
Fish							
Pallid sturgeon	*Scaphirhynchus albus*						
Blue sucker	*Cycleptus elongatus*		X	X	X	X	X
Northern redbelly dace x Finescale dace	*Phoxinus eos x Phoxinus neogaeus*		X				
Sauger	*Stizostedion canadense*		X	X	X	X	X
Mammals							
Long-eared myotis	*Myotis evotis*		X	X	X	X	X
Swift fox	*Vulpes velox*						
Townsend's big-eared bat	*Corynorhinus townsendii*		X	X	X	X	X
Birds							
Interior least tern	*Sterna antillarum athalassos*						
Whooping crane	*Grus americana*						
Bald eagle	*Haliaeetus leucocephalus*		X	X	X	X	X
Mountain plover	*Charadrius montanus*						
Greater sage-grouse	*Centrocercus urophasianus*	X	X	X	X	X	X
Black tern	*Chilodonias niger*						
Burrowing owl	*Athene cunicularia*		X	X	X	X	X
Ferruginous hawk	*Buteo regalis*	X	X	X	X	X	X
Golden eagle	*Aquila chrysaetos*	X	X	X	X	X	X
Loggerhead shrike	*Lanius ludovicianus*	X	X	X	X	X	X
Long-billed curlew	*Numenius americanus*		X	X	X	X	X
Chestnut-collared longspur	*Calcarius ornatus*		X	X	X	X	X
McCown's longspur	*Calcarius mccownii*		X	X	X	X	X
Marbled godwit	*Limosa fedoa*		X	X	X	X	X
Baird's sparrow	*Ammodramus bairdii*		X	X	X	X	X
Brewer's sparrow	*Spizella breweri*		X	X	X	X	X
Sprague's pipit	*Anthus spragueii*		X	X	X	X	X
Swainson's hawk	*Buteo swainsonii*	X	X	X	X	X	X
Willet	*Cataptrophorus semipalmatus*		X	X	X	X	X
Wilson's phalarope	*Phalaropus tricolor*		X	X	X	X	X

Red-headed woodpecker	*Melanerpes erythrocephalus*		X	X	X	X	X
Sharp-tailed grouse	*Tympanuchus phasianellus*		X	X	X	X	X

Table 3.7-15. Roadways, Transmission Lines, and Sensitive Wildlife Habitats Along The Transmission Line Alternatives (linear miles)

Resource Type	Alternative				
	A	B	C	D	E
Graded roadways[1]	3.9	18.1	12.5	23.1	0
Two-track[1]	0	7.8	0	0	5.4
Transmission line[2]	12.9	0.0	0.0	2.7	0
Mule deer winter range	2.4	2.4	5.4	6.5	7.7
Pronghorn winter range	0.0	0.0	4.0	0.0	0
Sharp-tailed grouse[3]	24.8 (2)	19.7 (2)	19.0 (6)	22.8 (8)	19.9 (4)
Greater sage-grouse[3]	0.4 (1)	6.8 (3)	4.8 (3)	13.2 (6)	6.8 (4)
Cottonwood riparian	0.6	0.2	0.2	0.4	0.6
Herb/willow riparian	0.1	0.1	0.1	0.0	0.2
Snowberry riparian	1.4	0.8	1.4	0.6	1.2

[1] Miles existing roadway along the alternative
[2] Miles existing transmission line along the alternative
[3] Miles of potential habitat along the alternative (# historic leks within 4 miles)

Community types crossed by this corridor provide potential habitat for a number of birds, raptors, mammals, reptiles, and amphibians. Special status species likely to occur along the corridor are listed in Table 3.7-14. More than two-thirds of this route crosses through native prairie grasslands that provide habitat for a number of grassland obligate bird species. These grasslands are relatively contiguous for the northernmost 16 miles (Link 1 MP 0.4 through Link 5 MP 12.0). The mature cottonwood forest, particularly along the Milk River, represent potential perching habitat for the bald eagle. Alternative A crosses through approximately 300 linear feet of mature cottonwood forest adjacent to the Milk River.

Alternative A crosses through approximately 2.4 miles of mule deer winter range (Table 3.7-15) along the Buggy Creek drainage (Link 3 MP 1.0-3.4). Potential greater sage-grouse habitat along this corridor is extremely limited due to the absence of any sizeable, high quality sagebrush communities. The primary suitable habitat is within the sagebrush steppe community that occurs immediately adjacent to the Richardson Coulee substation. Several greater sage-grouse leks have been identified in the general vicinity of this substation by MFWP (Map 8). The northern portion of this alternative traverses grassland habitats that represent potential sharp-tailed grouse habitat, and 2 leks have been identified within 4 miles of this route (Map 8). A total of 24.8 miles of Alternative A (Link 1 MP 0.04 to Link 5 MP 23.8) crosses through potential sharp-tailed grouse habitat. Along this same segment, approximately 5.6 miles of the corridor is located within 4 miles of a known sharp-tailed grouse lek.

Alternative B

Vegetation

The Alternative B corridor is dominated by native short- and mid-grass prairie communities (63.1%) interspersed with patches of agriculture (33.2%), upland shrubs (0.5%), sagebrush steppe (0.3%) and riparian vegetation (2.9%; Table 3.7-13). With the exception of small pockets of agriculture, riparian, and upland shrub communities, the northern and central portions of this alternative are primarily composed of native mixed-grass prairie (Link 1 MP 0.7-1.0 to Link 10 MP 11.2). This alternative crosses the Buggy Creek drainage approximately 2 miles south of the Northern Border Compressor Station (Link 3 MP 2.6-3.0). At this location, the drainage is relatively broad with a narrow band (approximately 20 feet wide) of herbaceous/shrub riparian vegetation. The corridor also crosses a narrow band of snowberry in the Wolf Creek drainage approximately 3 miles south of the Buggy Creek crossing (Link 6 MP 2.8-3.0). The middle portion of Alternative B parallels Jensen Road, (Link 10 MP 11.2) traversing small tracts of grassland and agricultural fields until it crosses the Milk River (Link 24 MP 0.7-0.8, 1.0-1.1). At this crossing, the alternative passes through approximately 300 linear feet of cottonwood gallery forest. The remainder of the corridor crosses primarily agricultural lands with the exception of a small area of sagebrush steppe vegetation (Link 24 MP 6.5-6.5; 0.64 miles) adjacent to the proposed Antelope Creek Substation. No noxious weeds are known to occur in the vicinity of the Alternative B corridor. A historical observation of poison suckleya, a Montana Species of Concern, was documented in the Milk River valley near Glasgow in 1900. No plant surveys have been conducted along the Alternative B corridor.

Wildlife

Alternative B intersects Cornwell Road at Link 6 MP 0.0, and follows this graded road for 5.2 miles. The alternative also follows the Jensen Trail (2-track) for 7.8 miles (Link 10 MP 2.7-10.5) and Jensen Trail (graded) for another 9 miles. The southern portion of the Alternative would utilize approximately 3.9 miles of existing graded roads on Jensen Trail and Billingsley Road (Table 3.7-15).

Community types crossed by this corridor are extremely similar to those crossed by Alternative A (Table 3.7-13) and provide potential habitat for a number of birds, raptors, mammals, reptiles, and amphibians. Special status species likely to occur along the corridor are listed in Table 3.7-14. Approximately 63% of Alternative B traverses native prairie grasslands that provide habitat for a number of grassland obligate bird species. These grasslands are relatively contiguous for the northernmost 20 miles (Link 1 MP 0.4 through Link 10 MP 10.6). Alternative B crosses through approximately 300 linear feet of mature cottonwood forest cottonwood at the Milk River crossing, which represents potential perching habitat for the bald eagle (Link 24 MP 0.7-0.8).

Alternative B crosses through approximately 2.4 miles of mule deer winter range (Table 3.7-15) along the Buggy Creek drainage (Link 3 MP 1.0-3.4). Potential greater sage-grouse habitat along the northern portion of this corridor is extremely limited due to the absence of any sizeable, high quality sagebrush communities. However, 2 historic leks have been identified within 4 miles of the route (Map 8). The first of these (Link 6 MP 2.4 to 4.8) was located in the Buggy Creek drainage, approximately 2 miles west of this corridor. The second was likely in silver sagebrush communities along a drainage bottom

the vicinity of Link 10 MP 8.0. The primary suitable habitat along Alternative B is the sagebrush steppe community immediately adjacent to the Richardson Coulee Substation. Several greater sage-grouse leks have been identified within 4 miles of this Substation by MFWP (Map 8).

The northern portion of this alternative traverses grassland habitats that represent potential sharp-tailed grouse habitat. A total of 19.7 miles of Alternative B (between Link 1 MP 0.04 and Link 10 MP 11.1) crosses potential sharp-tailed grouse habitat. Three leks have been identified along this segment in the vicinity (within 4 miles) of the route, and several other leks have been found in the general area (Map 8). Approximately 2.8 miles of the corridor is located within 4 miles of a known sharp-tailed grouse lek.

Alternative C

Vegetation

The Alternative C corridor is dominated by native short- and mid-grass prairie communities (76.4%) interspersed with patches of agriculture (16.7%), upland shrubs (0.6%), sagebrush steppe (1.7%), and riparian vegetation (4.6%; Table 3.7-13). The northern portion of this corridor passes through extensive prairie grasslands (Link 1 MP 0.7-1.0), with the exception of small pockets of agriculture, riparian, and upland shrub vegetation. This alternative crosses the Buggy Creek drainage approximately 2 miles south of the Northern Border Compressor Station (Link 3 MP 2.6-3.0). At the crossing location, the drainage is relatively broad with a narrow band (approximately 20 feet wide) of herbaceous/shrub riparian vegetation. The corridor also crosses a narrow band of snowberry in the Wolf Creek drainage approximately 3 miles south of the Buggy Creek crossing (Link 6 MP 2.8-3.0). The middle portion of Alternative C parallels Cornwell Road, traversing small tracts of grassland and agricultural fields until it crosses the Milk River (Link 22 MP 2.5-2.7, 3.5-3.6). At this crossing, the alternative passes through approximately 150 linear feet of cottonwood gallery forest. The remainder of the corridor crosses primarily agricultural lands with the exception of a small area of sagebrush steppe vegetation (Link 22 MP 5.9-6.4; 0.64 miles) adjacent to the proposed Antelope Creek Substation. No species of concern are known to occur in the vicinity of the Alternative C corridor, although surveys have not been conducted along this corridor. Leafy spurge is known to occur along this route and spotted knapweed has been documented in the vicinity (Map 7).

Wildlife

Alternative C intersects Cornwell Road at Link 6 MP 0.0, and follows this graded road southward for 11.1 miles. The southern portion of the Alternative would utilize approximately 1.4 miles of existing graded road on Billingsley Road (Table 3.7-15). Community types crossed by this corridor are extremely similar to those crossed by Alternative B (Table 3.7-13), and provide potential habitat for a number of birds, raptors, mammals, reptiles, and amphibians. Special status species likely to occur along the corridor are listed in Table 3.7-14. Just over 76% of Alternative C traverses native prairie grasslands that provide habitat for a number of grassland obligate bird species.

These grasslands are relatively contiguous for the northernmost 19 miles (Link 1 MP 0.4 through Link 11 MP 10.0). Alternative C crosses through approximately 150 linear feet of mature cottonwood forest cottonwood at the Milk River crossing, which represents potential perching habitat for the bald eagle (Link 22 MP 2.5-2.7).

Alternative C crosses through 2 sections of mule deer winter range totaling approximately 5.4 miles (Table 3.7-15). These sections are located along the Buggy Creek drainage (Link 3 MP 1.0-3.4) and Wire Grass Coulee (Link 11 MP 4.7-7.7). Potential greater sage-grouse habitat along the northern portion of this corridor is extremely limited due to the absence of any sizeable, high quality sagebrush communities. However, 2 historic leks have been identified within 4 miles of the route (Map 8). The first of these (Link 6 MP 2.4 to MP 4.8) was located in the Buggy Creek drainage, approximately 2 miles west of this corridor. The second was likely in silver sagebrush communities along a drainage bottom the vicinity of Link 11 MP 7.8. Approximately 4.3 miles of the corridor is located within 4 miles of a known sage-grouse lek. The primary suitable habitat along Alternative C is the sagebrush steppe community immediately adjacent to the Richardson Coulee Substation. Several greater sage-grouse leks have been identified within 4 miles of this Substation by MFWP (Map 8).

The northern portion of this alternative traverses grassland habitats that represent potential sharp-tailed grouse habitat. A total of 19 miles of Alternative C (between Link 1 MP 0.4 and Link 11 MP 10.0) crosses potential sharp-tailed grouse habitat. Six leks have been identified along this segment within 4 miles of the route (Map 8). Several other leks have been found in the general area. Approximately 9.1 miles of the corridor is located within 4 miles of a known sharp-tailed grouse lek.

Alternative D

Vegetation

The Alternative D corridor is dominated by native short- and mid-grass prairie communities (58.0%) interspersed with patches of agriculture (14.3%), badlands (1.3%), sagebrush steppe (23.5%), and riparian vegetation (2.7%; Table 3.7-13). The portion of this corridor north of the Milk River parallels Britsch Road and Vandalia Roads. The northern portion of this corridor passes through prairie grasslands (Link 2 MP 0.4 to Link 14 MP 0.9) and a small area of badlands habitat adjacent to the BCWSA (Link 9 MP 1.0-1.5). The middle portion of this corridor traverses a combination of grassland and agricultural fields (Link 14 MP 0.9 to 4.9). At the Milk River crossing, the alternative passes through approximately 2,000 linear feet of cottonwood gallery forest (Link 16 MP 0.0-0.1, 0.2-0.3, 0.4-0.6. The remainder of the corridor traverses agricultural lands intermixed with mixed-grass prairie (Link 14 MP 4.9 to Link 16 MP 4.2), and approximately 9 miles of sagebrush steppe vegetation (Link 16 MP 4.2 to Link 25 MP 1.3). No species of concern are known to occur in the vicinity of the Alternative D corridor, although surveys have not been conducted. Leafy spurge is known to occur along this route, and spotted knapweed has been located in the vicinity.

Wildlife

Alternative D follows Britsch Road and Vandalia Road from Link 2 MP 0.0 southward for 23.1 miles. It also parallels an existing transmission line for 2.7 miles from Link 16 MP 10.7 to the substation (Table 3.5-15). The majority (58%) of Alternative D crosses native grasslands that provide habitat for a number of grassland obligate bird species. Special status species likely to occur along this corridor are listed in Table 3.7-14. These grasslands are relatively contiguous for the northernmost 19 miles (Link 2 MP 0.4 through Link 14 MP 0.9). South of this point, the route traverses a mixture of upland prairie, agricultural fields, and residential areas. South of the Milk River, this alternative traverses approximately 9 miles of sagebrush steppe that represents potential habitat for variety of sagebrush species including the greater sage-grouse.

Alternative D crosses through 6.5 miles of mule deer winter range (Link 2 MP 1.1-7.6 (Table 3.15-7). Potential greater sage-grouse habitat along the northern portion of this corridor is extremely limited due to the absence of any sizeable, high quality sagebrush communities. One historic lek has been identified within 4 miles of the route between MP 0.8 and 4.6 on Link 9 (Map 8). This alternative also crosses high quality sage-grouse habitat in the southwest corner of the study area. A total of 5 leks have been documented in the vicinity of Link 16 (between MP 3.6 and 12.1) and Link 25 from milepost 0.0 to the substation. Approximately 13.2 miles of the corridor is located within 4 miles of a known sage-grouse lek.

Potential sharp-tailed grouse habitat occurs where Alternative D traverses grasslands to the north and south of the Milk River. A total of 19 miles of Alternative D north of the Milk River (Link 2 MP 0.04 to Link 14 MP 0.9) crosses potential sharp-tailed grouse habitat. Seven leks have been identified within 4 miles of this segment, and several other leks have been found in the vicinity (Map 8). A total of 3.8 miles of Alternative D south of the Milk River (Link 16 MP 0.7- 4.5) crosses relatively low quality potential sharp-tailed grouse habitat, and one lek has been identified within 4 miles of this segment. Approximately 20.2 miles of the corridor is located within 4 miles of a known sharp-tailed grouse lek.

Alternative E

Vegetation

The Alternative E corridor is dominated by native short- and mid-grass prairie communities (54.7%) interspersed with patches of agriculture (19.0%), upland shrubs (0.3%), sagebrush steppe (19.6%), and riparian vegetation (6.0%; Table 3.7-13). The northern portion of this corridor passes through prairie grasslands and several riparian shrub communities (Link 1 MP 0.8 to Link 8 MP 8.4) associated with Canyon Creek (Link 4 MP 2.7-2.8, 3.1-3.4; Link 8 MP 0.9-1.0), West Fork of Canyon Creek (Link 8 MP 2.6-2.8), Bear Creek (Link 8 MP 5.4-5.5), and Brush Fork of Bear Creek (Link 8 MP 7.5-7.6. Alternative E then parallels an unnamed farm road and traverses grassland and agricultural fields (Link 8 MP 8.4 to Link 12 MP 8.3). This alternative crosses over a stock pond approximately one-mile north of the Milk River (Link 12 MP 7.6-7.7). Alternative E passes through approximately 1,600 linear feet of cottonwood gallery forest along the Milk River (Link 12 MP 8.3-8.7. The remainder of the corridor traverses a

combination of agricultural lands and mixed-grass prairie (Link 12 MP 8.7 to Link 17 MP 2.7) and 4 miles of sagebrush steppe vegetation (Link 17 MP 2.7 to Link 25 MP 1.3). It also crosses approximately 500 feet of forest and shrub riparian habitat along Antelope Creek immediately north of the proposed Antelope Creek Substation (Link 17 MP 7.5-7.7). No species of concern or noxious weeds are known to occur in the vicinity of the Alternative E corridor, although surveys have not been conducted along this corridor.

Wildlife

Alternative E parallels an existing 2-track from Link 12 MP 0.0-5.4. It does not follow any existing graded roadways or transmission lines (Table 3.7-15). Special status species likely to occur along this corridor are listed in Table 3.7-14. Alternative E crosses through approximately 1,600 linear feet of mature cottonwood forest cottonwood at the Milk River crossing, which represents potential perching habitat for the bald eagle (Link 16 MP 0.0- 0.6).

Alternative E crosses through 7.7 miles of mule deer winter range (Link 4 MP 0.3 to Link 8 MP 3.8). The corridor does not traverse any coulees that are used for winter range by pronghorn. Potential greater sage-grouse habitat along the northern portion of this corridor is extremely limited due to the absence of any sizeable, high quality sagebrush communities, and no historic leks occur within 4 miles of the route. This alternative also crosses 6.5 miles of potential sage-grouse habitat south of the Milk River. A total of 4 leks have been documented within 4 miles of the route between Link 17 MP 2.2 and the substation (Map 8). Approximately 6.8 miles of the corridor is located within 4 miles of a known sage-grouse lek.

Potential sharp-tailed grouse habitat is limited to the northern portion of Alternative D. A total of ten leks have been identified within 4 miles of this segment (Map 8). A total of 19.9 miles of Alternative E crosses potential sharp-tailed grouse habitat, and approximately 15.6 miles of the corridor is located within 4 miles of a known sharp-tailed grouse lek.

3.7.1.5 Antelope Creek Substation

Vegetation

The proposed Antelope Creek substation is located adjacent to the existing Richardson Coulee Substation on Billingsley Road. The principle vegetative community in the vicinity is Wyoming big sagebrush-western wheatgrass. No special status plants or noxious weeds are known to occur in the vicinity of the substation.

Wildlife

Special status wildlife species that may potentially occur at the Substation site are identified in Table 3.7-14. The existing substation, power lines, roadway, and adjacent agricultural activities have disturbed habitat and increase human activity in the vicinity of the Proposed Substation. Pronghorn were observed in the vicinity of the Substation during field investigations. Although sage-grouse leks are known to occur in the area, the substation site does not represent high quality habitat for the greater sage-grouse.

3.7.2 Environmental Consequences and Mitigation Measures

This section describes the potential impacts to biological resources that could occur as a result of construction, operation, and maintenance of the wind farm, transmission line, and substation. Where potential adverse impacts to biological resources were identified, mitigation measures have been proposed to reduce or avoid impacts.

3.7.2.1 Assessment Methodology

Initial and residual impact levels from the various project elements were determined by recording impact locations and intensities by link number and milepost, and describing the impact area. In order to determine impact intensity, impact assessment methodology was developed for biological resources using the following criteria:

- **Resource sensitivity** – the probable response of a particular resource to project-related activities
- **Resource quality** – the pre-project condition of the resource potentially affected
- **Resource quantity** – the amount of the resource potentially affected
- **Duration of impact** – the period of time over which the resource would be affected, measured as short-term (up to a few years) or long-term (life of VCWEP and beyond)
- **Time of year** – the season or period of time which the resource would be affected

Impact Levels

These criteria were systematically applied to biological resources and the results were used to determine potential impacts. Using this methodology, the predicted effects associated with the VCWEP. were compared with the pre-construction environment to determine the initial impacts on the biological resource. Applying these criteria facilitated qualitative impact levels of high, moderate, low, or no-identifiable impact. Impacts to biological resources were classified as **high** if the action would result in one or more of the following:

- There would be an irretrievable or irreversible loss of Species of Concern. These are plants defined by the MNHP (2003) as at-risk or potentially at-risk in Montana;
- Federally listed, candidate, or state-listed sensitive species would be adversely affected;
- New populations of noxious weeds or invasive species became established or increased;

- A riparian area would be destroyed that provides habitat for rare plant or animal species or populations;
- The "take" of a federally endangered, threatened, or candidate wildlife species;
- The permanent loss of habitat that would result in higher mortality or lower reproductive success for an entire species or population;
- The long-term loss of unique habitats or inability to use a biologically-important habitat, such as spawning areas, leks, or winter range;
- The direct mortality that results in population-level effects to a relatively common wildlife species;

Impacts were classified as **moderate** if the action would result in one or more of the following:

- A native plant community would be permanently eliminated through removal of plant parts and/or alteration of the substrate upon which the plants exist.
- In riparian areas, native tree species would be permanently removed or a portion of the canopy would be topped.
- Effect a federally endangered, threatened, or candidate wildlife species through disturbance during a critical period or the loss of habitat;
- The short-term loss of habitat that would result in higher mortality or lower reproductive success for an entire species or population;
- The short-term inability to use a biologically-important habitat, such as spawning areas, leks, or winter range;
- The direct mortality that does not result in population-level effects to a relatively common wildlife species;
- The permanent loss of habitat or reduction in population viability for a BLM sensitive species or state Species of Concern;

Impacts were classified as **low** if the action would result in one or more of the following:

- Native vegetation would be temporarily disturbed or altered such that recovery of native plant communities would occur;
- Non-native plant species would be completely and permanently eliminated from the plant community;

- Create an effect on a federally endangered, threatened, or candidate wildlife species that could be largely mitigated;
- The short-term loss of habitat that would result in higher mortality or lower reproductive success for an entire species or population;
- A limited amount of direct mortality to a relatively common wildlife species;
- The short-term loss of habitat or reduction in population viability for a BLM sensitive species or state Species of Concern;

Impacts were classified as **no identifiable** if the action would result in one or more of the following:

- There would be no direct or indirect disturbance to native plant communities;
- Individual species, populations, and habitats of Species of Concern, federally listed, candidate, or state listed sensitive species would be completely avoided;
- There would be no increase in the cover or distribution of noxious weed or invasive species populations;
- No effect upon wildlife or small effects that can be largely mitigated;

Impact Types

Vegetation

A number of potential adverse impacts to vegetation can occur as a result of construction and operation and maintenance O activities associated with the wind farm, transmission line, and substation (Table 3.7-16). The potential adverse impacts include injury or mortality of vegetation, generation of fugitive dust, exposure to contaminants, increased public access, and fire. Where possible, these impacts would be reduced or avoided through the implementation of mitigation measures.

Table 3.7-16. Summary of Potential Project Impacts on Vegetation

Impact Type	Associated Activity or Feature	Potential Impact	Duration
Wind Farm Construction			
Direct injury or mortality of vegetation	Site clearing and grading; construction of turbines, access roads and utility corridors; construction equipment travel.	Destruction and injury of vegetation, habitat reduction or degradation.	Long-term within construction footprints for turbines, support facilities, and access roads; short-term in areas adjacent to the construction area.
Fugitive dust generation	Site clearing and grading; construction of turbines, access roads and utility lines; construction equipment	Damage to plant cuticle which increases water loss; decreased carbon dioxide uptake, decreased photosynthesis.	Short-term and localized.
Exposure to contaminants	Accidental; accidental release of fuel or hazardous materials.	Exposure may affect plant survival, reproduction, or growth.	Short-term and localized to spill area.
Invasive vegetation/Noxious weeds	Site clearing and grading.	Establishment of invasive vegetation/noxious weeds, decrease in native vegetation.	Long-term if established in areas where turbines, support facilities, and access roads would be situated.
Wind Farm Operation & Maintenance			
Direct injury or mortality to vegetation	Mowing at support buildings, turbine locations, utility corridors, and transmission corridors.	Maintenance of plant communities in early successional stages; invasive plant establishment.	Short-term for vegetation injury; long-term for invasive vegetation establishment.
Exposure to contaminants	Accidental spill of fuel or hazardous materials.	Exposure may affect plant survival, reproduction, or growth.	Short-term and localized to spill area.
Increased foot and vehicle traffic	Access via facility access roads, and transmission corridors.	Trampling of vegetation by foot and vehicle traffic.	Short- or long-term, in areas adjacent to the wind farm and transmission corridors.
Invasive vegetation/ Noxious weeds	Access to surrounding areas along facility access roads,	Establishment of invasive vegetation/noxious weeds; decrease in	Long-term, both on and off site.

Impact Type	Associated Activity or Feature	Potential Impact	Duration
	and transmission corridors.	native vegetation.	
Fire	Access to surrounding areas along facility access roads, and transmission corridors.	Loss of native vegetation; introduction and establishment of invasive vegetation.	Long-term
Transmission Line Construction, Operation and Maintenance			
Direct injury or mortality of vegetation	Access road and transmission corridor construction; construction equipment travel.	Destruction and injury of vegetation, habitat reduction or degradation.	Long-term within construction footprints for transmission line structures and access roads; short-term in areas adjacent to the construction area.
Fugitive dust generation	Access road and transmission corridor construction; construction equipment.	Damage to plant cuticle which increases water loss; decreased carbon dioxide uptake, decreased photosynthesis.	Short-term and localized.
Exposure to contaminants	Accidental spill of pesticides, fuel or materials.	Exposure may affect plant survival, reproduction, or growth.	Short-term and localized to spill area.
Invasive vegetation/ Noxious weeds	Access road and transmission corridor construction	Establishment of invasive vegetation/noxious weeds, decrease in native vegetation.	Long-term both on and off site.
Fire	Access to surrounding areas along facility access roads and transmission corridors.	Loss of native vegetation; introduction and establishment of invasive vegetation.	Long-term

Source: Adapted from USDI 2004*c*.

Wildlife

Potential adverse impacts to wildlife associated with development of the wind farm, transmission line, and substation can be separated into impacts associated with project construction and those related to O&M (Table 3.7-17). The primary potential adverse impacts include direct mortality, habitat loss and fragmentation, disturbance and displacement of individual animals, interference with behavioral activities, and increased public access. Effects associated with increased potential for exposure to contaminants, generation of fugitive dust, and fire risk are discussed under Vegetation. These effects would be largely mitigated through the implementation of appropriate control plans and training programs, and are therefore not discussed in relation to wildlife.

Table 3.7-17. Potential Effects of Wind Energy Developments on Wildlife

Impact	Associated Project Activities	Potential Effects and Taxa Affected	Effect Extent and Duration
Wind Farm Construction			
Direct injury and mortality	Site clearing and grading; construction of turbines, access roads, and support facilities; storage and off road travel during construction.	Mortality and injury of species that burrow or have limited mobility; destruction of nests/eggs.	Temporary (duration of construction); within and adjacent to construction sites and storage areas.
Habitat loss and fragmentation	Site clearing and grading; construction of turbines, access roads, and support facilities.	Loss and fragmentation of existing habitat for all wildlife species.	Permanent habitat loss within footprints of turbines, access roads, and support facilities; fragmentation throughout the wind farm.
Disturbance	Noise and human presence associated with site clearing, grading, and construction.	Displacement from and avoidance of local habitats; birds and mammals.	Temporary disturbance (duration of construction) within wind farm and along access roads.
Behavioral interference	Site clearing and grading; construction of turbines, access roads, and support facilities; construction vehicles.	Disturbance of foraging, migration, and breeding behaviors; avoidance of construction areas; birds and mammals.	Temporary (duration of construction) for most species; permanent for species sensitive to presence of turbines.
Exposure to contaminants	Accidental spill during equipment maintenance and refueling.	Exposure may affect survival, reproduction, development, or growth; all wildlife species.	Temporary (duration of construction); localized to spill site.
Generation of fugitive dust	Site clearing and grading; construction of turbines, access roads, and support facilities; vehicles.	Respiratory impairment; all wildlife species.	Temporary (duration of construction); in immediate vicinity of access roads and construction sites.
Erosion and sedimentation	Site clearing and grading; construction of turbines, access roads,	Degradation of aquatic habitats; amphibians, waterfowl, and fish.	Temporary (duration of construction); may extend beyond site boundaries.

Impact	Associated Project Activities	Potential Effects and Taxa Affected	Effect Extent and Duration
	and support facilities.		
Wind Farm Operation and Maintenance			
Disturbance and interference with behaviors	Noise associated with operation of turbines and support machinery; human presence and vehicle activities.	Displacement from and avoidance of local habitats; disturbance of foraging, migration, and reproduction; all wildlife.	Permanent and temporary; greatest effects in areas with highest activity and noise levels and for species sensitive to turbines.
Collision with turbines	Presence and operation of turbines.	Mortality and injury; birds and bats.	Permanent but low magnitude; localized to turbine strings.
Exposure to contaminants	Accidental spill from maintenance vehicles.	Exposure may affect survival, reproduction, development, or growth; all wildlife.	Temporary (duration of construction); localized to spill area.
Increased public access	Construction of new roads	Increased legal and illegal take of wildlife; disruption of foraging, breeding and migratory behaviors.	Permanent; in vicinity of access roads.
Fire	Access by maintenance vehicles and unauthorized vehicles.	Habitat loss of native and establishment of non-native vegetation.	Permanent; in vicinity of access roads.
Transmission Line Construction, Operation, and Maintenance			
Direct injury and mortality	Site clearing and grading; construction of turbines, access roads, and support facilities; storage and off road travel during construction.	Mortality and injury of species that burrow or have limited mobility; destruction of nests/eggs.	Temporary (duration of construction); within and adjacent to construction sites and storage areas.
Habitat loss and fragmentation	Site clearing and grading; construction of turbines, access roads, and support facilities.	Loss and fragmentation of existing habitat for all wildlife species.	Permanent habitat loss within footprints of turbines, access roads, and support facilities; fragmentation throughout the wind farm.

Impact	Associated Project Activities	Potential Effects and Taxa Affected	Effect Extent and Duration
Disturbance and behavioral interference	Noise and human presence associated with site clearing, grading, and construction of turbines, access roads, and support facilities; construction vehicles.	Displacement from and avoidance of construction areas; disturbance of foraging, migration, and breeding behaviors; all wildlife species.	Temporary disturbance (duration of construction) within wind farm and along access roads; permanent for species sensitive to turbines.
Exposure to contaminants	Accidental spill during equipment maintenance and refueling.	Exposure may affect survival, reproduction, development, or growth; all wildlife species.	Temporary (duration of construction); localized to spill site.
Generation of fugitive dust	Site clearing and grading; construction of turbines, access roads, and support facilities; vehicles.	Respiratory impairment; all wildlife species.	Temporary (duration of construction); in immediate vicinity of access roads and construction sites.
Erosion and sedimentation	Site clearing and grading; construction of turbines, access roads, and support facilities.	Degradation of aquatic habitats; amphibians, waterfowl, and fish.	Temporary (duration of construction); may extend beyond site boundaries.
Legal and illegal take of wildlife	Increases public access via new roads and transmission corridors	Impacts to wildlife habitats; increased disturbance and mortality; all wildlife species.	Temporary and permanent; along transmission line corridor
Fire	Access by maintenance vehicles and unauthorized vehicles.	Habitat loss of native and establishment of non-native vegetation.	Permanent; in vicinity of access roads.

The actual impacts associated with the wind farm would be largely dependent upon the spatial and temporal extent of VCWEP, the presence and abundance of wildlife species at VCWEP site, and the relative mobility and sensitivity of species. Since the potential effects on avian and bat species are of particular concern, mortality estimates obtained through research at existing wind farms is utilized to quantify estimates of mortality that would likely result from operation of the turbines. Anticipated impact levels were determined after applying specific mitigation measures.

Potential impacts to wildlife for each alternative transmission line corridor were assessed through an evaluation of existing conditions and potential project-related effects. These effects include temporary disturbance during construction and maintenance activities, habitat loss and fragmentation effects associated with clearing and grading of tower sites and access roads, the creation of new public access into undisturbed habitats, and the potential for increased predation by raptors. Effects related to generation of dust, exposure to contaminants, invasive weeds, and increased risk of fire are considered of lesser significance to wildlife, and are discussed in the Vegetation section. Sensitive or important wildlife habitat within the study area include 1) extensive, intact native prairie grasslands that provides habitat for a number of BLM sensitive bird species, 2) mule deer winter range, 3) greater sage-grouse and sharp-tailed grouse winter habitat and leks, and 4) mature riparian cottonwood forests that represent a unique habitat type and potential bald eagle winter habitat.

Initial impacts were largely determined based upon the habitat type crossed, and the known (i.e., mule deer winter range) or potential (i.e., historic sage-grouse leks) sensitive wildlife resources within that habitat type. Generally, portions of the wind farm and segments of transmission line corridors that contain native grasslands, sagebrush steppe, mule deer winter range, riparian cottonwood forests, or are within 4 miles of a known lek were initially classified as high impact because of the potential for disturbance, habitat loss, increased public access, and grouse predation. Initial impact values for segments of transmission line corridors were lowered to moderate due to the presence of mitigating conditions. These conditions included the presence of an existing transmission line or roadway, the use of existing roadways for construction and maintenance (rather than constructing a new road through undisturbed habitat), and areas where native habitats have been fragmented by residential and agricultural activities (rather than a large expanse of intact habitat). Portions of transmission lines that cross cultivated agricultural lands were assigned initial impact values of either no identifiable impact (if no grouse leks/habitat occurred in the vicinity) or low impact (if grouse leks/habitat does occur in the vicinity).

Residual impacts were determined by applying one or more mitigation measures to reduce the potential adverse effects associated with wind farm, transmission line, and substation. For example, new roads constructed in mule deer winter range would be gated to prevent general public access and minimize the potential for disturbance impacts during winter months. The mitigation measures that relate specifically to wildlife are identified below. Through the implementation of mitigation measures, residual impacts were generally reduced to moderate, low, or no identifiable impact. The only high

residual impacts occur where transmission line corridors traverse riparian cottonwood forest because of the regional importance of this habitat type.

Mitigation Measures

As listed in Chapter 2, a number of mitigation measures will be implemented to reduce potential impacts to biological resources. In addition to generic mitigation measures, selectively committed mitigation measures have been applied where when appropriate. Selectively committed mitigation measures that have been proposed to minimize potential impacts to biological resources associated with the wind farm, transmission line, and substation include:

S2: In selected areas on public lands, access roads that disturb sensitive features will be rerouted or will cross overland. That is, construction and maintenance traffic will use existing roads or cross-country access routes (including the right-of-way). To minimize ground disturbance, construction traffic routes must be clearly marked with temporary markers such as easily visible flagging. The construction routes or other means of avoidance must be approved in advance of use by the authorized officer or landowner.

S4: To limit new or improved accessibility into the area, all new access undesired or not required for maintenance will be closed using the most effective and least environmentally damaging methods appropriate to that area with concurrence of the landowner or land manager.

S5: To minimize the amount of sensitive feature disturbed and/or to reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S7: With the exception of emergency situations, construction, restoration, maintenance, and decommissioning activities will be modified or curtailed in designated areas during sensitive periods (e.g., nesting and breeding periods) for endangered, threatened, or sensitive wildlife species. No such activities will occur in the wind farm area or along the selected transmission line route within 1) 1 mile of an active sage-grouse or sharp-tailed grouse lek, 2) mule deer winter range during winter months, and 3) within cottonwood riparian winter habitat for bald eagle during winter months. Sensitive periods and areas of concern would be determined in consultation with BLM and MFWP, and activities in sensitive areas approved in advance of construction or maintenance by the authorized officer.

S8: All new access roads constructed in mule deer winter range will be gated during winter months to preclude public access.

S9: Avoid the placement of transmission lines over ponds wherever feasible.

S10: Conduct surveys for sensitive plant species to inventory and evaluate these resources within the selected corridor and any appurtenant impact zones beyond the corridor, such as access roads and construction equipment yards. In consultation with appropriate land managing agencies, specific mitigation measures will be developed and implemented to mitigate any adverse impacts on state or BLM lands. These may include project modifications to avoid adverse impacts, monitoring of construction activities, or data recovery studies.

S11: Greater sage-grouse and sharp-tailed grouse lek surveys will be conducted to inventory and evaluate these resources within the wind farm area, selected transmission line corridor, and associated impact zones prior to construction. Specific mitigation measures will be developed and implemented in coordination with BLM and MFWP to mitigate potential adverse impacts. These measures may include project modification and post-construction monitoring. Raptor excluders will be places on all transmission towers that are located within ½ mile of an active lek and winter range.

S18: Wind Hunter will submit final wind turbine and transmission line tower locations and heights to the Federal Aviation Administration for review and potential marking and lighting requirements. The proposed Project would comply with any Federal Aviation Administration requirements regarding safety to the public. If acceptable to the FAA, white light will be utilized on turbines and towers to minimize the risk of avian collisions.

S25: Areas of disturbed soil will be reclaimed using weed-free native grasses, forbs, and shrubs. Reclamation activities will be undertaken as early as possible on disturbed areas.

S26: Certified weed-free mulch will be used when stabilizing areas of disturbed soil.

S27: Fill materials that originate from areas with known noxious/invasive vegetation problems will not be used.

S28: Access roads, transmission line corridors, and tower site areas will be monitored regularly for noxious weeds and invasive species establishment and control measures will be initiated immediately upon evidence of invasive/noxious species introduction.

S30: In designated areas, wind farm infrastructure will be placed so as to avoid sensitive features such as, but not limited to, riparian areas and water courses, within limits of reasonable design. If these sensitive features cannot be completely avoided, infrastructure will be placed so as to minimize the disturbance.

S31: A comprehensive wildlife study plan will be developed and implemented in coordination with USFWS, BLM, and MFWP. This plan will include pre-construction surveys and post-construction monitoring within the wind farm area and along the selected transmission line alternative. Pre-construction studies will include surveys of 1) sage-grouse and sharp-tailed grouse leks and winter range, 2) distribution and abundance of passerines and raptors, 3) raptor nests, 4) mule deer winter range, 5) bat species, 6) reptiles and amphibians, and 7) swift fox. Post-construction monitoring will include changes in and the distribution and abundance of all species surveyed, including grouse lek use as well as avian and bat mortality at the wind farm. Data from surveys and

monitoring will be used to adaptively manage the operation of existing turbines and siting of future turbine strings. Raptor excluders will be placed on transmission towers where appropriate.

3.7.2.2 Wind Farm

Proposed Action – 500 MW Facility

Vegetation

A number of construction- and O&M-related activities could adversely impact vegetation in the wind farm area. These activities include the clearing and grading of vegetated areas in preparation of turbine and infrastructure construction; clearing and grading of utility corridors and access roads; assembly of turbines; construction of transmission line towers; and refueling of construction equipment. During construction and O&M of the Proposed Action, vegetation may be adversely affected by injury or mortality, generation of fugitive dust, exposure to contaminants, introduction of noxious weeds and invasive species, increased public access, and increased risk of fire (Table 3.7-16). Selectively committed mitigation measures are described in detail above, in the Mitigation Measures portion of this section. See Chapter 2 for a complete list of all generic mitigation measures.

Clearing, grading, and construction activities would result in the direct injury to and/or loss of vegetation, thereby altering plant communities in the disturbed areas of the Proposed Action. Impacts to vegetation in equipment laydown and staging areas for construction equipment would be temporarily disturbed. Permanent vegetation loss could occur from trampling, crushing, or removal of vegetation at the turbines, crane pads, support buildings, parking area, turnaround areas, and access road locations. Vegetation in the direct construction footprint of the turbines, support facilities, and access roads would permanently remove approximately 100.7 acres of native mixed-grass prairie and approximately 1.6 acres of riparian shrub (snowberry) communities and temporarily disturb approximately 474.2 acres of mixed-grass prairie (Table 3.7-17). This represents the permanent and temporary disturbance of 0.5% and 2.4% of the total wind farm area, respectively. The impacts to vegetation would be alleviated by leaving vegetation in place wherever possible and reseeding areas with substantial ground disturbance.

Table 3.7-17. Vegetation Impacts Associated with the Wind Farm (in Acres)

Vegetation Impact	Phase I	Phase II	Phase III	Phase IV
Temporary Loss				
Mixed-grass prairie	49.6	79.6	140.3	201.6
Riparian	0	0	0	0
Agricultural	13.3	22.8	13.2	3.1
Total	62.9	102.4	153.5	204.7
Permanent Removal				
Mixed-grass prairie	13.6	16.3	28.8	41.4
Riparian	1.6	0	0	0
Agricultural	4.1	4.7	2.7	0.6
Total	19.3	21.0	31.5	42.0

Fugitive dust generated during clearing, grading, and travel on roadways may impact vegetation. For example, dust could have an effect on vegetation by coating plant leaves with particulate matter. This potential impact would be greatest during construction of the Proposed Action. However, fugitive dust generation during construction would be short-term and localized to the immediate area of the Project. Predicted vehicle travel between the O&M facility and individual turbines during project operations would be minimal as scheduled maintenance is typically preformed on each turbine every six months. Potential impacts to onsite vegetation would be negligible through the implementation of appropriate dust control measures to minimize fugitive dust emissions from construction-related traffic and additional wind-blown dust as a result of ground disturbance (see Section 3.15).

During construction and O&M activities, vegetation communities may be subject to exposure to contaminants. Construction equipment would need to be refueled and very small quantities of hazardous materials (such as waste paints and degreasing agents) may be generated (see Section 3.13). Accidental fuel spills (gasoline, diesel), pesticides, or releases of hazardous materials could result in the exposure of vegetation at the project site and reestablishment of the vegetation may be impacted or delayed because of residual soil contamination. Because of the relatively small amount of fuel and pesticides expected to be stored and used, any accidental releases would be small and affect vegetation primarily at the release site. See Section 3.13 for a discussion of hazardous materials and waste management impacts and pertinent mitigation measures.

Project construction and O&M activities could introduce noxious weeds and invasive species to the site that, in turn, could alter the vigor of existing vegetation communities in the Proposed Action area. Clearing associated with new roads often provides routes for the migration of noxious weeds and invasive species into areas that were previously devoid of noxious/invasive vegetation. Seeds may become stuck in tire treads, in soil, or mud on vehicles or other equipment and be transported to new, potentially suitable habitats. Mowing during O&M activities is not expected to directly result in the establishment and spread of invasive vegetation, however continued mowing could encourage the establishment of some invasive species. The severity of noxious/invasive species advancement would depend upon a variety of factors, including the health and vigor of the existing vegetation; the timing and duration of clearing, reseeding, and replanting of cleared areas; and the noxious/invasive species present in the vicinity. However, the establishment of noxious/invasive vegetation may be limited by early detection and subsequent eradication of the plants. Leafy spurge, a noxious weed, is known to occur in the northern and central portions of Phase I and the southwest corner of Phase IV. There are also heavy infestations of leafy spurge in the adjacent BCWSA. In compliance with the Montana County Noxious Weed Control Act (MCA §7-22-2101 to 2153) and Executive Order 13112 (USFR 1999), a noxious weed and invasive species control plan will be developed prior to construction to prevent the introduction and spread of noxious weeds and invasive species in the Proposed Project area. Control measures include cleaning construction vehicles of all possible weed seeds; quickly revegetating disturbed areas; reclaiming areas with weed-free native grasses, forbs, and shrubs; using certified weed-free mulch; and monitoring access roads and tower site areas for noxious weed and invasive species establishment.

The construction of new roads may increase access to adjacent lands that previously had limited access. Impacts to vegetation could occur from increased use, unauthorized off-highway vehicle (OHV) use and illegal dumping. Human activities, especially from OHV use and hiking into previously less accessible areas, may act to disperse seeds of noxious weeds and invasive vegetation. Visitors may carry seeds on their clothing and equipment and motorized vehicles may carry seeds on tires and in vehicle mud. Increased human activity also increases the potential for fires. Wildland fires could be ignited by contact with hot engine parts during OHV use and careless cigarette use. The potential for wildland fires would be expected to be greatest in summer and autumn, when native grasses have died back and fuel loads are at their greatest. To limit new or improved access into the area all new access roads which are undesired or not required will be closed, thereby decreasing the potential for noxious weeds/invasive vegetation spread and wildland fire ignition.

Project construction, O&M activities have the potential to ignite wildfires if precautions are not taken. Because it is not clear if wildfires would have a positive or negative effect on project area vegetation, the most prudent course of action will be to implement measures to maintain current fire frequency patterns. Prior to construction, a comprehensive fire control plan would take into account the semi-arid climate, and address risks on a seasonal basis. See Section 3.13, Health and Safety for a detailed description of mitigation measures to minimize or prevent the risk of fire and explosion during the construction and O&M. Implementation of these measures would protect vegetation during the construction, O&M of the wind farm.

No rare or sensitive plant species are known to occur in the Proposed Action area. However, pre-construction pedestrian surveys for sensitive plant species will be conducted to inventory and evaluate all areas to be temporarily or permanently disturbed. Additionally, all supervisory construction personnel will be instructed on the protection of rare or sensitive plants and the boundaries of rare or sensitive plant populations will be clearly delineated with flagging or fencing.

Wildlife

Mitigation measures to minimize potential adverse effects upon biological resources are described in the Assessment Methodology (Section 3.7.2.1). The measures that will be implemented to specifically minimize adverse effects to wildlife include S2, S4, S7, S8, S9, S11, S18, S25, S30, and S31. In order to avoid excessive repetition, the individual mitigation measures are not identified in every wildlife section.

Birds

Construction

Construction activities would potentially affect birds through direct mortality, habitat loss and fragmentation, and disturbance and displacement effects. The potential for mortality of adult birds during construction is extremely low given their mobility and the relatively slow speeds at which construction equipment travels. The risk of mortality from construction is generally limited to the potential destruction of nests with eggs or newborn young of ground-dwelling species. The amount of nest destruction and mortality of young will be largely determined by the amount of disturbance, timing of

construction activities, and density of nests in the area. Construction activities for each phase will likely occur during the nesting period for many bird species.

The Proposed Action will result in some habitat loss for grassland bird species. However, the amount of habitat destroyed is relatively small in relation to the amount of this habitat type in the general vicinity. The project would result in the permanent loss of 114 acres of the grassland habitat, which represents 0.5% within the wind farm area and an even smaller fraction of grassland habitat in the general vicinity of the wind farm. This loss represents a small, permanent adverse impact to grassland birds that inhabit the wind farm area. At full build-out, the proposed turbine strings and accessory facilities would be distributed throughout the wind farm area. While construction would not result in a substantial amount of physical habitat disturbance, the spatial characteristics of the Proposed Action may fragment habitat within the wind farm area. The actual fragmentation effects would be highly species specific, but could effectively reduce the habitat capacity for species that are relatively sensitive to the presence of turbines and accessory structures.

Construction activities would also result in disturbance and displacement effects. Noise from construction machinery and increased human activity may temporarily displace individual birds from the project area for the duration of construction. Such disturbance may also interfere with behavioral activities, such as foraging, migration, breeding, and nesting. Phasing of the Proposed Action will allow displaced animals to move into undisturbed portions of the wind farm and adjacent grasslands. These individuals would be able to return to the area upon completion of construction. Each phase will not extend over more than a single breeding and nesting season, thereby limiting the amount of disturbance at any given time. Displaced individuals would be able to move to unaffected portions of the wind farm and adjacent grassland habitats outside of the wind farm area. Given the presence of large tracts of native grassland habitats in the vicinity, displaced individuals are expected to find adequate suitable habitat. The potential disturbance and displacement effects associated with the Proposed Action would result in a small adverse impact to birds.

Passerines and Grassland Species

Direct mortality of adult birds associated with construction activities is expected to be negligible. Although a number of passerine species are known to nest in the wind farm area, the densities of ground nests in this area are unknown. Full build out of the Proposed Action will result in the disturbance of approximately 576 acres, or 2.9% of the entire wind farm area. Construction will be spatially and temporally distributed across 4 phases, thereby limiting the amount of disturbance in any one area at any point in time. While construction activities will likely destroy some bird nests and eggs, the actual losses are expected to be relatively low based upon the small area of disturbance associated with each project phase. Construction of each phase will not last longer than one nesting season, thereby minimizing the duration of potential effects.

The effects of habitat loss and fragmentation would be species specific for passerines. The Proposed Action will permanently remove approximately 0.5% of native grassland habitat in the wind farm area. The presence of turbines and accessory structures may also

fragment undisturbed habitats in proximity to the turbines, thereby reducing effective habitat for species that are sensitive to these structures. Habitat loss and fragmentation impacts are largely mitigated by the presence of extensive tracts of native grassland habitats in the immediate vicinity of the wind farm. Additionally, construction phasing will limit the spatial and temporal extent of construction-related disturbances during any given period. Given the limited amount of habitat to be permanently disturbed and the availability of large tracts of similar habitat in the area, potential habitat loss and fragmentation associated with the Proposed Action is expected to represent a small adverse impact to grassland bird species.

The Proposed Action will result in disturbance and displacement of individual birds inhabiting the construction areas, and may interfere with foraging, migration, breeding, and nesting activities. As a result, the project may result in slight reductions in survival and reproductive success. These impacts will be somewhat reduced by the project phasing, which will limit the duration and spatial extent of the displacement and behavioral interference. Phased construction will allow displaced animals to move into undisturbed portions of the wind farm and adjacent grasslands. Given the presence of large tracts of native grassland habitats in the vicinity, displaced individuals would be expected to find adequate suitable habitat. These individuals would be able to return to the area upon completion of construction. Each phase will not extend over more than a single breeding and nesting season, thereby limiting the duration of any disruption of behaviors. Activities will be limited in known breeding habitats during sensitive periods (i.e., courting, nesting, incubation). The potential displacement and behavioral effects associated with the Proposed Action would likely result in a small adverse impact.

Raptors

Construction activities are not expected to result in any direct mortality of raptors. With the exception of the northern harrier, no raptors are known to nest in the wind farm area. Preliminary surveys indicated moderate raptor use of the wind farm area for foraging, and construction activities would result in the loss of a small amount of foraging habitat and the temporary displacement of individuals from portions of the wind farm area. Habitat loss and disturbance/displacement impacts would largely be mitigated by the existence of large tracts of native grassland habitats within and immediately adjacent to the wind farm. Construction phasing will limit the spatial and temporal extent of construction-related disturbances during any given period. Given the limited amount of habitat to be permanently disturbed and availability of large tracts of similar habitat in the area, potential habitat loss and displacement associated with the Proposed Action is expected to represent a small adverse impact to raptors. In order to minimize the potential for destruction of harrier nests, pre-construction surveys will be completed prior to any clearing and grading to ensure that active nests are not disturbed until the young have fledged.

Waterfowl

Given the absence of high quality waterfowl habitat within the wind farm area, construction activities are not likely to result in waterfowl mortality. During construction

of specific phases, there could be disturbance of waterfowl utilizing the small livestock ponds during seasonal migrations. This disturbance will be minimal given the distance of most turbines from any surface waters and the availability of other small livestock ponds throughout undisturbed portions of the wind farm and adjacent areas. Wards Reservoir, located one mile east of the wind farm, represents the only high quality waterfowl-nesting habitat in the area. Waterfowl occupying Wards Reservoir may experience some disturbance associated with construction traffic on Kerr Road. However, Kerr Road currently experiences low levels of vehicle and equipment traffic associated with the Northern Border Compressor Station. Additionally, the main portion of this reservoir is set back several hundred feet from Kerr Road. This distance will reduce potential disturbance effects and will preclude permanent displacement associated with traffic and associated vehicle noise. Construction of the Proposed Action is expected to result in no identifiable impact to waterfowl.

Operation and Maintenance Impacts

Potential impacts to birds associated with O&M of the Proposed Action include general disturbance and behavioral interference, collisions with turbines, and effects associated with increased public accessibility. Human activity and noise associated with O&M activities would likely represent long-term disturbance effects, and could potentially displace birds inhabiting the wind farm phases. Most information regarding disturbance or displacement effects is derived from studies on waterfowl and shorebirds in wetland habitats in Europe (Larsen and Madsen 2000; Pederson and Poulsen 1991; Winkelman 1992). With the exception of one study (Pedersen and Poulsen 1991), this research has indicated that wind farm operations do not result in any disturbance or displacement for most avian groups (Karlsson 1983; Phillips 1994; Winkelman 1990).

Studies of wind farm disturbance in North America have had mixed findings. Research at Buffalo Ridge in Minnesota indicated that bird abundance was lower on plots with turbines than on those without turbines. Differences in avian use were correlated with distance from turbines, with reduced bird abundance limited to an area within 100 meters of a turbine. The authors attributed this displacement effect to bird avoidance of turbine noise and maintenance activities, as well as reduced habitat effectiveness due to access roads and gravel pads surrounding turbines (Johnson et al. 2000). A study by Leddy et al. (1999) reported higher bird densities in control sites and areas >180 meters from turbines compared to sites <80 meters of turbines. The authors hypothesized that reduced densities near turbines were due to noise, the presence of an access road, and the physical movement of the turbines. At Foote Creek Rim in Wyoming, no significant changes in bird abundance were associated with the operation of the wind farm based upon pre- and post-construction point count surveys (Johnson et al. 2000). At this location, a pair of golden eagles successfully nested within 0.5 miles of the operational wind farm (Clayton Derby, Western EcoSystems Technology, Inc., personal communication).

The results of various studies suggest that the bird densities in the vicinity of wind energy projects may be reduced near turbines and other facilities if continuous noise levels are >40 dBA (USDI 2004*c*). However, birds may not be able to distinguish blade noise from ambient wind noise when the blade and wind noise levels are within 1.5 dBA of each

other. Under normal wind conditions, blade noise would add to background noise levels across the sound spectrum and would be inaudible to birds at a distance of 25 meters from the turbine (Dooling 2002). Human activities and vehicle traffic associated with O&M activities are expected to be considerably less than during construction, and the new generation turbines are relatively quiet. Operation of the Proposed Action will likely cause some disturbance to grassland birds inhabiting the wind farm area, and species that are relatively sensitive to noise, turbine presence, and human activity may be permanently displaced. While it is difficult to distinguish the effects of habitat loss from O&M activities, adverse impacts upon birds associated with O&M would likely be additive to habitat loss.

The operational impact of greatest concern is mortality resulting from turbine collisions. Bird fatalities at wind farms have included a variety of taxa, including raptors, passerines, waterfowl, and shorebirds (Erickson et al. 2001). The number of turbines has been determined to be the primary corollary of potential avian mortality in wind farms (EFSEC 2003). Increased prey abundance in the vicinity of turbines (i.e., burrowing animals, insects, etc.) can increase the potential for turbine collisions (NWCC 2002; NWCC Wildlife Workgroup 2003). Birds conducting long-range migrations generally fly at higher altitudes, and are less likely to be impacted by turbines compared to resident species that fly lower and spend more time in the wind farm area (Hanowski and Hawrot 2000; Janss 2000). In comparison to early-generation turbines, the new-generation turbines have a larger rotor diameter and, therefore, a larger rotor-swept area (RSA). In addition to fatalities per turbine, bird collision metrics are often provided as fatalities per 100,000 m^2 of RSA. Despite the larger RSA of new generation turbines, old generation turbines are shorter and have higher rotor speeds and present a higher potential for avian mortality.

Bird mortality data has been collected at a number of wind energy facilites in the United States. Fatalities per turbine per year ranged from 0 at Searsburg, Vermont and Algona, Iowa to 4.5 at Buffalo Ridge in Minnesota (Table 3.7-18). The Buffalo Ridge estimate was based on a single field season and was inflated by the occurrence of the highest single fatality event ever observed (14 birds at two turbines; Erickson et al. 2001). These data indicate an overall average of 2.19 avian fatalities per turbine per year (Erickson et al. 2001). Excluding Altamont Pass in California, which is situated within a major movement corridor and utilizes old-generation turbines, the average number of fatalities per turbine per year for wind projects in North America is 1.83.

Table 3.7-18. Avian Fatality Rates Observed at Existing Wind Energy Projects

Wind Resource Area	State	Number of Turbines	Annual Bird Fatalities per Turbine	Annual Bird Fatalities per 100,000 m^2 RSA	Annual Raptor Fatalities per Turbine
Altamont Pass	CA	7,340	0.05 to 0.19	NA	0.007 to 0.1
Buffalo Ridge (all phases)	MN	354	2.8	161.0	NA
Buffalo Ridge Phase 1	MN	73	0.33 to 0.66	NA	0.01
Buffalo Ridge Phase 2	MN	143	2.27	NA	0.0
Buffalo Ridge Phase 3	MN	138	4.45	NA	0.0
Foote Creek Rim	WY	69	1.5 -1.75	108.0	0.03, 0.036
Green Mountain (Searsburg)	VT	11	0.0	0.0	0.0
IDWGP (Algona)	IA	3	0.0	0.0	0.0
Klondike	OR	16		43.3	
Montezuma Hills	CA	600	NA	NA	0.48
Mountaineer Wind Energy Center	WV	44	4.04	NA	0.33
Nine Canyon	WA	37	3.59	119.8	0.08
Princeton	MA	8	0.0	0.0	0.0
San Gorgonio	CA	2,900	2.31	N/A	0.01
Somerset County	PA	8	0.0	0.0	0.0
Stateline	OR/WA	454	1.7	96.6	0.05
Vansycle	OR	38	0.63	38.0	0.0
Wisconsin	WI	31	2.83	73.3	0.02

Source: USDI 2004*c*

Resident and migratory passerine species have comprised more than 80% of all bird fatalities associated with collisions with turbines (Erickson et al. 2001). At Foote Creek Rim, 92% of avian fatalities have been passerines (Young et al. 2003). Although nearly 50% of the passerine mortalities have involved nocturnal migrants, no single large mortality events have been documented during seasonal migrations. At Foote Creek Rim, annual mortality is estimated at 1.5 birds per turbine per year (Young et al. 2003). Fatality rates have ranged from 38 to 161 birds per 100,000 m^2 RSA. Based upon mortality estimates from existing wind farms (Table 3.7-18), average expected mortality for passerines is approximately 1.2 to 1.8 birds per turbine per year (USDI 2004*c*). These rates of mortality do not likely have any population-level consequences for individual species, largely because the most fatalities have involved relatively common species

including the European starling, American robin, horned lark, and western meadowlark (Young and Erickson 2003).

Raptors fatalities are of particular concern because of their relatively low abundance and federal protection. The number of turbines, not relative species abundance, has been determined to be the primary corollary of raptor mortality at wind farms (EFSEC 2003; Thelander and Rugge 2000). The number of raptors killed at wind farms in North America has been relatively small. Overall, there has been an average of 0.033 raptor fatalities per turbine per year (Erickson et al. 2001). Excluding Altamont Pass, the average is 0.006 raptor fatalities per turbine per year. The Foote Creek Rim wind farm in Wyoming has experienced 0.03 raptor casualties per turbine per year, which is considered low based upon the high raptor use at this site. This equates to a fatality rate of three raptors per 100,000 m^2 RSA. No studies have identified population-level effects to raptors associated with turbine collisions (USDI 2004*c*).

Waterfowl and shorebird mortality at wind energy projects has been relatively minor. The potential for waterfowl and shorebird collisions with turbines is primarily dependent upon the availability of suitable habitat for these species within and adjacent to turbine strings. Wind farms situated in proximity to large open water areas, such San Gorgonio, and Buffalo Ridge, have experienced the highest rates of waterfowl and shorebird mortality (comprising 10-20% of all avian fatalities). While large flocks of Canada geese have been observed in proximity to operational wind farms, only one goose fatality has ever been documented (Erickson et al. 2002).

Data indicate bird vulnerability to collisions with turbines is species-specific, habitat-specific, and facility-location-specific (Erickson et al. 2001). In Wyoming, passerines represent the vast majority of turbine-related mortalities while only a single waterfowl mortality event has occurred. This is likely due to the fact that wind farms are typically constructed in upland environments, which limits the presence of waterfowl. Turbines located along a defined ridgeline or rim edge have a greater potential for raptor mortality than do those that are set back from such areas. The spatial arrangement of turbines, tower types (lattice versus tubular), and tower height/rotor diameter (blades rotate closer to the ground on shorter turbines) also influence the potential for avian mortality. Some studies have found that turbines located at the end of a string experience proportionately higher collision rates compared to interior turbines. Conditions that reduce visibility (i.e., fog, clouds, darkness) are believed to contribute to bird collisions with turbines (Johnson et al. 2002). Additionally, it appears that some species cannot detect rotors because of motion smear caused by rapidly rotating blade tips (Stemer 2002; Hodos 2003). FAA-required aviation marker lights may actually contribute to bird fatalities (NWCC 2002). Turbine lighting may attract birds to the wind farm and increase the potential for collision mortality with both the lit and unlit turbines (Johnson et al. 2002). Birds are most sensitive to red light, and appear to be attracted to that color. Blinking red marker lights in poor visibility conditions appear to disorient birds and may simulate stars that birds utilize as navigation cues. Quickly flashing white strobes may to be less attractive to birds (Ugoretz 2001).

Passerines and Grassland Species

General disturbance and behavioral interference associated with O&M activities would be species-specific for passerines and grassland species, which makes it difficult to quantify potential disturbance and behavioral impacts. Certain species will be relatively unaffected by O&M activities, some may be temporarily disturbed, and others may be permanently displaced from habitats immediately adjacent to turbines and access roads. Collectively, these species may be more sensitive to disturbance during breeding and nesting periods. Based upon studies completed to date, it appears reasonable to assume that effects could range from no disturbance/behavioral interference to reduced abundance within 100 meters of turbines. This would represent a worst-case scenario of reduced use on a total of approximately 2,600 acres (13% of the wind farm area) for those passerines and grassland species that are sensitive to wind farm operation. Post-construction avian surveys will be conducted to evaluate changes in distribution and abundance of passerines and grassland species. These surveys will be designed and implemented in coordination with wildlife biologists from the BLM, MFWP, and USFWS.

Based upon average mortality rates of 1.2 to 1.8 birds per turbine per year, annual passerine mortality associated with the Proposed Action at full build out is estimated at 402 to 600 birds (Table 3.7-19). Utilizing a relatively high RSA fatality rate of 108 birds per 100,000 m^2 from Foote Creek Rim, estimated annual passerine mortality associated with the Proposed Action at full build out would be 1,680 birds. The RSA estimate is likely to be significantly higher than actual realized mortality as a result of the wind farm physiography, spatial arrangement of turbines, tower types, and tower size, which will reduce the potential for collision mortality.

Table 3.7-19 Estimated Annual Avian Fatalities in the Wind Farm by Phase[1]

Phase	Number of Turbines	Annual Passerine Fatalities	Annual Raptor Fatalities
I	33	40-59	1
II	63	76-113	2
III	104	125-187	3
IV	134	161-241	4
Total	334	402-600	10

Source: Erickson et al. 2001; Young and Erickson 2003

The wind farm and adjacent lands do not contain any large, distinct ridgelines or rim edges that would represent pathways to direct migratory birds into the wind farm area. Turbine strings are well dispersed across the higher plateaus, and would be generally oriented southwest-northeast to parallel the larger drainages that bisect the wind farm area. This layout and orientation will minimize collision risk by reducing tower densities in individual phases and by avoiding bird movement pathways into and through the drainages. In addition, the wind farm will utilize a tubular turbines rather than lattice towers. Tubular structures do not provide potential perching sites and therefore do not attract passerine species into the RSA. The large, new generation turbines employed at the wind farm would pose a lower risk of avian collisions than smaller turbines due to slower rotor speeds and higher rotor blades (tips are 136 feet above ground level at the

lowest point). Anecdotal evidence indicates that painting rotors can increase visibility and reduce avian collisions. If determined to be beneficial by the involved agencies, rotors could be painted. Depending on FAA requirements, white lights will be installed on turbines to reduce bird attraction. Post-construction avian surveys will be conducted to evaluate mortality rates of passerines and grassland birds. These surveys will be designed and implemented in coordination with wildlife biologists from the BLM, MFWP, and USFWS. Should individual turbines/turbine strings be determined to cause disproportionately high mortality, turbine operation and construction of future phases would be modified to reduce such mortality. Similarly, turbine operation may be modified if monitoring identifies specific periods/seasons with elevated mortality rates. While collision-related mortalities will occur, the expected mortality would not likely have any population-level consequences for individual species (Young and Erickson 2003).

O&M would not result in increased access for the general public. Two existing public roads, Kerr Road and Britsch Road, currently provide access to the wind farm area. These roads may experience increased traffic due to interest in seeing the operational turbines, however, all traffic would be restricted to the existing public roads. While new access roads to individual turbine strings will constructed for each phase, these roads will be gated to preclude public access. No adverse impacts to passerines and grassland species are anticipated as a result of increased in public access.

Raptors

O&M activities are expected to result in some disturbance and/or displacement of raptors. While the most significant affects to raptors would likely be associated with habitat loss due to direct disturbance and turbine presence, the occasional human activities associated with O&M would likely disturb and temporarily displace raptors foraging within the wind farm area. Potential aboveground nesting habitat is extremely limited in the wind farm area, and no direct impacts to nests and/or young raptors are expected. O&M activities are likely to result in a small disturbance effect to raptors in the wind farm area. Raptor nest surveys will be conducted in the wind farm and adjacent areas prior to construction. The location of any active nests will be identified, and turbine location and construction activities modified as necessary to minimize potential adverse impacts to nesting raptors and their young. Pre- and post-construction surveys will be conducted to evaluate changes in relative use of the wind farm and adjacent areas by raptors.

Based upon an average mortality rate of 0.03 per turbine per year raptor mortality associated with the Proposed Action at full build out is expected to be approximately 10 individuals per year (Table 3.7-19). Utilizing the RSA fatality rate of 3 raptors per 100,000 m^2 from Foote Creek Rim, estimated annual raptor mortality associated with the Proposed Action at full build out would be 47 birds. The RSA estimate is likely to be significantly greater than realized mortality based upon data from existing wind farms. The local physiography, turbines spatial arrangement, and tower types reduce potential collision risk. Although the wind farm receives moderate levels of use by foraging raptors, there are no distinct ridgelines or rim edges that concentrate use or direct birds into the area. There are also no concentrated prey sources (i.e., prairie dog towns) within

the wind farm area to attract raptors. Turbine strings would be well dispersed across on the higher plateaus, and their spacing provides ample room for foraging raptors without risk of intersecting the RSA. Tubular turbine structures (rather than lattice) will be utilized, thereby eliminating the creation of potential perching sites in proximity to RSA's. The use of large, new generation turbines employed at the wind farm will reduce for raptor collision risk compared to smaller turbines (Erickson 2002).

Pre-construction raptor surveys will be conducted to evaluate raptor use of the wind farm area and identify areas that receive concentrated use and/or have a high potential for turbine collisions. Turbine layouts will be modified based upon the results of these studies. Post-construction avian surveys will be conducted to monitor raptor mortality. These surveys will be designed and implemented in coordination with wildlife biologists from the BLM, MFWP, and USFWS. Should individual turbines and/or turbine strings cause disproportionately high mortality, turbine operation and construction of future phases would be modified to reduce mortality. Similarly, turbine operation may be modified should monitoring identify specific periods/seasons with elevated mortality rates. While collision-related mortalities will occur, the expected mortality would not likely have any population-level consequences for individual species and represent a moderate adverse impact (Young and Erickson 2003).

O&M should not result either in increased accessibility to the site by the general public or in any adverse impacts to raptors associated with increased public access. All new roads to individual turbine strings will be gated to preclude public access.

Waterfowl

Potential disturbance, displacement, and behavioral effects upon waterfowl associated with project O&M activities are expected to be extremely small. These activities may disturb waterfowl utilizing the small livestock ponds during seasonal migrations. Species nesting on Wards Reservoir may also experience minor disturbance associated with vehicle traffic on Kerr Road. However, such disturbance would be temporary (duration of vehicle passing) and would be minimized or attenuated by the distance of Wards Reservoir from the road.

Waterfowl mortality due to collisions with turbines has only been experienced at a few wind farms that encompass or are adjacent to large open waters. Given the absence of such areas within or adjacent to the wind farm, waterfowl mortality is expected to be extremely low. A small potential risk of collision exists for waterfowl utilizing Wards Reservoir and the small livestock ponds. As Wards Reservoir is approximately 1.2 miles northeast of the nearest turbine, it is unlikely that waterfowl would intersect the RSA on their way to/from the reservoir. Several small livestock ponds occur throughout the wind farm area and may be utilized during seasonal migrations. Although the turbines are not generally located in proximity to these ponds, there is a small likelihood that waterfowl may intersect a RSA on their way to/from a pond.

O&M should not result either in increased accessibility to the site by the general public or in any adverse impacts to waterfowl associated with increased public access. New roads

will be gated and will not provide increased public access to Wards Reservoir or small livestock ponds.

Bats

Construction Impacts

Construction would potentially affect bats through direct mortality, habitat loss and fragmentation, and disturbance and displacement effects. The potential for mortality of adult bats during construction is extremely low given their mobility and the absence of any roosts or hibernacula in the wind farm area. Habitat loss and fragmentation effects are also expected to be small. Given the availability of large tracts of adjacent grassland habitats, the permanent loss of 114 acres of potential foraging habitat would represent a small, permanent adverse impact to bats that forage in the wind farm. No shrub or forested riparian areas will be disturbed, thereby eliminating potential impacts to bats that forage in these habitat types. The presence of turbines may result in some fragmentation effects that reduce potential foraging habitat to a greater extent than is caused by physical disturbance. The actual fragmentation effects would be highly species specific, but could potentially reduce effective habitat for species that are relatively sensitive to the presence of turbines and accessory structures. Given the frequency with which various bat species are observed foraging in proximity to natural (i.e., trees) and man-made structures (i.e., barns, houses, etc.) and their use of echolocation, the presence of towers is not expected to result in any significant fragmentation effects for bats. Construction would not likely result in disturbance and displacement effects since most activities will be conducted during daylight hours when bats are not present in the wind farm area.

Operation and Maintenance Impacts

Potential impacts upon bats associated with O&M of the Proposed Action include general disturbance and behavioral interference, effects associated with increased public accessibility, and mortality resulting from collisions with turbines. General disturbance, behavioral interference, and public access effects are expected to be minimal. Maintenance activities will be conducted during daylight hours when bats are not present, and would not result in disturbance or behavioral interference effects. Noise and movement from operating turbines are not likely to affect bats. There will be no increase in public access into the area.

The primary concern regarding bats at wind farms is fatalities associated with turbine collisions. Some level of bat mortality is expected to occur at wind farms (Erickson et al. 2002). Bat mortality rates have ranged from 0.74 bats per turbine at Vansycle Ridge in Oregon to 3.21 bats per turbine at the Nine Canyon in Washington, and data indicate an annual average of 1-2 fatalities per turbine (Table 3.7-20). Estimated mortality at Buffalo Ridge between 1996 and 1999 was 1.53 bats per turbine per year (Johnson et al. 2003). These data from Buffalo Ridge indicate that observed mortality rates are not sufficient to cause population declines, and no significant difference has been noted in mortality rates at lit and unlit turbines (Johnson et al. 2003). Major mortality trends include 1) the majority of bat mortalities are tree-dwelling vespertilionids, and 2) most mortality involves migrant or dispersing bats rather than resident breeding bats (Johnson and

Strickland 2004; Johnson et al. 2003; Keeley 2001). Hoary bats and silver-haired bats have been the most common species killed at wind farms in western states.

Table 3.7-20. Estimated Bat Fatality Rates at Various Wind Energy Projects

Location	State	Number of Turbines	Annual Fatalities per Turbine	Annual Fatalities per 100,000 m^2 RSA
Buffalo Mountain	TN	3	10.0	NA
Buffalo Ridge	MN	354	2.3	164.0
Buffalo Ridge- Ph. I	MN	73	0.07, 0.26, 2.02	NA
Buffalo Ridge- Ph. II	MN	143	1.78, 2.02	NA
Buffalo Ridge-Ph. III	MN	138	2.04, 2.32	NA
Foote Creek Rim	WY	69	1.04, 1.34	97.0
Klondike	OR	16		33.3
Nine Canyon	WA	37	3.21	106.6
Stateline	OR/ WA	454	0.95	53.3
Vansycle	OR	38	0.74	45.0
Wisconsin	WI	31	1.1	246.4

Utilizing the general average of 1-2 bat fatalities per turbine per year, the Proposed Action would result in a total annual bat mortality of 334-668 individuals (Table 3.7-21). Mortality rates are expected to be somewhat lower than this due to the absence of any hibernacula or roosts within or in the vicinity of the wind farm that would concentrate bat use. While it is unknown whether the wind farm lies within a bat migration corridor, the general site physiography does not lend itself to representing a major corridor nor does it likely funnel or direct bats into the area. Foraging bats would generally not fly within the RSA of the new generation turbines. Studies have shown that bats do not typically forage higher than 25 meters above ground level (Erickson et al. 2002), which would be approximately 16 meters below the bottom of the turbine rotor. Post-construction surveys will be conducted to determine bat mortality rates and identify particular turbines/turbine strings that cause substantial mortality. This information will be utilized to micro-site turbines and reduce the potential for bat strikes. While these measures will reduce the potential for bat mortality, collisions with turbines will likely occur and represents a moderate adverse impact upon bats.

Table 3.7-21. Estimated Annual Bat Fatalities in the Wind Farm by Phase

Phase	Number of Turbines	Estimated Annual Bat Fatalities
I	33	33-66
II	63	63-126
III	104	104-208
IV	134	134-268
Total	334	334-668

Big Game

Construction Impacts

The potential for direct mortality of mule deer or pronghorn a result of construction activities is extremely limited. Adults are extremely mobile and would be able to avoid construction equipment. Newborn fawns are more susceptible to mortality from construction equipment given their instinctive behavior to lie still when danger approaches. In order to mitigate the potential for mortality, all construction areas will be surveyed for mule deer or pronghorn fawns immediately prior to any clearing or grading during the period of highest susceptibility (May 15-June 30).

The effects of habitat loss would be relatively small given the limited area of permanent disturbance (0.5% of the wind farm), the existence of large tracts of similar habitat in the immediate vicinity, and the relatively low densities of mule deer or pronghorn in the wind farm. These species are also relatively tolerant of turbines and accessory structures, and will likely utilize habitats in the vicinity of turbines. Accordingly, the Proposed Action would not result in any habitat fragmentation effects for these species. The southern portion of the wind farm area includes approximately 8,521 acres of mule deer winter range (Table 3.7-22). A total of 115 turbines and associated access roads would be constructed within this winter range, resulting in the permanent disturbance of 34 acres. This amount of disturbance represents 0.4% of winter range within the wind farm area and a much smaller proportion of total available winter range in the vicinity. The direct loss of 34 acres of winter range habitat would represent a small adverse impact to mule deer.

Table 3.7-22. Construction Disturbance of Mule Deer Winter Range in the Wind Farm Area

Phase	Amount of Winter Range	Number of Turbines Located in Winter Range	Temporary Disturbance	Permanent Disturbance
I	464 acres	9	13 acres	1 acres
II	685 acres	15	19 acres	4 acres
III	1,439 acres	7	10 acres	2 acres
IV	5,933 acres	84	129 acres	27 acres
Total	8,521 acres	115	171 acres	34 acres

Construction activities would disturb and displace individual mule deer or pronghorn in the vicinity of the construction areas. These activities would also likely interfere with foraging, breeding, and migration activities depending on the timing and season during which construction occurs. Construction within mule deer winter range could represent a potential significant adverse effect if activities were to occur while deer were occupying the range during winter months. General disturbance and displacement from winter range will be mitigated by a number of factors. Project phasing will minimize these impacts, limiting the duration and spatial extent of disturbance and allowing displaced mule deer and pronghorn to move into undisturbed portions of the wind farm and adjacent habitats. Given the presence of large tracts of similar habitats in the vicinity, displaced individuals would be expected to find adequate suitable habitat. These

individuals would be able to return to the area upon completion of construction. Each phase would not extend over more than a single fawning season, thereby limiting the duration of any disruption of reproductive behaviors. No construction activities will be conducted within mule deer winter range during winter periods. The specific dates will be determined in consultation with MFWP prior to the initiation of construction. As a result of these measures, potential displacement and behavioral effects associated with the Proposed Action would likely be relatively small.

Operation and Maintenance Impacts

Potential impacts associated with O&M of the Proposed Action include general disturbance and behavioral interference, habitat fragmentation, and increased legal and illegal harvest associated with increased public access. Human activity and noise associated with turbine O&M vehicle traffic represent long-term disturbance effects that could potentially displace mule deer and pronghorn. Given the general adaptability of these species, such activities are not likely to substantially interfere with foraging, breeding, and migration activities. While vehicles may cause a temporary disturbance and displacement effect, such an effect would not be significant. Occasional maintenance activities may be required within mule deer winter range during winter months, which could result in the disturbance of deer on winter range. This disturbance would be temporary, and displaced individuals would move to other, undisturbed portions of the winter range. In winter months, the potential disturbance effects associated with maintenance work will be reduced due to location differences; mule deer winter in drainages and turbines are located on upland plateaus. Contractors and maintenance personnel will be instructed to avoid disturbing and harassing wintering animals to the maximum extent practicable. General disturbance and behavioral interference effects associated O&M activities are expected to be relatively small.

The potential habitat fragmentation effects upon big game species are significantly less than for other taxa such as grassland birds. Mule deer and pronghorn are relatively tolerant of turbines and other man-made structures. Therefore, the presence of turbine strings throughout the wind farm will not reduce the capacity of the area as deer and pronghorn habitat. O&M are not anticipated to create any fragmentation effects for big game.

The Proposed Action will increase access for the general public. Two existing public roads, Kerr Road and Britsch Road, currently provide access into the wind farm. These roads may be improved for the project but will not create new access into the area. The roads may experience some increase in general traffic levels due to interest in seeing the operational turbines, however, any increased traffic would be restricted to existing public roadways. New roads constructed for access to individual turbine strings will be gated to preclude public access. The project will not result in increased accessibility into deer winter range. As a result, no increase in public access or associated increases in the legal and illegal harvest of mule deer or pronghorn are anticipated as a result of O&M.

<u>Federally Listed Species</u>

Pallid Sturgeon (Endangered)

No pallid sturgeon habitat occurs in the wind farm area, and no adverse impacts are anticipated for this species.

Interior Least Tern (Endangered)

No interior least tern habitat occurs in the wind farm area, and no adverse impacts are anticipated for this species.

Whooping Crane (Endangered)

No whooping crane foraging or roosting habitats occur in the wind farm area. Although there is an extremely low probability that a transient individual could fly over the area during seasonal migrations, whooping cranes typically fly at 1,000-5,000 feet above the ground during migrations. As a result, there have been extremely few crane mortalities at wind farm sites (USDI 2004*c*). Based upon the low probability of occurrence in the area and the height at which migrant travel, there is a very small potential risk associated with turbine collisions for the whooping crane.

Bald Eagle (Threatened)

Construction Impacts

Bald eagles occurrence in the wind farm area is limited to individuals either flying through during seasonal migrations or foraging on big game winter range during winter months. Construction activities would not result in any direct mortality or habitat loss for the bald eagle. These activities may disturb and displace any eagles in the vicinity, but as construction would be limited during the winter and eagle migration periods, disturbance and displacement effects are expected to be minor. To mitigate construction-related disturbance, construction crews will be instructed to avoid disturbing or harassing bald eagles.

Operation and Maintenance Impacts

Potential impacts upon bald eagles associated with O&M of the Proposed Action include general disturbance and behavioral interference, collisions with turbines, and effects associated with increased public accessibility. The limited presence of bald eagles in the wind farm area reduces the potential for disturbance and behavioral interference effects. There will be no increase in public access into or within the wind farm area. Data from other wind farms indicate a relatively low occurrence of bald eagle mortality due to turbine collisions. While the potential for mortality of individual migrants and foraging eagles would exist, it is difficult to calculate an estimate of annual expected mortality. Post-construction surveys will monitor bald eagle mortality and operation of individual turbines and turbine strings that are determined to cause disproportionate mortality would be modified. As a result, the potential for bald eagle mortality is relatively low.

BLM Sensitive Species

Reptiles and amphibians

Potential adverse impacts to reptile and amphibian species are associated with habitat loss and mortality of individuals inhabiting construction sites. Since turbine and road

construction on the wind farm will be limited to upland habitats, the species that could be adversely affected include the Plains spadefoot, greater short-horned lizard, and the western hognose snake. The limited amount of permanent habitat loss (114 acres) would represent a small adverse effect in light of the availability of similar habitat in the area. Clearing and grading could result in mortality of individuals in underground burrows. While above ground, hognose snakes would be mobile enough to escape. However, greater short-horned lizards and plains spadefoot are relatively slow and would be more susceptible to mortality. As a result of limited disturbance and project phasing, potential mortality of sensitive reptile and amphibian species would represent a small adverse effect.

Fish

No habitat for any of the BLM sensitive fish species occurs in the wind farm area, and no adverse impacts are anticipated for these species.

Mammals

Given the lack of evidence that swift fox currently inhabit the wind farm or adjacent habitats, no adverse impacts are anticipated for this species. Based upon habitat requirements and species distribution information, both bat species listed as sensitive by BLM (long-eared myotis Townsend's big-eared bat) have a relatively low probability of occurrence in the wind farm area. The site physiography does not funnel or direct bats into the area and there are no known hibernacula or roosts in the area. Potential effects are similar to those previously described for all bat species. General disturbance effects would be minimal since maintenance activities will be conducted during daylight hours when bats are not present. Noise and movement from operating turbines are not likely to affect bats. Construction-related effects, including habitat loss and disturbance and displacement, would be minimal. Potential O&M effects include general disturbance and mortality resulting from collisions with turbines.

Limited data precludes any estimates of potential mortality rates for the long-eared myotis and Townsend's big-eared bat associated with turbine collisions. These species are not commonly killed at existing wind farms in western states (Erickson et al. 2002). Bats foraging in the area would generally not fly within the RSA of the new generation turbines. Post-construction surveys will be conducted to determine bat mortality rates and identify particular turbines/turbine strings that cause substantial mortality. This information will be utilized to micro-site turbines and reduce the potential for bat strikes. While these factors reduce the potential for mortality, there exists a very small potential for limited mortality of these bat species.

Raptors

Construction Impacts

Construction impacts upon raptor species identified as sensitive by BLM (ferruginous hawk, golden eagle, and Swainson's hawk) would be similar to those described above for raptors. Construction activities are not expected to cause any direct mortality of sensitive raptors, but would result in the loss of a small amount of foraging habitat and in the

temporary displacement of individuals from portions of the wind farm area. Habitat loss and disturbance/displacement impacts would largely be mitigated by existing large tracts of native grassland habitats within and immediately adjacent to the wind farm. Construction phasing will limit the spatial and temporal extent of construction-related disturbances during any given period. Although nesting habitat within the wind farm is extremely limited for these species, pre-construction nest surveys will be conducted. Construction activities would be limited in the vicinity of active nests until the young have fledged. Given the limited amount of habitat to be permanently disturbed and availability of large tracts of similar habitat in the area, potential habitat loss and displacement associated with the Proposed Action is expected to represent a small adverse impact to these species.

Operation and Maintenance Impacts

O&M activities are expected to result in some disturbance and/or displacement of sensitive raptor species. While the most significant affects would be associated with direct habitat loss, human activities associated with O&M would temporarily disturb and displace raptors foraging within the wind farm area. Potential aboveground nesting habitat is extremely limited in the wind farm area, and no direct impacts to nests and/or young raptors are expected. Pre-construction raptor nest surveys will be conducted in the wind farm and adjacent areas prior to construction. The location of any active nests will be identified and turbine location and construction activities modified as necessary to minimize potential adverse impacts to nesting raptors and their young. Post-construction surveys will be conducted to evaluate changes in relative use of the wind farm and adjacent areas by raptors. These surveys will be designed and implemented in coordination with wildlife biologists from the BLM, MFWP, and USFWS. O&M should not result either in increased accessibility to the site by the general public or in any adverse impacts to raptors associated with increased public access. New roads to individual turbine strings will be gated to prohibit public access.

Some mortality of sensitive raptor species may occur as a result of turbine collisions. The local physiography, turbines spatial arrangement, and tower types reduce potential collision risk. There are no distinct ridgelines, rim edges, or concentrated prey sources (i.e., prairie dog towns) that would lead or attract raptors into the wind farm area. The use of tubular turbine structures will minimize the creation of perch sites. Pre-construction raptor surveys will be conducted to identify areas that receive concentrated use and/or have a high potential for turbine collisions. Turbine layouts will be modified based upon the results of these studies. Post-construction surveys will be designed and implemented in coordination with wildlife biologists from the BLM, MFWP, and USFWS to monitor raptor mortality. Operation of individual turbines and turbine strings determined to cause disproportionate mortality would be modified. Similarly, turbine operation may be modified during specific periods/seasons during which elevated mortality rates are experienced. While collision-related mortalities will occur, they would not likely result in population-level effects upon sensitive raptor species.

Grouse

Construction Impacts

The grouse species listed as sensitive by the BLM include the greater sage-grouse and the sharp-tailed grouse. Potential suitable habitat for greater sage-grouse is extremely limited in the wind farm area, and only occurs along the drainages in the extreme southern end of the area. As a result, impacts to this species resulting from construction, operation, and maintenance of the wind farm would be negligible. Sharp-tailed grouse are known to inhabit the wind farm area. Several leks have been discovered in the vicinity and the species likely nests in the area. Construction could potentially affect sharp-tailed grouse through direct mortality, habitat loss and fragmentation, and disturbance and displacement effects.

The potential for mortality of adult birds during construction is extremely low given their mobility. Mortality risk during construction includes the potential destruction of nests with eggs and newborn young. The amount of nest destruction and mortality of young is a function of the amount of disturbance, timing of construction activities, density of nests in the area. Since construction activities would likely occur during the nesting period, pre-construction sharp-tailed grouse nest surveys will be conducted within all areas designated for temporary or permanent disturbance. Where active nests are discovered, clearing and grading activities will not occur until the young have fledged to minimize mortality risk.

The Proposed Action would permanently disturb 114 acres of potential sharp-tailed grouse habitat, represents 0.5% of the wind farm area and an even smaller proportion of grassland habitat in the vicinity. Direct habitat loss associated with the project would represent a small adverse impact to sharp-tailed grouse. While construction would not cause substantial physical disturbance, the presence of turbine strings and accessory facilities may fragment undisturbed habitat within the wind farm. There have been no studies evaluating the effect of turbines on sharp-tailed grouse habitat use, although anecdotal information suggests that there is some avoidance of tall structures by gallinaceous species (Braun 1998). Accordingly, the presence of turbines throughout the area could potentially reduce effective habitat capacity for sharp-tailed grouse. Pre-construction surveys and post-construction monitoring will be completed to document changes in the distribution and abundance of sharp-tailed grouse within the wind farm, and potential habitat effects associated with turbine presence. Habitat loss and fragmentation would be largely mitigated by construction phasing and the presence of extensive tracts of native grassland habitats in the immediate vicinity, which would limit the spatial and temporal extent of construction-related disturbances during any given period. Given the limited amount of habitat to be permanently disturbed and the availability of similar habitat in the area, potential habitat loss and fragmentation associated with the Proposed Action represents a small adverse impact to sharp-tailed grouse.

Studies have suggested that noise from construction and human activities disturb gallinaceous species, displacing birds from traditional habitats, reducing use of leks, and causing nest abandonment (Young 2003). Noise from construction machinery and increased human activity may temporarily displace individual grouse from the project area for the duration of construction. Phasing of the Proposed Action will allow displaced animals to move into undisturbed portions of the wind farm and adjacent

grasslands. These individuals would be able to return to the area upon completion of construction. As each phase will not extend over more than a single breeding and nesting season, the amount of disturbance at any given time will be limited. Displaced individuals could move to unaffected portions of the wind farm and adjacent grassland habitats outside the wind farm area. Given the presence of large tracts of native grassland habitats in the vicinity, displaced individuals would be expected to find adequate suitable habitat. For each project phase, lek surveys will be conducted in the spring immediately prior to construction. No construction activities will occur within a ½ mile radius of active leks until all lekking activities have concluded. Turbine sites will be moved away from known leks when possible. No construction activities will occur in the vicinity of active nests identified through pre-construction surveys until the brood leaves the area. The potential displacement and behavioral effects associated with the Proposed Action would likely result in a small moderate impact to sharp-tailed grouse.

Operation and Maintenance Impacts

Potential O&M impacts upon sharp-tailed grouse include general disturbance and behavioral interference, collisions with turbines, and effects associated with increased public accessibility. Human activity and noise associated with turbine O&M vehicle traffic represent long-term disturbance effects and could potentially displace grouse within the wind farm. Compared with the construction phase, O&M disturbances would likely be of lower intensity. Spatial and temporal disturbance effects would be limited by construction phasing and the presence of extensive tracts of native grassland habitats in the immediate vicinity. Activities will be restricted in the vicinity of occupied leks and nests during sensitive periods.

Mortality of sharp-tailed grouse due to collisions with turbines has been relatively rare, although a few mortalities have been documented at existing wind farms (Erickson et al. 2002). The limited numbers preclude any annual per turbine mortality estimates of sharp-tailed grouse. Grouse flight characteristics greatly reduce the potential for turbine collisions, with average flight heights of 14 and 23 meters females and males, respectively (Royal BC Museum 2004). As a result, grouse generally do not fly within the RSA and are at limited risk for collision with turbines. Post-construction monitoring will help to evaluate grouse mortality and identify turbines/turbine strings. Operation of individual turbines and turbine strings determined to cause disproportionate mortality would be modified. Similarly, turbine operation may be modified during specific periods/seasons during which elevated mortality rates are experienced. While the Proposed Action could potentially result in some collision mortality, the risk is extremely low. In addition, the use of tubular turbine structures would avoid the creation of potential raptor perches that could result in increased sharp-tailed grouse mortality due to predation.

Grassland Birds

Construction Impacts

A total of 10 grassland birds species listed as BLM sensitive occupy the wind farm area. Four of these species, the long-billed curlew, marbled godwit, willet, and Wilson's phalarope, utilize wetlands and adjacent grassland habitats that are extremely rare within

the wind farm area. Given the limited availability of suitable habitat and the placement of turbines and associated facilities on upland plateaus, the potential for disturbance and mortality effects associated with construction, operation, and maintenance of the wind farm is extremely small.

Potential construction, operation, and maintenance impacts upon the other six sensitive grassland species (loggerhead shrike, chestnut-collared longspur, McCown's longspur, Baird's sparrow, Brewer's sparrow, Sprague's pipit) would be similar to those described for grassland birds above. The relatively small amount of habitat disturbance, and the spatial and temporal distribution of construction across 4 phases will minimize habitat loss, disturbance, displacement, and nest and egg destruction. Construction of each phase will not last longer than one nesting season, thereby minimizing the duration of potential effects. In order to minimize egg destruction, pre-construction surveys will be completed prior to any clearing and grading to ensure that active nests are avoided.

Operation and Maintenance Impacts

General disturbance and behavioral interference associated with O&M activities would be species-specific. A worst-case scenario indicates reduced use on approximately 2,600 acres (13% of the wind farm area) for species that are sensitive to turbines. Pre- and post-construction avian surveys will be conducted to evaluate changes in distribution and abundance of passerines and grassland species. These surveys will be designed and implemented in coordination with wildlife biologists from the BLM, MFWP, and USFWS. Some mortality of these species is likely based upon data from existing wind farms, although it is difficult to estimate expected mortality rates. The use of tubular rather than lattice structures will prevent the creation of perches within the wind farm. The new generation turbines pose a lower risk of avian collisions than smaller turbines due to slower rotor speeds and higher rotor blades. Rotors could be painted white lights utilized to meet FAA requirements and reduce bird attraction. Post-construction avian surveys will be conducted to evaluate mortality rates to grassland birds. These surveys will be designed and implemented in coordination with wildlife biologists from the BLM, MFWP, and USFWS. Should individual turbines/turbine strings be determined to be causing disproportionate mortality, turbine operation and construction of future phases would e modified to reduce and minimize such mortality. Similarly, turbine operation may be modified should monitoring identify specific periods/seasons of elevated mortality rates. While collision-related mortalities will occur, the expected mortality would not likely have any population-level consequences for individual species (Young and Erickson 2003).

Alternative A (Phases I and II)

Vegetation

As with the Proposed Action, Alternative A includes a number of construction- and O&M-related activities that may adversely impact vegetation (Table 3.7-16). The impacts to vegetation would be less, as Alternative A contains fewer acres than the Proposed Action. Direct injury to and/or loss of vegetation would result from the same construction and O&M activities described in the Proposed Action. Construction of the

turbines, access roads, and accessory facilities associated with Alternative A would result in the permanent loss of native mixed-grass prairie on approximately 29.9 acres and approximately 2 acres of snowberry shrubs and the temporary disturbance of mixed-grass prairie on approximately 129.2 acres (Table 3.7-17). This represents permanent and temporary disturbance of 0.8% and 3.3% of Alternative A's total area, respectively. Mitigation measures would be the same as discussed for the Proposed Action.

The potential impacts to vegetation from fugitive dust generation, exposure to contaminants, and increased access would be the same as discussed for the Proposed Action.

The potential for project construction and O&M activities to introduce noxious weeds and invasive species is similar to the Proposed Action. Leafy spurge, a noxious weed, is known to occur in the northern and central portions of Phase I and also in the adjacent BCWSA. Mitigation measures to prevent the introduction and spread of leafy spurge, other noxious weeds, and invasive species were discussed for the Proposed Action.

Construction activities could affect threatened, endangered, and sensitive species in the same manner as was previously discussed. Currently, no rare or sensitive plant species are known to occur in Alternative A.

Wildlife

Potential adverse impacts to wildlife associated with Alternative A would generally be of lesser magnitude compared to the Proposed Action. This Alternative would result in the temporary disturbance of 129 acres of grassland and the permanent loss of 30 acres of grassland and 1.6 acres of snowberry shrub (Table 3.7-17). This represents 73% less temporary and 71% less permanent loss of grassland habitat compared to the Proposed Action, and would result in reduced construction-relation effects upon wildlife. Alternative A would involve construction of 96 turbines in the western portion of the wind farm. This represents 30% of the turbines included in the Proposed Action, and would reduce operational and maintenance effects including habitat fragmentation, disturbance and displacement, and mortality resulting from collisions with turbines. All mitigation measures identified in the Assessment Methodology and under the Proposed Action would be implemented for Alternative A to minimize adverse effects to wildlife.

Birds

Direct mortality, habitat loss and fragmentation, and disturbance and displacement effects would be somewhat reduced compared to the Proposed Action for passerines and grassland species, raptors, and waterfowl. The reduced amount of temporary and permanent habitat loss would result in reduced potential adverse impacts associated with destruction of nests, eggs, and newborn young, habitat loss, fragmentation of undisturbed habitats in the wind farm area, and disturbance and displacement effects. General disturbance and behavioral interference associated with O&M would also be reduced as a result of fewer phases and the concentration of turbines in the western portion of the wind farm. Assuming a worst-case scenario of reduced abundance within 100 meters of

operational turbines, Alternative A would result in reduced use on a total of approximately 770 acres (4% of the wind farm area).

The potential for avian collisions with turbines would also be reduced in this alternative (Table 3.7-19), with annual estimated passerine mortality of 116 to 172 birds. Utilizing the relatively high RSA fatality rate of 108 birds per 100,000 m^2 from Foote Creek Rim, results in estimated annual passerine mortality of 483 birds. Based upon an average mortality rate of 0.03 individuals per turbine per year, annual raptor mortality would be 3 birds. Utilizing the Foote Creek Rim RSA fatality rate of 3 raptors per 100,000 results in estimated annual mortality of 13 birds. Collision-related mortalities under this alternative would not likely have population-level consequences for individual species. Impacts to waterfowl, including collision mortality, are expected to be negligible.

Bats

Direct mortality, habitat loss and fragmentation, and disturbance and displacement effects would be somewhat reduced compared to the Proposed Action. The reduced amount of temporary and permanent habitat loss would result in reduced potential adverse impacts associated with loss of foraging habitat, fragmentation of undisturbed habitats in the wind farm area, and disturbance and displacement effects. General disturbance and behavioral interference associated with O&M would also be reduced as a result of fewer phases and the concentration of turbines in the western portion of the wind farm.

The potential for bat collisions with turbines would also be reduced in this alternative (Table 3.7-21). Based upon an estimated average mortality rate of 1-2 individuals per turbine per year, annual bat mortality would be 96 to 192 individuals. The absence of any bat hibernacula, roosts, or major migration corridors and the flight heights of foraging bats below rotor height reduce the potential for adverse impact upon bats associated with this alternative.

Big Game

Potential fawn mortality and habitat loss effects for mule deer or pronghorn would be reduced under this Alternative. General disturbance and displacement effects would be reduced during construction, operation, and maintenance. A total of 24 turbines and associated access roads would be constructed within mule deer winter range, resulting in the temporary disturbance of 32 acres and permanent loss of 5 acres (Table 3.7-22). This represents the permanent loss of 0.06% of winter range within the wind farm area, and a much smaller proportion of total available winter range. The siting of turbines in the western portion of the wind farm reduces the potential for habitat fragmentation effects upon big game species. No increase in public access or associated increases in the legal and illegal harvest of mule deer or pronghorn are anticipated under this alternative. Potential adverse impacts to these species would be low.

Federally Listed Species

Pallid Sturgeon

No pallid sturgeon habitat occurs in Phases I and II, and no adverse impacts are anticipated for this species.

Interior Least Tern

No interior least tern habitat occurs in Phases I and II, and no adverse impacts are anticipated for this species.

Whooping Crane

No whooping crane foraging or roosting habitats occur in Phases I and II. Potential risk of mortality associated with turbine collisions is reduced under this alternative due to the construction of fewer turbines. Potential adverse impacts to this species would be low.

Bald Eagle

Potential disturbance and displacement effects and the potential risk of mortality associated with turbine collisions are reduced under this alternative due to the construction of fewer turbines. As a result of limited presence of bald eagles in the wind farm area and the presence of fewer turbines, potential adverse impacts to this species would be low.

BLM Sensitive Species

Reptiles and amphibians

Potential mortality and habitat loss effects for sensitive reptile and amphibian species would be reduced under this Alternative. General disturbance and displacement effects would be reduced during construction, operation, and maintenance. Since turbine and road construction would be limited to upland habitats, the species that could be adversely affected include the Plains spadefoot, greater short-horned lizard, and the western hognose snake. The lesser amount of temporary and permanent habitat loss under this Alternative would reduce potential construction-related mortality. As a result of limited disturbance and project phasing, potential adverse impacts to this species would be low.

Fish

No habitat for any of the sensitive fish species occurs in Phases I and II, and no adverse impacts are anticipated for these species.

Mammals

No adverse impacts are anticipated for the swift fox. Potential adverse effects to sensitive bat species would be lessened in proportion to reduced amount of habitat loss and fewer turbines. Limited data precludes any mortality estimates for these species, but overall bat mortality would be significantly reduced. The limited potential for occurrence

and absence of roosts or hibernacula in Phases I and II further reduce potential impacts to sensitive bat species.

Raptors

Potential adverse effects to sensitive raptor species would be proportionately less as a result of reduced habitat loss and fewer turbines. Limited data precludes any mortality estimates for these particular species, but overall raptor mortality would be significantly reduced. The limited nesting habitat and absence of concentrated prey sources in Phases I and II further reduce potential impacts to sensitive raptors.

Sharp-Tailed Grouse

Direct mortality, habitat loss and fragmentation, and disturbance and displacement effects would be somewhat reduced compared to the Proposed Action. The reduced amount of temporary and permanent habitat loss would result in reduced potential adverse impacts associated with destruction of nests, eggs, and newborn young, habitat loss, fragmentation of undisturbed habitats, and disturbance and displacement effects. General disturbance and behavioral interference associated with O&M would also be reduced as a result of fewer phases and the concentration of turbines in the western portion of the wind farm. The potential for collisions with turbines, which was relatively low for the Proposed Action, would be further lessened in this alternative. Collision-related mortalities under this alternative would not likely have population-level consequences for individual species. Potential for disturbance of leks and displacement of nesting birds would be proportionately reduced as well. Alternative 2 would likely result in a small impact to sharp-tailed grouse.

Grassland Birds

Potential adverse effects to sensitive upland prairie species would be proportionately less as a result of reduced habitat loss and fewer turbines. The reduced amount of temporary and permanent habitat loss would lessen potential adverse impacts associated with destruction of nests, eggs, and newborn young, habitat loss, fragmentation of undisturbed habitats in the wind farm area, and disturbance and displacement effects. General disturbance and behavioral interference associated with O&M activities would also be reduced as a result of fewer phases and the concentration of turbines in the western portion of the wind farm. The potential for avian collisions with turbines would also be reduced in this alternative, and would not likely have population-level consequences for individual species. Alternative 2 would likely result in a small impact to sensitive grassland bird species.

Alternative B (Phases I, II, & III)

Vegetation

Similar to the Proposed Action, Alternative B includes construction- and O&M-related activities that may adversely impact vegetation (Table 3.7-16). As Alternative B contains fewer acres than the Proposed Action, correspondingly the impacts to vegetation would be less.

Direct injury to and/or loss of vegetation would result from various construction and O&M activities. Construction of the turbines, access roads, and accessory facilities associated with Alternative B would permanently remove approximately 58.7 acres of native mixed-grass prairie and approximately 1.6 acres of riparian shrub (snowberry) communities and temporarily disturb approximately 269.5 acres of mixed-grass prairie (Table 3.7-17). This represents permanent and temporary disturbance of 0.6% and 2.9% of Alternative B's total area, respectively. Mitigation measures are the same as discussed for the Proposed Action.

The potential impacts to vegetation from fugitive dust generation, exposure to contaminants and increased access are the same as those described for the Proposed Action.

The potential for project construction and O&M activities to introduce noxious weeds and invasive species is similar to the Proposed Action. Leafy spurge is present in the southwest corner of Phase IV and is widely distributed in the adjacent BCWSA. Mitigation measures to prevent the introduction and spread of noxious/invasive species were discussed in the Proposed Action.

Construction activities could affect threatened, endangered, and sensitive species in the same manner as was previously discussed for the Proposed Action. Currently, no rare or sensitive plant species are known to occur in the Alternative B.

Wildlife

Alternative B is comprised of Phases I, II, and II, and involves the construction of 200 turbines (60% of the turbines associated with the Proposed Action) in the western portion of the wind farm. Potential adverse impacts to wildlife associated with this alternative would generally be lesser than the Proposed Action and greater than Alternative A. This Alternative would result in the temporary disturbance of 270 acres of grassland and the permanent loss of 60 acres of grassland and 2 acres of snowberry shrub (Table 3.7-17). This represents 43% less temporary and 42% less permanent loss of grassland habitat compared to the Proposed Action. Construction, operation, and maintenance effects upon wildlife, including habitat fragmentation, disturbance, displacement, and mortality resulting from collisions with turbines, would, in general, be reduced proportionately in comparison to the Proposed Action. All mitigation measures identified in the Assessment Methodology and under the Proposed Action would be implemented for Alternative B to minimize adverse effects to wildlife.

Birds

Direct mortality, habitat loss and fragmentation, and disturbance and displacement effects would be somewhat reduced compared to the Proposed Action for passerines and grassland species, raptors, and waterfowl. The reduced amount of temporary and permanent habitat loss would result in reduced potential adverse impacts associated with destruction of nests, eggs, and newborn young, habitat loss, fragmentation of undisturbed habitats in the wind farm area, and disturbance and displacement effects. General

disturbance and behavioral interference associated with O&M would also be reduced as a result of fewer phases and the concentration of turbines in the western and central portion of the wind farm. Assuming a worst-case scenario of reduced abundance within 100 meters of operational turbines, Alternative B would result in reduced use on a total of approximately 1,557 acres (8% of the wind farm area).

The potential for avian collisions with turbines would also be reduced in this alternative (Table 3.7-19). Based upon an estimated average mortality rate of 1.2 to 1.8 individuals per turbine per year, annual passerine mortality would be 241 to 359 birds. Utilizing the relatively high RSA fatality rate of 108 birds per 100,000 m^2 from Foote Creek Rim results in estimated annual passerine mortality of 1,006 birds. Based upon an average mortality rate of 0.03 individuals per turbine per year, annual raptor mortality would be 6 birds. Utilizing the Foote Creek Rim RSA fatality rate of 3 raptors per 100,000, results in estimated annual mortality of 28 birds. Collision-related mortalities under this alternative would not likely have population-level consequences for individual species. Impacts to waterfowl, including collision mortality, are expected to be negligible.

Bats

Direct mortality, habitat loss and fragmentation, and disturbance and displacement effects would be somewhat reduced compared to the Proposed Action. The reduced amount of temporary and permanent habitat loss would result in reduced potential adverse impacts associated with loss of foraging habitat, fragmentation of undisturbed habitats in the wind farm area, and disturbance and displacement effects. General disturbance and behavioral interference associated with O&M would also be reduced as a result of fewer phases and the concentration of turbines in the western portion of the wind farm.

The potential for bat collisions with turbines would also be reduced in this alternative (Table 3.7-21). Based upon an estimated average mortality rate of 1-2 individuals per turbine per year, annual bat mortality would be 200 to 400 individuals. The absence of any bat hibernacula, roosts, or major migration corridors and the flight heights of foraging bats below rotor height reduce the potential for adverse impact upon bats ass

Big Game

Potential fawn mortality and habitat loss effects for mule deer or pronghorn would be reduced under this Alternative. General disturbance and displacement effects would be reduced during construction, operation, and maintenance. A total of 31 turbines and associated access roads would be constructed within mule deer winter range, resulting in the temporary disturbance of 42 acres and permanent loss of 7 acres (Table 3.7-22). This represents the permanent loss of 0.08% of winter range within the wind farm area, and a much smaller proportion of total available winter range. The siting of turbines in the western and central portion of the wind farm would reduce the potential for habitat fragmentation effects upon big game species. No increase in public access or associated increases in the legal and illegal harvest of mule deer or pronghorn are anticipated under this alternative. Potential adverse impacts to these species would be low.

Federally Listed Species

Pallid Sturgeon
No pallid sturgeon habitat occurs in Phases I, II, and III, and no adverse impacts are anticipated for this species.

Interior Least Tern
No interior least tern habitat occurs in Phases I, II, and III, and no adverse impacts are anticipated for this species.

Whooping Crane
No whooping crane foraging or roosting habitats occur in Phases I, II, and III. Potential risk of mortality associated with turbine collisions is reduced under this alternative due to the construction of fewer turbines. Potential adverse impacts to this species would be low.

Bald Eagle
Potential disturbance and displacement effects and the potential risk of mortality associated with turbine collisions are reduced under this alternative due to the construction of fewer turbines. As a result of limited presence of bald eagles in the wind farm area and the presence of fewer turbines, potential adverse impacts to this species would be low.

BLM Sensitive Species

Reptiles and amphibians
Potential mortality and habitat loss effects for sensitive reptile and amphibian species would be reduced under this Alternative. General disturbance and displacement effects would be reduced during construction, operation, and maintenance. Since turbine and road construction would be limited to upland habitats, the species that could be adversely affected include the Plains spadefoot, greater short-horned lizard, and the western hognose snake. The lesser amount of temporary and permanent habitat loss under this Alternative would reduce potential construction-related mortality. As a result of limited disturbance and project phasing, potential adverse impacts to this species would be low.

Fish
No habitat for any of the sensitive fish species occurs in Phases I, II, and III, and no adverse impacts are anticipated for these species.

Mammals
No adverse impacts are anticipated for the swift fox. Potential adverse effects to sensitive bat species would be lessened in proportion to the reduced amount of habitat loss and fewer turbines. Limited data precludes any mortality estimates for these species, but overall bat mortality would be significantly reduced. The limited potential for occurrence and absence of roosts or hibernacula in Phases Phases I, II, and III further reduce potential impacts to sensitive bat species.

Raptors

Potential adverse effects to sensitive raptor species would be proportionately less as a result of reduced habitat loss and fewer turbines. Limited data precludes any mortality estimates for these particular species, but overall raptor mortality would be significantly reduced. The limited nesting habitat and absence of concentrated prey sources in Phases I, II, and III further reduce potential impacts to sensitive raptors.

Sharp-Tailed Grouse
Direct mortality, habitat loss and fragmentation, and disturbance and displacement effects would be somewhat reduced compared to the Proposed Action. The reduced amount of temporary and permanent habitat loss would result in reduced potential adverse impacts associated with destruction of nests, eggs, and newborn young, habitat loss, fragmentation of undisturbed habitats, and disturbance and displacement effects. General disturbance and behavioral interference associated with O&M would also be reduced as a result of fewer phases and the concentration of turbines in the western and central portion of the wind farm. The potential for collisions with turbines, which was relatively low for the Proposed Action, would be further lessened in this alternative. Collision-related mortalities under this alternative would not likely have population-level consequences for individual species. Potential for disturbance of leks and displacement of nesting birds would be proportionately reduced as well. Alternative B would likely result in a small impact to sharp-tailed grouse.

Grassland Birds
Potential adverse effects to sensitive upland prairie species would be proportionately less as a result of reduced habitat loss and fewer turbines. The reduced amount of temporary and permanent habitat loss would lessen potential adverse impacts associated with destruction of nests, eggs, and newborn young, habitat loss, fragmentation of undisturbed habitats in the wind farm area, and disturbance and displacement effects. General disturbance and behavioral interference associated with O&M would also be reduced as a result of fewer phases and the concentration of turbines in the western and central portion of the wind farm. The potential for avian collisions with turbines would also be reduced in this alternative, and would not likely have population-level consequences for individual species. Alternative B would likely result in a small impact to sensitive grassland bird species.

Decommissioning

Impacts to biological resources from decommissioning activities would be similar in nature to the impacts that are associated with construction, but effects would likely be at a reduced magnitude. Primary effects include temporary increases in noise and disturbance associated with the removal of wind energy project facilities and site restoration. No loss of vegetation or wildlife habitat would be expected, and injury and mortality rates would be much lower than would occur during construction. Removal of turbines, meteorological towers, and overhead transmission components would eliminate avian and bat collision mortality. Restoration and revegetation of disturbed areas would facilitate the return to pre-project conditions.

3.7.2.3 230kV Transmission Line

Alternative A

Vegetation

A number of construction- and O&M-related activities could adversely impact vegetation in the corridor for Alternative A. These activities include the clearing and grading of vegetated areas in preparation of transmission line construction; clearing and grading of access roads; construction of transmission line towers; and refueling of construction equipment. During construction and O&M of Alternative A, vegetation may be adversely affected by injury or mortality, generation of fugitive dust, exposure to contaminants, introduction of noxious weeds and invasive species, increased public access, and fire (Table 3.7-16). Selectively committed mitigation measures utilized to minimize potential impacts were described in Mitigation Measures presented above.

Clearing, grading, and construction activities would result in the direct injury to and/or loss of vegetation, thereby altering the plant communities in the disturbed areas of this Alternative. Impacts to vegetation in staging areas for construction equipment, structure work areas, reel and pole storage yards, and pulling and tensioning sites would be temporarily disturbed. Impacts from trampling, crushing, or removal of vegetation could result in permanent vegetation loss at the staging areas and access road locations. Vegetation in the direct construction footprint of transmission line structures would be permanently removed. Construction of Alternative A would result in the permanent loss of native vegetation on approximately 89.7 acres (Table 3.7-23). Temporary disturbances associated with laydown areas are anticipated, however precise locations have not been selected (Table 3.7-23). The impacts to vegetation would be alleviated by leaving vegetation in place wherever possible and reseeding areas with substantial ground disturbance.

Table 3.7-23. Acres of Vegetation Loss Associated with the Transmission Line Alternatives

Vegetation Community	Alternative				
Permanent Disturbance	A	B	C	D	E
Mixed-Grass Prairie	83.6	50.0	53.3	20.0	46.8
Riparian – Cottonwood	0.4	0.0	0.0	0.6	0.5
Riparian – Shrub/Herbaceous	4.9	3.3	4.1	1.5	3.5
Upland Shrub	0.7	0.7	0.7	0	0.1
Sagebrush Steppe	0.1	0.1	0.4	27.2	13.0
Badlands	0	0	0	0.4	0
Total	89.7	54.1	58.5	49.7	63.9
Total Temporary Disturbance	113.3	99.6	100.1	100.6	85.5

Fugitive dust generated during clearing, grading, and travel on roadways may impact vegetation. For example, dust could have an effect on vegetation by coating plant leaves with particulate matter. This potential impact would be greatest during construction of Alternative A. However, fugitive dust generation during construction would be short-term and localized to the immediate area of the transmission line. Potential impacts to

onsite vegetation would be negligible through the implementation of appropriate dust control measures to minimize fugitive dust emissions from construction-related traffic and additional wind-blown dust as a result of ground disturbance (see Section 3.15).

During construction and O&M activities, vegetation communities may be subject to exposure to contaminants. Construction equipment would need to be refueled and very small quantities of hazardous materials (such as waste paints and degreasing agents) may be generated (see Section 3.13). Accidental fuel spills (gasoline, diesel), pesticides, or releases of hazardous materials could result in the exposure of vegetation at the project site, and reestablishment of the vegetation may be impacted or delayed because of residual soil contamination. Because of the relatively small amount of fuel and pesticides expected to be used, any accidental releases would be small and affect vegetation primarily at the release site. See Section 3.13 for a discussion of hazardous materials and waste management impacts and pertinent mitigation measures.

Transmission line construction and O&M activities could introduce noxious weeds and invasive species to the area that, in turn, could alter the vigor of existing vegetation communities. Clearing associated with new roads often provides routes for the migration of noxious weeds and invasive species into areas that were previously devoid of noxious/invasive vegetation. Seeds may become stuck in tire treads, in soil, or mud on vehicles or other equipment and be transported to new, potentially suitable habitats. The severity of noxious/invasive species advancement would depend upon a variety of factors, including the health and vigor of the existing vegetation; the timing and duration of clearing, reseeding, and replanting of cleared areas; and the noxious/invasive species present in the vicinity. However, the establishment of noxious/invasive vegetation may be limited by early detection and subsequent eradication of the plants. In compliance with the Montana County Noxious Weed Control Act (MCA §7-22-2101 to 2153) and Executive Order 13112 (USFR 1999), a noxious weed and invasive species control plan will be developed prior to construction to prevent the introduction and spread of noxious weeds and invasive species in Alternative A. Currently, no noxious weeds are known to occur in the vicinity of the Alternative A corridor, however surveys have not been conducted. Control measures include cleaning construction vehicles of all possible weed seeds; quickly revegetating disturbed areas; reclaiming areas with weed-free native grasses, forbs, and shrubs; using certified weed-free mulch; and monitoring access roads for noxious weed and invasive species establishment.

The construction of new roads may increase access to adjacent lands that previously had limited access. Impacts to vegetation could occur from increased use, unauthorized off-highway vehicle (OHV) use and illegal dumping. Human activities, especially from OHV use and hiking into previously less accessible areas may act to disperse seeds of invasive vegetation. Visitors may carry seeds on their clothing and equipment and motorized vehicles may carry seeds on tires and in vehicle mud. Increased human activity also increases the potential for fires. Wildland fires could be ignited by contact with hot engine parts during OHV use and careless cigarette use. The potential for wildland fires would be expected to be greatest in summer and autumn, when native grasses have died back and fuel loads are at their greatest. To limit new or improved

access into the area, all new access roads which are undesired or not required will be closed.

Transmission line construction, O&M activities have the potential to ignite wildfires if precautions are not taken. Because it is not clear if wildfires would have a positive or negative effect on vegetation in the area, the most prudent course of action will be to implement measures to maintain current fire frequency patterns. Prior to construction, a comprehensive fire control plan will be developed to take into consideration the semi-arid climate and will address seasonal fire risks. See Section 3.13, Health and Safety for a detailed description of mitigation measures to minimize or prevent the risk of fire during the construction and O&M. Implementation of these measures would protect vegetation during the construction, O&M of the transmission line Alternative.

Alternative A crosses a riparian area with herbaceous vegetation and shrubs and 2 riparian cottonwood forest communities. Construction of Alternative A would result in permanent loss of riparian vegetation on approximately 5.2 acres. In addition to mitigation measures mentioned above, structures in riparian areas will be placed to avoid sensitive features and/or to allow conductors to clearly span the features, within the limits of tower design. If sensitive features cannot be avoided, towers will be placed so as to minimize the disturbance.

No federally listed endangered or threatened plant species are known to occur, however, this does not mean that none exist, as surveys have not been conducted. Chaffweed, a BLM Watch Species, has been identified recently north of Dry Fork Creek. This location is several miles to the northeast of this alternative, therefore transmission line construction and O&M activities are not expected to impact this population. Approximately 10 miles of this Alternative may potentially cross through an extensive tract of northern porcupine grass-thickspike wheatgrass, a community that is considered important by the MNHP. The loss of northern porcupine grass-thickspike wheatgrass would be long-term within the construction footprint for the transmission line structure and access roads. Poison suckleya, a Montana Species of Concern, was documented in the Milk River Valley near Glasgow in 1900. The potential impacts to rare, sensitive, unique plants/communities would be alleviated or avoided by leaving vegetation in place wherever possible and reseeding areas with substantial ground disturbance. In addition, pre-construction pedestrian surveys for sensitive plant species/unique plant communities will be conducted to inventory and evaluate these resources within all areas to be temporarily or permanently disturbed. All supervisory construction personnel will be instructed on the protection of rare or sensitive plants and the boundaries of rare or sensitive plant populations will be clearly delineated with flagging or fencing.

Wildlife

Residual impact levels associated with Alternative A are identified in Table 3.7-24. These residual impacts were determined utilizing the Assessment Methodology outlined in Section 3.7.2.1. Except for the agricultural fields (Link 1 MP 0.0-0.7 and Link 3 MP 0.0-0.6), the northern segment of Alternative A from Link 1 MP 0.6 to Link 5 MP 10.1 had a high initial impact level as a result of the corridor crossing undisturbed native prairie, habitat for sensitive obligate grassland birds, the Buggy Creek riparian zone,

mule deer winter range, and potential sharp-tailed grouse habitat. The implementation of the mitigation measures described in Section 3.7.2.1 would reduce the residual impact level to moderate. Remaining impacts would include disturbance, increased predation upon grassland birds and grouse, and loss and fragmentation of native grasslands that provide habitat for a number of sensitive bird species.

Table 3.7-24. Residual Impacts Levels for Wildlife Resources Along the Transmission Line Alternatives[1]

Alternative	**Alternative**				
Impact Level	A	B	C	D	E
High	0.6	0.2	0.2	0.4	0.7
Moderate	14.1	14.8	9.8	8.5	23.1
Low	14.9	9.8	16.2	22.7	3.0
No Identifiable	10.9	12.3	8.6	5.5	6.3

[1] Linear miles based upon analysis of 0.10 mile increments

Initial impact levels for the section of Link 5 between MP 10.1 and MP 23.9 are moderate. This segment crosses a mixture of grassland and agricultural fields, is immediately adjacent to an existing transmission line, and parallels Highway 24. The implementation of mitigation measures described in Section 3.7.2.1 would reduce the residual impact level to low. Moderate residual impacts remain where the alternative crosses over Glasgow Base Pond due to the potential for waterfowl collisions with the line and towers.

The residual impact level for the remaining segment of Alternative A from Link 5 MP 23.9 to the Antelope Creek substation is low/NI since this portion of the corridor passes through a checkerboard of small patches of grassland within an agricultural landscape, and parallels Billingsley Road and associated transmission lines. The crossings of mature cottonwood riparian habitats along Cherry Creek (Link 5 MP 23.9 and MP 24.1) and the Milk River (Link 24 MP 0.7-0.8) have a high initial and residual impact levels due to the loss of rare forested habitat and the potential to disturb wintering bald eagles.

Potential adverse impacts to mule deer winter range, greater sage- and sharp-tailed grouse, and special status species are, for the most part, directly associated with the length of transmission line and amount of disturbance within mule deer winter range, and habitats for sage-grouse, sharp-tailed grouse, and special status species. This alternative will not adversely affect any aquatic wildlife species. As indicated in Table 3.7-15, Alternative A traverses a large amount of sharp-tailed grouse habitat and relatively little sage-grouse habitat. Table 3.7-24 indicates that this alternative would result in the permanent disturbance of 8.16 acres of mule deer winter range. This alternative also crosses through potential habitat for a number of special status species (Table 3.7-14).

The implementation of the mitigation measures described in Section 3.7.2.1, including completion of pre-construction surveys and a comprehensive wildlife study, would minimize the potential adverse effects upon special status species.

Table 3.7-24. Permanent Disturbance of Mule Deer Winter Range Associated with the Transmission Line Alternatives

	Alternative				
	A	B	C	D	E
Acres of Disturbance	8.16	8.16	16.42	4.55	20.92

Alternative B

Vegetation

As with Alternative A, this Alternative includes a number of construction- and O&M-related activities could adversely impact vegetation (Table 3.7-16). Selectively committed mitigation measures utilized to minimize potential impacts were described in Mitigation Measures presented above.

Direct injury to and/or loss of vegetation would result from various construction and O&M activities. Vegetation in the direct construction footprint of the transmission line structures would be permanently removed. Table 3.7-23 summarizes permanent vegetation community impacts associated with each alternative. Construction of Alternative B would result in permanent loss of native vegetation on approximately 54 acres. Mitigation measures are the same as those discussed for Alternative A.

The potential impacts to vegetation from fugitive dust generation, exposure to contaminants, and increased access would be the same as discussed for Alternative A.

The potential for transmission line construction and O&M activities to introduce noxious weeds and invasive species is similar to those described for Alternative A. No noxious weeds are known to occur in this corridor, although surveys have not been conducted.

Alternative B crosses 2 riparian communities with herbaceous vegetation and shrubs and one riparian cottonwood forest community. Construction of Alternative B would result in permanent loss of riparian vegetation on approximately 3.3 acres. Mitigation measures are the same as discussed for Alternative A.

No federally listed endangered or threatened plant species are known to occur, however, this does not mean that none exist, as surveys have not been conducted. Poison suckleya, a Montana Species of Concern, was documented in the Milk River Valley near Glasgow in 1900. The potential impacts to rare and sensitive plants are the same as those discussed for Alternative A.

Wildlife

Residual impact levels associated with Alternative B are identified in Table 3.7-24. Residual impacts from Link 1 MP 0.0 to Link 3 MP 1.0 were low/NI due to the presence

of agricultural fields. Residual impacts for the 18.4 miles between Link 3 MP 1.0 and Link 10 MP 10.4 were moderate due to impacts associated with crossing native prairie habitat, the Buggy Creek riparian zone, mule deer winter range, and potential sharp-tailed grouse habitat. Where the corridor follows Cornwell Road, residual impacts were low because of prior disturbance and existing public access. Residual impact levels for the section from Link 10 MP 10.4 to the Milk River crossing (Link 24 MP 0.1) are low/NI due to the use of an existing roadway (Jensen Trail) and the large proportion of active cropland crossed. The crossing of mature cottonwood riparian habitat along the Milk River (Link 24 MP 0.7-0.8) has high initial and residual impact levels due to the loss of rare forested habitat and the potential to disturb bald eagles. The residual impact level for the remaining segment of Alternative A from the Milk River to the Antelope Creek substation is low/NI since this portion of the corridor passes through a checkerboard of small patches of grassland within an agricultural landscape, and parallels Billingsley Road and associated transmission lines.

As indicated in Table 3.7-15, Alternative B utilizes a large amount of existing roads and traverses moderate amounts of sharp-tailed grouse and sage-grouse habitat. Table 3.7-24 indicates that this alternative would result in the permanent disturbance of 8.16 acres of mule deer winter range. This alternative also crosses through potential habitat for a number of special status species (Table 3.7-14). The implementation of the mitigation measures described in Section 3.7.2.1, including completion of pre-construction surveys and a comprehensive wildlife study, would minimize the potential adverse effects upon special status species.

Alternative C – Proposed Action

Vegetation

As with Alternative A, this Alternative includes a number of construction- and O&M-related activities could adversely impact vegetation (Table 3.7-16). Selectively committed mitigation measures utilized to minimize potential impacts were described in Mitigation Measures presented above.

Direct injury to and/or loss of vegetation would result from various construction and O&M activities. Table 3.7-23 summarizes permanent vegetation community impacts associated with each alternative. Construction of Alternative C would result in permanent loss of native vegetation on approximately 58.4 acres. Mitigation measures are the same as those discussed for Alternative A.

The potential impacts to vegetation from fugitive dust generation, exposure to contaminants, and increased access would be the same as discussed for Alternative A.

The potential for transmission line construction and O&M activities to introduce noxious weeds and invasive species is similar to those described for Alternative A. Leafy spurge occurs along this route and spotted knapweed has been documented in the vicinity.

Alternative C crosses one herbaceous/shrub riparian community and one riparian cottonwood forest community. Construction of Alternative C would result in permanent

loss of riparian vegetation on approximately 4 acres. Mitigation measures are the same as discussed for Alternative A.

No federally listed endangered or threatened plants or Species of Concern are known to occur along this Alternative, however, this does not mean that none exist, as surveys have not been conducted. The potential impacts to rare and sensitive plants are the same as those discussed for Alternative A.

Wildlife

Residual impact levels associated with Alternative C are identified in Table 3.7-24. Residual impacts from Link 1 MP 0.0 to Link 3 MP 1.0 were low/NI due to the presence of agricultural fields. Residual impacts for the 5.8 miles between Link 3 MP 1.0 and Link 6 MP 3.0 were moderate due to impacts associated with crossing native prairie habitat, the Buggy Creek riparian zone, mule deer winter range, and potential sharp-tailed grouse habitat. Link 6 MP 3.0 to Link 11 MP 6.2 follows an existing road (Cornwell Road) through mule deer winter range and potential sage-grouse and sharp-tailed grouse habitat. Residuals impacts were low for this section. The corridor does not follow an existing road from Link 11 MP 6.2 to MP 10.9 and this segment had a moderate residual impact level, while the section between Link 11 MP 10.9 to the Milk River crossing (Link 22 MP 2.5) had low/NI residuals because it traverses an agricultural landscape and parallels Highway 2. The crossing of mature cottonwood riparian habitat along the Milk River has high initial and residual impact levels due to the loss of rare forested habitat and the potential to disturb bald eagles. The residual impact level for the remaining segment of Alternative A from the Milk River to the Antelope Creek substation is low/NI since this portion of the corridor passes through small patches of grassland within an agricultural landscape, and parallels Billingsley Road and associated transmission lines.

As indicated in Table 3.7-15, Alternative C utilizes a large amount of existing roads and traverses moderate amounts of sharp-tailed grouse and sage-grouse habitat. Table 3.7-24 indicates that this alternative would result in the permanent disturbance of 16.42 acres of mule deer winter range. This alternative also crosses through potential habitat for a number of special status species (Table 3.7-14). The implementation of the mitigation measures described in Section 3.7.2.1, including completion of pre-construction surveys and a comprehensive wildlife study, would minimize the potential adverse effects upon special status species.

<u>Alternative D</u>

Vegetation

As with Alternative A, this Alternative includes a number of construction- and O&M-related activities could adversely impact vegetation (Table 3.7-16). Selectively committed mitigation measures utilized to minimize potential impacts were described in Mitigation Measures presented above.

Direct injury to and/or loss of vegetation would result from various construction and O&M activities. Table 3.7-23 summarizes permanent vegetation community impacts associated with each alternative. Construction of Alternative D would result in

permanent loss of native vegetation on approximately 49.6 acres. Mitigation measures are the same as those discussed for Alternative A.

The potential impacts to vegetation from fugitive dust generation, exposure to contaminants, and increased access would be the same as discussed for Alternative A.

The potential for transmission line construction and O&M activities to introduce noxious weeds and invasive species is similar to those described for Alternative A. Leafy spurge occurs along this route and spotted knapweed has been documented in the vicinity.

Alternative D crosses one herbaceous/shrub riparian vegetation community and one riparian cottonwood forest community. Construction of Alternative D would result in permanent loss of riparian vegetation on approximately 2 acres. Mitigation measures are the same as discussed for Alternative A.

No federally listed endangered or threatened plants or Species of Concern are known to occur along this Alternative; however, this does not mean that none exist, as surveys have not been conducted. The potential impacts to rare and sensitive plants are the same as those discussed for Alternative A.

Wildlife

Residual impact levels associated with Alternative D are identified in Table 3.7-24. Residual impacts for the northernmost 23.4 miles (Link 2 MP 0.0 to Link 16 MP 0.0) were low/NI. This entire segment follows existing roadways (Britsch Road and Vandalia Road), although the northern portion does cross native prairie habitat, mule deer winter range, and potential sharp-tailed grouse habitat. The Milk River crossing (Link 16 MP 0.0-0.6) had a high residual impact level due to the loss of rare forested habitat and the potential to disturb bald eagles. Link 16 MP 0.6-MP 1.9 had low/NI residual impact levels because of the predominance of cropland and presence of existing roads. The portion of Link 16 between MP 2.5 and MP 10.7 had moderate residual impacts because it traverses undisturbed sagebrush steppe vegetation that represents high quality habitat for greater sage-grouse. The last 2.7 miles of Alternative D from Link 16 MP 10.7 and the Antelope Creek substation has a low residual impact because it parallels an existing transmission line and the substation area has been previously disturbed by construction of the Richardson Coulee substation.

As indicated in Table 3.7-15, Alternative D utilizes the largest amount of existing roads and traverses large amounts of sharp-tailed grouse and sage-grouse habitat. This corridor also passes through the best greater sage-grouse habitat in the study area. Table 3.7-24 indicates that this alternative would result in the permanent disturbance of 4.55 acres of mule deer winter range. This alternative also crosses through potential habitat for a number of special status species (Table 3.7-14). The implementation of the mitigation measures described in Section 3.7.2.1, including completion of pre-construction surveys and a comprehensive wildlife study, would minimize the potential adverse effects upon special status species.

Alternative E

Vegetation

As with Alternative A, this Alternative includes a number of construction- and O&M-related activities could adversely impact vegetation (Table 3.7-16). Selectively committed mitigation measures utilized to minimize potential impacts were described in Mitigation Measures presented above.

Direct injury to and/or loss of vegetation would result from various construction and O&M activities. Table 3.7-23 summarizes permanent vegetation community impacts associated with each alternative. Construction of Alternative E would result in permanent loss of native vegetation on approximately 64.5 acres. Mitigation measures are the same as those discussed for Alternative A.

The potential impacts to vegetation from fugitive dust generation, exposure to contaminants, and increased access would be the same as discussed for Alternative A.

The potential for transmission line construction and O&M activities to introduce noxious weeds and invasive species is similar to those described for Alternative A. No noxious weeds are known to occur in this corridor, although surveys have not been conducted.

Alternative E crosses 4 herbaceous/shrub riparian vegetation communities and one riparian cottonwood forest community. Construction of Alternative E would result in permanent loss of riparian vegetation on approximately 4 acres. Mitigation measures are the same as discussed for Alternative A.

No federally listed endangered or threatened plants or Species of Concern are known to occur along this Alternative, however, this does not mean that none exist, as surveys have not been conducted. The potential impacts to rare and sensitive plants are the same as those discussed for Alternative A.

Wildlife

Residual impact levels associated with Alternative E are identified in Table 3.7-24. Residual impacts for the first mile (Link 1 MP 0.0 to Link 4 MP 0.0) were low/NI due to the presence of agricultural fields. The next 16.7 miles from Link 4 MP 0.0 to Link 12 MP 3.9 had a moderate residual impact level due to the crossing of native prairie habitat, several small riparian zones, mule deer winter range, and potential sharp-tailed grouse habitat. A portion of this segment utilizes an existing 2-track road. A high residual impact was assigned to Link 12 MP 3.9 where the corridor crosses Black Coulee cottonwood riparian zone. The portion of the corridor between Link 12 MP 3.9 and the Milk River riparian zone (Link 12 MP 8.3) includes moderate, low, and NI as a result of the checkerboard of agriculture and grasslands with some existing roadways. The Milk River between Link 12 MP 8.3 and MP 8.7 had a high residual impact level due to the loss of rare forested habitat and the potential to disturb bald eagles. There is a combination of moderate, low, and NI levels for the 3.5 miles between Link 12 MP 8.7 to Link 17 MP 2.7 due to the checkerboard of agriculture and grasslands. Between Link 17 MP 2.7 and MP 7.5, the corridor crosses sagebrush steppe and potential greater sage-

grouse habitat and was assigned a moderate residual impact level. The Antelope Creek crossing at Link 17 MP 7.5- MP 7.7 had a high residual due to the loss of riparian forest and the potential to disturb bald eagles. Link 17 MP 7.7 to Link 25, MP 0.0 traverses potential greater sage-grouse habitat and has a moderate residual level. The last 1.3 miles of Alternative E to the Antelope Creek substation has a moderate low residual impact because it parallels an existing road and the substation area has been previously disturbed by construction of the Richardson Coulee substation.

As indicated in Table 3.7-15, Alternative E utilizes a few existing roads and traverses through a large amount of sage-grouse habitat and a moderate amount of sharp-tailed grouse habitat. Table 3.7-24 indicates that this alternative would result in the permanent disturbance of nearly 21 acres of mule deer winter range. This alternative also crosses through potential habitat for a number of special status species (Table 3.7-14). The implementation of the mitigation measures described in Section 3.7.2.1, including completion of pre-construction surveys and a comprehensive wildlife study, would minimize the potential adverse effects upon special status species.

3.7.2.4 Antelope Creek Substation

Vegetation

During construction and O&M of the Substation, vegetation may be adversely affected by (1) injury or mortality of vegetation, (2) fugitive dust, (3) exposure to contaminants and (4) introduction of noxious weeds and invasive species. Selectively committed mitigation measures are described in detail above, in the Mitigation Measures portion of this section.

Clearing, grading, and construction activities would result in the direct injury to and/or loss of vegetation, thereby altering the plant communities in the disturbed areas of Antelope Creek Substation. Impacts to vegetation in material laydown areas and staging areas for construction equipment would be temporarily disturbed. Vegetation in the direct construction footprint Substation and parking areas would be permanently removed. Construction of the Substation would remove approximately 5 acres of Wyoming big sagebrush-western wheatgrass vegetation. The majority of the disturbance would be long-term. The impacts to vegetation would be alleviated by leaving vegetation in place wherever possible and reseeding areas with substantial ground disturbance.

Fugitive dust generated during clearing, grading and travel on Billingsley Road may impact vegetation. For example, dust could have an effect on vegetation by coating plant leaves with particulate matter. This potential impact would be greatest during construction of the Substation. However, fugitive dust generation during construction would be short-term and localized to the immediate area of the Substation. Potential impacts to vegetation in the vicinity of the Substation would be negligible through the implementation of appropriate dust control measures to minimize fugitive dust emissions from construction-related traffic and additional wind-blown dust as a result of ground disturbance (see Section 3.15).

During construction and O&M activities, vegetation communities may be subject to exposure to contaminants. Construction equipment would need to be refueled and very small quantities of hazardous materials (such as waste paints and degreasing agents) may be generated (see Section 3.13). Accidental fuel spills (gasoline, diesel), pesticides, or releases of hazardous materials could result in the exposure of vegetation at the Substation site, and reestablishment of the vegetation may be impacted or delayed because of residual soil contamination. Because of the relatively small amount of fuel and pesticides expected to be stored and used, any accidental releases would be small and affect vegetation primarily at the release site. See Section 3.13 for a discussion of hazardous materials and waste management impacts and pertinent mitigation measures.

Project construction could introduce noxious weeds and invasive species to the site that, in turn, could alter the vigor of existing vegetation communities in the Substation area. No noxious weeds are known to occur in the Substation area. In compliance with the Montana County Noxious Weed Control Act (MCA §7-22-2101 to 2153) and Executive Order 13112 (USFR 1999), a noxious weed and invasive species control plan will be developed prior to construction to prevent the introduction and spread of noxious weeds and invasive species in the Substation area. Control measures include cleaning construction vehicles of all possible weed seeds; quickly revegetating disturbed areas; reclaiming areas with weed-free native grasses, forbs, and shrubs; and using certified weed-free mulch.

No federally listed endangered or threatened plant species are known to occur, however, this does not mean that none exist, as surveys have not been conducted. The potential impacts to rare, sensitive, unique plants/communities would be alleviated or avoided by leaving vegetation in place wherever possible and reseeding areas with substantial ground disturbance. In addition, pre-construction pedestrian surveys for sensitive plant species/unique plant communities will be conducted to inventory and evaluate these resources within all areas to be temporarily or permanently disturbed. All supervisory construction personnel will be instructed on the protection of rare or sensitive plants and the boundaries of rare or sensitive plant populations will be clearly delineated with flagging or fencing.

Wildlife

Construction and operation of the substation would have minor adverse effects upon wildlife. While the site is located in sagebrush steppe habitat, the presence of an existing, adjacent substation and Billingsley Road reduce the habitat value of the area. There are relatively few special status species that could potentially occur at the substation site. The implementation of the mitigation measures described in Section 3.7.2.1, including completion of pre-construction surveys and avoidance of construction activities during sensitive periods if species are present, would minimize the potential adverse effects upon special status species.

3.7.2.5 No Action Alternative

Under the No Action Alternative, the project would not be constructed or operated. There would not be any alteration to the lands; therefore, no impacts to vegetation would occur as a result of the Project. However, development of a different nature could occur

in Valley County. Depending on the location, type, and magnitude for future development at the project site, impacts on vegetation, wildlife, or to threatened or endangered plant and animal species would be similar to or even greater than the proposed action.

3.8. WATER RESOURCES & WETLANDS

This section describes the existing surface water and wetland resources in the Valley County Wind Energy Project (VCWEP) study area. Applicable regulations are presented, the known environmental features documented, and potential impacts to water and wetland resources are discussed.

3.8.1 Affected Environment

Regulatory Overview

Wetlands are regulated by federal (i.e., Section 404 of The Clean Water Act, Executive Order 11990), state, and local laws and policies. The Army Corps of Engineers is responsible for the regulation of wetlands at the federal level. The Montana Department of Environmental Quality (MDEQ) regulates wetlands at the state level through Section 401 State Certification of Water Quality of the Clean Water Act (CWA), and provide for a review of potential adverse water quality impacts associated with discharges of dredged or fill materials in wetlands and other waters of the United States. MDEQ also provide guidelines on the delineation of wetlands, wetland characterization and functional assessments, and mitigation.

Nationwide Permits

Nationwide Permit 12 would be utilized where necessary during construction of utilities, access roads and associated infrastructure as long as such activities do not exceed the loss of 1/2-acre of U.S. waters. Waters of the U.S. temporarily affected by filling, flooding, excavation, or drainage, where VCWEP area is restored to pre-construction contours and elevation, would not be included in the calculation of permanent loss of waters of the US. This includes temporary construction mats (e.g., timber, steel, geotextile) used during construction and removed upon completion of the work. Where certain functions and values of waters of the US are permanently adversely affected, such as the conversion of a forested wetland to a herbaceous wetland in the permanently maintained utility line right-of-way, mitigation required to reduce the adverse effects of VCWEP to the minimal level. In all such cases, features would be identified and surveyed wherever potential impacts may occur, and avoided within reasonable design limits.

Montana Water Quality Act (MCA 75-5-401 et seq.)

Disturbance of over one acre would require development of a detailed Stormwater Pollution Prevention Plan (SWPPP) to minimize the potential for pollutant discharge from the site during construction, operation and maintenance activities, and decomissioning. The SWPPP would be designed to meet the requirements of the Montana Department of Environmental Quality through its stormwater pollution control program. The MDEQ, under the authority of the Montana Water Quality Act, regulates the discharge of pollutants into state waters through the adoption of water quality standards and the permit process. The MDEQ authorizes storm water discharges through

the Montana Pollutant Discharge Elimination System (MPDES), General Discharge Permit for Storm Water Associated with Construction Activity. The 318 Authorization Short-Term Turbidity Permit authorizes short-term exemptions from certain surface water quality standards for total suspended sediment and turbidity.

Montana Natural Streambed and Land Preservation Act (MCA 75-7-101 et seq.)

This Act requires a permit to engage in construction activities in or near perennial streams on public and private lands. The 310 Permit is issued by the Valley County Conservation District, in cooperation with Montana Fish, Wildlife, and Parks.

Montana Floodplain and Floodway Management Act (MCA 76-5-401 through 406)

Through the Floodplain Development Permit, this Act allows construction activity within a designated 100-year floodplain. The Floodplain permit is issued by the Department of Natural Resources and Conservation (Region 3).

3.8.1.1 Study Methods

This section addresses the current state of water resources in the study area. Resources addressed in this section include streams, wetlands, and related features. Water and wetland information were acquired from various sources including the Montana Natural Heritage Program, the Montana Natural Resource Information System, The National Wetlands Inventory (NWI), Federal Emergency Management Agency (FEMA), Flood Insurance Rate Maps (FIRMs), and, The Natural Resources Conservation Service. NWI and FEMA data coverage for the study area was incomplete. NWI data were extrapolated to areas not covered based on factors such as landscape position and apparent water feature development. No wetland delineation has occurred in the study area. USGS 7.5" topographic maps were also used to help identify water features.

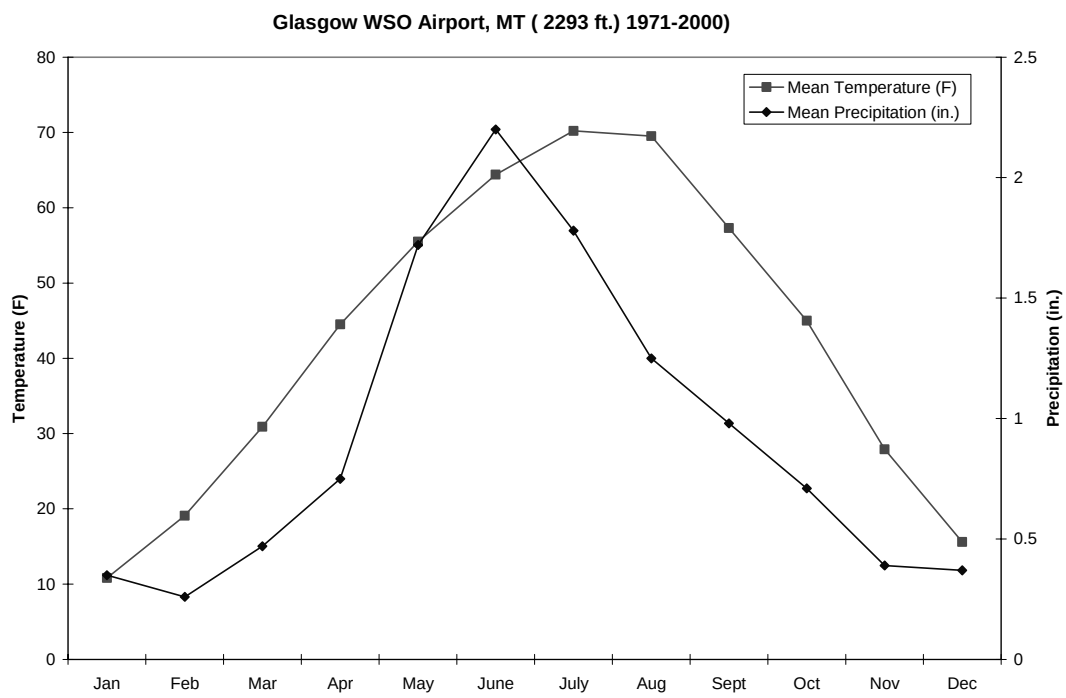
Data from existing FEMA and NWI sources were digitized or imported into exiting base maps created for VCWEP. FEMA maps are only available the southern half of the study area, while NWI data was available only for the northern half of VCWEP. FEMA Zone A (100-yr floodplains) and all classes of NWI wetlands are shown on Map 10 “Water Resources and Wetlands”. Other sources of data include existing documentation of regional features from public agencies, literature review, and consultation with Army Corps of Engineers personnel.

3.8.1.2 Study Area Overview

The VCWEP. is located within the Northwestern Glaciated Plains ecoregion of the Great Plains physiographic province (Omernik 1987). The Northwestern Glaciated Plains ecoregion is a transitional region between the flatter and moister Northern Glaciated Plains and the irregular and dryer Northwestern Great Plains. The western and southwestern boundaries of this ecoregion generally correspond to the limits of continental glaciation (EPA 2004). The ecoregion is generally characterized by level to gently rolling glacial till plains at elevations ranging between 2,500 and 5,000 feet MSL. The climate within the vicinity of the study area is considered a semi-arid continental climate, with frigid winters and warm to hot summers (Cooper et al. 2001; Figure 3.8-1).

Precipitation ranges from 10 to 14 inches a year, peaking in late spring-early summer with the occurrence of steady, soaking, frontal system rains. In summer, convection storms (cloudbursts, thunderstorms) provide scattered, intense bursts of rain. Snow cover is considered to be a significant ecological factor in this area. As wind redistributes and compacts snow to lee positions and swales and creates mesic micro sites, snow affects the distribution of plant communities in this ecoregion (Jones 2003). The heaviest snowfalls consistently occur in late winter to early spring and are typically accompanied by high winds.

Figure 3.8-1. Climate diagram showing average monthly temperature and precipitation for Glasgow, Montana.



Source: Adapted from Western Regional Climate Center Data 2004.

Water Resources

The Study Area lies within the Milk River Basin watershed. This basin covers approximately 22,232 square miles in northern Montana, and the southern parts of Alberta and Saskatchewan, Canada. The Milk River is a tributary to the Missouri River. Tributaries to the Milk River draining the study area are generally intermittent or ephemeral. There are three main streams draining the study area: Bear Creek, Buggy Creek, and Cherry Creek. There are many other named and unnamed tributary creeks and coulees contributing to the flows of these main drainages. Many of these drainages have FEMA identified 100-year floodplains with associated narrow, often discontinuous riparian corridors. Riparian corridors generally are more consistently and robustly

expressed in the lower reaches of the larger streams such as Buggy Creek. Riparian zones, if they exist, are on the smaller more ephemeral streams, and are typically very narrow stringers.

Stream hydrology within the study area is substantially to partially intact depending on the landscape position, adjacent irrigation diversions, and other land uses. Major sources of hydrologic disturbance are on-channel impoundments. These impoundments occur sporadically throughout the study area and restrict seasonal flooding where they exist. Agricultural activities have also impacted the character and quality of water resources to varying degrees. The Milk River's tributaries exhibit much more annual hydrologic variability than the Milk River itself due to the nature of intermittent streams and small drainage basins. Water flow in these tributaries is from north to south to the Milk River, which flows to the east towards the Missouri River. The hydrologic regime of the Milk River has been substantially altered by dams, including the Fresno Dam, approximately 160 miles up stream from Vandalia. On the western (upstream) portion of the study area lies the Vandalia Diversion Dam. The potential for seasonal flooding has been significantly curtailed, if not eliminated, as a result of this damn. The river channel is deeply incise.. Historically, the Milk River floodplain was formed by the ancient path of the Missouri River, and is typically 3-5 miles wide in the vicinity of the study area.

As measured at Tampico, the peak flows for the river typically occur in March and the lowest flows occur in December (Table 3.8-1). The probability of flooding on the river since the regulation of flows are summarized in Table 3.8-2. The floodplains of the Milk River extend a substantial distance from the river channel. The FEMA (Zone A) floodplain extends from the Milk River up several of the tributaries (Map 10 "Water Resources and Wetlands"). Tributaries identified as floodplains by FEMA data that may also be impacted by VCWEP include: Bear Creek, Hall Coulee, Lime Creek, Brush Fork of Bear Creek, Buggy Creek, Spring Creek, Chapman Coulee, Money Coulee, Richardson Coulee, Cherry Creek, School Section Coulee, Foss Coulee, Antelope Creek, Hay Coulee, and Buffalo Coulee.

Several relatively small man-made impoundments or stock dams occur in the study area. These impoundments are generally located on stream channels, but some have been developed in upland depressions. The impoundments are generally small, ranging in size from approximately 15 acres to less than one acre. Typically, these impoundments serve as water sources for livestock grazing and the surrounding area can be highly trampled and overgrazed.

Table 3.8-1: Mean Monthly Streamflow as measured at the Milk River near Tampico, MT (cfs)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Mean of monthly streamflows	212	178	1,053	771	551	568	508	205	168	185	217	152

Source: USGS 2004a

Table 3.8-2: Flood Frequency as measured at the Milk River near Vandalia, MT

Exceedance Probability (%)	99.5	99	95	90	80	50	20	10	4	2	1	0.5	0.2
Flow (CFS)	157	249	800	1400	2610	7340	16900	24300	33900	41000	47800	54400	62500

Source: USGS 2004b

Wetlands

Wetlands are intrinsically important because they can provide essential wildlife habitat, and perform hydrologic (e.g., flood attenuation, surface water, ground water recharge) and water quality (sediment retention, pollution control) functions (Novitzki et al. 1999). There are 8 wetland types identified by the NWI. All types are palustrine, or nontidal wetlands dominated by trees, shrubs, emergents, mosses or lichens. Wetlands lacking such vegetation are also included in this type if they exhibit all of the following characteristics:

- are less than 8 hectares (20 acres);
- do not have an active wave-formed or bedrock shoreline feature;
- have at low water a depth less than 2 meters (6.6 feet)in the deepest part of the basin; and
- have a salinity due to ocean-derived salts of less than 0.5 points per thousand..

All water bodies visible on the aerial photography that are less than 8 hectares (20 acres) in size are considered to be in the Palustrine System unless depth information is available, or unless an active wave-formed or bedrock shoreline feature is visible (NWI 2004).

NWI Wetland Classes identified in the study area include:

- Palustrine, Aquatic Bed, Semipermanently Flooded, Diked/Impounded (PABFh)
- Palustrine, Emergent, Temporarily flooded (PEMA)
- Palustrine, Emergent, Temporarily flooded, Diked/Impounded (PEMAh)
- Palustrine, Emergent, Saturated (PEMB)
- Palustrine, Emergent, Seasonally Flooded (PEMC)
- Palustrine, Emergent, Seasonally Flooded, Diked/Impounded (PEMCh)
- Palustrine, Emergent, Semipermanently Flooded, Diked/Impounded (PEMFh)
- Palustrine, Unconsolidated Shore, Seasonally Flooded, Diked/Impounded (PUSCh)

Wetlands appear to be most commonly associated with palustrine areas along creeks, often in drainages known as "coulees". Coulees are a regional feature associated with enclosed bottomlands, and are typified by flat bottomed valleys enclosed by somewhat steep hillsides. In these drainages, there is a relative abundance of trees and understory shrubs such as boxelder (*Acer negundo*), silver sagebrush (*Artemisia cana*), redosier dogwood (*Cornus sericea*), chokecherry (*Prunus virginiana*), Wood's rose (*Rosa woodsii*), willow (*Salix* spp.), silver buffaloberry (*Sheperdia argentea*), and western snowberry (*Symphorocarpos occidentalis*). These wetland areas generally are narrow and closely associated with the stream channels. Vegetation types in these areas include marshes, wet meadows, and in some areas gallery forests of plains cottonwood.

The study area lies in the prairie pothole region. Prairie potholes are wetlands that occur in depressions created by retreating glaciers during the Pleistocene Epoch. These isolated wetlands are often less than one acre in size and are characterized by ephemeral or seasonal inundation. Many are landlocked, while others have a drainage outlet to streams or other potholes. Most have standing water for much of the growing season in years of normal or above normal precipitation, but are neither inundated nor have saturated soils during most of the growing season in years of below normal precipitation. During dry years, potholes often become incorporated into farming plans, and are either planted to row crops (e.g. soybeans) or are mowed as part of a haying operation. When this occurs, wetland indicators of one or more parameters may be lacking. For example, tillage would eliminate any on-site hydrologic indicator, and would make detection of soil and vegetation indicators much more difficult (Environmental Laboratory 1987). The ACOE identifies prairie potholes as potential "problem areas" for identification. There are certain wetland types and/or conditions that may make application of indicators of one or more parameters difficult, at least at certain times of the year. These are not considered to be atypical situations; instead, they are wetland types in which wetland indicators of one or more parameters may be periodically lacking due to normal seasonal or annual variations in environmental conditions that result from causes other than human activities or catastrophic natural events (Environmental Laboratory 1987). Prairie pothole wetlands in the area are dominated by herbaceous communities, including water sedge (*Carex aquatilis*), clustered field sedge *(Carex praegracilis*), narrow spike reedgrass (*Calamagrostis stricta*), Baltic rush (*Juncus balticus*) and tufted hairgrass (*Deschampsia caespitosa*) as well as shrubby cinquefoil (*Dasiphora floribunda*) dominated shrublands (Cooper et al. 2001).

Prairie potholes potentially occur throughout the study area, however, the potential to encounter prairie potholes declines in the southern portion of the study area where agricultural activities have likely impacted or eliminated many of these isolated wetlands. As many prairie potholes are hydrologically isolated (without outlets), prairie potholes within the study area are not likely to be regulated by the ACOE (Allan Steinle, ACOE, personal communication). However, surveys have not been conducted to determine the location of prairie potholes within the study area. Prior to construction, all areas where VCWEP. components would be located will be surveyed for the presence of wetlands by a qualified wetland delineator.

Compared to other types of wetlands, prairie potholes are fairly rare. Their value comes from regional support of waterfowl and general productivity. According to the U.S. Prairie Pothole Joint Venture (PPJV) Implementation Plan (1995), the prairie pothole region is the most important waterfowl producing region on the continent. The PPJV region (Montana, the Dakotas, Minnesota, and Iowa) generates nearly 15% of the continental waterfowl population (PPJV 1995). In addition, the wetlands and grasslands habitats in the PPJV region provide breeding habitat to over 200 species of migratory birds (PPJV 1995).

Hydrologically, the systems are variable, and can function as flow-through systems or groundwater recharge and discharge sites (Mitsch and Gosselink 1993, NPWRC 2004). Groundwater recharge wetlands receive water primarily from the atmosphere, with little or no groundwater inflow. Wetlands that function as flow-through systems receive and discharge groundwater and solutes. The hydrologic function (recharge, discharge, and flow-through) of a wetland is determined by climate variations and location, the configuration of the water table, and the type of underlying geologic substrate (Mitsch and Gosselink 1993).

In general, the soils in the study area are shallow to deep and well drained. Hydric soils are localized in VCWEP area in several areas. Refer to Chapter 3.1 for complete soil data.

3.8.1.3 Wind Farm

The affected area related to the wind farm consists of four distinct phases. Phase 1 consists of 33 turbines spread over approximately 1,094 acres. Phase 2 consists of 63 turbines spread over approximately 2,800 acres. Phase 3 consists of 104 turbines spread over approximately 5,520 acres. Phase 4 consists of 134 turbines spread over approximately 10,706 acres. Collectively, Phases 1 through 4 represent the Proposed Action. Phases I and II comprise Alternative A.

Phase I-50 MW Area

The upper reaches of Buggy and Canyon Creeks drain Phase I. Canyon Creek is a tributary to Buggy Creek. The upper reaches of these drainages appear ephemeral. NWI data indicate there are six palustrine wetlands in Phase I. Four are described as emergent, temporarily flooded, one as impounded, aquatic bed, semi-permanently flooded, and one as impounded, unconsolidated shore, seasonally flooded. Four small impoundments occur in Phase I. There are no FEMA floodplain data for the wind farm area.

NWI wetlands inventoried for this phase of VCWEP include:

PABFh	Palustrine, Aquatic Bed, Semipermanently Flooded, Diked/Impounded
PEMA	Palustrine, Emergent, Temporarily flooded
PUSCh	Palustrine, Unconsolidated Shore, Seasonally Flooded, Diked/Impounded

Phase II-100 MW Area

The upper reaches of Buggy and Canyon Creeks drain Phase II. NWI data indicate there are twelve palustrine wetlands in Phase II. Ten are described as emergent, temporarily flooded (one impounded) and two as aquatic bed, semi-permanently flooded, impounded, and one as emergent, seasonally flooded. Six small impoundments occur in Phase II. There are no FEMA floodplain data for the wind farm project area.

NWI wetlands inventoried for this phase of VCWEP include:

PABFh	Palustrine, Aquatic Bed, Semipermanently Flooded, Diked/Impounded
PEMA	Palustrine, Emergent, Temporarily flooded
PEMAh	Palustrine, Emergent, Temporarily flooded, Diked/Impounded
PEMC	Palustrine, Emergent, Seasonally Flooded
PEMCh	Palustrine, Emergent, Seasonally Flooded, Diked/Impounded

Phase III-150 MW Area

The upper reaches of Buggy, Canyon, and Chrisholm Creeks drain Phase III. NWI data indicate there are twelve of palustrine wetlands in Phase III. Seven are described as emergent, temporarily flooded (one impounded), one as emergent, seasonally flooded, impounded, and four as aquatic bed, semi-permanently flooded, impounded. Nine small impoundments occur in Phase III. There are no FEMA floodplains for the wind farm area.

NWI wetlands inventoried for this phase of VCWEP include:

PABFh Palustrine, Aquatic Bed, Semipermanently Flooded, Diked/Impounded
PEMA Palustrine, Emergent, Temporarily flooded
PEMAh Palustrine, Emergent, Temporarily flooded, Diked/Impounded
PEMB Palustrine, Emergent, Saturated
PEMC Palustrine, Emergent, Seasonally Flooded
PEMCh Palustrine, Emergent, Seasonally Flooded, Diked/Impounded
PEMFh Palustrine, Emergent, Semipermanently Flooded, Diked/Impounded

Phase IV-200 MW

Buggy and Canyon Creeks drain Phase IV. The main stem of Buggy Creek appears to be intermittent in nature. The portion of Canyon Creek is in the upper reaches and ephemeral. NWI data indicate there are twenty-nine of palustrine wetlands in Phase IV. Thirteen are described as emergent, temporarily flooded (one impounded), ten as aquatic bed, semi-permanently flooded, impounded, two as emergent, saturated, and three as emergent, seasonally flooded (one impounded). The main stem of Buggy Creek is classified as palustrine, emergent seasonally flooded. Ten small impoundments occur in Phase IV. There are no FEMA floodplain data for the wind farm area.

NWI wetlands inventoried for this phase of VCWEP include:

PABFh	Palustrine, Aquatic Bed, Semipermanently Flooded, Diked/Impounded
PEMA	Palustrine, Emergent, Temporarily flooded
PEMAh	Palustrine, Emergent, Temporarily flooded, Diked/Impounded
PEMB	Palustrine, Emergent, Saturated
PEMC	Palustrine, Emergent, Seasonally Flooded
PEMCh	Palustrine, Emergent, Seasonally Flooded, Diked/Impounded
PEMFh	Palustrine, Emergent, Semipermanently Flooded, Diked/Impounded
PUSCh	Palustrine, Unconsolidated Shore, Seasonally Flooded, Diked/Impounded

Palustrine Wetlands	**Phase I**	**Phase II**	**Phase III**	**Phase IV**
Aquatic Bed, Semi-permanently Flooded, Diked/Impounded	1	2	4	10
Emergent, Temporarily Flooded	4	9	6	12
Emergent, Temporarily Flooded, Diked/Impounded		1	1	1
Emergent Saturated				2
Emergent, Seasonally Flooded		1		3
Emergent, Seasonally Flooded, Diked/Impounded			1	1
Unconsolidated Shore, Seasonally Flooded, Diked/Impounded	1			

Source:NWI 2004

3.8.1.4 Transmission Line

The affected area related to the transmission line consists of a 400-foot wide corridor with the transmission line alignment serving as the centerline. The alignment alternatives

vary in length from approximately 34.8 miles for the Proposed Action (Route C) to approximately 40.5 miles for the "HWY 24" alternative (Route A). Other affected areas associated with the transmission line would include improved or new access roads, construction marshalling yards, and pulling/tensioning sites outside of the 400-foot wide corridor.

Potential impacts to water resources may occur for all alternatives during construction, operations, and decommissioning of the 230kV alternatives. FEMA 100 year Floodplains are crossed along several links in each Alternative, and are summarized in Table 3.8-4 "Transmission Line FEMA Floodplain Crossing".

Alternative A (Links 1, 3, 23, and 24)—Highway 24

The upper reaches of Buggy Creek drains the northern portion of Alternative A. Drainage channels along this portion of Buggy Creek appear ephemeral in nature. The central portion of this alternative is drained by ephemeral sections of Dry Fork and Cherry Creek. The southern portion of this alternative is drained by intermittent sections of Cherry Creek and its tributaries. This alternative crosses 3 small ephemeral creeks and The Milk River. The FEMA floodplains crossed for this alternative include Foss Coulee Cherry Creek, and The Milk River.

Table 3.8-4 Transmission Line Link FEMA Floodplain Crossing

Link #	Mile Marker	Floodplain/Water Course
5	18.9 – 19.2	Foss Coulee
5	19.3 – 19.8	Foss Coulee
5	20.1 -20.3	Foss Coulee
5	20.5 -20.7	Foss Coulee
5	20.8 -21.0	Foss Coulee
5	21.1 – 21.4	Foss Coulee
5	21.5 – 21.8	Foss Coulee
5	23.8 – 24.1	Foss Coulee
5	24.7 – 25.1	Foss Coulee
5	26.0 – 26.2	Foss Coulee
8	7.4 – 7.6	Brush Fork – Bear Creek
10	8.7 – 9.0	Cherry Creek
11	8.7 – 9.0	Spring Creek
11	15.7 – 15.9	Spring Creek
12	3.9 – 4.1	Bear Creek
12	7.5 – 9.0	Milk River
14	2.0 – 2.3	Lime Creek
14	4.1 -4.9	Milk River
15	0.0 – 1.7	Milk River
15	2.6 – 2.8	Milk River
16	0.0 – 0.7	Milk River
16	1.8 – 2.0	Buffalo Coulee
16	5.5 – 5.7	Hay Coulee
16	10.2 – 10.5	Antelope Creek
17	7.2 – 7.7	Antelope Creek
19	0.9 – 1.0	Richardson Coulee
21	0.7 – 0.8	Richardson Coulee
21	1.6 – 2.2	Milk River
22	1.2 -1.3	Mooney Coulee
22	1.6 – 4.0	Milk River
22	4.0 – 5.0	Milk River/Antelope Creek

Alternative B (Links 1, 3, 6, 10, 18, 23, and 24)—Jensen Trail

The upper reaches of Buggy Creek drains the northern portion of Alternative B. This portion of Buggy Creek is ephemeral. The central portion of this alternative is drained by ephemeral sections of Spring and Cherry Creeks.

The southern portion of this alternative is drained by intermittent sections of Cherry Creek and its tributaries. The alternative crosses 2 ephemeral creeks as well as The Milk River The FEMA floodplains crossed for this alternative include Cherry Creek and The Milk River.

Alternative C (Links 1, 3, 6,, 20, and 22)—East Central-Proposed Action

The upper reaches of Buggy Creek drains the northern portion of Alternative C. Drainage channels along this portion of Buggy Creek appear ephemeral in nature. The central portion of this alternative is drained by ephemeral sections of Spring, Crooked, and Wolf Creeks. These smaller creeks are tributaries to Buggy Creek. The southern portion of this alternative is drained by Chapman and Mooney Coulees, both direct tributaries of the Milk River. The alignment of this alternative would cross streams an estimated 36 times, and two well developed flood plains associated with the Milk River and Mooney Coulee. NWI data indicate that the alignment would cross an estimated six wetland areas. The FEMA floodplains crossed for this alternative include Spring Creek, Money Coulee, and The Milk River.

Alternative D (Links 2, 9, 14, 16, 25)—Britsch Road

The upper reaches of Buggy and Canyon Creeks drain the northern portion of Alternative D. Canyon Creek is a tributary to Buggy Creek. Drainage channels along this portion of Buggy and Canyon Creeks appear ephemeral in nature. The central portion of this alternative is drained by ephemeral sections of Lime Creek, Alkali Creek, and Hall an Ellsworth Coulees. These drainages are tributaries to Bear Creek. Antelope Creek, Hay and Buffalo Coulees drain the southern portion of this alternative and are direct tributaries to the Milk River. This alternative crosses 3 ephemeral creeks as well as The Milk River . The FEMA floodplains crossed for this alternative include Lime Creek, The Milk River, Buffalo Coulee, Hay Coulee, and Antelope Creek.

Alternative E (Links 1, 4, and 25)—West Central

The upper reaches of Buggy and Canyon Creeks drain the northern portion of Alternative E. Canyon Creek is a tributary to Buggy Creek. Drainage channels along this portion of Buggy and Canyon Creeks appear ephemeral in nature. The central portion of this alternative is drained by Bear Creek and its tributaries. Antelope Creek drains the southern portion of this alternative. This alternative crosses 5 ephemeral creeks as well as The Milk River. The FEMA floodplains crossed for this alternative include Brush Fork Bear Creek, Milk River, and Antelope Creek.

3.8.1.4 Antelope Creek Substation

The affected area related to the Antelope Creek Substation consists of a contiguous land parcel approximately five acres in size. There are no drainages or apparent wetland areas located at the proposed Antelope Creek Substation site. The nearest drainage is a canal located approximately 0.2 miles west of the proposed site. The canal is connected to Antelope Creek.

3.8.2 Environmental Consequences and Mitigation Measures

3.8.2.1 Assessment Methodology

When data were available, potential impact locations were evaluated and recorded by milepost. However, surveys have not been conducted to determine the exact location of water resources and wetlands within VCWEP area. Prior to construction, all areas where

VCWEP. components would be located will be surveyed for the presence of wetlands by a qualified wetland delineator.

Factors considered in conducting the impact analysis include the nature of the water resource, the intensity, duration and frequency of impacts, and mitigation measures. Ground disturbance levels were estimated for the VCWEP. considering topography, the amount of new or existing roads, and other estimated disturbance areas relating to construction.

Impact Levels

Potential impacts to water resources and wetlands could result from accelerated erosion and sedimentation from the construction and maintenance activities on or adjacent to streams or wetlands. Other potential impacts include water quality degradation, and decreased wetland size, function, or value. In areas where potential impacts to water resources and wetlands are possible, mitigation measures would be expected to be effective in reducing or eliminating those potential impacts.

Impact levels relating to water resources and wetlands would be classified as **high** in this document if the action being considered would result in one or more of the following:

- A substantial erosion hazard or loss of productive potential to water resource or wetland would result from construction, operation, maintenance, or abandonment of the VCWEP.,
- A water resource or wetland area would be destroyed by permanently filling all or most of it, or by altering wetland hydrology,
- A water resource or wetland area would be destroyed that serves as habitat for a rare plant or animal species,

Impacts would be classified as **moderate** in this document if the action being considered would result in one or more of the following:

- Some erosion hazard or loss of productive potential would result from the construction, operation, maintenance, or abandonment of the VCWEP.; or
- A portion of a water resource or wetland area would be filled such that the majority of the wetland would still be able to function as a wetland (e.g., for a road crossing through a wetland adjacent to a creek).

Impacts would be classified as **low** in this document if the action being considered would result in one or more of the following:

- A small erosion hazard or loss of productive potential would result from the construction, operation, maintenance, or abandonment of the VCWEP.;

- A water resource or wetland would be temporarily filled or wetland hydrology, soils, or vegetation would be altered. This would be followed by restoring or enhancing the area.

Impacts would be classified as **no identifiable** in this document where;

- No loss of soil or productive potential would occur; or
- Direct impacts to wetlands would be avoided; or
- Water resource or Wetland hydrology, vegetation, or soils would not be affected by nearby activities.

Project-Wide Erosion and Sedimentation Control

Sedimentation or pollution of water resources will be prevented thought the use of best management practices (BMP's) as presented in the Stormwater Pollution Prevention Plan as required by the State of Montana. All potential sources of pollution will be identified, and site specific measures will be implemented to address:

- Project EPA/MDEQ Filing and other Requirements
- Unique Site Features & Endangered Species
- Potential Pollution Sources
- Project Schedule
- Soil Stabilization and Sediment Control
- Tracking Control
- Waste Materials
- Hazardous Waste
- Spill Prevention & Material Management
- Spill Control Practices
- BMP Maintenance, Inspection and Repair

3.8.2.2 Wind Farm

Impacts to water resources would primarily be related to vegetation and soil disturbance from wind farm construction activities. These indirect impacts would be temporary and generally low to moderate in intensity. Few direct impacts to water resources are expected. For optimum performance, turbine strings would be placed on high ground above drainages and stream courses would be located. Additionally, selective mitigation measures emphasizing avoidance would be employed to further reduce the potential for direct impacts to water resources.

During construction, each turbine structure would require the excavation of soil for each base. Where new access roads are required, a 24 foot wide corridor would be bladed, compacted, and graveled between Kerr Road and the proposed collector substation at the wind farm, a distance of approximately 2 miles. New access road construction would result in temporary soil exposure. The construction of an 18 foot wide graveled road would also be built to access to the various rows of turbines and other wind farm facilities. The internal wind farm roads would accommodate two lane traffic and have a compacted gravel surface. Soils would also be exposed during the construction of a permanent O&M facility that would consist of a 5,000 square feet structure, and graveled outdoor parking and turnaround area totaling approximately 2 acres. Other facilities that could potentially impact water resources include the collector system, staging areas, and crane pad areas.

The construction, operation and maintenance and decommissioning of the wind farm could impacts water and wetland resources by:

- Construction of access roads
- Sedimentation and filling of waterways and wetlands as the result of exposed soils
- Sediment tracking into roadways
- Pollution though accidental hazardous material spill such as petroleum products, hydraulic fluid, antifreeze, etc.
- Concrete washout
- Sands and aggregates
- Lighting and Wiring
- PVC Conduit
- Petroleum Based Products, paints, solvents
- Construction site litter and refuse
- Revegetation/landscape materials and fertilizers
- Airborn dust

Project construction would occur during the period of highest rainfall. Potential impacts to water resources would be mitigated by the implementation of erosion and sediment control best management practices (BMP's) as required by the State of Montana and presented in Stormwater Pollution Prevention Plans (SWPPP). The BMP's implemented and the SWPPP's developed would be part of the civil engineering process, and would be

developed based on the specific soil disturbance conditions and the nature of the construction, operation and maintenance, or decommissioning.

Potential impacts to water resources may occur for all alternatives during construction, operations, and decommissioning of the Wind Farm. The areas for temporary and permanent ground disturbance are summarized in Tables 3.8-5 and 3.8-6, respectively.

Table 3.8-5 Temporary Disturbance Areas of Wind Farm Alternatives (Acres)

	Alternative A	**Alternative B**	**Proposed Action**
Project Component	Phase I & II 150 MW	Phase II 300 MW	Phase III 500 MW
Operations Building	2.0	2.0	2.0
Collector Substation	1.0	1.0	1.0
Access Road	8.7	8.7	8.7
Internal Road Network	13.9	21.0	35.0
Wind Turbines	0.3	0.6	1.0
Turbine Pads	22.8	45.6	76.0
Material Staging	99.0	198.0	330.0
Collector System	21.0	41.9	69.8
Total Temporary Disturbance Area	**165.3**	**318.8**	**523.5**

Table 3.8-6 Permanent Disturbance Areas of Wind Farm Alternatives (Acres)

	Alternative A	**Alternative B**	**Proposed Action**
Project Component	Phase I & II 150 MW	Phase II 300 MW	Phase III 500 MW
Operations Building	2.0	2.0	2.0
Collector Substation	1.0	1.0	1.0
Access Road	5.8	5.8	5.8
Internal Road Network	31.2	62.4	104.0
Wind Turbines	0.3	0.6	1.0
Total Permanent Disturbance Area	**40.3**	**71.7**	**113.8**

Proposed Action –500 MW Facility

The Proposed Action is composed of Phases I, II, III and IV. The total area encompassed is approximately 20,120 acres. Temporary and permanent disturbance are estimated to be 523.5 and 113.8 acres respectively. Total disturbance represents approximately 3.2 & of the area for the Proposed Action.

Alternative A- 150 MW (Phases I and II).

Alternative A is composed of Phases I and II. The total area encompassed by this alternative is approximately 3,894 acres. Temporary and permanent disturbance are estimated to be 165.3 and 40.3 acres respectively. Total disturbance represents approximately 5.3% of the area for Alternative A.

Alternative B- 300 MW (Phases I, II & III)

Alternative B is compose of Phases I, II and III. The total area encompassed by this alternative is approximately 9,414 acres. Temporary and permanent disturbance are estimated to be 318.8 and 71.8 acres respectively. Total disturbance represents approximately 4.1 & of the area for Alternative B.

Selective Mitigation Measures

Impacts associated with wind farm construction and operation would be minimized to the impact levels indicate project. Consultation with appropriate agencies will occur to develop site specific avoidance methods and mitigation strategies. These measures would provide for avoiding sensitive water features where practicable and minimizing impacts

where they cannot be avoided.d through effective implementation of selective mitigation measures 1, 2, 3, 4, 30, and 31 described in Chapter 2 of this document. These measures include conducting wetland surveys and delineation to identify wetland resources that may be potentially affected by the

Mitigation Measures

A variety of mitigation measures may be implemented to reduce potential impacts to water resources and wetlands (see Chapter 2). In addition to generic mitigation measures, selectively committed mitigation measures will be applied on a case-by-case basis when appropriate. Selectively committed mitigation measures utilized to minimize potential impacts to water resources and wetlands include:

S1 In areas where soils and vegetation are particularly sensitive to disturbance, existing access roads will be repaired only in areas where they are otherwise impassable.

S2 In selected areas on public lands, access roads that disturb sensitive features will be rerouted or will cross overland. That is, construction and maintenance traffic will use existing roads or cross-country access routes (including the right-of-way). To minimize ground disturbance, construction traffic routes must be clearly marked with temporary markers such as easily visible flagging. The construction routes or other means of avoidance must be approved in advance of use by the authorized officer or landowner.

S3 To minimize ground disturbance and/or reduce scarring (visual contrast) of the landscape, the alignment of any new access roads or cross-country route will follow the landform contours in designated areas where practicable, providing that such alignment does not impact resource values additionally

S4 To limit new or improved accessibility into the area, all new access undesired or not required for maintenance will be closed using the most effective and least environmentally damaging methods appropriate to that area with concurrence of the landowner or land manager.

S5 To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S29 Wetland surveys will be conducted during the appropriate season to identify and inventory wetland resources potentially affected by the selected wind farm, transmission line, and substation site alternatives. In consultation with appropriate agencies, develop site specific avoidance and mitigation strategies to minimize potential wetland impacts.

S30 In designated areas, wind farm infrastructure will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, and water courses, within limits of

reasonable design. If these sensitive features cannot be completely avoided, infrastructure will be placed so as to minimize the disturbance.

3.8.2.3 230kV Transmission Line

During construction, each transmission structure would require the excavation of soil for each base. Where new access roads are required, a 14 foot wide corridor would be bladed along the transmission lines resulting in approximately 34 acres of temporary soil exposure.

The construction, operation and maintenance, and decommissioning of the 230kV transmission line could impacts water and wetland resources by:

- Sedimentation and filling of waterways and wetlands as the result of exposed soils
- Sediment tracking into roadways
- Pollution though accidental hazardous material spill such as petroleum products, hydraulic fluid, antifreeze, etc.
- Construction site litter and refuse
- Revegetation/landscape materials and fertilizers
- Airborn dust

Project construction will occur during the period of highest rainfall. Potential impacts to water resources would be mitigated by the implementation of erosion and sediment control best management practices (BMP's) as required by the State of Montana and presented in SWPPP. The BMP's implemented and the SWPPP's developed would be part of the civil engineering process, and would be developed based on the specific soil disturbance conditions and the nature of the construction, operation and maintenance, or decommissioning. Table 3.8-7 shows the anticipated temporary and permanent disturbance areas for 230kV transmission line alternatives.

Table 3.8-7 Temporary & Permanent Disturbance Areas of 230kV Transmission Line Alternatives (Acres)

Route	Actual Length	Acres Disturbance (Roads)	Acres Disturbance Laydown Areas	Acres Pulling and Tensioning	Acres Staging Areas	Acres Structures (Perm)
A	40.28	96.62	97.2	16.0	5.0	0.082
B	36.80	58.26	89.04	10.5	5.0	0.075
C	34.39	61.49	83.52	16.5	5.0	0.070
D	36.81	50.46	89.04	11.5	5.0	0.075
E	32.77	73.19	79.44	6.0	5.0	0.067

Alternative A—Highway 24

Alternative A is composed of links 1, 3, 5, 23 and 24. Total length is approximately 40.4 miles. Low impacts to water resources are projected to occur along approximately 5.4 miles of Alternative A. No impacts to water resources have been identified along the remaining 33.2 miles of this alternative.

Alternative B – Jensen Trail

Alternative B is composed of links 1,3,6,10,18,23, and 24. Total length is approximately 37.1 miles. Low impacts to water resources are projected to occur along approximately 2.2 miles of Alternative B. Moderate impacts are projected to occur along approximately 0.8 miles. No impacts to water resources have been identified along the remaining 34.1 miles of this alternative.

Alternative C – East Central-Proposed Action

Alternative C is composed of links 1, 3, 6, 11, 20, and 22. Total length is approximately 34.8 miles. Low impacts to water resources are projected to occur along approximately 2.8 miles of Alternative C. Moderate impacts are projected to occur along approximately 0.6 miles. No impacts to water resources have been identified along the remaining 31.4 miles of this alternative.

Alternative D—Britsch Road

Alternative D is composed of links 2, 9, 14, 16, and 25. Total length is approximately 37.1 miles. Low impacts to water resources are projected to occur along approximately 3.5 miles of Alternative D. Moderate impacts are projected to occur along approximately 0.8 miles. No impacts to water resources have been identified along the remaining 32.8 miles of this alternative.

Alternative E—West Central

Alternative E is composed of links 1, 4, 8, 12, 17, and 25. Total length is approximately 33.1 miles. Low impacts to water resources are projected to occur along approximately 4.1 miles of Alternative E. Moderate impacts are projected to occur along approximately 1.2 miles. No impacts to water resources have been identified along the remaining 27.8 miles of this alternative. Refer to Appendix 3.8-x, Water Resources Impact Table, for more details.

Selective Mitigation Measures

A variety of mitigation measures may be implemented to reduce potential impacts to water resources and wetlands (see Chapter 2). In addition to generic mitigation measures, selectively committed mitigation measures will be applied on a case-by-case basis when appropriate. Selectively committed mitigation measures utilized to minimize potential impacts to water resources and wetlands include:

S6 In areas where soils and vegetation are particularly sensitive to disturbance, existing access roads will be repaired only in areas where they are otherwise impassable.

S7 In selected areas on public lands, access roads that disturb sensitive features will be rerouted or will cross overland. That is, construction and maintenance traffic will use existing roads or cross-country access routes (including the right-of-way). To minimize ground disturbance, construction traffic routes must be clearly marked with temporary markers such as easily visible flagging. The construction routes or other means of avoidance must be approved in advance of use by the authorized officer or landowner.

S8 To minimize ground disturbance and/or reduce scarring (visual contrast) of the landscape, the alignment of any new access roads or cross-country route will follow the landform contours in designated areas where practicable, providing that such alignment does not impact resource values additionally

S9 To limit new or improved accessibility into the area, all new access undesired or not required for maintenance will be closed using the most effective and least environmentally damaging methods appropriate to that area with concurrence of the landowner or land manager.

S10 To minimize amount of sensitive feature disturbed and/or reduce visual contrast, in designated areas structures will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, water courses, and cultural sites, and/or to allow conductors to clearly span the features, within limits of standard tower design. If the sensitive features cannot be completely avoided, towers will be placed so as to minimize the disturbance.

S31 Wetland surveys will be conducted during the appropriate season to identify and inventory wetland resources potentially affected by the selected wind farm, transmission line, and substation site alternatives. In consultation with appropriate agencies, develop site specific avoidance and mitigation strategies to minimize potential wetland impacts.

S32 In designated areas, wind farm infrastructure will be placed so as to avoid sensitive features such as, but not limited to, riparian areas, and water courses, within limits of reasonable design. If these sensitive features cannot be completely avoided, infrastructure will be placed so as to minimize the disturbance.

3.8.2.4 Antelope Creek Substation

No direct impacts to water resources are anticipated as a result of constructing or operating Antelope Creek substation. Indirect impacts may occur. Accelerated soil erosion (refer to soil erosion discussion in the sections above), subsequent downstream sedimentation and potentially reduced surface water quality could occur during construction of the proposed substation. Impacts from construction activities would be localized and would occur in the short term. No selectively committed mitigation measures are proposed for the Antelope Creek substation site.

3.8.2.5 No Action Alternative

No impacts to water resources directly related to this VCWEP. would occur under the No Action Alternative. It should be noted that if the VCWEP. is not developed it is likely

that a similar wind generation project would be developed elsewhere. Thus impacts of a similar nature to the VCWEP. would likely be displaced to another location.

3.9. GEOLOGY AND GEOHAZARDS

3.9.1 Affected Environment

3.9.1.1 Study Methods

Geologic maps of Valley County were acquired from Montana Bureau of Mines and Geology (Robert Bergantino, MBMG Open-file reports 390, 440). The geologic maps were produced in digital Arc Info format and were the primary source of data used to delineate geologic contacts within VCWEP area. USGS National elevation dataset (NED) was used to create a slope coverage. Assuming best road design would be on slopes less than 8%. (Building Forest Access Roads – Road Planning and Location). Slope polygons were produced using values 0-8%, 8-15%, 15-30% and >30%. The geology data, together with slope information, were then draped over VCWEP area using Arc Info software. Analysis of the various alternative transmission corridors and wind farm phases were based largely on slope, geology and lithologic characteristics.

3.9.1.2 Study Area Overview

The VCWEP. is located within the Missouri Plateau section of the Great Plains physiographic province in northeast Montana. Northeastern Montana has undergone extensive continental glaciation. Glaciers have retreated and advanced several times in the last two million years. Subsequently, thick layers of glacial till were deposited overtop of the existing bedrock. As the glaciers melted and retreated, erosion exposed much of the bedrock. The proposed wind farm, associated transmission line and substation, lie entirely within Valley County. Valley County is underlain by gently dipping sedimentary rocks of Upper Cretaceous to Tertiary age. Cretaceous rocks include the Claggett Shale, Judith River Formation, Bearpaw Shale, Fox Hills Sandstone and the Hell Creek Formation. Tertiary age rocks belong to the Flaxville and Fort Union Formations. The Bearpaw shale is the most extensively exposed formation in VCWEP area. It is predominantly composed of noncalcareous, silty marine shales with numerous interbedded bentonite layers. Most of the recent surficial deposits are Pleistocene tills and alluviums. Shale associated with the Bearpaw and Claggett formations are known to be susceptible to landslides and mass wasting (USGS Professional paper 1183). Robert Bergantino's geologic maps of Valley County show three substantial landslides, although none were mapped within the study area. While western Montana is considered to be tectonically active, northeast Montana is rated low in earthquake hazard (USGS Earthquake hazard map). There are no known active tectonic features in northeast Montana. The only known mineral deposits within VCWEP area are industrial minerals, primarily sands and gravels. Most of the economically feasible coal deposits in the region are associated with the Fort Union Formation and are not exposed in VCWEP area (USGS Bulletin 2189).

Wind Farm

Geologic formations exposed in the area of the wind farm are Tertiary age tills, primarily sands and gravels. The till forms protective caps overlaying the erosive Cretaceous shale of the Bearpaw formation.

Transmission Line

VCWEP area and associated transmission line routes can be broken into two distinct geomorphic environments. To the south the landscape is controlled by the meandering floodplain of the Milk River. This part of the study area is nearly flat farmland overlying recent flood deposits.

The area north of the Milk River is dominated by gently sloping uplands of Cretaceous sediments. The Cretaceous sediments are capped with glacial tills and outwash deposits. As the more resistant tills are weathered away, softer more erosive sediments are exposed producing moderately incised drainage systems.

Substation

The five-acre property for the proposed Antelope Creek substation is underlain by relatively stable till and alluvium deposits. The parcel is located above the Milk River floodplain, immediately adjacent to an existing substation. Geologic mapping (Bergantino, 1999) indicate an escarpment, several hundred feet to the southwest of the property. No construction activities associated with VCWEP are planned near the escarpment.

3.9.1.3 Wind Farm

Phase 1 of the wind farm has a footprint of 1,094 acres. 800 acres are relatively stable sands, gravels and tills of Tertiary age. The remaining 294 acres are Bearpaw shale. This equates to roughly 75% of the acreage as sands and gravels and the remaining 25% is Bearpaw shale. Approximately 97% of the Phase 1 acreage is quite flat, between 0 and 8%. The remaining 3% of the area is between 8 and 15% slope.

Phase 2 has a 2,800-acre footprint, of which approximately 2,150 acres are sands and gravels of Tertiary age, 114 acres of Quaternary sands and gravels and around 536 acres of Bearpaw shale. Roughly 80% of the acreage is sands and gravels and the remaining 20%, Bearpaw shale. Slope values within Phase 2 show that 97% of the acreage is relatively flat, less than 8% slope. The remaining 3% of the area is between 8 and 15% slope. There are very minor areas within Phase 2, with slope values between 15 and 30% and no slopes greater than 30%.

Phase 3 is 5,520 acres. 4,200 acres are Tertiary sands and gravels, 477 acres of Quaternary sands and gravels and 843 acres of Bearpaw shale. 85% is sand, gravel and till and the remaining 15% is Bearpaw shale. Slopes within Phase 3 are gentle, with 94% of the total acreage at 0 and 8% and 5% of the total acreage is between an 8 and 15% slope and less than 1% is between 15 and 30% slope.

Phase 4 has a 10,706-acre footprint, of which approximately 3,634 acres are sands and gravels of Tertiary age, 798 acres of Quaternary sands and gravels and 6,274 acres of Bearpaw shale. 42% of the Phase 4 acreage is sand and gravel and the remaining 58% is Bearpaw shale. Slopes within Phase 4 are 89% of the area 0 and 8%, 10% of the acreage is between 8 and 15%; the remaining 1% is between 15 and 30%.

3.9.1.5 230kV Transmission Line

The geology of each of the proposed transmission line alternatives is similar. It consists of gently sloping sedimentary rocks of late Cretaceous to early Tertiary age. Stream erosion has formed dendritic drainage patterns producing moderate to steeply incised valleys. Extensive areas of glacial outwash and Quaternary fluvial deposits are exposed throughout each of the alternative routes. Much of the area is farmland and open range, accessible thru an extensive network of improved and unimproved roads.

Alternative A - Hwy 24

At 40.5 miles, alternative A is the longest of all the proposed transmission line routes being considered. As the route leaves the wind farm, it trends in a southeast direction, crossing the Buggy Creek drainage (link 3, mile 2.4). The route then passes thru flat, open rangeland, over Tertiary gravels and Bearpaw shale. About 12.5 miles from the wind farm, the route begins to parallel Hwy 24 (link 5). Here, it is mostly flat open range, underlain by Bearpaw shale and Foxhills sandstone. Five miles north of Glasgow, the line turns southwest and crosses the Cherry Creek drainage. Near Cherry Creek (link 5, mile 24) the topography becomes steeper as it drops into the Milk River drainage (link 23). South of Hwy 2 the route crosses the Milk River through cultivated agriculture lands developed on recent alluvial deposits. After leaving the Milk River it travels over Tertiary deposits of sand and gravel to the proposed Antelope Creek Substation site.

Most of the topography in the routes 40.5 miles is gentle in slope. Four sections of the route have been identified as Bearpaw shale having slopes greater than 8%.

1) Buggy Creek crossing - link 3, near mile 2.5

2) South of Shepp Road – link 5, near mile 16.4

3) Cherry Creek crossing – link 5, near mile 25.2

4) The junction of Jensen Trail and Hwy 2 – link 23, near mile 1.4

Alternative B - Jensen Trail

Alternative B is 37.1 miles in length and crosses geology similar to Alternative A. This route uses the same Buggy Creek crossing (link 3) as Alternative A., thus the same short section of 8-15% slope. By turning south, several miles west of Hwy 24, Alternative B misses the steep sections near Shepp Road and Cherry Creek. As the route approaches the Milk River it follows the same path (link 23) as Alternative A and traverses the same section of 8-15% slopes. From the Hwy 2 crossing to the substation Alternative B uses the same route as Alternative A.

Topography in Alternative B. is mostly gentle in slope (0 to 8% slope). Two sections of the route have slopes greater than 8% in Bearpaw shale.

1) Buggy Creek crossing - link 3, near mile 2.5

2) The junction of Jensen Trail and Hwy 2 – link 23, near mile 1.4

Alternative C - East Central-Proposed Action

Alternative C is 34.8 miles in length and crosses geology similar to both Routes A & B. Alternative C uses the same Buggy Creek crossing (link 3) as Alternatives A and B, crossing the same section of 8-15% slope. At the Spring Creek crossing (link 11) the route traverses another short section of 8-15% slope. At the mouth of Mooney Coulee (link 22, mile 1.0) the route crosses a third section of 8 to 15% slope in Bearpaw shale. In all, this route traverses a total of 1.1 miles of slope greater than 8%, 0.9 miles of which are in Bearpaw shale.

Alternative C has three sections of Bearpaw shale with slopes greater than 8%.

1) Buggy Creek crossing - link 3, near mile 2.5

2) Spring Creek crossing – link 11, near mile 7.1

3) Mooney Coulee crossing – link 22, near mile 1.0

Alternative D - Britsch Road

Alternative D is 37.1 miles in length. The geology changes in this part of the study area. Alternative D crosses much more of the Cretaceous Judith River sandstone (Kjr). Approximately three miles of steep terrain are crossed by this route. Since most of the access uses existing roads, only 1.0 mile of new road would be required to be built on slopes >8%, 0.3 miles of which, would be in Bearpaw shale.

In Alternative D all new road construction occurring on slopes >8% would occur along link 16.

Alternative E - West Central

Alternative E is 33.1 miles in length. This route also crosses much of the Judith River Formation. There is a total of 3.3 miles of steep terrain crossed by this route. Much of this route uses existing roads. 1.4 miles of new roads would be required to be built in slopes greater than 8% with 1.0 mile of new road in Bearpaw shale with slopes greater than 8%.

3.9.1.5 Antelope Creek Substation

The proposed substation would be located adjacent to an existing substation. It would be located on flat, well-consolidated glacial tills and alluvium of Quaternary age. Potential for slumping or mass wasting is minimal.

3.9.2 Environmental Consequences and Mitigation Measures

3.9.2.1 Assessment Methodology

The largest impacts to the geology of the area would occur due to the construction of new roads and upgrading of existing roads. Shales of the Bearpaw and Claggett formations are known to be susceptible to mass wasting and slope failure. The high swelling and high plasticity characteristics of these shales, coupled with their high slaking potential, tend to produce slope failure in moderate to steep terrains. Areas of potential slope failure have been delineated and recorded. Factors taken into consideration are primarily lithologic characteristics, existing slope and ground disturbance from new roads or improvement of existing roads.

Impact levels to geologic resources:

High Impact. – High impact to the geologic resources would occur if the construction, operation, maintenance or abandonment of VCWEP would cause substantial mass wasting or slope failure.

Moderate Impact – Moderate impact to the geologic resources would occur if the construction, operation, maintenance, or abandonment of VCWEP would cause minor amounts of slope failure.

Low Impact – Low impact to the geologic resources would occur if the construction, operation, maintenance or abandonment of VCWEP would cause a slight increase in erosion, rillwash or slumping.

No Impact – No impact to the geologic resources would occur where no formation is disturbed.

The most significant direct impact to the geologic resources would be large-scale erosion brought on by slope failure. This could occur from poor road construction practice in areas of steep terrain and unconsolidated clay shales. This type of high level, direct impact to the resource can be prevented through selectively committed mitigation measures and onsite geotechnical surveys. Any new road building would have some minor impact on geologic resources, although those impacts can also be minimized through road construction mitigation measures 1, 3 and 4.

3.9.2.2 Wind Farm

Proposed Action –500 MW Facility

The proposed action, Phase I, II, III and IV:

Phase I Topography	97% < 8% slope 3% is 8-15% slope
Phase I Geology.	75% tills 25% shale

Use of existing roads would have no impact on geologic resources. Improvement of existing roads would be subject to generic mitigation measure 1, leaving low to no impact. All new road construction would be subject to generic mitigation measures 3 and 4 and new road construction on steep, shale slopes, should require on site geotechnical work. Under these conditions, new road construction would have low impact. Construction of wind towers and transmission structures would be subject to generic mitigation measure 4 and geotechnical evaluation.

Phase II Topography. 97% < 8% slope
3% is 8-15% slope

Phase II Geology. 80% tills
20% shale

Use of existing roads would have no impact on geologic resources. Improvement of existing roads would be subject to generic mitigation measure 1, leaving low to no impact. All new road construction would be subject to generic mitigation measures 3 and 4 and new road construction on steep, shale slopes, should require on site geotechnical work. Construction of wind towers and transmission structures would be subject to generic mitigation measure 4 and geotechnical evaluation. Under these conditions, construction would have low impact.

Phase III Topography. 94% < 8% slope
5% is 8-15% slope
1% is 15-30% slope

Phase III Geology. 85% tills
15% shale

Use of existing roads would have no impact on geologic resources. Improvement of existing roads would be subject to generic mitigation measure 1, leaving low to no impact. All new road construction would be subject to generic mitigation measures 3 and 4 and new road construction on steep, shale slopes, should require on site geotechnical work. Construction of wind towers and transmission structures would be subject to generic mitigation measure 4 and geotechnical evaluation. Under these conditions, construction would have low impact.

Phase IV Topography. 89% < 8% slope
10% is 8-15% slope
1% is 15-30% slope

Phase IV Geology 42% tillis
58% shale

Use of existing roads would have no impact on geologic resources. Improvement of existing roads would be subject to generic mitigation measure 1, leaving low to no impact. All new road construction would be subject to generic mitigation measures 3 and 4 and new road construction on steep, shale slopes, should require on site geotechnical work. Construction of wind towers and transmission structures would be subject to

generic mitigation measure 4 and geotechnical evaluation. Under these conditions, construction would have low impact.

The geology and topography of the lands included in Phase I, II, III and IV, do not indicate major impacts to the geologic resources would occur. Road construction mitigation process and on site geotechnical studies would likely reduce any project related impacts to low impact or no impact.

Alternative A - 150 MW (Phases I and II)

Phase I Topography**.** 97% < 8% slope
3% is 8-15% slope

Phase I Geology 75% tills
25% shale

Total land disturbance of 82.2 acres, 62.9 acres temporarily disturbed and 19.3 acres would be permanently disturbed.

Phase II Topography 97% < 8% slope
3% is 8-15% slope

Phase II Geology 80% tills
20% shale

Total land disturbance of 123.4 acres, 102.4 acres temporarily disturbed and 21.0 acres would be permanently disturbed.

Use of existing roads would have no impact on geologic resources. Improvement of existing roads would be subject to generic mitigation measure 1, leaving low to no impact. All new road construction would be subject to generic mitigation measures 3 and 4 and new road construction on steep, shale slopes, should require on site geotechnical work. Under these conditions, new road construction would leave a low impact.

Alternative B - 300 MW (Phases I, II and III)

Phase I Topography 97% < 8% slope
3% is 8-15% slope

Phase I Geology 75% tills
25% shale

Total land disturbance of 82.2 acres, 62.9 acres temporarily disturbed and 19.3 acres would be permanently disturbed.

Phase II Topography. 97% < 8% slope
3% is 8-15% slope

Phase II Geology. 80% tills

20% shale

Total land disturbance of 123.4 acres, 102.4 acres temporarily disturbed and 21.0 acres would be permanently disturbed.

Phase III Topography. 94% < 8% slope
5% is 8-15% slope
1% is 15-30% slope

Phase III Geology. 85% tills
15% shale

Total land disturbance of 185.0 acres, 153.5 acres temporarily disturbed and 31.5 acres would be permanently disturbed.

Use of existing roads would have no impact on geologic resources. Improvement of existing roads would be subject to generic mitigation measure 1, leaving low to no impact. All new road construction would be subject to generic mitigation measures 3 and 4 and new road construction on steep, shale slopes, should require on site geotechnical work. Under these conditions, new road construction would leave a low impact.

Alternative B - 300 MW (Phases I, II and III)

Phase I Topography 97% < 8% slope
3% is 8-15% slope

Phase I Geology. 75% tills
25% shale

Total land disturbance of 82.2 acres, 62.9 acres temporarily disturbed and 19.3 acres would be permanently disturbed.

Phase II Topography. 97% < 8% slope
3% is 8-15% slope

Phase II Geology. 80% tills
20% shale

Total land disturbance of 123.4 acres, 102.4 acres temporarily disturbed and 21.0 acres would be permanently disturbed.

Phase III Topography. 94% < 8% slope
5% is 8-15% slope
1% is 15-30% slope

Phase III Geology. 85% tills
15% shale

Total land disturbance of 185.0 acres, 153.5 acres temporarily disturbed and 31.5 acres would be permanently disturbed.

Use of existing roads would have no impact on geologic resources. Improvement of existing roads would be subject to generic mitigation measure 1, leaving low to no impact. All new road

construction would be subject to generic mitigation measures 3 and 4 and new road construction on steep, shale slopes, should require on site geotechnical work. Under these conditions, new road construction would leave a low impact.

3.9.2.3 230kV Transmission Line

Alternative A - Highway 24

Alternative A traverses a total of 1.6 miles in slopes greater than 8%. Access to 0.2 of those miles would use existing roads.

- 1.4 miles would require new road construction on slopes >8%.
  - 1.2 miles of new roads would be built in Bearpaw shale with slope >8%.

Use of existing roads would have no impact on geologic resources. Improvement of existing roads would be subject to generic mitigation measure 1, leaving low to no impact. All new road construction would be subject to generic mitigation measures 3 and 4 and new road construction on steep, shale slopes, should require on site geotechnical work. Under these conditions, new road construction would leave a low impact.

Alternative B - Jensen Trail

Alternative B traverses a total of 0.9 miles in slopes greater than 8%. Access to 0.2 of those miles would use existing roads.

- This route would require 0.7 miles of new road construction on slopes >8%.
  - 0.5 miles of new road would be built in Bearpaw shale with slope >8%.

Use of existing roads would have no impact on geologic resources. Improvement of existing roads would be subject to generic mitigation measure 1, leaving low to no impact. All new road construction would be subject to generic mitigation measures 3 and 4 and new road construction on steep, shale slopes, should require on site geotechnical work. Under these conditions, new road construction would leave a low impact.

Alternative C - East Central-Proposed Action

Alternative C has a total of 1.1 miles in slopes greater than 8%. Access to 0.1 of those miles would use existing roads.

- This would require 1.0 mile of new road construction on slopes >8%, and
  - 0.8 miles of new road would be built in Bearpaw shale with slope >8%.

Use of existing roads would have no impact on geologic resources. Improvement of existing roads would be subject to generic mitigation measure 1, leaving low to no impact. All new road construction would be subject to generic mitigation measures 3 and 4 and new road construction on steep, shale slopes, should require on site geotechnical work. Under these conditions, new road construction would leave a low impact.

Alternative D - Britsch Road

Alternative D covers a total of 3.0 miles with slope greater than 8%.

- mile of this would require new road construction on slopes >8%.
- 0.3 miles of new roads would be built in Bearpaw shale with slope >8%.

Use of existing roads would have no impact on geologic resources. Improvement of existing roads would be subject to generic mitigation measure 1, leaving low to no impact. All new road construction would be subject to generic mitigation measures 3 and 4 and new road construction on steep, shale slopes, should require on site geotechnical work. Under these conditions, new road construction would leave a low impact.

Alternative E - West Central

Alternative E covers a total of 3.3 miles of slopes >8%.

- 1.4 miles would require new road construction on slopes >8%.
- mile of new road would be built in Bearpaw shale with slope >8%.

Use of existing roads would have no impact on geologic resources. Improvement of existing roads would be subject to generic mitigation measure 1, leaving low to no impact. All new road construction would be subject to generic mitigation measures 3 and 4 and new road construction on steep, shale slopes, should require on site geotechnical work. Under these conditions, new road construction would leave a low impact.

3.9.2.4 Antelope Creek Substation

Use of existing roads would have no impact on geologic resources. Improvement of existing roads would be subject to generic mitigation measure 1, leaving low to no impact. All new road construction would be subject to generic mitigation measures 3 and 4 and new road construction on steep, shale slopes, should require on site geotechnical work. Under these conditions, new road construction would leave a low impact.

3.9.2.5 No Action Alternative

No impact to geologic resources would occur under the No Action Alternative

3.10.SOILS

3.10.1 Affected Environment

3.10.1.1 Study Methods

Soil resource information was acquired from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). The NRCS provided the Soil Survey of Valley County, Montana. Additional data were also acquired via the Internet from various NRCS web sites. State Soil Geographic (STATSGO) and Soils Survey Geographic (SSURGO) databases were utilized as the primary source of information for this soil resources inventory.

The study area related to the wind farm consists of four distinct phases. Phase 1 consists of 33 turbines spread over approximately 1,094 acres. Phase 2 consists of 63 turbines spread over approximately 2,800 acres. Phase 3 consists of 104 turbines spread over approximately 5,520 acres. Phase 4 consists of 134 turbines spread over approximately 10,706 acres. Collectively, Phases 1 through 4 represent the Proposed Action.

The study area related to the transmission line consists of a 400-foot wide corridor with the transmission line alignment serving as the centerline. The alignment alternatives vary in length from approximately 34.8 miles for the Proposed Action (Route C) to approximately 40.5 miles for the "HWY 24" alternative (Route A). Other affected areas associated with the transmission line would include improved or new access roads, construction marshalling yards, and pulling/tensioning sites outside of the 400-foot wide corridor.

The study area related to the Antelope Creek Substation consists of a contiguous land parcel approximately five acres in size.

3.10.1.2 Study Area Overview

Wind Farm

The portion of the study area related to the wind farm is typically dominated by nearly level to hilly, shallow to deep well drained soils on glaciated plains and shale uplands. Soils in this portion of the study area generally fall into three broad categories:

- Deep, nearly level to hilly soils on uplands that formed in glacial till.
- Deep, nearly level to strongly sloping soils on uplands that formed in glacial till.
- Shallow to deep, nearly level to hilly soils formed in parent material weathered from clay shale and in glacial till on uplands.

Transmission Line

The portion of the study area related to the transmission is typically dominated by two different landforms. The portion of the area generally encompassing the Milk River is dominated by nearly level to gently sloping deep well drained soils located on flood plains and associated fans, and low terraces. Soils along the Milk River generally fall into two broad categories:

- Level soils which formed in alluvium on flood plains and associated low terraces.
- Nearly level to gently sloping soils which formed in alluvium on fans and low terraces.

The upland portion of the area is typically dominated by level to hilly, shallow to deep well drained soils that formed on glaciated plains and shale uplands. Soils in this portion of the study area generally fall into four broad categories:

- Deep, nearly level to hilly soils on uplands that formed in glacial till.
- Deep, nearly level to strongly sloping soils on uplands that formed in glacial till.
- Deep, upland soils on nearly level to strongly rolling lands that formed in glacial till.
- Shallow to deep, nearly level to hilly soils formed in parent material weathered from clay shale and in glacial till on uplands.

Substation

The portion of the study area related to the substation is typically dominated by nearly level, deep well-drained soils that formed on glaciated plains and shale uplands. Soils in this portion of the study area generally fall into one broad category:

- Deep, upland soils on nearly level to strongly rolling lands that formed in glacial till.

A summary of expected soil name and series, erosion potential, and other characteristics for the wind farm, 230kV transmission line, and Antelope Creek Substation is presented in Table 3.10.1.

3.10.1.3 Wind Farm

Soil map units occurring in each wind farm phase are discussed below. Refer to Table 3.10-1, Selected Soil Characteristics for more detailed information.

Phase I-50 MW Area

Five detailed soil map units occur in Phase I of the wind farm. They are identified in Table 3.10-1. Soils in Phase I are predominantly deep, well drained, and formed in glacial till on uplands. The exception is the Lisam-Dilts clays which are shallow uplands soils that formed in shales. There is no hydric soil mapping units occurring in this phase. There are no prime farmlands or farmland of statewide importance mapping units occurring in this phase. Erosion potential for the area is predominantly moderate (75%) with the remainder being high.

Phase II-100 MW Area

Nine detailed soil map units occur in Phase II of the wind farm. They are identified in Table 3.10-1.

Soils in Phase II are predominantly deep, well drained, and formed in glacial till on uplands. Exceptions are the Lisam-Dilts clays which are shallow upland soils that formed in shales, Aquic ustifluvents that formed in alluvium along streams, and Nishon loams which formed in basins. The Nishon loam is a hydric soil mapping unit. Minor amounts of this soil occur in Phase II. There are no prime farmland or farmland of statewide importance mapping units occurring in this phase. Erosion potential for the

area is predominantly moderate (77%) with the vast majority of the remainder being high. Approximately one & of the area has low erosion potential.

Phase III-150 MW Area

Twelve detailed soil map units occur in Phase III of the wind farm. They are identified in Table 3.10-1

Soils in Phase III are predominantly deep, well drained, and formed in glacial till on uplands. Exceptions are the Lisam-Dilts clays which are shallow upland soils that formed in shales and Aquic ustifluvents that formed in alluvium along streams. Rock outcrops also occur in this phase. There are no hydric soil mapping units occurring in this phase. There are no prime farmland or farmland of statewide importance mapping units occurring in this phase. Erosion potential for the area is predominantly moderate (71%) with the vast majority of the remainder being high. Less than one & of the area has low erosion potential.

Phase IV-200 MW Area

Fifteen detailed soil map units occur in Phase IV of the wind farm. They are identified in Table 3.10-1.

Soils in Phase IV are also predominantly deep, well drained, and formed in glacial till on uplands. Exceptions are the Lisam-Dilts clays which are shallow upland soils that formed in shales, Nishon loams which formed in basins, and Ustic Torrifluvents that formed in recent alluvial deposits on flood plains and stream terraces. Rock outcrops also occur in this phase. The Nishon loam is a hydric mapping unit. Minor amounts of this soil occur in Phase IV. There are no prime farmland or farmland of statewide importance mapping units occurring in this phase. Erosion potential for this area is split between moderate (54%) and high (46%).

3.10.1.4 230kV Transmission Line

Soil map units occurring along each transmission line alternative are discussed below. Refer to Table 3.10-1, Selected Soil Characteristics for more detailed information.

Alternative A—Highway 24

Twenty-six detailed soil map units occur along Alternative A, and are identified in Table 3.10-1

A large portion of the soils along Alternative A of the transmission line are deep, well drained, and formed in glacial till and alluvium on uplands. Exceptions to this include the following soils. Lisam, Dilts, and Thebo clays formed in upland shales. Nishon loams formed in basins. Ustic Torrifluvents formed in recent alluvial deposits on flood plains and stream terraces. Rock outcrops also occur in this phase. Tinsley soils are excessively drained and formed in gravelly alluvium on valley slopes. The Nishon loam is a hydric mapping unit. Minor amounts of this soil occur along Alternative A. Minor amounts of Redvale loam, a prime farmland if irrigated, occur along this alternative.

Minor amounts of Havre silty clay loam, considered farmland of statewide importance also occurs along Alternative A. Erosion potential for the area is predominantly moderate (77%) with the remainder being high.

Alternative B - Jensen Trail

Twenty-four detailed map units occur along Alternative B, and are identified in Table 3.10-1.

The majority of soils along Alternative B are deep, well drained, and formed in glacial till and alluvium on uplands. Exceptions to this include the following soils. Lisam, and Thebo clays formed in upland shales. Nishon loams formed in basins. Ustic Torrifluvents formed in recent alluvial deposits on flood plains and stream terraces. Rock outcrops also occur in this phase. Tinsley soils are excessively drained and formed in gravelly alluvium on valley slopes. The Nishon loam is a hydric mapping unit. Minor amounts of this soil occur along this alternative. Minor amounts of Havre silty clay loam, considered farmland of statewide importance, occur along Alternative B. Erosion potential for the area is predominantly moderate (84%) with the remainder being high.

Alternative C - East Central-Proposed Action

Twenty-three detailed soil map units occur along Alternative C, and are identified in Table 3.10-1.

The majority of soils along Alternative C are also deep, well drained, and formed in glacial till and alluvium on uplands. Exceptions to this include the following soils. Nishon loams formed in basins. Ustic Torrifluvents formed in recent alluvial deposits on flood plains and stream terraces. Tinsley soils are excessively drained and formed in gravelly alluvium on valley slopes. Aquic Ustifluvents formed in alluvium along streams. Lallie silty clays occur on oxbows, abandoned stream channels and flood plains and are hydric. The Nishon loam is also a hydric mapping unit. Minor amounts of this soil occur along this alternative. Minor amounts of Redvale loam, a prime farmland if irrigated, occur along this alternative. Minor amounts of Havre silty clay loam, considered farmland of statewide importance, occur along Alternative C. Erosion potential for the area is predominantly moderate (74%) with the vast majority of the remainder being high.

Alternative D - Britsch Road

Twenty-nine detailed soil map units occur along Alternative D, and are identified in Table 3.10-1.

The majority of soils along Alternative D are also deep, well drained, and formed in glacial till and alluvium on uplands. Exceptions to this include the following soils. Lisam, Dilts, and Thebo clays formed in upland shales. Typic fluvaquents are level soils that formed in recent alluvium along oxbows and stream channels. Ustic Torrifluvents formed in recent alluvial deposits on flood plains and stream terraces. Minor amounts of Redvale loam, a prime farmland if irrigated, occur along this alternative. Minor amounts of Havre silty clay loam, considered farmland of statewide importance, also occur along

Alternative D. Erosion potential for this area is mainly moderate (70%) with the remainder being high.

Alternative E - West Central

Twenty-seven detailed soil map units occur along Alternative E., and are identified in Table 3.10-1.

The majority of soils along Alternative E are also deep, well drained, and formed in glacial till and alluvium on uplands. Exceptions to this include the following soils. Lisam, and Dilts clays formed in upland shales. Lallie silty clays occur on oxbows, abandoned stream channels and flood plains and are hydric. The Nishon loam is also a hydric mapping unit. Minor amounts of this soil occur along this alternative. Tinsley soils are excessively drained and formed in gravelly alluvium on valley slopes. Ustic Torrifluvents formed in recent alluvial deposits on flood plains and stream terraces. Minor amounts of Attewan loam, a prime farmland if irrigated, occur along this alternative. Minor amounts of Havre silty clay loam, considered farmland of statewide importance, occur along Alternative E. Erosion potential for this area is mainly moderate (59%) with the remainder being high.

3.10.1.5 Antelope Creek Substation

Soil map units occurring within the substation boundaries are discussed below. Refer to Table 3-10-1, Selected Soil Characteristics for more detailed information.

Two detailed soil map units occur on the substation site.

These soils are deep, well drained, and formed in glacial till and alluvium on uplands. Erosion potential for these soils is moderate.

Table 3.10-1 Selected Soil Characteristics: Wind Farm Phases, 230kVTransmission Line Alternatives, and Antelope Creek Substation.

Map Symbol	Soil Name	Hydric	*PFL/SW	Erosion Potential		Shrink Well Potential	Topsoil Quality	Wind Farm				Transmission Line Alternatives					Antelope Creek Substation
				Wind	Water			Phase I	Phase II	Phase III	Phase IV	A	B	C	D	E	
1	Absher-Vaeda complex, 1 to 5 percent slopes			Slight	Mod	High	Poor – salt, clay, alkali								X	X	
2	Aquic Ustifluvents, saline			Slight	Slight				X	X				X			
3	Attewan loam, 0 to 4 percent slopes		If irr.	Mod	Mod	Mod	Fair - thin									X	
7	Elloam clay loam, 1 to 5 percent slopes			Mod	Mod	High	Poor – salt, clay, alkali		X	X	X	X	X	X	X	X	
8	Elloam gravelly clay, 2 to 9 percent slopes			Slight	Mod	High	Poor – salt, clay, alkali	X	X	X	X	X	X	X	X	X	
9	Elloam-Sunburst clay loam, 9 to 35 percent slopes			Mod	Severe	High	Poor – salt, clay, alkali	X	X	X	X	X	X	X	X	X	
12	Evanston loam, sandstone substratum, 2 to 5 percent slopes		SW	Mod	Mod	Mod	Fair – clay, thin								X		
13	Evanston-Lonna loams, 2 to 9 percent slopes			Mod	Mod	Mod	Fair – clay, thin					X	X	X		X	X
15	Evanston-Marmarth loams, 3 to 12 percent slopes			Mod	Mod	Mod	Fair – clay, thin								X		
22	Harlem Silty clay loam			Mod	Slight	High	Poor – clay					X	X		X	X	
23	Harlem clay			Mod	Slight	High	Poor – clay					X	X	X	X	X	
24	Harlem clay, wet			Mod	Slight	High	Poor – clay					X	X	X			
25	Havre silty clay loam		SW	Mod	Slight	Mod	Fair – clay					X	X	X	X	X	
26	Havre-Glendive complex		SW	Mod	Mod	Mod	Fair – clay								X		
27	Havre-Harlem silty clays			Mod	Slight	High	Fair – clay					X				X	
30	Hillon-Telstad loams, 9 to 15 percent slopes			Mod	Severe	Mod	Fair – clay									X	
32	Lallie silty clay	Yes		Slight	Slight		Poor – clay, wet							X		X	
34	Lisam-Dilts clays, 5 to 35 percent slopes			Mod	Severe	High	Poor – clay, reclaim	X	X		X				X	X	
35	Lisam-Dilts-Rock Outcrop complex, 9 to 35 percent slopes			Mod	Severe	High	Poor – clay, reclaim			X	X					X	
38	Marias clay, 1 to 9 percent slopes			Mod	Mod	High	Poor - clay					X	X	X	X	X	
39	Marmarth-Cabbart loams, 5 to 25 percent slopes			Mod	Severe	Mod	Fair - thin								X		
42	Nishon loam	Yes		Slight	Slight	High	Poor – clay, wet		X		X	X	X	X		X	
44	Nobe-Absher complex, 0 to 3 percent slopes			Mod	Slight	High	Poor – clay, salts, alkali					X	X	X	X		
46	Phillips loam, 0 to 5 percent slopes			Mod	Mod	High	Poor – thin, clay		X	X	X	X	X	X	X	X	
47	Phillips-Elloam complex, 1 to 9 percent slopes			Mod	Mod	High	Poor – thin, clay			X	X	X	X	X	X	X	X
48	Phillips-Nobe-Absher complex, 1 to 5 percent			Mod	Mod	High	Poor – thin, clay								X		

Map Symbol	Soil Name	Hydric	*PFL/SW	Erosion Potential		Shrink Well Potential	Topsoil Quality	Wind Farm				Transmission Line Alternatives					Antelope Creek Substation
				Wind	Water			Phase I	Phase II	Phase III	Phase IV	A	B	C	D	E	
	slopes																
49	Phillips-Scobey complex			Mod	Mod	High	Poor – thin, clay			X		X	X	X	X	X	
50	Phillips-Telstad loams, 2 to 9 percent slopes			Mod	Mod	High	Poor – thin, clay				X	X					
51	Phillips-Thoeny loams, 0 to 2 percent slopes			Mod	Slight	High	Poor – thin, clay			X			X				
52	Redvale loam, 0 to 3 percent slopes		If irr.	Mod	Slight	Mod	Poor – thin, clay					X		X	X		
55	Rock Outcrop																
57	Scobey clay loam, 1 to 9 percent slopes			Mod	Mod	High	Fair - clay								X		
59	Scobey-Sunburst clay Loams, 5 to 25 percent slopes			Mod	Severe	High	Fair - clay			X	X	X	X	X	X	X	
60	Sunburst clay loam, 9 to 35 percent slopes			Mod	Severe	Mod	Poor – clay, slope		X		X	X	X	X	X	X	
61	Sunburst-Lisam complex, 9 to 35 percent slopes			Mod	Severe	Mod	Poor – clay, slope	X		X	X	X	X	X		X	
65	Telstad loam, 1 to 9 percent slopes			Mod	Mod	Mod	Fair – clay, slope							X	X	X	
66	Thebo clay, 2 to 9 percent slopes			Mod	Mod	High	Poor - clay								X		
68	Thebo-Lisam clays, 2 to 15 percent slopes			Mod	Severe	High	Poor - clay					X	X				
69	Thoeny-Phillips complex, 1 to 5 percent slopes			Mod	Mod	High	Poor – clay, alkali	X	X	X	X	X	X	X	X	X	
70	Tinsley complex, 9 to 35 percent slopes			Mod	Severe	Low	Poor – sandy, stones				X	X	X	X		X	
74	Typic Fluvaquents, gently sloping			Slight	Mod									X	X		
75	Ustric Torrifluvents, gently sloping			Slight	Mod						X	X	X		X	X	
76	Vaeda silty clay			Slight	Mod	High	Poor – alkali, clay								X		
79	Water																

3.10.2 Environmental Consequences and Mitigation Measures

3.10.2.1 Assessment Methodology

The primary concerns regarding soil resources are to avoid or minimize potential impacts related to wind and water erosion during and after construction. Potential impact locations have been evaluated and recorded by phase for the wind farm , and by milepost for the transmission line . Factors considered in conducting the impact analysis include the erosion hazard of specific soil types, the intensity, duration and frequency of impacts, and mitigation measures. Ground disturbance levels were estimated for the VCWEP. considering topography, the amount of new or existing roads, and other estimated disturbance areas relating to construction. Initial impact levels were estimated by combining projected ground disturbance levels, soil characteristics (particularly soil erosion hazard), and generic mitigation measures. Applying selectively committed mitigations measures was then evaluated to determine if projected impacts to soil resources could be further reduced. Initial and residual impacts are one in the same where no selectively committed mitigation measures are proposed. Residual impacts are "final" estimated impacts where selectively committed mitigations are proposed.

Impact Levels

Impact levels relating to soils resources are defined as follows:

- **High Impact** - A high level of impact to soil resources would result if the construction, operation, maintenance, or abandonment of the VCWEP. would potentially cause a substantial erosion hazard or loss of soil productive potential.

- **Moderate Impact** - A moderate level of impact to soil resources would result if the construction, operation, maintenance, or abandonment of the VCWEP. would potentially cause some erosion hazard or loss of soil productive potential.

- **Low Impact** - A low level of impact to soil resources would result if the construction, operation, maintenance, or abandonment of the VCWEP. would potentially cause a small erosion hazard or loss of soil productive potential.

- **No-Identifiable Impact** - No identifiable impact to soil resources would be indicated where no loss of soil or loss of productive potential would occur.

All soil map units affected by the VCWEP. would be subject to some level and type of disturbance. Soil surface disturbance, compaction, and erosion would occur to varying degrees. These disturbances would likely result in some increase to wind and water erosion rates and compaction levels, and result in the relocation of some soil resources.

Direct impacts to soil resources would result from construction activities. Construction activities associated with the wind farm generally would include road building for access, erecting the wind turbines and associated collector infrastructure, and constructing an operations building. Construction activities associated with the transmission line would

generally include road building for access, transmission structure installation sites, material lay-down areas, conductor pulling and tensioning areas, and construction staging areas. These direct impacts would be temporary during construction and permanent where wind turbines, roads, transmission structures and other facilities are placed.

The following generally describes the conditions associated with estimated initial impact levels:

High

- Construction activities in steep terrain. An example would be new road construction in sloping terrain.
- High to moderate soil erosion potential.

Moderate

- Construction activities in flat to moderately sloping terrain. An example would be new road construction in gently sloping terrain.
- Moderate soil erosion potential.

Low

- Ancillary activities related to construction. An example would be using unimproved existing roads or overland travel in agricultural areas.
- Moderate to low soil erosion potential.

3.10.2.2 Wind Farm

There are a number of potential impacts related to soil resources associated with all Alternatives of VCWEP. They would be associated with construction, operation and maintenance, and decommissioning of the site, and include:

- Site grading and excavation associated with roadway construction, trenching, accessory structure and turbine foundation construction, and equipment and material staging that would result in soil exposure and potential erosion;
- Operation and maintenance impacts caused by road and underground facility maintenance and repair that require importation of additional gravel, sand, asphalt, and other materials. Typically, only minor soil disruption would occur, and they would be temporary in duration; and
- Decommissioning impacts associated with the removal of above-ground structures to a depth of 3 feet. Typically, only minor soil disruption would occur, and they would be temporary in duration.

During construction, each turbine structure would require the excavation of soil for each base. Where new access roads are required, a 24’ wide corridor would be bladed,

compacted, and graveled between Kerr Road and the proposed collector substation at the wind farm, a distance of approximately 2 miles resulting in approximately x acres of temporary soil exposure. The construction of an 18 foot wide graveled road would also be built as access to the various rows of turbines and other wind farm facilities. The internal wind farm roads would accommodate two lane traffic and have a compacted gravel surface. Soil resources would also be impacted during the construction of a permanent O&M facility that would consist of a 5,000 square feet structure and graveled outdoor parking and turnaround area totaling approximately 2 acres. Other facilities that would impact soil resources include the collector system, staging areas, and crane pad areas.

Soil resource impacts would be mitigated by the implementation of erosion and sediment control best management practices (BMP's) as required by the State of Montana and presented in Stormwater Pollution Prevention Plans (SWPPP). The BMP's implemented and the SWPPP's developed would be part of the civil engineering process, and would be developed based on the specific soil disturbance conditions and the nature of the construction, operation and maintenance, or decommissioning (See Mitigation Measures below).

Proposed Action – 500 MW Facility

The Proposed Action is composed of Phases I, II III, and IV. In addition to those erosion potentials discussed below for Phases I, II, and III, high erosion potential has been identified on 4,912.5 acres and moderate erosion potential on 5,773.5 acres of Phase IV. Refer to Table 3.10-2, Wind Farm Erosion Potential. The Proposed Action would result in an estimated 353.6 and 168.7 acres of temporary disturbance to moderately and severely erosive soils respectively. The Proposed Action would also result in an estimated 76.0 and 37.5 acres of permanent disturbance to moderately and severely erosive soils respectively. Refer to Table 3.10-3, Permanent and Temporary Disturbance to Erosive Soils – Wind Farm.

Impacts associated with the Proposed Action include those discussed below for Phases I, II, and III in addition to those impacts associated with Phase IV. Developing the internal road network for Phase IV would result in approximately 41.6 acres of direct, permanent adverse impact and 14.0 acres of direct, temporary adverse impact. Collector infrastructure installation would result in approximately 27.9 acres of direct, temporary adverse impacts to soil resources. Wind turbine construction would result in approximately 0.4 acres of direct, permanent adverse impacts and approximately 30.8 acres of direct, temporary adverse impacts. The use of material staging areas would result in approximately 132.0 acres of direct, temporary adverse impacts.

Alternative A - 150 MW (Phases I and II)

Alternative A is composed of Phases I and II. Phase I encompasses approximately 1,094 acres. Phase II encompasses approximately 2,800 acres. High erosion potential has been identified on 267.6 and 617.7 acres respectively for Phases I and II. Moderate erosion

Table 3.10-2 Wind Farm Erosion Potential (acres).

Erosion Potential	Phase I	Phase II	Phase III	Phase IV	Total
Low	-	29.5	16.2	-	45.7
Moderate	823.9	2152.2	3939.1	5773.5	12688.7
High	267.6	617.7	1564.3	4912.5	7362.1

Table 3.10-3 Permanent and Temporary Disturbance to Erosive Soils -Wind Farm (acres).

Erosion Potential	Proposed Action (Phases I, II, III, & IV)	Alternative A (Phases I & II)	Alternative B (Phases I, II, & III)
Temporary			
Moderate	353.6	128.9	241.1
High	168.7	35.6	76.5
Permanent			
Moderate	76.0	30.8	53.3
High	37.5	9.3	18.2

potential has been identified on 823.9 acres and 2152.2 acres respectively for Phases I and II. Refer to Table 3.10-2, Wind Farm Erosion Potential. Low erosion potential has been identified on 29.5 acres of Phase II. Alternative A would result in an estimated 128.9 and 35.6 acres of temporary disturbance to moderately and severely erosive soils respectively. Alternative A would also result in an estimated 30.8 and 9.3 acres of permanent disturbance to moderately and severely erosive soils respectively. Refer to Table 3.10-3, Permanent and Temporary Disturbance to Erosive Soils – Wind Farm.

Road building activities associated with Phase I would include a new access road and an internal road network. The new access road would result in a direct, permanent adverse impact to approximately 5.8 acres and a direct, temporary impact to approximately 8.7 acres. Developing the internal road network for Phase I would result in approximately 10.4 acres of direct, permanent adverse impact and 3.5 acres of direct, temporary adverse impact. Collector infrastructure installation would result in approximately 1.0 acres of direct, permanent adverse impacts and approximately 8.0 acres of direct, temporary adverse impacts to soil resources. Construction of the operations building would result in approximately 2.0 acres of direct, permanent impacts and approximately 2.0 acres of direct, temporary adverse impacts. Wind turbine construction would result in

approximately 0.1 acres of direct, permanent adverse impacts and approximately 7.7 acres of direct, temporary adverse impacts. The use of material staging areas would result in approximately 33.0 acres of direct, temporary adverse impacts.

Developing the internal road network for Phase II would result in approximately 20.8 acres of direct, permanent adverse impact and 7.0 acres of direct, temporary adverse impact. Collector infrastructure installation would result in approximately 14.0 acres of direct, temporary adverse impacts to soil resources. Wind turbine construction would result in approximately 0.2 acres of direct, permanent adverse impacts and approximately 15.4 acres of direct, temporary adverse impacts. The use of material staging areas would result in approximately 66.0 acres of direct, temporary adverse impacts.

Alternative B- 300 MW (Phases I, II & III)

Alternative B is composed Phases I, II, and III. In addition to those erosion potentials discussed above for Phases I and II, high erosion potential has been identified on 1,564.3 acres, moderate erosion potential on 3,939.1 acres, and low erosion potential on 16.2 acres of Phase III. Refer to Table 3.10-2, Wind Farm Erosion Potential. Alternative B would result in an estimated 241.1 and 76.5 acres of temporary disturbance to moderately and severely erosive soils respectively. Alternative B would also result in an estimated 53.3 and 18.2 acres of permanent disturbance to moderately and severely erosive respectively. Refer to Table 3.10-3, Permanent and Temporary Disturbance to Erosive Soils – Wind Farm.

Impacts associated with Alternative B include those discussed above for Phases I and II in addition to impacts associated with Phase III. Developing the internal road network for Phase III would result in approximately 31.2 acres of direct, permanent adverse impact and 10.5 acres of direct, temporary adverse impact. Collector infrastructure installation would result in approximately 20.9 acres of direct, temporary adverse impacts to soil resources. Wind turbine construction would result in approximately 0.3 acres of direct, permanent adverse impacts and approximately 23.1 acres of direct, temporary adverse impacts. The use of material staging areas would result in approximately 99.0 acres of direct, temporary adverse impacts.

Selective Mitigation Measures

Impacts associated with wind farm construction and operation would be minimized to the impact levels indicated through effective implementation of selective mitigation measures 1, 2, 3, 4,and 5 described in Chapter 2 of this document. These measures would provide for minimizing disturbance in sensitive areas, implementing surface stabilization and erosion control, and reseeding.

3.10.2.3 230kV Transmission Line

As with the wind farm, the transmission line would have a number of potential impacts related to soil resources associated with all Alternatives. They would be associated with construction, operation and maintenance, and decommissioning of the transmission line, and include:

- Site grading and excavation associated with roadway construction, excavation for poles, equipment and material staging, transmission line laydown areas, transmission line pulling and tensioning areas, that would result in soil exposure and potential erosion;

- Operation and maintenance impacts caused by road and underground facility maintenance and repair that require importation of additional gravel, sand, asphalt, and other materials. Typically, only minor soil disruption would occur, and they would be temporary in duration; and

- Decommissioning impacts associated with the removal of above-ground structures to a depth of 3 feet. Typically, only minor soil disruption would occur, and they would be temporary in duration.

During construction, each transmission structure would require soil excavation in an area of approximately 13 square feet for each base. Where new access roads are required, a 14' wide corridor would be bladed along the transmission lines resulting in approximately 34 acres of temporary soil exposure.

Soil resource impacts would be mitigated by the implementation of erosion and sediment control best management practices (BMP's) as required by the State of Montana and presented in Stormwater Pollution Prevention Plans (SWPPP). The BMP's implemented and the SWPPP's developed would be part of the civil engineering process, and would be developed based on the specific soil disturbance conditions and the nature of the construction, operation and maintenance, or decommissioning (See Mitigation Measures below).

Alternative A - Highway 24

Alternative A is composed of links 1, 3, 5, 23, and 24. Total length is approximately 40.4 miles. High erosion potential has been identified at the following locations: Link 3, mileposts 0.0 to 0.1, 0.2 to 0.5, 1.1 to 1.2, 1.4 to 1.8, 2.3 to 2.8, and 2.9 to 3.5; Link 5 mileposts 3.7 to 3.9, 5.4 to 6.4, 6.5 to 6.7, 6.8 to 7.0, 7.2 to 7.4, 7.5 to 7.8, 11.2 to 11.5, 11.7 to 12.2, 12.8 to 13.0, 14.4 to 14.6, 15.7 to 17.2, 24.2 to 24.3, 25.1 to 25.7, and 25.9 to 26.4; Link 23 mileposts 1.3 to 1.8; Link 24 mileposts 5.9 to 6.5. The balance of this alternative has moderate erosion potential. Hydric soils are located along Link 3 mileposts 0.7 to 0.8 and Link 24 mileposts 0.6 to 0.8, 1.3 to 1.4. Prime farmlands (if irrigated) are located along link 5 mileposts 19.3 to 19.4, 19.7 to 20.2, and 20.7 to 21.1. Farmlands of statewide importance are located along link 24 mileposts 0.6 to 1.5.

Moderate impacts to soil resources would occur along approximately 7.7 miles of Alternative A. Low impacts would occur on the remainder of 32.8 miles. Road building activities would result in direct impacts to an estimated 96.6 acres of soil resources. Roads will be vegetatively restored following construction with the road prism remaining. Direct road building impacts would generally be long term and adverse. Installation of transmission line structures would result in direct impacts to approximately 0.1 acres of soil resources. These impacts would be long term and adverse.

Approximately 97.2 acres of direct impacts related to material lay-down areas would occur. These impacts would be short term and adverse. Approximately 5.5 acres of direct impacts related to conductor pulling and tensioning sites would occur. These impacts would be short term and adverse. Approximately 5.0 acres of direct impacts would occur related to a construction staging area. These impacts would be short term and adverse. See Soil Resources Impact Table in Appendix A. and Table 3.10-4 Soil Characteristics Along Transmission Line Alternatives.

Table 3.10-4 Soil Characteristics Along Transmission Line Alternatives (miles).

Alternative	Erosion Potential			Prime Farmland	Farmland Statewide Importance	Hydric Soil
	Low	Moderate	High			
A	--	31.3	9.1	1.0	0.9	0.4
B	0.1	31.2	5.8	--	0.9	0.8
C	0.3	27.7	6.8	0.9	0.6	0.6
D	--	29.6	7.5	0.4	1.2	0.1
E	--	20.7	12.4	0.2	0.8	0.4

Alternative B - Jensen Trail

Alternative B is composed of links 1, 3, 6, 10, 18, 23, and 24. Total length is approximately 37.1 miles. High erosion potential has been identified at the following locations: Link 3, mileposts 0.0 to 0.1, 0.2 to 0.5, 1.1 to 1.2, 1.4 to 1.8, 2.3 to 2.8, and 2.9 to 3.5; Link 6 mileposts 1.4 to 2.0, 2.2 to 2.6, 2.9 to 3.2; Link 10 mileposts 0.5 to 0.8, 5.3 to 5.5, 5.6 to 6.5; Link 23 mileposts 1.3 to 1.8; Link 24 mileposts 5.9 to 6.5. Low erosion potential has been identified at Link 10 milepost 16.4 to 16.5. The balance of this alternative has moderate erosion potential. Hydric soils are located along Link 3 mileposts 0.7 to 0.8, link 10 mileposts 16.3 to 16.6, 17.0 to 17.1, and Link 24 mileposts 0.6 to 0.8, 1.3 to 1.4. Farmlands of statewide importance are located along link 24 mileposts 0.6 to 1.5.

Moderate impacts to soil resources would occur along approximately 3.9 miles of Alternative B. Low impacts would occur on the remainder of 32.9 miles excepting 0.1 miles where no impact is projected to occur.

Road building activities would result in direct impacts to an estimated 58.3 acres of soil resources. Roads will be vegetatively restored following construction with the road prism remaining. Direct road building impacts would generally be long term and adverse. Installation of transmission line structures would result in direct impacts to approximately 0.1 acres of soil resources. These impacts would be long term and adverse. Approximately 89.0 acres of direct impacts related to material lay-down areas would

occur. These impacts would be short term and adverse. Approximately 4.5 acres of direct impacts related to conductor pulling and tensioning sites would occur. These impacts would be short term and adverse. Approximately 5.0 acres of direct impacts would occur related to a construction staging area. These impacts would be short term and adverse.

Alternative C - East Central-Proposed Action

Alternative C is composed of links 1, 3, 6, 11, 20, and 22. Total length is approximately 34.8 miles. High erosion potential has been identified at the following locations: Link 3, mileposts 0.0 to 0.1, 0.2 to 0.5, 1,1 to 1.2, 1.4 to 1.8, 2.3 to 2.8, and 2.9 to 3.5; Link 6 mileposts 1.4 to 2.0, 2.2 to 2.6, 2.9 to 3.2; Link 11 mileposts 2.1 to 2.2, 2.4 to 2.6, 3.4 to 3.7, 4.4 to 4.6, 4.7 to 5.4, 5.5 to 5.7, 5.9 to 6.3, 6.4 to 6.5, 6.9 to 7.7, 9.0 to 9.8; Link 22 mileposts 0.9 to 1.7. Low erosion potential has been identified at Link 11 milepost 8.7 to 9.0. The balance of this alternative has moderate erosion potential. Hydric soils are located along Link 3 mileposts 0.7 to 0.8 and link 22 mileposts 2.0 to 2.4, 2.5 to 2.6. Prime farmlands (if irrigated) are located along link 11 milepost 10.4 to 11.2 and 11.6 to 11.7. Farmlands of statewide importance are located along link 22 mileposts 1.6 to 1.9 and 2.3 to 2.6.

Moderate impacts to soil resources would occur along approximately 4.1 miles of Alternative C. Low impacts are projected to occur on the remainder of 30.7 miles. Road building activities would result in direct impacts to an estimated 61.5 acres of soil resources. Roads will be vegetatively restored following construction with the road prism remaining. Direct road building impacts would generally be long term and adverse. Installation of transmission line structures would result in direct impacts to approximately 0.1 acres of soil resources. These impacts would be long term and adverse. Approximately 83.5 acres of direct impacts related to material lay-down areas would occur. These impacts would be short term and adverse. Approximately 4.5 acres of direct impacts related to conductor pulling and tensioning sites would occur. These impacts would be short term and adverse. Approximately 5.0 acres of direct impacts would occur related to a construction staging area. These impacts would be short term and adverse.

Alternative D - Britsch Road

Alternative D is composed of links 2, 9, 14, 16, and 25. Total length is approximately 37.1 miles. High erosion potential has been identified at the following locations: Link 2, mileposts 0.6 to 0.8, 1.4 to 1.6, 2.6 to 3.1, 3.5 to 3.6, 4.7 to 4.9, 5.1 to 6.2, 6.8 to 7.3; Link 9 mileposts 0.9 to 1.5, 1.7 to 1.9, 4.5 to 4.9, 5.3 to 6.0, 9.6 to 9.9; Link 16 mileposts 0.6 to 0.8, 0.9 to 1.2, 1.6 to 1.8, 1.9 to 2.1, 2.5 to 2.8, 3.3 to 3.6, 4.2 to 4.4, 5.1 to 5.6, 5.8 to 7.0, 8.7 to 8.9, 9.5 to 9.8, 9.9 to 10.1, 10.8 to 11.8; Link 25 mileposts 0.0 to 0.3, 0.5 to 5.9, 1.0 to 1.2. The balance of this alternative has moderate erosion potential. Hydric soils are located along Link 16 mileposts 3.8-3.9. Prime farmlands (if irrigated) are located along link 14 milepost 1.5 to 1.9. Farmlands of statewide importance are located along link 14 mileposts 4.7 to 4.9 and along link 16 mileposts 0.1 to 0.6, 1.7 to 2.0, and 3.7 to 3.9.

Moderate impacts to soil resources would occur along approximately 4.0 miles of Alternative D. Low impacts are projected to occur on the remainder of 33.1 miles. Road

building activities would result in direct impacts to an estimated 50.5 acres of soil resources. Roads will be vegetatively restored following construction with the road prism remaining. Direct road building impacts would generally be long term and adverse. Installation of transmission line structures would result in direct impacts to approximately 0.1 acres of soil resources. These impacts would be long term and adverse. Approximately 89.0 acres of direct impacts related to material lay-down areas would occur. These impacts would be short term and adverse. Approximately 4.0 acres of direct impacts related to conductor pulling and tensioning sites would occur. These impacts would be short term and adverse. Approximately 5.0 acres of direct impacts would occur related to a construction staging area. These impacts would be short term and adverse.

Alternative E - West Central

Alternative E is composed of links 1, 4, 8, 12, 17, and 25. Total length is approximately 33.1 miles. High erosion potential has been identified at the following locations: Link 4, mileposts 0.0 to 0.2, 0.8 to 3.1, 3.4 to 4.4; Link 8 mileposts 0.0 to 1.0, 1.1 to 1.7, 2.1 to 2.7, 2.9 to 4.7, 4.8 to 5.2, 5.5 to 5.7, 6.6 to 7.4, 8.3 to 8.4; Link 12 mileposts 0.0 to 0.2, 5.7 to 6.1, 7.1 to 7.3, 7.4 to 7.7, 9.1 to 9.3; Link 17 mileposts 3.2 to 3.5, 3.8 to 4.1, 5.6 to 6.1, 6.4 to 6.7, 7.0 to 7.4, 7.7 to 7.9, 8.0 to 8.1; Link 25 mileposts 0.0 to 0.3, 0.5 to 0.9, 1.0 to 1.2. The balance of this alternative has moderate erosion potential. Hydric soils are located along Link 12 mileposts 7.8 to 7.9, 8.4 to 8.5 and Link 17 mileposts 1.2 to 1.4. Prime farmlands (if irrigated) are located along link 12 mileposts 7.1 to 7.3. Farmlands of statewide importance are located along link 12 mileposts 7.7 to 7.8, 7.9 to 8.5, and 8.8 to 8.9.

Moderate impacts to soil resources would occur along approximately 7.8 miles of Alternative E. Low impacts are projected to occur on the remainder of 25.3 miles. Road building activities would result in direct impacts to and estimated 73.2 acres of soil resources. Roads will be vegetatively restored following construction with the road prism remaining. Direct road building impacts would generally be long term and adverse. Installation of transmission line structures would result in direct impacts to approximately 0.1 acres of soil resources. These impacts would be long term and adverse. Approximately 79.4 acres of direct impacts related to material lay-down areas would occur. These impacts would be short term and adverse. Approximately 3.5 acres of direct impacts related to conductor pulling and tensioning sites would occur. These impacts would be short term and adverse. Approximately 5.0 acres of direct impacts would occur related to a construction staging area. These impacts would be short term and adverse.

Selective Mitigation Measures

Impacts associated with transmission line construction and operation would be minimized to the impact levels indicated through effective implementation of selective mitigation measures 1, 2, 3, 4, and 5 described in Chapter 2 of this document. These measures would provide for minimizing disturbance in sensitive areas, implementing surface stabilization and erosion control, and reseeding.

As with the wind farm, a detailed SWPPP would be developed by the applicant for VCWEP to reduce the potential for erosion and pollutant discharge from the site during construction, operation, and decommissioning potions of VCWEP.

3.10.2.4 Antelope Creek Substation

As with the other project elements, the Antelope Creek Substation would have a number of potential impacts related to soil resources. They would be associated with construction, operation and maintenance, and decommissioning, and include:

- Site grading and excavation associated with accessory structures and equipment and material staging that would result in soil exposure and potential erosion;
- Operation and maintenance impacts caused by facility maintenance and repair that require importation of additional gravel, sand, asphalt, and other materials. Typically, only minor soil disruption would occur, and they would be temporary in duration; and
- Decommissioning impacts associated with the removal of above-ground structures to a depth of 3 feet. Typically, only minor soil disruption would occur, and they would be temporary in duration.

Soil resource impacts would be mitigated by the implementation of erosion and sediment control best management practices (BMP's) as required by the State of Montana and presented in Stormwater Pollution Prevention Plans (SWPPP). The BMP's implemented and the SWPPP's developed would be part of the civil engineering process, and would be developed based on the specific soil disturbance conditions and the nature of the construction, operation and maintenance, or decommissioning (See Mitigation Measures below).

Approximately 5 acres of direct impacts to soil resources would occur as a result of substation construction. These impacts would be long term and adverse. No selectively committed mitigation measures are proposed for the Antelope Creek substation site.

3.10.3 Erosion Control Mitigation

3.10.3.1 Erosion Control During Project Construction

Before construction begins, a detailed SWPPP would be developed for VCWEP to minimize the potential for pollutant discharge from the site during construction and operation activities. The SWPPP would be designed to meet the requirements of the Montana Department of Environmental Quality through its stormwater pollution control program associated with construction activities (General Permit for Storm Water Discharges Associated with Construction Activity MPDES), and the requirements of the National Pollution Discharge Elimination System (NPDES) Stormwater Construction Permit would also be followed.

The SWPPP would include both structural and non-structural BMPs. Examples of structural BMPs include the installation of silt curtains and/or other physical controls to divert flows from exposed soils or otherwise limit runoff and pollutants from exposed areas of the site. Examples of non-structural BMPs include materials handling protocol, disposal requirements, and spill prevention methods.

The SWPPP would be prepared along with a detailed project grading plan by the site engineers and /or contractors when design level topographic surveying and mapping are prepared for VCWEP site. The contractor would carry out the construction BMPs, with enforcement by VCWEP's environmental monitor, who would be responsible for implementing the SWPPP.

Site-specific BMPs would be identified on the construction plans for the site slopes, construction activities, weather conditions, and vegetative buffers. The sequence and methods of construction activities would be controlled to limit erosion. Clearing, excavation, and grading would be limited to the minimum areas necessary to construct VCWEP. Surface protection measures, such as erosion control blankets or straw matting, also may be required during construction before site restoration if the potential for erosion is high.

Construction practices would emphasize erosion control over sediment control through such non-quantitative activities as:

- Using straw mulch and vegetating disturbed surfaces;
- Retaining original vegetation wherever possible;
- Directing surface runoff away from denuded areas;
- Keeping runoff velocities low by minimizing slope steepness and length; and
- Providing and maintaining stabilized construction entrances.

Work on the access roads would include grading and regraveling existing roads and constructing new roads. The site would have gravel roadways generally with a low profile design, allowing water to flow over them in most areas. Erosion control measures to be installed during work on the access roads include:

- Maintaining vegetative buffer strips between the affected areas and any nearby receiving waterways;
- Installing sediment fence/straw bale barriers on disturbed slopes and other locations shown in the SWPPP;
- Using straw mulch at locations adjacent to an affected road;

- Providing temporary sediment traps and Sediment-type mats downstream of seasonal stream crossings;
- Installing silt fences on steep, exposed slopes; and
- Planting affected areas with designated seed mixes.

At each turbine location, a crane pad area would be graded and covered with road rock. During construction, silt fences, hay bales, or matting would be placed on the downslope side of the crane pad. Wind turbine equipment such as blades, tower sections, and nacelles would be transported and off-loaded at each turbine location near the foundation and crane pad. After construction, disturbed areas around all crane pad staging areas would be reseeded as necessary to restore the area as closely as possible to its original condition.

3.10.3.2 Erosion Control during Project Operations

VCWEP operations group would be responsible for monitoring the SWPPP measures that are implemented during construction to ensure they continue to function properly. Final designs for the permanent BMPs would be incorporated into the final construction plans and specifications prepared by the engineering team's civil design engineer. The EPC contractor's civil design engineer and VCWEP's engineering team would prepare an operations manual for permanent BMPs. The permanent stormwater BMPs would include erosion and sedimentation control through site landscaping, grass, and other vegetative cover. The final designs for these permanent BMPs would conform to the Montana Department of Environmental Quality standards for erosion and sediment control.

Operational BMPs would be adopted, as part of the SWPPP, to implement good housekeeping, preventive and corrective maintenance procedures, steps for spill prevention and emergency cleanup, employee training programs, and inspection and record keeping practices, as necessary, to prevent stormwater pollution. Examples of good operational housekeeping practices, which would be used by VCWEP, include:

- Prompt cleanup and removal of spillage;
- Regular pickup and disposal of garbage;
- Regular sweeping of floors;
- HAZMAT data sheet cataloguing and recording; and
- Proper storage of containers.

3.10.2.5 No Action Alternative

No impacts to soil resources directly related to this VCWEP. would occur under the No Action Alternative. It should be noted that if the VCWEP. is not developed it is likely

that a similar wind generation project would be developed elsewhere. Thus impacts of a similar nature to the VCWEP. would likely be displaced to another location.

3.11.PALEONTOLOGY

Paleontological resources (i.e., fossils) are the remains, traces, or imprints of plants or animals that have been preserved in a geologic context, and are more than 10,000 years old. No previously recorded fossil localities occur within the Valley County Wind Energy Project area, and details of these negative findings are described below. In addition, each geologic formation present in VCWEP area is described and evaluated with respect to: (1) its potential to contain fossils, and (2) the probability that those fossils would be considered significant. Based on literature reviews, file searches, and personal communications presented below, these two aspects of each formation are ranked as low to none, low, low to moderate, moderate, moderate to high, or high. These two rankings are the basis for the paleontological resource sensitivity rating, which is assigned to each geologic formation and utilized in the impact assessment.

3.11.1. Affected Environment

3.11.1.1. Study Methods

This inventory is based solely on literature review, and no reconnaissance field survey was undertaken during this analysis. Literature review includes evaluating relevant geologic maps, searching GeoRef bibliographic database, and conducting file searches with Montana State Historic Preservation Office (SHPO), Montana Department of Natural Resources and Conservation (DNRC), and U. S. Department of the Interior Bureau of Land Management (BLM). In addition, each geologic unit/formation exposed at the ground surface is evaluated with respect to its potential to contain buried paleontological remains based on available faunal and floral lists. Although almost all sedimentary units have at least some potential for preservation of paleontological resources (Lyman 1994), the fossils may or may not be rare and critical to scientific research (i.e., significant). Thus, a geologic unit may have low potential for presence of fossils, but a high probability that those remains, if discovered, would be significant. Guidelines for determining significance and integrity of paleontological resources are presented in Figure 3.11-1.

3.11.1.2. Study Area Overview

The following geologic units occur in or near VCWEP area: Cretaceous Claggett Shale, Judith River Formation, and Bearpaw Shale; Tertiary Flaxville Formation; and Quaternary alluvial, colluvial, glacial, and landslide deposits (Bergantino 1999, 2001; Ross et. al 1955). A review of relevant published work on the paleontology and geology of the area and file searches at SHPO and DNRC indicate that no previously recorded paleontological localities occur within the Valley County Wind Energy Project area boundaries. A search of paleontological resource permit application files at the BLM Montana State Office reveals that several of the permits granted in Montana include Valley County. However, no specific paleontological localities in VCWEP area are documented in the BLM files. Although paleontological resource permit holders are

required to submit a final report documenting their findings, reports submitted in the past have been variable and thus specific information is not always available. For this reason, correspondence with BLM paleontological resource permit holders for Valley County was undertaken in order to verify the absence of previously recorded paleontological localities in VCWEP area. According to information available in the BLM files and communications with relevant permit holders, paleontological resource surveying on BLM land in VCWEP area either never took place or occurred outside the Valley County Wind Energy Project area boundaries (John Constenius, personal communication, August 27, 2004; Kurt Constenius, personal communication, September 13, 2004; Richard Hilton, personal communication, September 2, 2004). Local museums, including Fort Peck Field Station of Paleontology, Fort Peck Dam Interpretive Center, and Judith River Dinosaur Institute (Malta), have reportedly not searched for fossils in the portion of Valley County encompassed by VCWEP area (Chris Morrow, personal communication, September 13, 2004; Nate Murphy, personal communication, September 13, 2004). Finally, Montana's State Paleontologist is not aware of any sites within VCWEP area, although he did visit a plesiosaur locality nearby this past field season in the Bearpaw Shale (John R. Horner, personal communication, September 14, 2004).

Cretaceous System

During the Late Cretaceous Period, a convergent plate boundary was present on the western margin of North America, and subduction of the Farallon Plate resulted in volcanism and orogeny (mountain building) (Horner et al. 2001). Along with fold-and-thrust belt development came subsidence of the foreland basin, which accommodated significant volumes of sediment and allowed inundation by an epicontinental seaway. The Western Interior Cretaceous Seaway bisected the continent and stretched from the Arctic Ocean to the Gulf of Mexico (Perry 1962). In general, the climate during the Late Cretaceous was warm and equable (Varricchio 1993). Rises and falls in sea level resulted in migration of the more or less north-south trending shoreline. In Montana, transgressions during sea level high stands resulted in marine sediments being deposited further west, whereas regressions during sea level low stands allowed terrestrial sediments to be deposited further east (Horner et al. 2001). These transgressive-regressive cycles caused changes in available terrestrial habitat that led to evolutionary changes in some groups of dinosaurs (Varricchio 1993). The Cretaceous-age units exposed in VCWEP area are part of the Montana Group, which is a series of interfingering nonmarine and marine rocks consisting of: "…eastward-pointing wedges of regressive deposits of nonmarine and shallow-water marine strata (Telegraph Creek, Eagle, Parkman, Judith River, Two Medicine, and Fox Hills and its equivalents) that enclose westward-thinning wedges of fine-grained transgressive deposits of marine strata (Claggett and Bearpaw Shales)" (Gill and Cobban 1973). These units often contain distinct beds of volcanic ash (bentonite) that can be correlated laterally through biostratigraphy and dated radioisotopically (Gill and Cobban 1973; Rogers 1998).

Claggett Shale The Claggett Shale (120 m thick) is composed of dark gray marine and brackish water sediments (shales and intercalated sandstones) deposited during westward transgression of the epicontinental seaway beginning 80 million years ago (Ma) and continuing until maximum regression at 75.4 Ma in the extreme eastern part of the state

(Bergantino 1999; Gill and Cobban 1973; Hagener 1979; Horner et al. 2001; Sahni 1972). Selenite crystals are abundant (Sahni 1972). In VCWEP area, this formation was deposited between approximately 80 and 77 Ma. The Claggett Shale is reportedly quite fossiliferous and has produced remains of invertebrates, champsosaurs, and water ferns (Balster 1971; Hagener 1979; Hall 1969). Marine reptiles are also likely to occur. Although the Claggett Shale has a moderate to high potential for producing fossil material, the probability that the material would be significant is only low to moderate. This prediction of significance is based on the relative abundance of invertebrate material present in this formation.

Judith River Formation The Judith River Formation is a nonmarine deposit containing fossilized plants (water fern, fern, conifer, angiosperm), invertebrates (mollusk, insect), and vertebrates (fish, shark, amphibian, turtle, champsosaur, crocodile, lizard, dinosaur, mammal, bird, marine reptile) (Clemens and Goodwin 1985; Fiorillo 1997; Hagener 1979; Hall 1969; Horner 1989; Sahni 1972). The formation is a clastic wedge of fluvial rocks ranging in thickness from 140 m on the west side of VCWEP area to 80 m on the east (Bergantino 2001). In north-central Montana, these sediments were deposited between approximately 78.0 and 74.5 Ma by rivers flowing into the Western Interior Cretaceous Seaway (Goodwin and Deino 1989; Horner et al. 2001). The package of sediments in VCWEP area is somewhat thinner, and probably dates to between 77 and 75 Ma. Several notable dinosaur specimens have been recovered from the Judith River Formation north of Malta, Montana, including a duck-billed dinosaur (Brachylophosaurus canadensis) with fossilized soft tissue (Murphy et al. 2002). The transitional nature of the deposits from terrestrial coastal plain on the west to marine on the east is well demonstrated in exposures of the Judith River Formation near Rudyard, Montana, where sharks (both freshwater and brackish water to near-shore marine varieties) and a marine reptile (plesiosaur) caudal vertebra have been collected (Clemens and Goodwin 1985). The Judith River Formation has a high potential to contain fossils, and a moderate to high probability that the fossil material would be significant.

Bearpaw Shale The Bearpaw Shale formed in a marine setting 75.4 to 74.0 Ma and is 340 m thick in VCWEP area (Bergantino 2001; Horner et al. 2001). Marine reptiles (mosasaurs, plesiosaurs), gastroliths (stomach stones), shark teeth, marine turtles, mollusks, and even dinosaurs occur in the Bearpaw Shale, which was deposited on top of the Judith River Formation during the final transgression of the Western Interior Cretaceous Seaway (Darby and Ojakangas 1980; Hagener 1979; Horner 1979, 1989; Jensen and Varnes 1964; Nicholls et al. 1990; Pierce 2002; Russell 1970; Tokaryk 1987). The Bearpaw Shale is similar to the Claggett Shale in regard to "…lithology, mode of deposition, type of fossils, weathering surfaces, and in the occurrence of selenite crystals" (Sahni 1972:335). However, the Bearpaw Shale exceeds the Claggett in thickness, fossil abundance, and faunal diversity (Bowen 1915). Rates of sedimentary basin subsidence were greater than sediment supply, causing the Bearpaw transgression to extend much further west than the Claggett (Gill and Cobban 1973; Varricchio 1993). The Bearpaw Shale has high potential for producing fossil material, with moderate probability that the fossils would be considered significant.

Tertiary System

During the Late Tertiary Period, the Flaxville Formation formed by deposition of gravels and sands by rivers. Although the age of this formation is uncertain, it is thought to have formed during the Miocene and Pliocene epochs between approximately 15 and 1.8 million years ago. When originally deposited, this gravel may have been a laterally continuous sheet forming a desert plain, which was subsequently dissected by erosion (Alt and Hyndman 1986; Colton 1962). It has also been suggested that the formation was not as laterally extensive as has been proposed, and instead formed as more localized deposits that may or may not be equivalent (Storer 1969). The climate during deposition of the Flaxville Formation is suggested to have been very dry and it is inferred that "…shifting desert streams spread a thick blanket of coarse gravel across the region" (Alt and Hyndman 1986:23).

Flaxville Formation The Flaxville Formation (or Flaxville Gravel) is up to 30 m thick in VCWEP area, and consists of locally cemented gravel, sand, clay, marl, lignite, and volcanic ash deposited during the latter part of the Tertiary Period (Colton 1962; Collier and Thom 1918). The Flaxville Formation caps even-topped plateaus and unconformably overlies the Fort Union, Hell Creek, or Bearpaw formations (Collier and Thom 1918). Sediments comprising this formation were deposited by rivers and formed either as a laterally continuous sheet that has subsequently been dissected by erosion (Colton 1962; Perry 1962), or as discrete deposits that were not as laterally continuous as has been suggested (Storer 1969). Isolated, poorly preserved, and often fragmentary fossil material recovered from this formation includes rhinoceros, horse, camel, oreodont, gopher, rabbit, saber-tooth cat, canid, and fish (Brown 1952; Collier and Thom 1918; Storer 1969). A late Miocene to Pliocene age (15 to 1.8 Ma) has been reported based on the fossil assemblage, although it is possible that some or all of the fossils are reworked from an older deposit, which would make this formation considerably younger (Brown 1952; Collier and Thom 1918; Colton 1962; Denson and Gill 1965; Storer 1969; Witkind 1959). It has also been proposed that the Flaxville Formation includes deposits of more than one age (Storer 1969). The Flaxville Formation has a low potential for producing fossil material, and a low probability for producing significant fossils.

Quaternary System

Climatic conditions during the Pleistocene Epoch (1.8 Ma to 10,000 years ago) of the Quaternary Period would have been moister and cooler than at present (Alt and Hyndman 1986). Large continental ice sheets formed in central Canada and spread into northern Montana during the Bull Lake (maximum 130,000-70,000 years ago) and Pinedale (maximum ~15,000 years ago) ice ages (Alden 1932; Alt and Hyndman 1986). These large masses of ice disrupted river courses and in many instances formed glacial lakes by blocking drainage routes. Between Havre and Fort Peck, the Milk River now occupies the pre-ice age valley of the Missouri River, which was pushed southward by the ice sheets in the Pleistocene (Alden 1932).

Quaternary Deposits Quaternary deposits in VCWEP area are variable in thickness and include: alluvium, colluvium, landslides, glacial till, glacial outwash, and glacial moraines (Alden 1932; Bergantino 1999, 2001). Quaternary landslides usually involve

older bedrock and thus they will not be considered here. Glacial deposits overlie much of the bedrock in VCWEP area (Bergantino 2001). Continental glaciation during the Bull Lake ice age was more extensive than the later Pinedale ice age. During the Bull Lake episode, the ice sheet probably extended south of Glasgow (Alden 1932). Glacial deposits from the Pinedale ice age are not as well defined in VCWEP area. Some of the Quaternary deposits may contain Pleistocene fauna, such as mammoth, mastodon, ground sloth, giant short-faced bear, wolf, coyote, bobcat, cheetah, saber-tooth cat, horse, camel, deer, caribou, pronghorn antelope, bison, shrew, and numerous rodents (Denson and Gill 1965; Hill 2001; Jensen and Varnes 1964; Rasmussen 1974; Wilson and Hill 2000). Given the extent of the continental ice sheets however, the potential for discovery of Pleistocene-age fossils in VCWEP area is predicted to be low, and the probability that the fossil material would be significant is low to moderate. Holocene-age alluvium is too young to contain fossils in primary context. It is characterized as having a "low to none" potential for fossil potential and "low to none" significance probability.

Paleontological Resource Sensitivity Rating

A paleontological resource sensitivity rating is assigned to each geologic formation, and is based on the potential of the unit to contain fossils and the probability that those fossils would be considered significant (Table 3.11-1). Table 3.11-2 summarizes fossil potential, significance probability, and paleontological resource sensitivity for each geologic map unit as defined by Bergantino (1999, 2001) in or near VCWEP area. The map units that are relevant to VCWEP area include: Kcl (Cretaceous Claggett Shale), Kjr (Cretaceous Judith River Formation), Kb (Cretaceous Bearpaw Shale), Tsg/Tf (Tertiary Flaxville Formation and possible Pleistocene Deposits), and Qsg/Qac/Qg/Qal (Quaternary Deposits).

The Claggett Shale (Kcl) has moderate paleontological resource sensitivity, but is not mapped as being exposed at the ground surface within VCWEP area boundaries, and thus will not be discussed further. The Judith River Formation (Kjr) has a high sensitivity rating and the Bearpaw Shale (Kb) has a moderate rating. As discussed in the previous section, the Flaxville Formation has a low potential to produce fossil material, and there is a low probability that fossils from this formation would be significant. However, the Tsg and Tf map unit descriptions state that although this unit is thought to be Miocene-Pliocene (Tertiary) in age and equivalent to the Flaxville Formation, it may include Pleistocene (Quaternary) sands and gravels (Bergantino 1999, 2001). Therefore, the possible presence of Pleistocene-age deposits in map units Tsg and Tf increases their paleontological resource sensitivity rating to moderate. Quaternary deposits in VCWEP area are mapped as Qsg (Pleistocene-Holocene terrace deposits, glacial outwash, and colluvium), Qac (Pleistocene-Holocene alluvium, colluvium, and possibly glacial outwash), Qg (Pleistocene glacial deposits), and Qal (Holocene alluvium). Map units Qsg, Qac, and Qg all have moderate paleontological resource sensitivity. Since map unit Qal is Holocene in age, it is excluded from this analysis by definition since paleontological resources are defined as being greater than 10,000 years old. Although it is possible that Holocene alluvium might contain fossil material reworked from older deposits, the significance of such material would probably be low to none given its

secondary context. Thus, unit Qal is assigned a paleontological resource sensitivity rating of "none" (see Tables 3.11-1 and 3.11-2).

3.11.1.3. Wind Farm

Phase I—50 MW Area

Geologic map units in the Phase I-50 MW Area include Kb, Tsg, and Qsg. Unit Tsg is predominant, and includes the Tertiary Flaxville Formation and possible Pleistocene Deposits. This unit caps the relatively flat, plateau-like landforms (benches) where the turbines are to be placed. The Bearpaw Shale (Kb) underlies Tsg, and may be exposed on the flanks of the benches, in drainages, or other erosional areas. Unit Qsg includes Pleistocene-Holocene terrace deposits, glacial outwash, and colluvium. These deposits occur in and adjacent to modern and former drainages, as well as on the flanks of the Tsg-capped benches. No previously recorded fossil localities are present in the Phase I area. All three map units have a moderate paleontological resource sensitivity rating.

Phase II—100 MW Area

Geologic map units in the Phase II-100 MW Area include Kb, Tsg, and Qsg. Conditions for the Phase II area are the same as described above for Phase I.

Phase III—150 MW Area

Geologic map units in the Phase III-150 MW Area include Kb, Tsg, and Qsg. Conditions for the Phase III area are the same as described above for Phase I.

Phase IV—200 MW Area

Geologic map units in the Phase IV-200 MW Area include Kb, Tsg, and Qsg. Conditions for the Phase IV area are the same as described above for Phase I.

3.11.1.4. 230kV Transmission Line

Alternative A—Highway 24

Geologic map units along the Alternative A-Highway 24 transmission line route include Kb, Tsg/Tf, Qsg, Qac, Qg, and Qal. This route predominantly goes through units Kb and Tsg/Tf, which include Bearpaw Shale, Tertiary Flaxville Formation, and possible Pleistocene Deposits. Unit Tsg/Tf caps many of the benches crossed by the transmission line route, and overlies unit Kb. The latter typically does not form good exposures, although these may be present on the bench flanks, in drainages, or in areas where vegetation is unable to become stabilized. Quaternary Deposits includes units Qsg, Qac, Qg, and Qal. As described in the Paleontological Resource Sensitivity Rating section above, unit Qal is too young to contain fossil material in primary context. Units Qsg and Qac include Pleistocene-Holocene terrace deposits, glacial outwash, alluvium, and colluvium. These deposits occur in and adjacent to modern and former drainages, as well as on the flanks of some of the Tsg-capped benches. Unit Qg is composed of Pleistocene glacial deposits and occurs at the south end of the route. No previously recorded fossil localities are present in the Alternative A transmission line route corridor. Map units Kb, Tsg/Tf, Qsg, Qac, and Qg all have a moderate paleontological resource sensitivity rating.

Alternative B—Jensen Trail

Geologic map units along the Alternative B-Jensen Trail transmission line route include Kb, Tsg/Tf, Qsg, Qac, Qg, and Qal. Conditions for Alternative B are the same as described above for Alternative A.

Alternative C—East Central-Proposed Action

Geologic map units along the Alternative C-East Central transmission line route include Kb, Tsg/Tf, Qsg, Qac, Qg, and Qal. Conditions for Alternative C are the same as described above for Alternative A.

Alternative D—Britsch Road

Geologic map units along the Alternative D-Britsch Road transmission line route include Kjr, Kb, Tsg, Qsg, Qac, and Qal. This route predominantly goes through units Kjr and Kb, with some areas of Tsg along the northern part of the route. Unit Kjr is the Judith River Formation, which is overlain by the Bearpaw Shale (Kb). Unit Tsg, which includes Tertiary Flaxville Formation and possible Pleistocene Deposits, caps benches crossed by the transmission line route, and overlies unit Kb. The latter typically does not form good exposures, although these may be present on the bench flanks, in drainages, or in areas where vegetation is unable to become stabilized. Unit Kjr contains strata that are more resistant to weathering, and has a better potential to form good exposures that are more readily examined for fossil material. Quaternary Deposits include units Qsg, Qac, and Qal. As described in the Paleontological Resource Sensitivity Rating section above, unit Qal is too young to contain fossil material in primary context. Units Qsg and Qac include Pleistocene-Holocene terrace deposits, glacial outwash, alluvium, and colluvium. These deposits occur in and adjacent to modern and former drainages, as well as on the flanks of some of the Tsg-capped benches. No previously recorded fossil localities are present in the Alternative D transmission line route corridor. Map unit Kjr has a high paleontological resource sensitivity rating, and units Kb, Tsg, Qsg, and Qac all have moderate ratings.

Alternative E—West Central

Geologic map units along the Alternative E-West Central transmission line route include Kjr, Kb, Tsg/Tf, Qsg, Qac, Qg, and Qal. Conditions for Alternative E are the same as described above for Alternative D, with the exception of the presence of unit Qg in the southern part of the route corridor. Unit Qg is composed of Pleistocene glacial deposits, and has a moderate paleontological resource sensitivity rating. Note that map unit Tf is equivalent with unit Tsg.

3.11.1.5. Antelope Creek Substation

Bedrock at the Antelope Creek Substation site is mapped as Qac, with Kb and Qg in the surrounding area. No previously recorded fossil localities are present at or in the vicinity of the substation site. Unit Qac includes Pleistocene-Holocene alluvium, colluvium, and possibly glacial outwash. Its paleontological resource sensitivity rating is moderate. Near the substation site, a northwest-trending feature is mapped by Bergantino as a "[s]ignificant break in slope between two levels of Qac" (1999:map legend). It is

possible that this feature exposes some of the other map units present nearby, such as Kb (Bearpaw Shale) or Qg (Pleistocene glacial deposits), which have moderate paleontological resource sensitivity ratings.

3.11.2. Environmental Consequences and Mitigation Measures

3.11.1.1. Assessment Methodology

The following paleontological resource assessment evaluates the direct and reasonably foreseeable indirect impacts that may result from VCWEP. A reconnaissance field survey was not undertaken as part of this assessment, which is based solely on information gathered by research. The paleontological resource sensitivity rating for each geologic map unit present in VCWEP area forms the basis for evaluating impacts. This sensitivity rating is based on the potential of the unit to contain fossils and the probability that those fossils would be considered significant. The fossil potential and significance probability attributes are essentially parallel with the terms resource quantity and resource quality, respectively. The impact types associated with this project include ground disturbing activities, increased access into remote areas, and operation-related activities. Application of mitigation measures discussed below will substantially decrease initial impact levels to lower residual impact levels.

Impacts from ground disturbing activities have the highest potential to disturb paleontological resources, and could be direct, adverse, and long-term. Impacts from increased access into remote areas include theft or inadvertent damage to fossils, and would be adverse and long-term. Operation-related impacts include theft or inadvertent damage to fossils by personnel, and would also be considered adverse and long-term. A beneficial effect common to all of these impact types is the discovery of fossils, which are unknown, rare, or significant and would otherwise go undiscovered.

3.11.1.2. Wind Farm

Proposed Action—500 MW Facility

The Proposed Action-500 MW Facility includes four phases: Phase I-50 MW Area, Phase II-100 MW Area, Phase III-150 MW Area, and Phase IV-200 MW Area. Phase I is projected for the year 2007, Phase II in 2010, Phase III in 2013, and Phase IV in 2017. Impacts associated with each one of these phases include ground disturbing activities, increased access into remote areas, and operation-related activities. A beneficial effect common to all of these impact types is the discovery of fossils, which would otherwise go undiscovered and are unknown, rare, or significant.

Ground disturbing activities, such as road construction and excavation into bedrock, have the highest potential to disturb paleontological resources, and impacts could be direct, adverse, and long-term. However, application of Generic Mitigation Measures 6 and 16, along with Selectively Committed Mitigation Measure 17, substantially decreases initial impact levels to lower residual impact levels. By conducting a pre-construction field inventory in areas where significant paleontological resources may be encountered, specific mitigation measures could be applied to avoid most direct, adverse, long-term

impacts. Avoidance of any sensitive paleontological resources identified as a result of Selectively Committed Mitigation Measure 17 could be ensured by delineation with flagging or fencing as described in Generic Mitigation Measure 20.

Adverse, long-term impacts from increased access into remote areas include theft or inadvertent damage to fossils. New roads will likely result in increased use of public and state lands in VCWEP area, and it is possible that fossils will be illegally collected or accidentally disturbed as a result. Although public education efforts or signage might help reduce the potential for theft, such efforts may also end up drawing more attention to the resource. Thus, some adverse impacts to paleontological resources may be unavoidable. Inadvertent damage to fossils could occur with increased vehicle or foot traffic and would also be unavoidable.

Operation-related impacts include theft or inadvertent damage to fossils by personnel, and would be considered adverse and long-term. Recommended mitigation includes providing employees with: instruction on the laws that protect paleontological resources; an explanation of the importance of fossils in their original context; and a protocol for what to do/not to do if a fossil is discovered. This recommendation is covered by Generic Mitigation Measure 6 for the construction phase, and is partially addressed by Generic Mitigation Measure 16 for the operation phase.

Geologic map units in the Phase I-50 MW, Phase II-100 MW, Phase III-150 MW, and Phase IV-200 MW areas include Kb, Tsg, and Qsg. All three map units have a moderate paleontological resource sensitivity rating and will be subjected to a pre-construction paleontological inventory as described for Selectively Committed Mitigation Measure 17. The inventory will result in development of specific mitigation measures to avoid adverse impacts, such as monitoring of construction of activities, avoidance, or possibly data recovery if adverse impacts to the resource are unavoidable.

Alternative A—150 MW (Phases I and II)

The impacts and mitigation measures for Alternative A-150 MW (Phases I and II) are the same as described above for the Proposed Action-500 MW Facility. Geologic map units in the Phase I-50 MW and Phase II-100 MW areas include Kb, Tsg, and Qsg. All three map units have a moderate paleontological resource sensitivity rating and will be subjected to a pre-construction paleontological inventory as described for Selectively Committed Mitigation Measure 17.

Alternative B—300 MW (Phases I, II & III)

The impacts and mitigation measures for Alternative B-300 MW (Phases I, II, and III) are the same as described above for the Proposed Action-500 MW Facility. Geologic map units in the Phase I-50 MW, Phase II-100 MW, and Phase III-150 MW areas include Kb, Tsg, and Qsg. All three map units have a moderate paleontological resource sensitivity rating and will be subjected to a pre-construction paleontological inventory as described for Selectively Committed Mitigation Measure 17.

3.11.1.3. 230kV Transmission Line

In addition to considering the three impact types outlined in the Assessment Methodology section, the five transmission line route corridors are evaluated with respect to ground disturbance levels one through five (defined elsewhere in this report). Table 3.11-3 shows initial impact levels by relating paleontological resource sensitivity ratings (i.e., none, low, moderate, high) to transmission line ground disturbance levels. Table 3.11-4 applies information in Table 3.11-3, and shows the initial impact level for each relevant geologic map unit in relation to the transmission line ground disturbance levels. Application of mitigation measures discussed below will substantially decrease initial impact levels to lower residual impact levels.

Alternative A—Highway 24

Impacts associated with the Alternative A-Highway 24 transmission line route include ground disturbing activities, increased access into remote areas, and operation-related activities. A beneficial effect common to all of these impact types is the discovery of fossils, which would otherwise go undiscovered and are unknown, rare, or significant.

Ground disturbing activities, such as excavation into bedrock for transmission line poles and road construction, have the highest potential to disturb paleontological resources, and impacts could be direct, adverse, and long-term. However, application of Generic Mitigation Measures 6 and 16, along with Selectively Committed Mitigation Measure 17, substantially decreases initial impact levels to lower residual impact levels. By conducting a pre-construction field inventory in areas where significant paleontological resources may be encountered, specific mitigation measures could be applied to avoid most direct, adverse, long-term impacts. Avoidance of any sensitive paleontological resources identified as a result of Selectively Committed Mitigation Measure 17 could be ensured by delineation with flagging or fencing as described in Generic Mitigation Measure 20.

Adverse, long-term impacts from increased access into remote areas include theft or inadvertent damage to fossils. New roads will likely result in increased use of public and state lands in VCWEP area, and it is possible that fossils could be illegally collected or accidentally disturbed as a result. Although public education efforts or signage might help reduce the potential for theft, such efforts may also end up drawing more attention to the resource. Thus, some adverse impacts to paleontological resources may be unavoidable. Inadvertent damage to fossils could occur with increased vehicle or foot traffic and would also be unavoidable.

Adverse, long-term, operation-related impacts to paleontological resources include theft or inadvertent damage to fossils by personnel. Recommended mitigation includes providing employees with: instruction on the laws that protect paleontological resources; an explanation of the importance of fossils in their original context; and a protocol for what to do/not to do if a fossil is discovered. This recommendation is covered by Generic Mitigation Measure 6 for the construction phase, and is partially addressed by Generic Mitigation Measure 16 for the operation phase.

Geologic map units along the Alternative A transmission line route include Kb, Tsg/Tf, Qsg, Qac, Qg, and Qal. Unit Qal, Holocene alluvium, has a paleontological resource sensitivity rating of "none" and thus no-identifiable initial or residual impacts are projected for these portions of the route corridor. All of the other map units along Alternative A transmission line route have a moderate paleontological resource sensitivity rating and will be subjected to a pre-construction paleontological inventory as described for Selectively Committed Mitigation Measure 17. The inventory will result in development of specific mitigation measures to avoid adverse impacts, such as monitoring of construction of activities, avoidance, or possibly data recovery if adverse impacts to the resource are unavoidable.

Alternative B—Jensen Trail

The impacts and mitigation measures for Alternative B-Jensen Trail are the same as described above for Alternative A-Highway 24. Geologic map units along the Alternative B transmission line route include Kb, Tsg/Tf, Qsg, Qac, Qg, and Qal. With the exception of unit Qal, which is too young to contain fossils in primary context, all of the map units have a moderate paleontological resource sensitivity rating and will be subjected to a pre-construction paleontological inventory as described for Selectively Committed Mitigation Measure 17.

Alternative C—East Central-Proposed Action

The impacts and mitigation measures for Alternative C-East Central are the same as described above for Alternative A-Highway 24. Geologic map units along the Alternative C-East Central transmission line route include Kb, Tsg/Tf, Qsg, Qac, Qg, and Qal. With the exception of unit Qal, which is Holocene in age and too young to contain fossils in primary context, all of the map units have a moderate paleontological resource sensitivity rating and will be subjected to a pre-construction paleontological inventory as described for Selectively Committed Mitigation Measure 17.

Alternative D—Britsch Road

The impacts and mitigation measures for Alternative D-Britsch Road are the same as described above for Alternative A-Highway 24. Geologic map units along the Alternative D-Britsch Road transmission line route include Kb, Kjr, Tsg, Qsg, Qac, and Qal. As described in previous sections, unit Qal is too young to contain fossils with significance and integrity. Map unit Kjr has a high paleontological resource sensitivity rating, and units Kb, Tsg, Qsg, and Qac all have moderate ratings. Areas with high and moderate paleontological resource sensitivity ratings along the corridor will be subjected to a pre-construction paleontological inventory as described for Selectively Committed Mitigation Measure 17.

Alternative E—West Central

The impacts and mitigation measures for Alternative E-West Central are the same as described above for Alternative A-Highway 24. Geologic map units along the Alternative E-West Central transmission line route include Kb, Kjr, Tsg/Tf, Qsg, Qac, Qg, and Qal. Unit Qal is too young to contain fossils with significance and integrity.

Map unit Kjr has a high paleontological resource sensitivity rating, and units Kb, Tsg/Tf, Qsg, Qac, and Qg all have moderate ratings. Areas with high and moderate paleontological resource sensitivity ratings along the corridor will be subjected to a pre-construction paleontological inventory as described for Selectively Committed Mitigation Measure 17.

3.11.1.4. Antelope Creek Substation

Impacts associated with the Antelope Creek Substation include ground disturbing and operation-related activities. A beneficial effect common to both of these impact types is the discovery of fossils, which would otherwise go undiscovered and are unknown, rare, or significant.

Ground disturbing activities, such as blading and excavation, have the highest potential to disturb paleontological resources, and impacts could be direct, adverse, and long-term. However, application of Generic Mitigation Measures 6 and 16, along with Selectively Committed Mitigation Measure 17, substantially decreases initial impact levels to lower residual impact levels. By conducting a pre-construction field inventory in areas where significant paleontological resources may be encountered, specific mitigation measures could be applied to avoid most direct, adverse, long-term impacts. The inventory will result in development of specific mitigation measures to avoid adverse impacts, such as monitoring of construction of activities, avoidance, or possibly data recovery if adverse impacts to the resource are unavoidable. Avoidance of any sensitive paleontological resources identified as a result of Selectively Committed Mitigation Measure 17 could be ensured by delineation with flagging or fencing as described in Generic Mitigation Measure 20.

Operation-related impacts include theft or inadvertent damage to fossils by personnel, and would be considered adverse and long-term. Inadvertent damage to fossils could occur with increased vehicle or foot traffic and would be unavoidable. Recommended mitigation includes providing employees with: instruction on the laws that protect paleontological resources; an explanation of the importance of fossils in their original context; and a protocol for what to do/not to do if a fossil is discovered. This recommendation is covered by Generic Mitigation Measure 6 for the construction phase, and is partially addressed by Generic Mitigation Measure 16 for the operation phase.

The geologic map unit at the Antelope Creek Substation site is Qac, which has a moderate paleontological resource sensitivity rating. A significant break in slope mapped proximal to the substation site may expose units Kb and/or Qg, which have moderate paleontological resource sensitivity ratings. The substation site will be subjected to a pre-construction paleontological inventory as described for Selectively Committed Mitigation Measure 17.

3.11.1.5. No Action Alternative

The No Action Alternative reduces the opportunity for potential discovery and documentation of fossil resources in this part of Valley County. As outlined above, a beneficial effect of ground disturbing activities, increased access into remote areas, and

operation-related activities is the discovery of unknown, rare, or significant fossils, which may otherwise go undiscovered. On the other hand, the No Action Alternative indirectly protects paleontological resources by maintaining the relatively remote nature of the area, and not increasing the potential for theft or inadvertent destruction of fossils.

Paleontological remains are defined by the Montana Antiquities Act, as amended (1995), as "...fossilized plants and animals of a geological nature found upon or beneath the earth or under water which are rare and critical to scientific research". Significance is defined as the estimation of scientific or educational importance of paleontological materials under the National Environmental Policy Act (1969) and the Federal Land Policy and Management Act (1976). The following guidelines also address paleontological resource management information presented in several federal documents (Bureau of Land Management 1998a, 1998b; U. S. Department of the Interior 2000; Kuntz et al. 1989). Fossil resources that meet significance Criteria I and II may also be considered significant under the National Historic Preservation Act (NHPA) as amended (2001) (i.e., see significance Criterion III). Once significance is established, integrity (i.e., the ability of the site to convey scientific, educational, or historical values) is evaluated.

Table 3.11.1. Guidelines for Determining Significance and Integrity of

Paleontological remains are defined by the Montana Antiquities Act, as amended (1995), as "...fossilized plants and animals of a geological nature found upon or beneath the earth or under water which are rare and critical to scientific research". Significance is defined as the estimation of scientific or educational importance of paleontological materials under the National Environmental Policy Act (1969) and the Federal Land Policy and Management Act (1976). The following guidelines also address paleontological resource management information presented in several federal documents (Bureau of Land Management 1998a, 1998b; U. S. Department of the Interior 2000; Kuntz et al. 1989). Fossil resources that meet significance Criteria I and II may also be considered significant under the National Historic Preservation Act (NHPA) as amended (2001) (i.e., see significance Criterion III). Once significance is established, integrity (i.e., the ability of the site to convey scientific, educational, or historical values) is evaluated
SIGNIFICANCE
I. Materials Inventoried A) Vertebrate material i. cranial material (i.e., partial or complete skull and/or jaw) ii. articulated or complete (>25%) skeleton iii. concentration of vertebrate material iv. unique or rare occurrence, including trace fossils v. intimate association with paleoenvironment vi. coprolite(s) B) Invertebrate material i. good-excellent preservation of shell material ii. concentrations of diverse material iii. unique or rare occurrence, including certain trace fossils iv. intimate association with paleoenvironment v. important stratigraphic marker C) Plant material i. well preserved plant material ii. petrified wood iii. fossil stump(s) iv. intimate association with paleoenvironment v. important association of fossil plant and animal materials vi. coprolite(s)
II. Research or Education Potential A) material contributes to faunal or floral lists B) material significantly contributes to the systematics of group(s) collected C) material contributes to knowledge of the functional anatomy of the organism D) material contributes to knowledge of biostratigraphy, biogeography, paleoecology, paleoenvironment, and/or phylogeny E) material contributes to taphonomic analysis F) material contributes to a potential museum exhibit or educational activity
III. Eligible for the National Register of Historic Places under Criteria A or B A) Association with an event that has made a significant contribution to the broad patterns of our history. Refer to Section 106 regulations, 36 CFR Part 800, of the NHPA, as amended (2001). B) Association with the lives of persons significant in our past. Refer to Section 106 regulations, 36 CFR Part 800, of the NHPA, as amended (2001).
INTEGRITY
I. Site retains the ability to convey values that make it significant (e.g., site continues to produce important fossil material)
II. If the site is important for its association with an event, historical pattern, or person(s), and is potentially eligible for the National Register of Historic Places, it should retain some combination of the aspects of integrity (i.e., location, design, setting, materials, workmanship, feeling, association).

Table 3.11.2. Paleontological Resource Sensitivity Matrix.

Fossil Potential	----------Significance Probability----------					
	Low to None	**Low**	**Low to Moderate**	**Moderate**	**Moderate to High**	**High**
Low to None	*None*	*Low*	*Moderate*	*Moderate*	*Moderate*	*Moderate*
Low	*Low to None*	*Low*	*Moderate*	*Moderate*	*Moderate*	*Moderate*
Low to Moderate	*Low*	*Moderate*	*Moderate*	*Moderate*	*Moderate*	*Moderate*
Moderate	*Low*	*Moderate*	*Moderate*	*Moderate*	*Moderate*	*Moderate*
Moderate to High	*Low to Moderate*	*Moderate*	*Moderate*	*Moderate*	*Moderate*	*High*
High	*Low to Moderate*	*Moderate*	*Moderate*	*Moderate*	*High*	*High*

Table 3.11.3. Fossil Predictions according to Geologic Map Unit.

Geologic Map Units (Bergantino 1999, 2001)	----------Fossil Predictions----------		
	Fossil Potential	**Significance Probability**	**Resource Sensitivity**
Kcl Claggett Shale	*Moderate to High*	*Low to Moderate*	*Moderate*
Kjr Judith River Formation	*High*	*Moderate to High*	*High*
Kb Bearpaw Shale	*High*	**Moderate**	*Moderate*
Tsg* and Tf* Flaxville Formation	*Low*	*Low to Moderate**	*Moderate**
Qsg, Qac, and Qg Quaternary Deposits	*Low*	*Low to Moderate*	*Moderate*
Qal Quaternary Alluvium	*Low to None*	*Low to None*	*None*

*thought to be Miocene-Pliocene in age, but may include Pleistocene sands and gravels (Bergantino 1999, 2001); fossil prediction categories have been adjusted to reflect this possibility.

Table 3.11.4. Initial Impact Matrix for Transmission Line Alternatives.

Paleontological Resource Sensitivity	------Transmission Line Ground Disturbance and Access Assumptions------				
	Level 1	**Level 2**	**Level 3**	**Level 4**	**Level 5**
None	*No-Identifiable*	*No-Identifiable*	*No-Identifiable*	*No-Identifiable*	*No-Identifiable*
Low	*No-Identifiable*	*No-Identifiable*	*Low*	*Low*	*Low*
Moderate	*Moderate*	*Moderate*	*Moderate*	*Moderate*	*Moderate*
High	*High*	*High*	*High*	*High*	*High*

Table 3.11.5. Transmission Line Initial Impact Levels according to Map Unit Sensitivity.

Geologic Map Unit (Resource Sensitivity)	------Transmission Line Ground Disturbance and Access Assumptions------				
	Level 1	**Level 2**	**Level 3**	**Level 4**	**Level 5**
Kb (Moderate)	*Moderate*	*Moderate*	*Moderate*	*Moderate*	*Moderate*
Kjr (High)	*High*	*High*	*High*	*High*	*High*
Tsg, Tf (Moderate)	*Moderate*	*Moderate*	*Moderate*	*Moderate*	*Moderate*
Qsg, Qac, Qg (Moderate)	*Moderate*	*Moderate*	*Moderate*	*Moderate*	*Moderate*
Qal (None)	*No-Identifiable*	*No-Identifiable*	*No-Identifiable*	*No-Identifiable*	*No-Identifiable*

Paleontological Resources
Refer to Section 106 regulations, 36 CFR Part 800, of the NHPA, as amended (2001).

3.12.CULTURAL RESOURCE

Cultural resources are districts, sites, buildings, structures, or objects considered to be important to a culture, subculture, or community for scientific, traditional, religious or other reasons. For this document, cultural resources have been divided into three major categories: archaeological resources, architectural resources, and traditional cultural properties.

Archaeological resources are locations where human activity has measurably altered the earth or left deposits of physical remains (e.g., tipi rings, stone tools, house foundations, trails, bottles, tin cans). In eastern Montana, archaeological resources are generally either Native American or Euro-American in origin.

Architectural resources include standing buildings (e.g., houses, barns, outbuildings, schools, churches) or intact structures (e.g., dams, canals, bridges). In eastern Montana, architectural resources are usually associated with Euro-Americans.

Traditional cultural properties, or TCPs, are resources that are important to a community's traditional practices and beliefs and for maintaining the community's cultural identity (Parker and King 1998). Only members of appropriate traditional groups can determine the existence and importance of TCPs. In northeastern Montana, TCPs are usually associated with modern Native American groups and could potentially include archaeological resources, locations of battles and other historic events, sacred sites, sources of raw material used to make tools or sacred objects, or traditional hunting and gathering areas.

3.12.1 Affected Environment

3.12.1.1 Methods

This description of the affected environment for cultural resources uses data collected over the past 30 years by archaeologists, historians, and other researchers. No additional cultural resource field inventories were conducted in the study area as part of the analysis for this document. Data on archaeological and architectural resources were compiled from several sources:

- The Cultural Resource Annotated Bibliography System (CRABS) database of the Montana State Historic Preservation Office (SHPO) at the Montana Historical Society (MHS).
- The Cultural Resource Information System (CRIS) database of the Montana
- MHS cultural resource inventory forms housed at the Department of Anthropology, University of Montana, Missoula.
- Cultural resource inventory reports on file at the MHS office in Helena.
- The National Register Information System (NRIS) of the National Register of Historic Places (NRHP).
- The National Historic Landmarks Survey of the National Park Service (NPS).
- Data supplied by the Bureau of Land Management (BLM) Field Office in Glasgow.

Because of the potential for vandalism, information on the location and content of archaeological and architectural resources is considered confidential and cannot be presented in a public document.

The data sources listed above do not contain information on TCPs. The BLM and Western Area Power Administration (Western) are initiating consultation with Tribes having an interest in VCWEP area. The consultation process, which will be conducted on a government-to-government basis, may result in the identification of TCPs and other

important resources in the study area. This information will also be treated as confidential and will not be shared with the public.

Tribes to be contacted include:

- Assiniboine and Sioux Tribes, Fort Peck.
- Gros Ventre and Assiniboine Tribes, Fort Belknap.

The background research allowed the identification of all previously recorded cultural resources in VCWEP area as well as the locations of many of the cultural resource inventories performed in the area. However, the quality of the data is inconsistent:

- SHPO requirements for cultural resource field inventories and reporting have improved over the past three decades. Earlier inventories were sometimes not performed according to current standards, so previously surveyed locations might need to be re-surveyed to ensure that all cultural resources are identified. Also, in some inventory reports, maps of surveyed areas are of poor quality or are absent.
- Cultural resource recording standards have also changed over the past 30 years. Older inventory forms often have poor quality maps or no maps at all. On some forms, resource locations are very precise; in other cases, resources can only be located to within 0.25 mile. For this reason, it is often difficult to determine whether a specific cultural resource is located in an area that would be affected by the proposed action or alternatives.
- Most previously recorded cultural resources in the study area have not been evaluated for NRHP eligibility. Resources that have been determined ineligible for inclusion in the NRHP generally require no further protection from federal undertakings.

3.12.1.2 Study Area Overview

According to the CRABS report, as of June 2004, cultural resource investigations in the study area and surrounding region have been relatively sparse. There have many small (less than 10 acres) cultural resource surveys, most of them related to impoundments and other improvements on BLM land. Several larger inventories, sometimes covering hundreds of acres, have been conducted for major chisel plowing projects on BLM land (Julien 1989, 1993, 1998), on proposed National Guard training areas (Deaver and Aaberg 1977), and along linear corridors for roads, transmission lines, pipelines, and fiber optic lines (Archeological Services 1979; Brumley 1989; Dau 1993; Dau and Rennie 1993; Fredlund et al. 1986; GCM 1996; Greiser et al. 1985; Herbort and Munson 1986; Thompson 1996; Wirth Associates 1984). There have also been a few non-systematic, non-intensive cultural resource inventories by archaeologists and historians (e.g., Queen 1991).

While some portions of the study area, especially toward the northwest, have been intensively and systematically examined by archaeologists, overall it appears that less than 10% of the study area has been inspected by archaeologists using procedures that meet current standards. It is likely, therefore, that less than 10% of the cultural resources

in the study area have been identified or described in detailed. Also, for planning purposes, information on the absence of cultural resources can be as valuable as information on the presence of cultural resources. The sparse survey coverage means that there are few locations in the study area where archaeologists have demonstrated conclusively that no cultural resources exist.

Initially, the Montana SHPO was asked to provide information on previously recorded cultural resources in a 1,260 square mile area in Valley County west and north of Glasgow. According to the CRIS report, approximately 900 cultural resources have been recorded within this large area. Closer to the study area, within an area of nearly 600 square miles, about 450 cultural resources were recorded in the CRIS database.

The study area itself, which includes the proposed wind farm, land within 0.5 mile of the proposed transmission line and alternatives, and the site of the proposed Antelope Creek Substation, covers about 210 square miles. In the study area, a total of 113 cultural resources have been previously identified. Archaeological resources include sites with rock cairns (24), rock piles (13), rock alignments (12), tipi rings (74), lithic scatters (34), historic trash dumps (5), homestead remains (11), and foundation depressions (16). Architectural resources include houses (2), canals (2), a railroad grade (1), bridges (5), and other features. Of the 113 cultural resources, 87 are Native American, 31 are Euro-American (nine resources contain both Native American and Euro-American artifacts or features), and four are of uncertain cultural affiliation. All previously recorded architectural resources are Euro-American.

According to the CRIS report, at least 100 (88%) of the 113 cultural resources recorded in the study area have not had determinations of NRHP eligibility, three have been determined not eligible to the NRHP, and nine are in the process of having eligibility reviewed by the SHPO or other agencies.

The NRIS of the NRHP was examined on September 22, 2004. According to the NRIS, there are 11 NRHP-listed properties in Valley County -- eight in Fort Peck, one in Nashua, and two in Glasgow. All are located outside the study area.

The NPS lists 23 National Historic Landmarks in Montana. None of these is located in Valley County.

3.12.1.4 Wind Farm

In the land encompassed by the wind farm alternatives, archaeologists have surveyed less than 3% of the total area. Table 3.12-1 summarizes the estimated survey acreage and the number of previously recorded cultural resources associated with each phase of wind farm development.

Table 3.12-1. Cultural Resources and Surveyed Acreage by Wind Farm Development Phase

Wind Farm Development Phase	Total Acreage	Acreage Surveyed for Cultural Resources	Previously Recorded Cultural Resources

		Acres	%age	
Phase 1 (50MW)	1,094	26	2.4%	1
Phase II (100MW)	2,800	1	<0.1%	0
Phase III (150 MW)	5,520	47	0.9%	4
Phase IV (200MW)	10,706	483	4.5%	7
All Phases	20,120	540	2.8%	12

The 12 cultural resources in the wind farm study area include tipi rings, rock cairns, buildings, foundations, and surface scatters of historic and prehistoric artifacts. Both Native American and Euro-American resources are represented. Two of the resources have been determined not eligible for the NRHP, and the remaining 10 have not been evaluated. Given the small amount of cultural resources survey in the wind farm study area, in all likelihood there could be hundreds of other cultural resources in the study area that have not been identified.

3.12.1.5 230kV Transmission Line

Within the alternative transmission line corridors, roughly 8% of the land area has been previously surveyed for cultural resources. Table 3.12-2 summarizes the amount of survey and the number of previously recorded cultural resources with each of the transmission line alternatives.

Table 3.12-2. Cultural Resources and Surveyed Areas by Transmission Line Alternative

Transmission Line Alternative	Length (miles)	Amount Surveyed for Cultural Resources		Previously Recorded Cultural Resources Crossed by Corridor	Previously Recorded Cultural Resources Within 0.5. Mile of Corridor
		Length (miles)	%age		
A	40.28	0.9	2.2%	3	7
B	36.80	1.3	3.5%	6	13
C	34.39	1.3	3.8%	2	12
D	36.81	4.7	12.7%	12	52
E	32.77	3.6	11.0%	6	39

Eighteen previously recorded cultural resources would be crossed by one or more of the transmission line alternatives. They include tipi rings, rock cairns, scatters of prehistoric and historic artifacts, homestead sites, canals, and a water spreading system. Of the 18 cultural resources, 12 have not had their NRHP eligibility evaluated and six are in various stages of evaluation.

One hundred four (104) cultural resources have been recorded within 0.5 mile of the alternative transmission line corridors. These include 65 archaeological sites containing tipi rings (63 &), with the number of whole or partial tipi rings at a site ranging from 1 to 185. Rock features (cairns, piles, and alignments), which may be either prehistoric or historic in age, were recorded at 44 sites (42%). Homesteads, houses, foundations, or foundation depressions were identified in 16 locations (15%).

The transmission line alternatives also differ in the relative cultural resource sensitivity of the land they would cross. Sensitivity was assessed using three criteria: 1) the presence of known cultural resources; 2) the amount of land that has been surveyed and is known not to contain cultural resources; and 3) the amount of land that has been cultivated so that any cultural resources that might exist would be severely disturbed and their physical integrity compromised by agricultural activities. Natural environmental conditions (e.g. proximity to stream crossings, slope) were not used for the sensitivity analysis because the available cultural resource data were too limited to reveal useful patterns.

Table 3.12.3 illustrates the criteria for defining sensitivity classes, and Table 3.12.4 summarizes the quantity of land assigned to different sensitivity classes for the five alternatives. Each 0.10-mile segment within each transmission line alternative was assigned a sensitivity class.

Table 3.12-3. Cultural Resource Sensitivity Classes

Previously Surveyed	Cultural Resources Present	Currently Agricultural	Sensitivity Class
Yes	Yes	Yes	Moderate
Yes	Yes	No	High
Yes	No	Yes	Low
Yes	No	No	Low
No	Yes	Yes	Moderate
No	Yes	No	High
No	No	Yes	Low/Moderate
No	No	No	Moderate

Table 3.12-4. Cultural Resource Sensitivity by Transmission Line Alternative

Trans. Line Altern	Approx. Length (miles)	Sensitivity			
		Low	Low-Moderate	Moderate	High

ative		Miles	%	Miles	%	Miles	%	Miles	%
A	40.5	0.9	2.2%	8.6	21.2%	30.8	76.1%	0.2	0.5%
B	37.1	1.1	3.0%	10.1	27.2%	25.4	68.5%	0.5	1.4%
C	34.8	1.3	3.7%	5.4	15.5%	28.0	80.5%	0.1	0.3%
D	37.1	3.8	10.2%	6.1	16.4%	25.3	68.2%	1.9	5.1%
E	33.1	3.3	10.0%	7.4	22.4%	21.8	65.9%	0.6	1.8%

If one assigns 1 point for every mile of low sensitivity land, 1.5 points for every mile of low-moderate sensitivity land, 2 points for every mile of moderate sensitivity land, and 3 points for every mile of high sensitivity land, the transmission line alternatives can be ranked as shown in Table 3.12-5, in which 1 is the most sensitive for cultural resources and 5 is the least sensitive. However, for all alternatives, the majority of land falls into the moderate sensitivity category: the land either 1) contains a known cultural resource that has been affected by agricultural activities, or 2) has not been surveyed and has not been cultivated (see table 3.12-3). Also, even for high sensitivity areas, most of the known cultural resources have not been evaluated for NRHP eligibility.

Table 3.12-5. CulturalResourceSensitivity Rankings of Transmission Line Alternative

Transmission Line Alternative	Overall Sensitivity	Ranking
Alternative A	71.0	1
Alternative B	68.6	3
Alternative C	65.7	4
Alternative D	69.3	2
Alternative E	59.8	5

3.12.1.6 Antelope Creek Substation

The location of the proposed Antelope Creek Substation is an area that may have been surveyed for cultural resources, but available maps are inadequate for assessing specific locations of previous surveys in the vicinity. One nearby cultural resource is known to contain tipi rings and building foundations. Given the proximity of this cultural resource, the proposed substation site is considered to have high sensitivity for cultural resources.

3.12.2 Environmental Consequences and Mitigation Measures

3.12.2.1 Assessment Methodology

Under federal historic preservation regulations (36 CFR part 800), only significant cultural resources are typically considered when assessing the effects of a federal undertaking. Generally, significant cultural resources are those that are eligible or are recommended as being eligible for inclusion in the NRHP. The same procedures often form the basis for impact assessments under NEPA.

The significance of archaeological resources, architectural resources, and some TCPs is evaluated according to NRHP eligibility criteria (36 CFR 60.4), in consultation with the Montana SHPO. According to these criteria, significance is present in districts, sites, buildings, structures, and objects that:

- **a.** Are associated with events that have made a significant contribution to the broad patterns of our history; or
- **b.** Are associated with the lives of persons significant in our past; or
- **c.** Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic value or represent a significant and distinguishable entity whose components may lack individual distinction; or
- **d.** Have yielded, or may be likely to yield, information important in prehistory or history (36 CFR 60.4).

To be listed in or determined eligible for listing in the NRHP, a cultural resource must meet at least one of these criteria and must also possess integrity. Integrity is defined as the authenticity of a resource's identity based on the survival of physical characteristics that existed during the resource's occupation or use. The NRHP recognizes seven aspects of integrity: location, design, setting, materials, workmanship, feeling, and association. Also, eligible cultural resources must usually be at least 50 years old.

As discussed previously (see section 3.12.1), very few of the cultural resources in the study area have been identified and even fewer have been evaluated for NRHP eligibility. Therefore, for the analysis of potential impacts presented in section 3.12.2, all cultural resources will be assumed to be potentially eligible to the NRHP.

Certain categories of TCPs, such as prehistoric archaeological sites, may be protected through their eligibility to the NRHP. However, other resources of importance to Native Americans, such as natural features or spiritual locations, may not be eligible for the NRHP for a variety of reasons. These TCPs may still be protected according to the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA), American Indian Religious Freedom Act (AIRFA), and Executive Order 13007, Indian Sacred Sites.

Impacts to cultural resources are typically assessed by: 1) identifying the nature and location of all elements of the proposed action and alternatives; 2) comparing those locations with identified cultural resource locations, areas considered sensitive, and surveyed locales; 3) determining the known or potential NRHP eligibility of cultural resources that could be affected; 4) determining the extent, intensity, and context of the effects; and 5) assessing the potential for adequate mitigation.

Under Section 106 of the NHPA, an action results in adverse effects, or impacts, to a cultural resource eligible to the NRHP when it alters the resource's characteristics, including relevant features of its environment and use, that qualify it for inclusion in the NRHP (36 CFR part 800.9[b]). Potential impacts could include:

- Physical damage, destruction, damage or alteration of all or part of the property;
- Isolation of the property from, or alteration of the character of the property's setting when that character contributes to the property's qualifications for the NRHP;
- Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting;
- Neglect of a property resulting in its deterioration or destruction; and
- Transfer, lease, or sale of the property.

Impacts can also be categorized according to their source. For this analysis, potential sources of impacts to archaeological sites and historic structures potentially caused by the Proposed Actions and alternatives include:

- Ground disturbance resulting from construction, operation, or maintenance of the wind farm, transmission lines, access roads, and other facilities. Permanent and temporary ground disturbance would have identical impacts on cultural resources, which are non-renewable resources.
- Noise, vibrations, and visual impacts resulting from construction, operation, or maintenance.
- Access-related impacts resulting from increased vandalism, off-road vehicle (ORV) use, or unintentional site disturbance.
- Changes in land status that result in reduced legal protection for significant cultural resources.

As mentioned in section 3.12.1, most of the study area has not been surveyed for cultural resources and relatively few resources are recorded in the files of the MHS and fewer still have been evaluated for NRHP eligibility. The assessment of the environmental consequences of the Proposed Actions and alternatives on cultural resources is based on information on cultural resources known to exist in the study area and on estimates of the relative sensitivity of different areas for cultural resources.

3.12.2.2 Wind Farm

Proposed Action –500 MW Facility

Potential impacts to cultural resources associated with the proposed wind farm could be related to:

- Building of wind turbines and wind turbine pads.
- Construction of access roads and other roads.
- Construction of the Operations Building and Collector Substation
- Material staging
- Construction of the collector system

The proposed 500 MW facility would cause ground disturbance to a total of 616.8 acres in a total area of 20,120 acres. So little survey has been undertaken and so few cultural resources have been recorded in the wind farm study area (see Table 3.12-1) that it is impossible to say whether cultural resources would be impacted by specific components of the 500 MW facility. Also, the locations of access roads, wind turbines, and other facilities can often be modified to avoid cultural resources, if the precise locations of cultural resources are known. Avoidance by redesign would eliminate impacts in many cases.

Visual setting may be an important aspect of some, but not all, cultural resources. For example, rock art sites, certain types of historic buildings, TCPs, and historic landscapes could be determined eligible to the NRHP in part because of the scenic qualities of the surrounding environment. On the other hand, archaeological resources are rarely considered visually sensitive. Under the Proposed Action, a total of 334 wind turbines and a collector system could potentially have an effect on the setting of visually sensitive cultural resources. None of the 12 cultural resources previously recorded in the wind farm study area has been described on inventory forms or in reports as visually sensitive. Judging from other resources found within the overall study area, it is anticipated that few visually sensitive resources would be identified during future field surveys.

Improved access in the wind farm study area as a result of construction of new roads or improvement to existing roads could potentially result in increased vandalism or unintentional disturbance to cultural resources by providing routes to areas previously considered inaccessible. Studies of vandalism (e.g., pothunting, illegal ORV use, defacement) at cultural resources in other areas (Nickens et al 1981; USACE 1992, Williams 1978, Lyneis et al. 1980; Lightfoot and Francis 1978, Reid 1979, Warren at al.

1980; Scott 1980) have shown that: 1) proximity to unpaved roads is one predictor for rates of vandalism, and 2) increased vandalism is more likely to affect resources that are most visible (e.g., buildings and large archaeological sites). Of the 12 recorded sites in the wind farm study area, one is described on its inventory form as having had minor vandalism and another may have had slight disturbance in the past. The Proposed Action would result in the construction of new or improved permanent roads. Improved access could result in an increase in the risk of vandalism at cultural resources in the vicinity of these roads.

Potential impacts related to ground disturbance, changes in visual setting, and improved access could be reduced or eliminated by development and implementation of a Section 106 Programmatic Agreement (Selective Mitigation Measure 24) and implementation of other generic mitigation measures (6, 7, and 20). Avoidance would be the preferred mitigation measure. Residual impacts would range from "none identifiable" to "low".

Potential impacts on TCPs, if any exist in the study area, and appropriate mitigation measures cannot be identified without input from concerned Native American groups.

Alternative A- 150 MW (Phases I and II)

This alternative would cause ground disturbance to a total of 185 acres within a study area of 3,894 acres. So little survey has been undertaken and so few cultural resources have been recorded in the wind farm study area (see Table 3.12-1) that it is impossible to say whether cultural resources would be impacted by specific components of the 150 MW facility. However, one can assume in the absence of more complete survey data, that the potential for Alternative A to impact cultural resources from ground disturbance would be about 30% of the potential ground disturbance under the Proposed Action. As with the Proposed Action, the location of access roads, wind turbines, and other facilities can often be modified to avoid cultural resources. Avoidance by redesign would eliminate impacts in many cases.

Under Alternative A, 96 wind turbines and a collector system could potentially have an effect on the setting of visually sensitive cultural resources. Only one cultural resource is previously recorded in the study area for this alternative and it has not been described as visually sensitive. Judging from other resources found within the overall study area, it is anticipated that few visually sensitive resources would be identified during future surveys.

The single recorded cultural resource in the Alternative A study area may have been slightly disturbed in the past. Alternative A would result in the construction of new or improved permanent roads. Improved access could result in an increase in the risk of vandalism and other disturbance at cultural resources in the vicinity of these roads.

Because Alternative A would affect a land area 30% as large as the Proposed Action, it is anticipated that the potential impacts to cultural resources would also be smaller. As with the Proposed Action, potential impacts related to ground disturbance, changes in visual setting, and improved access could be reduced or eliminated by development and implementation of a Section 106 Programmatic Agreement (Selective Mitigation

Measure 24) and implementation of other generic mitigation measures (6, 7, and 20). Avoidance would be the preferred mitigation measure. Residual impacts would range from "none identifiable" to "low".

Potential impacts on TCPs, if any exist in the study area, and appropriate mitigation measures cannot be identified without input from concerned Native American groups.

Alternative B- 300 MW (Phases I, II & III)

Alternative B would cause ground disturbance to a total of 370 acres within a study area of 9,414 acres. So little survey has been undertaken and so few cultural resources have been recorded in the wind farm study area (see Table 3.12-1) that it is impossible to say whether cultural resources would be impacted by specific components of the 300 MW facility. However, one can assume in the absence of more complete survey data, that the potential for Alternative B to impact cultural resources from ground disturbance would be about 60% of the potential impacts from ground disturbance caused by the Proposed Action. Access roads, wind turbines, and other facilities can often be modified to avoid cultural resources; avoidance by redesign would eliminate impacts in many cases.

Under Alternative B, 200 wind turbines and a collector system could potentially have an effect on the setting of visually sensitive cultural resources. Only five cultural resources are recorded in the study area for this alternative and none has been described on inventory forms as visually sensitive. Judging from other resources within the overall study area, it is anticipated that few sensitive resources would be identified during future surveys.
Of the five recorded sites in the Alternative B study area, one may have been slightly disturbed by human activity some time in the past. Alternative B would result in the construction of new or improved permanent roads. Improved access could result in an increase in the risk of vandalism and other disturbance at cultural resources near these roads.

Because Alternative B would affect a land area 60% as large as the Proposed Action, it is anticipated that the potential impacts to cultural resources would also be smaller. Potential impacts related to ground disturbance, changes in visual setting, and improved access could be reduced or eliminated by development and implementation of a Section 106 Programmatic Agreement (Selective Mitigation Measure 24) and implementation of other generic mitigation measures (6, 7, and 20). Avoidance would be the preferred mitigation measure. Residual impacts would range from "none identifiable" to "low".

Potential impacts on TCPs, if any exist in the study area, and appropriate mitigation measures cannot be identified without input from concerned Native American groups.

3.12.2.3 230kV Transmission Line

Alternative A—Highway 24

Only a very small portion (2.2%) of Alternative A has been surveyed for cultural resources, and only seven cultural resources have been recorded within 0.5 mile of the transmission line corridor (Table 3.12-2). However, Alternative A is believed to cross

land with the highest sensitivity for cultural resources of any of the transmission line alternatives (Tables 3.12-4 and 3.12-5).

Ground disturbance (permanent and temporary) related to structures would equal about 98 acres, a staging area would be 5 acres, and access roads would cause about 96 acres of disturbance, for a total area of ground disturbance of 199 acres along a corridor 40.28 miles long. The locations of access roads, staging areas, structures, and other facilities can often be modified to avoid cultural resources. Avoidance by redesign would eliminate impacts in many cases

Approximately 284 structures would be built along the transmission line. None of the seven cultural resources previously recorded within 0.5 mile of the corridor has been described on inventory forms or in reports as visually sensitive. It is anticipated that few visually sensitive resources would be identified during future field surveys.

Alternative A would include the construction of new or improved roads. Improved access could result in an increase in the risk of vandalism and other disturbance at cultural resources near these roads.

Potential impacts related to ground disturbance, changes in visual setting, and improved access could be reduced or eliminated by development and implementation of a Section 106 Programmatic Agreement (Selective Mitigation Measure 24) and implementation of other generic mitigation measures (6, 7, and 20). Avoidance would be the preferred mitigation measure. Residual impacts would range from “none identifiable” to “low”.

Potential impacts on TCPs, if any exist in the study area, and appropriate mitigation measures cannot be identified without input from concerned Native American groups.

Alternative B—Jensen Trail

Only a very small portion (3.5%) of Alternative B has been surveyed for cultural resources, and only 13 cultural resources have been recorded within 0.5 mile of the transmission line corridor (Table 3.12-2). Alternative B is believed to cross land with the third highest sensitivity for cultural resources of the transmission line alternatives (Tables 3.12-4 and 3.12-5).

Ground disturbance (permanent and temporary) related to structures would equal about 89 acres, a staging area would be 5 acres, and access roads would cause about 60 acres of disturbance, for a total area of ground disturbance of 154 acres along a corridor 36.80 miles long. The locations of access roads, staging areas, structures, and other facilities can often be modified to avoid cultural resources. Avoidance by redesign would eliminate impacts in many cases

Approximately 260 structures would be built along the transmission line. None of the 13 cultural resources previously recorded within 0.5 mile of the corridor has been described on inventory forms or in reports as visually sensitive. Judging from other resources found within the overall study area, it is anticipated that few visually sensitive resources would be identified during future field surveys.

Alternative B would include the construction of new or improved roads. Improved access could result in an increase in the risk of vandalism, ORV use, and other disturbance at cultural resources near these roads.

Potential impacts related to ground disturbance, changes in visual setting, and improved access could be reduced or eliminated by development and implementation of a Section 106 Programmatic Agreement (Selective Mitigation Measure 24) and implementation of other generic mitigation measures (6, 7, and 20). Avoidance would be the preferred mitigation measure. Residual impacts would range from "none identifiable" to "low".

Potential impacts on TCPs, if any exist in the study area, and appropriate mitigation measures cannot be identified without input from concerned Native American groups.

Alternative C—East Central-Proposed Action

Only a very small portion (3.8%) of Alternative C has been surveyed for cultural resources, and only 12 cultural resources have been recorded within 0.5 mile of the transmission line corridor (Table 3.12-2). Alternative C is believed to cross land with the fourth highest sensitivity for cultural resources of the transmission line alternatives (Tables 3.12-4 and 3.12-5).

Ground disturbance (permanent and temporary) related to structures would equal about 84 acres, a staging area would be 5 acres, and access roads would cause about 61 acres of disturbance, for a total area of ground disturbance of 150 acres along a corridor 34.39 miles long. Access roads, staging areas, structures, and other facilities can often be modified to avoid cultural resources, and avoidance by redesign would eliminate impacts in many cases

Approximately 244 structures would be built along the transmission line. None of the 12 cultural resources previously recorded within 0.5 mile of the corridor has been described on inventory forms or in reports as visually sensitive. It is not anticipated that more than a few visually sensitive resources would be identified during future field surveys in the study area.

Alternative C would include the construction of new or improved roads. Improved access could result in an increase in the risk of vandalism and other disturbance at cultural resources in the vicinity of these roads.

Potential impacts related to ground disturbance, changes in visual setting, and improved access could be reduced or eliminated by development and implementation of a Section 106 Programmatic Agreement (Selective Mitigation Measure 24) and implementation of other generic mitigation measures (6, 7, and 20). Avoidance would be the preferred mitigation measure. Residual impacts would range from "none identifiable" to "low".

Potential impacts on TCPs, if any exist in the study area, and appropriate mitigation measures cannot be identified without input from concerned Native American groups.

Alternative D—Britsch Road

Only a small portion (12.7%) of Alternative D has been surveyed for cultural resources, and 52 cultural resources have been recorded within 0.5 mile of the transmission line corridor (Table 3.12-2). Alternative B is believed to cross land with the second highest sensitivity for cultural resources of the transmission line alternatives (Tables 3.12-4 and 3.12-5).

Ground disturbance (permanent and temporary) related to structures would equal about 89 acres, a staging area would be 5 acres, and access roads would cause about 51 acres of disturbance, for a total area of ground disturbance of 145 acres along a corridor 36.81 miles long. The locations of access roads, staging areas, structures, and other facilities can often be modified to avoid cultural resources. Avoidance by redesign would eliminate impacts in many cases

Approximately 260 structures would be built along the transmission line. None of the 52 cultural resources previously recorded within 0.5 mile of the corridor has been described on inventory forms or in reports as visually sensitive. Judging from other resources found within the overall study area, it is anticipated that few visually sensitive resources would be identified during future field surveys.

Alternative D would include the construction of new or improved roads. Improved access could increase the risk of vandalism and unintentional disturbance at cultural resources.

Potential impacts related to ground disturbance, changes in visual setting, and improved access could be reduced or eliminated by development and implementation of a Section 106 Programmatic Agreement (Selective Mitigation Measure 24) and implementation of other generic mitigation measures (6, 7, and 20). Avoidance would be the preferred mitigation measure. Residual impacts would range from “none identifiable” to “low”.

Potential impacts on TCPs, if any exist in the study area, and appropriate mitigation measures cannot be identified without input from concerned Native American groups.

Alternative E—West Central

Only a small portion (11.0%) of Alternative E has been surveyed for cultural resources, and 39 cultural resources have been recorded within 0.5 mile of the corridor (Table 3.12-2). Alternative B is believed to cross land with the lowest sensitivity for cultural resources of the transmission line alternatives (Tables 3.12-4 and 3.12-5).

Ground disturbance (permanent and temporary) related to structures would equal about 80 acres, a staging area would be 5 acres, and access roads would cause about 68 acres of disturbance, for a total of 153 acres of ground disturbance along 32.77 miles of corridor. Access roads, staging areas, structures, and other facilities can often be modified to avoid cultural resources, and avoidance by redesign would eliminate impacts in many cases

Approximately 232 structures would be built along the transmission line. None of the 39 cultural resources previously recorded within 0.5 mile of the corridor has been described

on inventory forms or in reports as visually sensitive. It is anticipated that few visually sensitive cultural resources would be identified during future surveys.

Alternative E would include the construction of new or improved roads. Improved access could result in an increase in the risk of vandalism at cultural resources in the vicinity of these roads.

Potential impacts related to ground disturbance, changes in visual setting, and improved access could be reduced or eliminated by development and implementation of a Section 106 Programmatic Agreement (Selective Mitigation Measure 24) and implementation of other generic mitigation measures (6, 7, and 20). Avoidance would be the preferred mitigation measure. Residual impacts would range from "none identifiable" to "low".

Potential impacts on TCPs, if any exist in the study area, and appropriate mitigation measures cannot be identified without input from concerned Native American groups.

3.12.2.4 Antelope Creek Substation

The Antelope Creek Substation would result in a total of 2.0 acres of permanent ground disturbance. Potential impacts related to ground disturbance could be reduced or eliminated by development and implementation of a Section 106 Programmatic Agreement (Selective Mitigation Measure 24) and implementation of other generic mitigation measures (6, 7, and 20). Avoidance would be the preferred mitigation measures. Residual impacts would range from "none identifiable" to "low".

Potential impacts on TCPs, if any exist in the study area, and appropriate mitigation measure cannot be identified without input from concerned Native American groups.

3.12.2.5 No Action Alternative

The No Action Alternative would result in no project-related impacts to cultural resources in the study area.

3.13.HEALTH AND SAFETY

This section describes existing health and safety hazards at VCWEP site and identifies potential health and safety risks from project construction and operation, including risk of fire or explosion, potential for release of hazardous materials, ice throw, tower collapse, blade throw, shadow-flicker, vandalism, electric and magnetic fields, and electric shock hazards. Mitigation measures are identified for potential impacts.

3.13.1 Affected Environment

The VCWEP. would be constructed on between approximately 1,100 to 11,000 acres (depending on VCWEP alternative) in a hilly, rural landscape of non-irrigated farmland and rangeland. VCWEP site has one new electric transmission line to the wind farm site and an existing Western Area Power Administration (WAPA) substation with additional (WAPA) transmission lines to the substation that are south of the wind farm project area.

There are few existing hazards at VCWEP site. Fire is the primary health and safety risk at the site. VCWEP site is generally arid rangeland with a predominant groundcover of grasses and sagebrush. The highest expected fire risks are grass fires during the hot, dry summer season. Under existing conditions, fires could be started by lightning strike or by human activities such as careless disposal of lighted cigarettes or dry vegetation contacting hot exhaust catalytic converters under vehicles.

3.13.2 Environmental Consequences

3.13.2.1 Wind Farm

This section describes the potential direct health and safety impacts in VCWEP area from development of the Valley County Wind Energy Project (VCWEP). Direct impacts could be associated with construction, operations, and decommissioning of any of the VCWEP. elements, including the wind turbines and meteorological towers, existing and new gravel access roads, the additional power line, the new substation, and the Operation & Maintenance (O&M) facility. Impacts associated with or attributable to specific project elements are discussed where applicable. Heath and safety risks during construction include potential fire or explosion. Health and safety risks during project operation include these risks as well as others specific to wind turbine generators such as ice throw, tower collapse, blade throw, and shadow-flicker. Indirect impacts are not anticipated because VCWEP is not expected to substantially induce regional growth to the extent that it would result in significant offsite health and safety risks.

Construction

Risk of Fire or Explosion

There is a risk of unintentional or accidental fire or explosion during project construction. The highest expected fire risks are grass fires during the hot, dry summer season. Natural risk of unintentional fire or explosion, such as from a lightning strike would be the same regardless of project phase. The potential fire risk from human activities would be greatest for the largest amount of activities such as ground disturbance (approximately

600 acres) and welding (on a per turbine basis) that could lead to accidental fire or explosion.

The proposed Fire and Explosion Risk Mitigation Plan, presented in Table 3.13-2 in Section 3.13.3, Mitigation Measures, lists sources of potential fire and explosion during project construction along with measures to mitigate these risks. Implementation of these programs would ensure that project construction would not pose a substantial fire or explosion risk to human health and safety or the environment. Impacts associated with provision of adequate fire protection services to the site during project construction are discussed further in Section 3.5, Socioeconomics and Public Services.

There are some areas of rocky conditions on site. Blasting would be required to excavate foundations for the proposed wind turbines. If solid rock is encountered close to the ground surface while installing the underground cables, blasting may also be performed to excavate the cable trench to the required depth. Implementing safety measures proposed as part of its Fire and Explosion Risk Mitigation Plan during blasting activities would minimize risks associated with use of explosives.

Releases or Potential Releases of Hazardous Materials to the Environment

Fuel and lubricating oils from construction vehicles and equipment are potential sources of hazardous materials that could accidentally leak or be spilled during project construction. However, this type of leak should not create a risk to health and safety or the environment because of the limited quantities of the materials involved. Diesel fuel is the primary potentially hazardous material that would be used in any significant quantity during project construction. Project construction would require the use of diesel fuel for operating construction equipment and vehicles. Estimated fuel consumption during construction would be approximately 30,000 gallons (diesel and gasoline) for mobile construction equipment, construction vehicles, and generators for the four project alternatives.

Mineral oil used to fill substation transformers is another potential source of hazardous materials that could accidentally be spilled during project construction. VCWEP includes one substation, with one or two substation transformers. Because they are delivered without oil in the tank, they would need to be filled with mineral oil onsite. As part of the commissioning process of the main transformers(s), they would be filled and tested. Each substation transformer would contain up to 12,000 gallons of mineral oil. The risk of an accidental spill of mineral oil at the substation construction sites would be low given the design features built into VCWEP (see Section 3.13.3).

There is also a potential for an accidental release of hydraulic fluid or lubricating oils from construction equipment. However, lubricating oils and hydraulic fluids used during construction would mostly be contained in the vehicles and equipment for which they are used. Small quantities of lubricating oils may also be stored in appropriate containers at the construction staging area located at the site of the O&M facility. Implementation of appropriate spill prevention and control measures would ensure that the risk of an accidental release of hazardous materials remains low throughout construction (see Section 3.13.3).

Operations and Maintenance

Risk of Fire or Explosion

There is a risk of unintentional or accidental fire or explosion during project operations and maintenance. The risk of accidental fires from human activities such as cigarette smoking and use of vehicles off established roadways would be expected at the VCWEP area due to the larger number of project employees (see Section 3.5, Socioeconomics and Public Services, for further discussion of project employment). For mechanical fires, this impact would be greatest with the fourth phase that involves the largest number of turbines (334). Impacts associated with provision of adequate fire protection services to the site during project operations and maintenance is discussed further in Section 3.5, Socioeconomics and Public Services.

Lightning-induced fires could occur in VCWEP area. As shown in the thunderstorm days map below (Figure 3.13-1), the state of Montana in northeast section of the state where Valley County is located, has moderate lightning activity between 30 and 40 thunderstorm days per year. The wind turbine generators and other mechanical equipment at the substation and meteorological towers would be equipped with specially engineered lightning protection systems that would minimize the risk of lightning-induced fire during project operations (see Section 3.13.6).

As is the case with complex machines, there is some potential for fire caused by mechanical malfunction inside the wind turbine generators and at other project facilities. Implementation of proposed design measures for specific facilities and equipment and operational procedures would ensure that the risk of mechanical fire in project facilities would not pose a risk to health and safety or the environment (see Section 3.13.3).

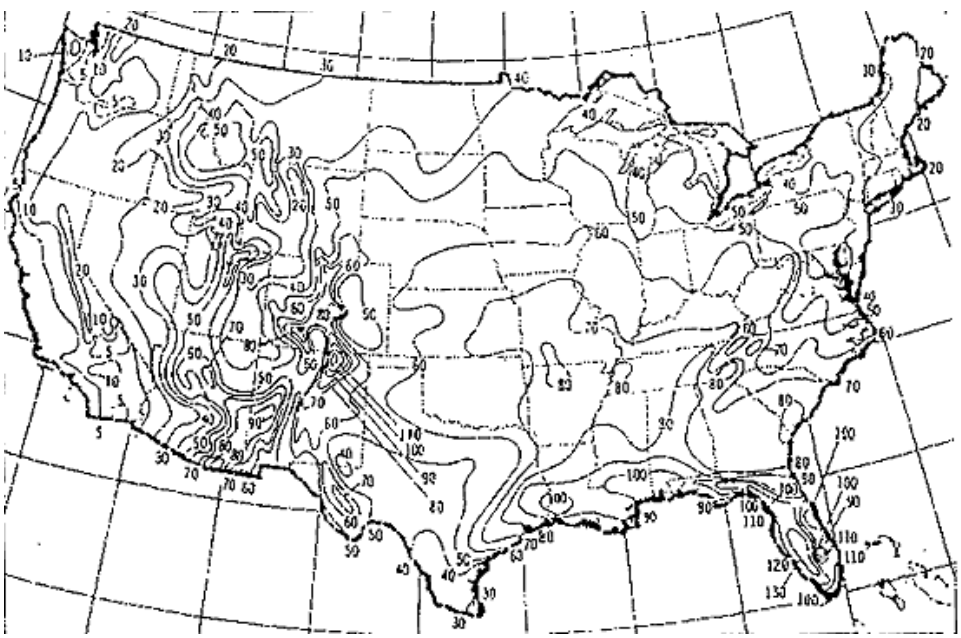


Figure 3.13-1. Lightning Thunderstorm Days Map

The majority of the proposed electrical collection system would be buried underground, although a small portion could be constructed as overhead cables. There should be no risk of explosion. However, a brush fire could occur in the rare event that a conductor on a portion of the overhead cable parted and one end of the energized wire fell to the ground. Under this circumstance, fire-fighting capabilities of local fire districts would be called upon according to pre-arranged agreements to respond to the situation (see Section 3.5, Socioeconomics and Public Services). Compliance with VCWEP's Fire Protection and Prevention Plan would ensure that the risk of fire or explosion at VCWEP facilities would not pose a risk to health and safety or the environment (see Section 3.13.3).

Releases or Potential Releases of Hazardous Materials to the Environment

Project operations would not result in the generation of regulated quantities of hazardous wastes. Because no fuel is burned to power the wind turbine generators, there would be no spent fuel, ash, sludge or other process wastes generated. Project operations would not require the use or storage of significant quantities of fuel or other materials that could cause a spill or other accidental release. Potential impacts associated with specific project facilities are described in more detail below.

Wind Turbine Generators

Periodic changing of lubricating oils and hydraulic fluids used in the individual wind turbine generators would result in the generation of small quantities of hazardous waste. These waste fluids would be generated in small quantities because they need to be changed only infrequently and the changing of these fluids is not done all at once, but rather on an individual turbine-by-turbine basis. The amounts of lubricating oils and hydraulic fluids are estimated; the total amount would be slightly larger and smaller under the first and fourth phases due to differences in the overall number of turbines. This potential impact would be greatest under the fourth project phase which would operate the largest number of turbines (334) and require the largest amount of oils and fluids during project operations, exceptions: 25,500 gallons of hydraulic oil, and 31,550 gallons of lubricating oil. Based on the limited quantities of fluids contained in the wind turbine generators (50 gallons/turbine glycol-water mix, 85 gallons/turbine hydraulic oil, and 105 gallons/turbine lubricating oil) and the leak detection and containment systems engineered into their design (see Section 3.13.3), the potential for an accidental spill from wind turbine malfunction is low.

Electrical Collection System

Power from the turbines would be fed through a breaker panel at the turbine base inside the tower and would be interconnected to a pad-mounted step-up transformer, which step the voltage up to 34.5kV. The pad-mounted transformers would contain mineral oil that acts as a coolant. Each pad-mounted transformer would contain up to 500 gallons of mineral oil. This potential impact would be greatest for the fourth phase with the largest number of turbines (334) and therefore require a total of 15,000 gallons of mineral oil for project operations. Based on the leak detection and containment systems engineered into their design (see Section 3.13.3), the potential for an accidental spill from malfunction or breach of the padmounted transformers is low.

Operations and Maintenance Facility

Waste fluids would be stored for short periods of time during project operations at the O&M facility. Measures incorporated into the design of the O&M facility would ensure that the risk of accidental spill or release of hazardous materials at the facility would be low and would not be a risk to health and safety or the environment.

Risk of Ice Throw from Turbine Blades

While more than 55,000 wind turbine generators have been installed worldwide, there has been no reported injury from ice thrown from wind turbines. Under icing conditions, all exposed parts of the wind turbine are liable to ice build-up. However, it has been observed that a moving turbine rotor is liable to accrete significantly heavier quantities of ice than stationary components. There are several mechanisms of ice accretion on structures. The most important of these, for wind turbines, is rime icing that occurs when the structure is at a sub-zero temperature and is subject to incident flow with significant velocity and liquid water content. The precise deposition mechanism is the subject of ongoing experimental and theoretical research (Morgan et al. 1998).

Ice throws occur as stationary turbine blades begin to rotate. Any ice shed prior to blade rotation would fall directly below the blade. Blades with ice build up turn slowly (only a few revolutions per minute) because the blade airfoil has been compromised by the ice, and the blades are unable to pick up any speed until the ice is shed. Reported data on ice throws at other projects indicate that ice fragments were found on the ground from 50 to 328 feet from turbines (less than 33 to 197 feet blade diameter) and were in the range of 0.2 to 2.2 pounds in mass (Morgan et al. 1998).

Studies of long-term weather data for the area indicate that icing conditions occur on average 10 – 15 days per year National Weather Service, (NWS). This is categorized as a "heavy icing" risk (5 to 25 days of icing per year) according to the Wind Energy in Cold Climates (WECO) study commissioned by the European Union's Environment Directorate (WECO n.d.). In contrast, "light icing risk" is less than 1 day icing per year and "moderate icing risk" is 1 to 5 days per year.

It is planned that the turbines will be incorporated with a cold weather package to avoid icing of the turbine blades, (see Section 3.13.3, Mitigation Measures).

Risk of Turbine Tower Collapse

Review of Internet sites on the topic of wind power risks revealed photographic evidence of wind tower collapse in Europe (Danish Society of Windmill Neighbours 2003; Martha Askume Ireleth Windfarm Action Group, (MAIWAG 2003). However, the specific conditions and circumstances supporting this photographic evidence is uncertain. Minimum setbacks incorporated into the VCWEP. layout would reduce the safety risks 3.13.3, Mitigation Measures).

Risk of Turbine Blade Throw

International experience to date has indicated that there are low risks associated with components falling from towers, including blade throw. Furthermore, risks have been

continually reduced as turbine technology has improved. Review of Internet sites on the topic of wind power risks revealed photographic evidence of wind tower parts such as blades detaching or failing (Country Guardian 2003). Blades were reported broken off on two occasions in 1995 at a facility in Tarifa, Spain (Windpower Monthly 1995), and in 1996, several cases of blade failures were documented in Germany (Country Guardian 2003). However, the specific conditions and circumstances supporting this photographic evidence and these reported cases of blade failure are uncertain. Minimum setbacks incorporated into the VCWEP. layout and compliance with engineering design and manufacturing safety standards would reduce safety risks associated with blade throw and other safety and nuisance concerns (see Section 3.13.3, Mitigation Measures).

Shadow-Flicker Effects

Shadow-flicker caused by wind turbines is defined as alternating changes in light intensity when the moving turbine blades cast shadows on the ground and objects (including windows at residences). Viewing the sun does not cause shadow-flicker through rotating wind turbine blades or moving (i.e., driving) through the shadows of a wind farm, nor by sunlight being reflected from the turbine blades. Shadow-flicker can occur in project area homes if the turbine is located near a home and is in a position where the blades interfere with very low-angle sunlight. The most typical effects are the visibility of a pulsating shadow in the rooms of the residence facing the wind turbines and subject to the shadow-flicker. Such locations are typically called shadow-flicker receptors. Visual obstacles such as terrain, trees, or buildings between the wind turbine and a potential shadow-flicker receptor significantly reduce or eliminate shadow-flicker effects. Shadow-flicker frequency is related to the rotor speed and number of blades on the rotor, which can be translated into a "blade pass frequency" measured in alternations per second, or Hertz (Hz). Two types of concerns have been raised regarding shadow-flicker effects: (1) they can cause epileptic seizures, and (2) that they can be an annoyance to local residences. Due to the fact that the wind farm area is not located in close proximity to residences, shadow-flicker is not considered as a concern.

Aviation Operations and Electromagnetic Interference (EMI)

The two main aviation safety considerations in the development of a wind energy project are (1) the physical obstruction of the tower itself, and (2) on communications, navigation, and surveillance systems, such as radar (DTI 2002). The potential vertical obstruction of the wind turbine, like any tall structure, could pose a hazard to aircraft arriving or departing at a nearby airfield as well as to military training and other low-flying aircraft (DTI 2002).

With respect to radar, moving wind turbine blades interfere with radar by essentially creating radar echoes (AWEA 2004). According to the British Wind Energy Association (BWEA 2004), radar installations can be modified to eliminate this problem: "This study concludes that radars can be modified to ensure that air safety is maintained in the presence of wind turbine farms. Individual circumstances will dictate the degree and cost of modification required, some installations may require no change at all whilst others may require significant modification."

Wind turbines have the potential to interfere with electromagnetic signals that make up much of modern communication networks. In addition to radar, interference with other electromagnetic transmissions can occur when a large wind turbine is placed between a radio, television, or microwave transmitter and receiver (Manwell et al. 2002). Disruptions of public safety communication systems (e.g., radio traffic related to emergency response activities) may be a potential public safety issue. EMI from wind turbines is affected by blade construction and rotational speed (Manwell et al. 2002). Modern blades made of glass-reinforced epoxy (a material similar to fiberglass) should not create any electrical disturbance. However, lightning protection on blade surfaces can increase EMI (Manwell et al. 2002).

Low-Frequency Sound

In addition to the review of Wind Farm noise (Section 3.14), wind turbines are capable of generating low-frequency sound waves (Hau 2000). Low-frequency sound is considered to be in the range of 20 to 80 Hertz (Hz), and infrasound is in the range of 1 to less than 20 Hz (ACGIH 2001). Low-frequency sound is generally the result of wind turbulence that causes the aerodynamic lift forces at the rotor blades to rapidly change (Hau 2000). Moller and Lydolf (2002) conducted a survey of 198 people in Denmark about complaints regarding infrasound and low-frequency noise and found that almost all participants experienced a sensory perception of sound. They perceived the sound not only with their ears but also as a vibration in their bodies or external objects (Moller and Lydolf 2002). This study supports earlier research results indicating that low-frequency sound is disturbing, irritating, and even tormenting to some people. Insomnia, headaches, and heart palpitations were also reported as secondary effects.

Infrasound and low-frequency noise are ubiquitous, since they are generated from natural sources (e.g., earthquakes, wind) and anthropogenic sources (e.g., automobiles, industrial machinery, household appliances) and are common in urban environments (Leventhall 2003). Because low-frequency noise and infrasound have numerous sources, propagate efficiently, and are inefficiently attenuated in buildings, their effects (including those on human health) have been the subject of considerable research. Leventhall (2003) reviewed much of the published literature on the effects of low-frequency noise on humans and concluded that the primary effect of infrasound appears to be annoyance. He also found that there is not much agreement in the many studies of the biological effects of infrasound on humans. However, while infrasound does not appear to result in "dramatic health effects," exposure at a perceptible level can "produce symptoms including weariness, annoyance, and unease"; these symptoms may present safety concerns in certain occupational settings (page 55, Leventhall 2003). Infrasound also has been found to have negative effects on mental performance; however, the ACGIH (2001) considers these to be the result of the relaxation effects of infrasound and not an adverse health impact.

It is clear that certain individuals exposed to infrasound and low-frequency sound experience stressful ear, central nervous system, and other resonance-related symptoms. However, there does not appear to be serious health consequences from exposure (Leventhall 2003). The ACGIH (2001) recommends threshold limit values (TLVs) for 1 to 80 Hz of sound to protect against auditory pain and the sensation of throat-tickling and

choking. However, the TLV also includes a note stating that infrasound and low-frequency sound exposures that cause unwanted vibrations and pressure sensations should be avoided. Low-frequency sound emissions in rotors can be reduced by careful turbine design that reduces flow velocity and optimizes rotor clearance to the tower (Hau 2002) and by the establishment of a sufficient safety zone or setback from roads and other public access areas.

Voltage Flicker

Variable power generation from wind generators is known to cause problems with voltage oscillations (Marei et al. 2003). As described by Manwell et al. (2002), these network voltage disturbances occur faster than steady-state voltage changes and cause lights to "flicker" or change brightness. The connection and disconnection of turbines, changing of generators on two-generator systems, and torque fluctuations in fixed-speed turbines can all cause voltage disturbances. While the human eye is most sensitive to brightness variations at frequencies of around 10 Hz, large wind turbine blades pass at a frequency that is closer to 1 to 2 Hz or less. However, the eye will still detect slight voltage variations at these frequencies. The magnitude of the flicker depends on a number of factors. Although flicker does not damage equipment connected to grid systems, voltage flicker may sometimes be an annoyance. Consequently, a number of countries have developed standards for measuring voltage fluctuations and limits for allowable flicker.

3.13.3 Electric and Magnetic Fields

Background

Electric and magnetic fields (EMF) are present wherever electricity flows: around appliances and power lines, in offices, schools, and homes. Electric fields are invisible lines of force, created by voltage, and are shielded by most materials. Units of measure are volts per meter (V/m). Magnetic fields are invisible lines of force, created by electric current and are not shielded by most materials, such as lead, soil and concrete. In the U.S., magnetic field strength units of measure are Gauss (G) or milliGauss (mG), where 1,000 mG = 1G. Much of the world scientific community measures magnetic field strength in units of Tesla (T) and microTesla (μT) where 10,000 G = 1 T, 1G = 100 μT, and 1mG = 0.1 μT. Electric and magnetic field strengths diminish with distance. These fields are low energy, extremely low frequency fields, and should not be confused with high energy or ionizing radiation such as X-rays and gamma rays.

A majority of people in the United States is exposed to magnetic fields that average less than 2 milliGauss (mG). Table 3.13-1 depicts estimated average magnetic field exposure of the U.S. population for residential sources, according to a study commissioned by the U.S. government as part of the EMF Research and Public Information Dissemination (EMF RAPID) Program. This study measured magnetic field exposure of a sample of people of all ages randomly selected among the U.S. population. Participants wore or carried with them a small personal exposure meter and kept a diary of their activities both at home and away from home. Magnetic field strength values were automatically

recorded twice a second for 24 hours. The study reported that exposure to magnetic fields is similar in different regions of the country and similar for both men and women.

Table 3.13-1. Residential Sources of Magnetic Fields

SOURCE	Magnetic Field Strength[1] (mG)
Kitchen	
Blenders	20
Coffee Makers	1
Dishwashers	30
Electric Ranges	30
Refrigerators	20
Bedroom	
Digital Clock	8
Analog Clock	30
Living/Family Room	
Color Televisions	20
Window Air Conditioners	20
Ceiling Fans	50
Laundry/Utility	
Electric Clothes Dryer	3
Washing Machines	30
Vacuum Cleaners	200
Portable Heaters	40
Workshop	
Drills	40
Power Saws	300

Source: "EMF Questions & Answers", U.S. National Institute of Environmental Health Services, EMF RAPID Program, 2002.

Possible Health Effects of Electric and Magnetic Fields

This section reviews the results of selected recent reports pertaining to possible links between electric and magnetic fields and health effects. Results are presented in chronological order and demonstrate how scientific knowledge in this area is still unfolding.

[1] The magnetic field strengths are measured at a distance of one (1) foot from the source.

A number of studies in the late 1980s and 1990s investigated a possible association between power lines and EMF and the incidence of childhood leukemia. The studies included:

- Four studies which used wire codes to assess exposure to EMF were considered to be of sufficient quality to evaluate an association between the incidence of childhood leukemia and exposure to magnetic fields (Wertheimer & Leeper, 1979, Savitz *et al.*, 1988,London *et al.*, 1991, and Linet *et al.*, 1997). (The wire code method includes a number of factors, such as the wiring in the home, and the distance of home from the power line.)

- Four studies were considered to be of sufficient quality by the National Institute of Environmental Health Sciences (NIEHS) to be used in an evaluation of the association between the incidence of childhood brain tumors and classification of exposure based on wire codes (Savitz *et al.*, 1988; Wertheimer & Leeper, 1979, Gurney *et al.*, 1996; and Preston-Martin *et al.*, 1996b).

- Three studies of appliance use evaluated the association between the incidence of childhood leukemia and exposure to magnetic fields (Hatch *et al.*, 1998; London *et al.*, 1991; Savitz *et al.*, 1990).

In 1996, a National Research Council committee of the National Academy of Sciences (NAS) released its evaluation of research on potential associations between EMF exposure and cancer, reproduction, development, learning, and behavior. The report concluded:

"Based on a comprehensive evaluation of published studies relating to the effects of power-frequency electric and magnetic fields on cells, tissues, and organisms (including humans), the conclusion of the committee is that the current body of evidence does not show that exposure to these fields presents a human-health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects."

The NAS focused primarily on the association of childhood leukemia with the proximity of the child's home to power lines. The NAS panel found that although a link between EMF exposure and increased risk for childhood leukemia was observed in studies that had estimated EMF exposure using the wire code method; this link was not found in studies that had included actual measurements of magnetic fields at the time of the study.

In 1992, the U.S. Congress authorized the Electric and Magnetic Fields Research and Public Information Dissemination Program (EMF-RAPID Program) in the Energy Policy Act (PL 102-486, Section 2118). The Congress instructed the National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health and the Department of Energy to direct and manage a program of research and analysis aimed at providing scientific evidence to clarify the potential for health risks from exposure to extremely low frequency (ELF) EMF.

Seven years later, the 1999 NIEHS report stated the following in its conclusion section:

> "The scientific evidence suggesting that ELF-EMF exposures pose any health risk is weak. The strongest evidence for health effects comes from associations observed in human populations with two forms of cancer: childhood leukemia and chronic lymphocytic leukemia in occupationally exposed adults. While the support from individual studies is weak, the epidemiological studies demonstrate, for some methods of measuring exposure, a fairly consistent pattern of a small, increased risk with increasing exposure that is somewhat weaker for chronic lymphocytic leukemia than for childhood leukemia. In contrast, the mechanistic studies and the animal toxicology literature fail to demonstrate any consistent pattern across studies although sporadic findings of biological effects (including increased cancers in animals) have been reported. No indication of increased leukemia in experimental animals has been observed.
>
> The lack of connection between the human data and the experimental data (animal and mechanistic) severely complicates the interpretation of these results. The human data are in the "right" species, are tied to "real-life" exposures and show some consistency that is difficult to ignore. This assessment is tempered by the observation that given the weak magnitude of these increased risks, some other factor or common source of error could explain these findings. However, no consistent explanation other than exposure to ELF-EMF has been identified.
>
> Epidemiological studies have serious limitations in their ability to demonstrate a cause and effect relationship whereas laboratory studies, by design, can clearly show that cause and effect are possible. Virtually all of the laboratory evidence in animals and humans and most of the mechanistic work done in cells fail to support a causal relationship between exposure to ELF-EMF at environmental levels and changes in biological function or disease status. The lack of consistent, positive findings in animal or mechanistic studies weakens the belief that this association is actually due to ELF-EMF, but it cannot completely discount the epidemiological findings.
>
> The NIEHS concludes that ELF-EMF exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures."

More recently, childhood leukemia has been associated with exposure to magnetic fields in the highest exposure groups, in recent reviews and pooled studies (International Agency for Research on Cancer (IARC) 2001, Ahlbom et al 2000, and Greenland et al 2000). The basis for these relationships remains unexplained (Brain et al 2003). Kavet and Zaffanella (2002) suggested that contact currents could explain the association between high residential magnetic fields and childhood leukemia. Contact currents flow through the body whenever a person touches two conductive surfaces that are at different

voltages. Leukemia in childhood is rare. In the US, about 2-3 cases per 100,000 person years for children 0-20 years old have been reported, but the rate peaks at two to three times this rate in 0-4-year olds (Brain et al 2003).

In the first of the analyses of pooled data, Ahlbom et al (2000) reported that if nine studies that included long-term measurements of magnetic fields were pooled, a statistically significant association could be found for childhood leukemia in the children with average exposures of 4 mG (0.4 microTesla) or greater. For children with lower average exposures, no significant elevation of childhood leukemia was found in the pooled studies. As indicated by Figure 4.2 magnetic field strength exceeds 4 mG from the center of the proposed transmission line to a point on either side of the line roughly 45 feet from the center of the transmission line. In the second of the analyses of pooled data, Greenland et al (2000) reported that if the 15 studies for which magnetic fields were measured (or could be estimated) were pooled, a statistically significant association (relative risk = 1.7) could be found for childhood leukemia in the children with average exposures of 3 mG (0.3 microTesla) The United States measures magnetic fields in milligauss {mG}, the rest of the world measures magnetic in Tesla (µT) or greater. For children with lower average exposures, no significant elevation of childhood leukemia was found in the pooled studies. According to the authors, this data indicates that exposure to power-frequency magnetic fields could account for 0-8% of childhood leukemia deaths in the United States.. As indicated by Figure 4.2 magnetic field strength exceeds 3 mG from the center of the proposed transmission line to a point on either side of the transmission line roughly 50 feet from the center of the transmission line. Along the proposed line approximately 21 residential parcels are located within the 3 mG zone and only one house is located near the proposed transmission line, and is 35 feet away.

The World Health Organization's International Agency for Research on Cancer (IARC) met in June 2001 to review the scientific evidence regarding the potential carcinogenicity of static and ELF-EMF. An international scientific panel was created consisting of 21 experts from 10 countries. The panel categorized its conclusions for carcinogenicity based on the IARC classification system that evaluates the strength of evidence from epidemiological, laboratory (human and cellular), and mechanistic studies (Classifications are "carcinogenic to humans," "probably carcinogenic to humans," and "possibly carcinogenic to humans."). The IARC concluded that,

> "ELF magnetic fields are possibly carcinogenic to humans, based on consistent statistical associations of high level residential magnetic fields with a doubling of risk of childhood leukemia and power-frequency (50 or 60 Hz) residential ELF magnetic field strengths above 0.4 microTesla. In contrast, no consistent evidence was found that childhood exposures to ELF electric or magnetic fields are associated with brain tumors or any other kinds of solid tumors. No consistent evidence was found that residential or occupational exposures of adults to ELF magnetic fields increase risk for any kind of cancer."

Short and Long Term Health Effects

Pacemakers. Sources such as welding equipment, power lines at electric generating plants, and rail transportation equipment can produce lower frequency EMF strong

enough to interfere with some models of pacemakers and defibrillators. The exposure guidelines developed by the American Conference of Governmental Industrial Hygienists (ACGIH), state that workers with cardiac pacemakers should not be exposed to a 60-Hz magnetic field greater than 1 gauss (1,000 mG) or a 60-Hz electric field greater than 1 kilovolt per meter (1,000 V/m). The electric and magnetic fields from the 161kV transmission line are below the levels established in the guidelines.

Breast Cancer. The interest by researchers that the possibility that EMF exposure might cause breast cancer was in part because breast cancer is such a common disease in adult women. The early studies identified a few electrical workers with male breast cancer, which is a very rare disease. A link between EMF exposure and alterations in the hormone melatonin was considered a possible hypothesis for breast cancer. This idea provided motivation to conduct research addressing a possible link between EMF exposure and breast cancer. Overall, the published epidemiological studies have not shown such an association with EMF exposure expected from the proposed Three Rivers-Jackrabbit transmission line and breast cancer.

Miscarriage. According to a recent article in EPRI Journal online, "the question of whether exposure to power-frequency electric and magnetic fields (EMF) might be linked to the risk of miscarriage and other adverse reproductive health outcomes has been the subject of scientific investigation for more than two decades. In 2002, the question took on new importance when the results of two large epidemiologic studies were published. The studies, conducted by research teams led by Dr. Geraldine Lee at the California Department of Health Services (CDHS) and Dr. De-Kun Li a the Kaiser Foundation Research Institute, found an increased risk of miscarriage among California women who were exposed to high peak magnetic fields (maximum exposure above 16 milligauss during the measurement day) in early pregnancy." Maximum magnetic field strength from the proposed line would be less than 16 mG.

Conclusion. The association between measured fields and childhood leukemia is weak, and it is not clear whether it represents a cause-and-effect relationship. At present, the available series of studies indicates no association between EMF exposure and childhood cancers other than leukemia. Far fewer of these studies have been conducted than studies of childhood leukemia. There have been more than 30 detailed reports on both long-term and short-term studies of EMF exposures in laboratory animals (bioassays) conducted by researchers. Long-term animal bioassays constitute an important group of studies in EMF research. Such studies have a proven record for predicting the carcinogenicity of chemicals, physical agents, and other suspected cancer-causing agents. Researchers compared groups of animals treated with cancer initiators to groups treated with cancer initiators and then exposed to EMF, to see if EMF exposure promoted the cancer growth (initiation-promotion model). Other studies tested the cancer promotion potential of EMF using mice that were predisposed to cancer because they had defects in the genes that control cancer. Most of the studies conducted for animals (primarily rodents such as rats) suggest a lack of carcinogenicity, and the few with borderline positive results are inadequate to conclude that exposure to magnetic fields at the magnitude and field configurations at which they were investigated increases the incidence of cancer in rodents.

3.13.2.2 230 kV Transmission Line Impacts

Electric and Magnetic Induction

Electric and magnetic fields from power lines can cause effects that occur beyond the confines of the phase conductors. The fields produce small amounts of electric charge on nearby conductive objects, an action known as coupling or induction. Magnetic fields primarily impact long and generally parallel objects (e.g., fences and pipelines) that have an electrical ground at some point of the object. Electric field effects are more likely to occur on objects well insulated from ground at all points. Good examples are motor vehicles and metal sheds that can acquire electric charges in an electric field. The primary issue is how the induced or coupled voltages and currents on these objects can compromise safety to a person who comes in contact with the object.

Electric induction involves a short-term electrical interaction between the transmission line and objects referred to as "capacitive coupling." In this type of coupling, a voltage is produced onto objects that are near the power line such as trees or houses.

Magnetic induction is a result of the current in the transmission line conductor coupling (this type of coupling occurs through the air) voltages into a parallel conductor (or nearly parallel which generally means that the conductors are at a angle of 45 degrees or less) system (fence, pipeline, etc.). This effect is referred to as "inductive or magnetic coupling." The conductor system must be generally in parallel to the line to cause any significant coupling or induction effects.

When grounded, objects such as irrigation pipes, pipelines, electric distribution lines, railroads or telephone lines, can form a conducting loop. The situation can become dangerous if only one end of such an object is grounded when an induced voltage appears across the open end of the loop. Electrical shock could occur if a person were to close the circuit by contacting both the ground and the conductor. Magnetic induction effects from the VCWEP. would be effectively reduced or eliminated through measures to reduce impacts such as appropriate grounding practices and maintenance of ground-to-wire clearances.

Electrical Safety

The VCWEP. would be designed and constructed in accordance with National Electrical Safety Code (NESC) requirements, which provides for minimum allowable distances between the lines and the ground or other objects and from the lines to the edge of the Right-Of-Way (ROW). The VCWEP. would be constructed at safe distances according to NESC requirements from existing structures and vehicle traffic, so that no electric or magnetic induction impacts are expected.

NESC requires that power lines be designed to keep the induced current from nearby objects below 5.0 milliamperes (mA) when short-circuited to ground. The short circuit current can be calculated for any object in or near the corridor to determine if the magnitude of the current is below the 5.0 mA rule for safety purposes.

Electric and Magnetic Fields

A computer model was used to determine the electrical and magnetic field strengths, for the proposed 230kV line. The most conservative (resulting in the highest) electric and magnetic field strengths for the proposed VCWEP 230kV transmission line would be based on minimum line clearances to ground (typically at the middle of the span between two transmission structures along the line), and the highest projected future load growth of the transmission line system. The 230kV transmission structure design is a H-Frame (see Chapter 2). The circuit loads are based on the different phases of VCWEP for additional wind turbine sources. Magnetic field strengths are calculated for Phase 1 with a 50 MW (126 Amperes) wind turbine capacity and Phase 4 with a 500 MW (1,255 Amperes) wind turbine capacity. The electric and magnetic field values are calculated along a profile perpendicular to the transmission line. The magnetic field strength plots for Phase 1 and 4 are shown in Figure 3.13-2. The plots show that the magnetic field strength at the edge of a 100-foot ROW (50 feet either side of centerline) would be 10 mG for Phase 1 and 102 mG for Phase 4. The electric field strength plot is shown in Figure 3.13-3. The electric field strengths will not change between the different phases of VCWEP.

Figure 3.13-2. 230kV Transmission Line Magnetic Field Strength

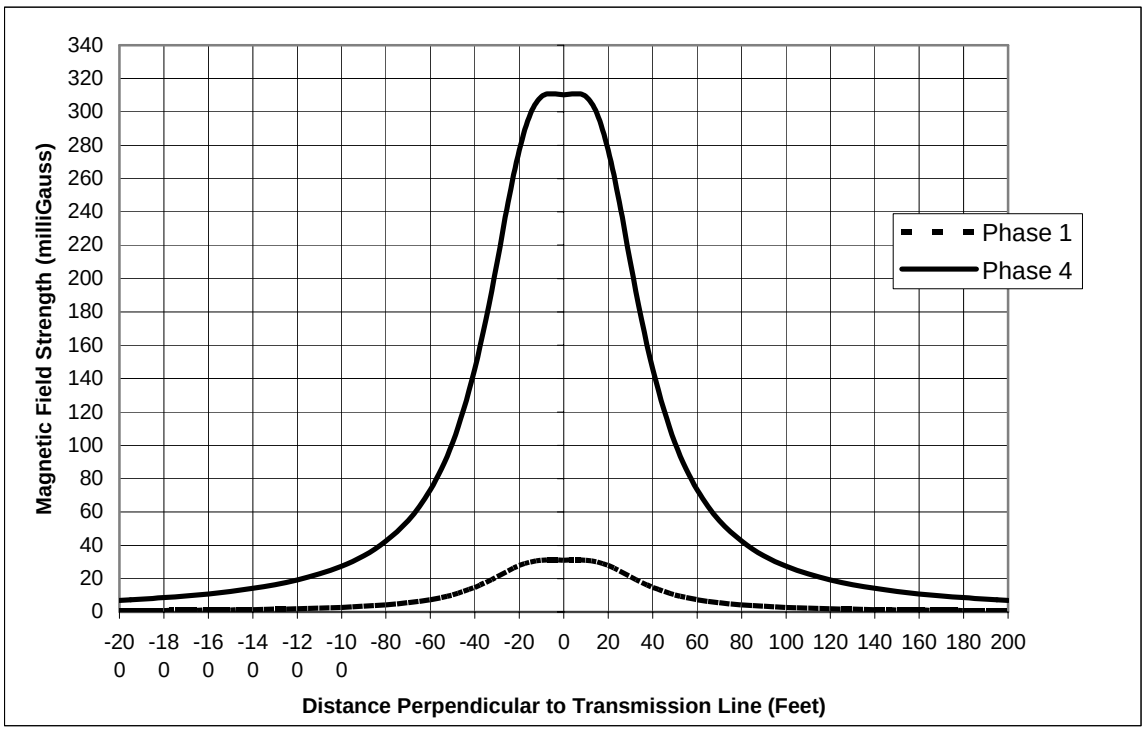
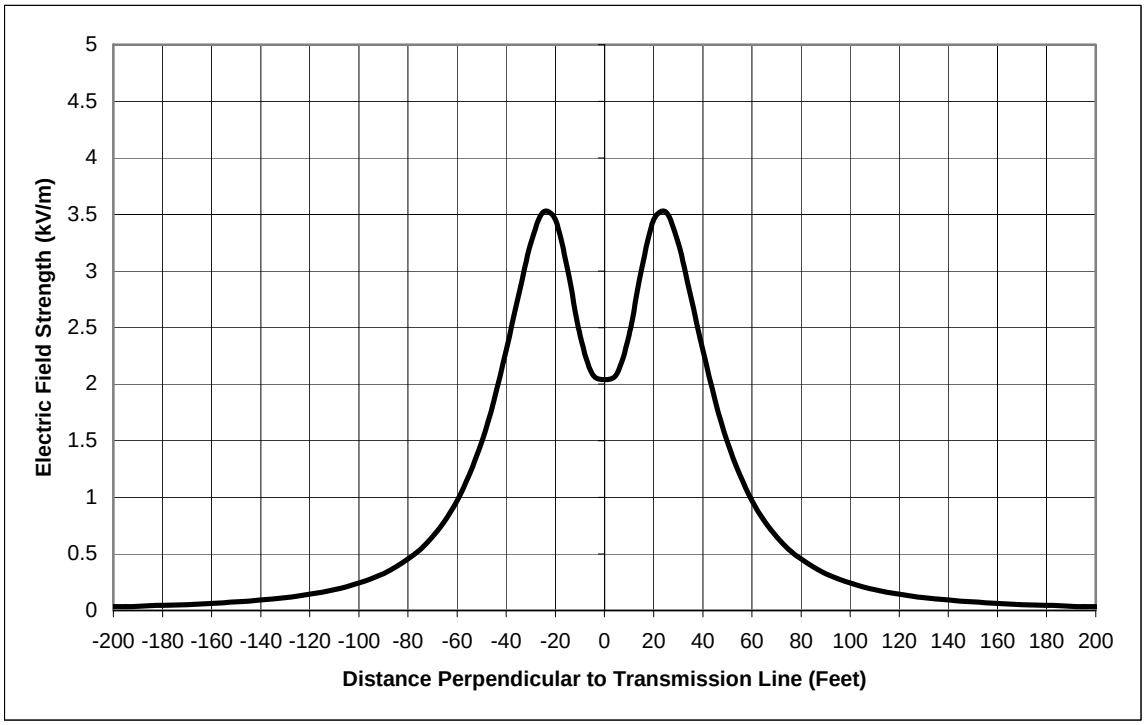


Figure 3.13-3. 230kV Transmission Line Electric Field Strength



Based on the design and safety provisions in the Applicant's proposal, the proposed transmission line would be located in an area where there are no sensitive receptors.

3.13.2.3 Antelope Creek Substation

VCWEP would be electrically connected to the power grid at a substation(s) that would be equipped with either one or two transformers. Each substation transformer would contain up to 12,000 gallons of mineral oil for cooling. Substation transformer requirements would be the same under the three project scenarios. Mineral oil used to fill substation transformers is a potential source of hazardous materials that could accidentally be spilled during project operations. The substation transformers would have a specifically designed containment system to ensure that any accidental fluid leak does not result in discharge to the environment (see Section 3.13.3).

3.13.4 Mitigation Measures

The Applicant and its subcontractors would comply with all applicable local, state, and federal safety, health, and environmental laws, ordinances, regulations, and standards. Some of the main laws, ordinances, regulations, and standards designed to protect human health and safety that would be reflected in the design, construction, and operation of VCWEP include:

- Occupational Safety And Health Act Of 1970 (29 USC 651, et seq.) and 29 CFR 1910, Occupational Safety and Health Standards;
- Uniform Fire Code;
- Americans with Disabilities Act;
- Uniform Fire Code Standards;
- Uniform Building Code;
- National Fire Protection Association, which provides design standards for the requirements of fire protection systems;
- National Institute for Occupational Safety and Health, which requires that safety equipment carry markings, numbers, or certificates of approval for stated standards;
- American Society of Mechanical Engineers, which provides plant design standards;
- American National Standards Institute, which provides plant design standards;
- National Electric Safety Code;
- American Concrete Institute Standards;
- American Institute of Steel Construction Standards;
- American National Standards Institute;
- American Society for Testing and Materials;
- Institute of Electrical and Electronic and Installation Engineers; and
- National Electric Code.

Fire and Explosion Risk Mitigation Plan (Construction and Operations)

Table 3.13-2 presents the potential causes of fire or explosion during both project construction and operations, and mitigation measures that would be employed to minimize or prevent the ris

Table 3.13-2. Fire and Explosion Risk Mitigation Plan

Construction (C)/Operation (O)	Potential Fire or Explosion Source	Mitigation Measures
C&O	General Fire Protection	• All onsite service vehicles fitted with fire extinguishers • Fire station boxes with shovels, water tank sprayers, etc. installed at multiple locations onsite along roadways during summer fire season • Minimum of one water truck with sprayers must be present on each turbine string road with construction activities during fire season
C&O	Dry vegetation in contact with hot exhaust catalytic converters under vehicles	• No gasoline-powered vehicles allowed outside of graveled areas • Mainly diesel vehicles (i.e., w/o catalytic converters) used on site • Use of high clearance vehicles on site if used off road
C&O	Smoking	• Restricted to designated areas (outdoor gravel covered areas)
C	Explosives used during blasting for excavation work	• Only state-licensed explosive specialist contractors are allowed to perform this work; explosives require special detonation equipment with safety lockouts. • Clear vegetation from the general footprint area surrounding the excavation zone to be blasted. • Standby water spray trucks and fire suppression equipment to be present during blasting activities
Table 3.13-2. Fire and Explosion Risk Mitigation Plan (Cont.)		

C&O	Electrical fires	• All equipment is designed to meet NEC and NFPA standards. • Graveled areas with no vegetation surrounding substation, fused switch risers on overhead pole line, junction boxes and pad switches • Fire suppressing, rock-filled oil containment trough around substation transformer
C&O	Lightning	• Specially engineered lighting protection and grounding systems at wind turbines and substations • Footprint areas around turbines and substation are graveled with no vegetation
C	Portable Generators – hot exhaust	• Generators not allowed to operate on open grass areas • All portable generators to be fitted with spark arresters on exhaust system
C	Torches or field welding onsite	• Immediate surrounding area will be wetted with water sprayer. • Fire suppression equipment to be present at location of welder/torch activity
C&O	Electrical arcing	• Electrical designs and construction specifications meet or exceed requirements of NEC and NFPA.

[1] Source: Sagebrush Power Partners LLC 2003c. Indicates risk during construction (C) and/or operations

Additional Measures to Reduce Risk of Fire and Explosion during Construction

- The Construction Manager would be responsible for staying abreast of fire conditions in VCWEP area by contacting the Montana Department of Labor & Industry (DLI) implementing necessary fire precautions.

- Fire risk reporting by the Montana DLI would be actively posted at the construction job site during the high-risk season.

- A Fire Protection and Prevention Plan would be developed and implemented, in coordination with Valley County Fire Marshal and other appropriate agencies.

- Potential hazards associated with use of flammable liquids such as construction equipment fuels would be reduced by compliance with a Construction Health and Safety Plan. Each contractor would develop its own plan tailored to suit the specific site conditions, design, and construction requirements for VCWEP. These contractors would administer the program to ensure compliance with laws, ordinances, regulations, and standards pertaining to worker safety, including the requirements of the Occupational Safety and Health Administration (OSHA) (Title 29, Labor, Code of Federal Regulations Part 1926, Safety and Health Regulations for Construction). The Construction Health and Safety Plan would include the following provisions:

  - Injury and illness prevention plan;

  - Written safety program;

  - Personnel protective devices program;

  - Onsite fire suppression program;

  - Offsite fire suppression support; and

  - Emergency plan.

Additional Measures to Reduce Risk of Fire and Explosion during Operations

- The Applicant has committed to developing and implementing emergency response procedures and employee training addressing the following topics:

  - Personnel injury;

  - Construction emergencies;

  - Project evacuation;

  - Fire or explosion;

  - Floods;
  - Extreme weather abnormalities;
  - Earthquakes;
  - Volcanic eruption; and
  - Facility blackout.

- The project O&M group and third party contractors would receive regular emergency response and safety training to ensure that effective and safe action would be taken to reduce and limit the impact of an emergency (including fires and explosions) during project operations.

- The wind turbine generators would be equipped with specially engineered lightning protection systems that connect the blades, nacelle, and tower to a grounding system at the base of the tower. The blades would be constructed with an internal copper conductor and an additional lightning rod that extends above the wind vane and anemometer at the rear of the nacelle. The Applicant also proposes to keep the areas around each turbine base graveled with no vegetation, to reduce fire risk.

- The turbine control system would detect overheating in turbine machinery. Internal fires would be detected by these sensors, causing the machine to shut down immediately and to send an alarm signal to the central SCADA system which would notify operators of the alarm by cell phone or pager.

- The proposed substations would be equipped with specially engineered lightning protection systems to minimize the risk of fire during substation operations. All electrical designs for the substations and interconnection facilities would comply with the National Electric Code and the National Fire Protection Agency regulations and standards. The substations would be completely enclosed by a locked fence and access would be limited to authorized personnel. The area surrounding the substations would be graveled and no combustible vegetation would be located within the fenced area.

- Permanent meteorological monitoring towers would be installed with a grounding system that protects the meteorological sensors and loggers from electrostatic discharge and provides lightning protection to the tower by bringing the tower and everything mounted on it to ground potential. Lightning dissipaters or rods would be installed at the top of the towers to provide an umbrella of protection for the upper sensors.

- Only qualified personnel would perform maintenance on the electrical cables. Sufficient clearance would be provided for all types of vehicles traveling under the overhead segments of the electrical lines.

Measures to Reduce Potential Releases of Hazardous Materials to the Environment during Construction

- During construction, the Engineering Procurement Construction, (EPC) contractor would use fuel trucks for refueling construction vehicles and equipment on site. There would be no fuel storage tanks used at the project site. To avoid spills, fueling trucks would be equipped with auto shutoff valves and other safety devices. The fuel trucks would be properly licensed and would incorporate features in equipment and operation, such as automatic shutoff devices, to prevent accidental spills.

- The oil truck used to fill substation transformers would be properly licensed and would incorporate several special features in equipment and operation, such as automatic shutoff devices, to prevent accidental spills.

- The details of how lubricating oils and other materials would be stored and contained at the construction staging area would be documented in a construction spill prevention and control plan developed and approved prior to commencement of construction. This plan would show storage, detention, and response procedures for all potential chemicals used on site. Implementation of appropriate spill prevention and control measures would ensure that the risk of an accidental release of hazardous materials remains low throughout construction.

- The EPC contractor would be responsible for compliance with applicable federal, state, and local laws, ordinances, regulations, and standards to ensure that the risk of release does not create an adverse health and safety or environmental impact. The EPC contractor would also be responsible for training its personnel in spill prevention and control and, if an incident occurs, would be responsible for containment and cleanup. Spills would be addressed in accordance with the construction spill prevention plan.

Measures to Minimize Risk of Ice Throw

In order to prevent ice from causing any potential danger, the proposed turbine manufacturer will incorporate a cold weather package in the design to avoid the icing of the turbine blades/

Measures to Minimize Risk of Tower Collapse and Blade Throw

- The wind turbines would meet international engineering design and manufacturing safety standards. This includes tower, blade, and generator design. There is an international quality control assurance program for turbines, and a number of relevant safety and design standards. Quality Assurance/Quality Control (QA/QC) inspections of the wind turbine generators and towers would typically include, but not be limited to, the following operations, checks, and review:

  - Inspection of turbines at manufacturer's facilities;

  - Review and inspection of manufacturer's QA/QC procedures;
  - Manufacturing drawing review and verification;
  - Verification of welding procedure specifications compliance ;
  - Material mill certificates tracking system and verification;
  - Overall visual inspection (including assembly, fastening systems and welding);
  - Inspection of flange interface flatness measurements, finishing and protection;
  - Witness or review of turbine run-in load testing;
  - Inspection of paint finishing and protection;
  - Inspection of painting/marking/preparation for shipment;
  - Verification of field wiring and tagging; and
  - Pre-Commissioning field testing and verification.

- Foundation design and commissioning checks would address potential equipment failure due to extreme events such as earthquakes or extreme wind loadings, as well as frequency tuning of the different parts of the structure to avoid failure due to dynamic resonance.

Measures to Minimize Exposure to EMF

Proposed high voltage transmission lines would be designed and built according to industry standards to reduce EMF levels.

Measures should be considered to reduce occupational EMF exposures, such as backing the generator with iron to shield magnetic fields, shutting down the generator when working in the vicinity, and/or limiting exposure time while the generator is running (Robichaud 2004).

Measures to Minimize Electric Shock

The substations would be designed and constructed to have a robust grounding grid that would divert stray surges and faults. Generally, the substation grounding grid would consist of heavy gauge bare copper conductor buried in a grid fashion and welded to a series of multiple underground grounding rods.

Measures during Decommissioning

An audit would be performed of the relevant operation records and a project site survey would be conducted to determine if a release of hazardous material has occurred. A review of all facilities would be performed to determine if hazardous or dangerous

materials (as then defined by regulation) are present as construction materials or materials used in the operation of any facility components such as cleaning and maintenance fluids, lubricating oils, and gases. VCWEP site inspection would determine and record the location, quantity, and status of all identified materials.

Additional Recommended Mitigation Measures

In addition to the mitigation measures proposed by the Applicant above, the following measures would further reduce health and safety related impacts and risks.

Measures to Minimize Risk of Tower Collapse and Blade Throw

The Applicant proposes setbacks of at least the turbine tip-height (ranging from 260 to 410 feet, depending on VCWEP scenario) from public roads and residences as a safety measure to reduce the risk of tower collapse or blade throw. However, some of the residents in VCWEP area travel on private roads to access their properties. Because some roads appear to be close to the proposed turbines, the Applicant should adjust the siting of individual turbines, as necessary, to avoid encroaching upon a 260- to 410-foot setback around private roads.

Measures to Minimize Electromagnetic Interference (EMI)

- The project should be planned to minimize EMI (e.g., impacts to radar, microwave, television, and radio transmissions). Signal strength studies should be conducted when proposed locations have the potential to impact transmissions. Potential interference with public safety communication systems (e.g., radio traffic related to emergency activities) should be avoided.
- In the event an installed wind energy development project results in EMI, the operator should work with the owner of the impacted communications system to resolve the problem. Potential mitigation may include realigning the existing antenna or installing relays to transmit the signal around the wind energy project. Additional warning information may also need to be conveyed to aircraft with onboard radar systems so that echoes from wind turbines can be quickly recognized.
- The project must be planned to comply with FAA regulations, including lighting requirements, and to avoid potential safety issues associated with proximity to airports, military bases or training areas, or landing strips.

Measures to Minimize Risk of Transmission Line Electric and Magnetic Induction

- The proposed project. would be constructed at safe distances according to NESC requirements from existing structures and vehicle traffic, so that no electric or magnetic induction impacts are expected.
- The project would also include line designs (such as upgrade to the railroad signal equipment or buried counterpoise wires) to eliminate safety or railway equipment concerns for the Burlington Northern Santa Fe Railway according to guidelines from the American Railway, Engineering and Maintenance-of-way Association (AREMA).

3.14.NOISE

3.14.1 Affected Environment

Noise is generally defined as unwanted sound. The degree to which noise can impact the human environment ranges from levels that interfere with speech and sleep (annoyance and nuisance) to levels that cause adverse health effects (hearing loss and psychological effects). Human response to noise is subjective and can vary greatly from person to person. Factors that influence individual response include the intensity, frequency, and pattern of noise, the amount of background noise present before the intruding noise, and the nature of work or human activity that is exposed to the noise source. The basic unit of measurement for sound is the decibel (dB). The decibel system of measuring sound provides a simplified relationship between the intensity of sound and its perceived loudness to the human ear. The decibel scale is logarithmic. Therefore, sound intensity increases or decreases exponentially with each decibel of change. For example, a 10 dB level is 10 times more intense than one dB, while a 20 dB level is one hundred times more intense, and a 30 dB level is one thousand times more intense.

Environments are characterized by various sound intensity levels that are generally perceived acceptable or unacceptable to local receptors. Lower levels are expected in rural or suburban areas than what would be expected for commercial or industrial zones. Nighttime ambient levels in urban environments are about seven decibels lower than the corresponding average daytime levels. The day-to-night difference in rural areas away from roads and other human activity can be considerably less. Areas with full-time human occupation that are subject to nighttime noise that are the same as daytime levels are often considered objectionable relative to noise disturbance. Noise levels above 45 dB(A) at night can result in the onset of sleep interference effects (U.S. Environmental Protection Agency (EPA) 1971). At 70 dB(A), sleep interference effects become considerable.

3.14.1.1 Study Methods

A number of sources were explored in order to inventory available noise data for the Valley County Wind Energy Project (VCWEP) area.Environmental Protection Agency, (EPA), Occupational Safety & Health Organization, (OSHA), and Federal Aviation Administration, (FAA), studies and guidelines were consulted for reference materials and literature searches completed to determine available evidence. This section presents a brief discussion of environmental noise fundamentals, background noise levels, noise propagation, and noise standards and guidelines.The VCWEP area is located on private, federal and state lands International Standardization Organization (ISO) Standard 1999.2 that is used for assessment of risk of noise induced hearing loss, were not used nor referred to for this project.

The unit to describe the intensity of sound in this study will be the decibel (dB). Audible sound levels range from 0 dB (threshold of hearing) to 140 dB (threshold of pain) (Beranek, 1992). Consequently, exposures are typically described in terms of the average A-weighted levels (referred to in units dB(A)), or the equivalent continuous A-weighted

sound pressure level (Leq), over an average workday. The permissible A-weighted sound level for an 8 hour exposure ranges from 75 dB(A) for the Environmental Protection Agency to 90 dB(A) for the Occupational Safety and Health Administration.

3.14.1.2 Study Area Overview

Federal and State Standards and Regulations

There are no federal noise standards that directly regulate noise from operation of wind turbines, electrical transmission lines, and substation facilities. However, it should be noted that the U.S. EPA has developed guidelines on recommended maximum noise levels to protect public health and welfare (U.S. EPA. 1974). Table 3.14-1 provides a summary of noise levels identified to protect public health and welfare with an adequate margin of safety. With regard to noise exposure and workers, OSHA regulations safeguard the hearing of workers exposed to occupational noise. Refer to 29 CFR Section 1910.95 (Code of Federal Regulations) for a list of permissible noise exposures. OSHA has set an action level of 85 dB at which hearing conservation measures must be implemented.

Table 3.14-1. Examples of Protective Noise Levels Recommended by U.S. E.P.A.

Effect	Level	Area
Hearing Loss	L_{eq} [5](24) < 70 dB	All areas
Outdoor Activity Interference and Annoyance	L_{dn} [6] < 55 dB	Outdoors in residential areas, farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use.
	L_{eq} (24) < 55 dB	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor Activity Interference and Annoyance	L_{dn} < 45 dB	Indoor residential areas
	L_{eq} (24) < 45 dB	Other indoor areas with human activities such as schools, etc.

Source: EPA, March 1974

Montana encourages each local government entity to perform noise studies and implement a noise element as part of their general plan. A General or Comprehensive Master Plan would administer the applicability and implementation of noise standards for an area. There are no local regulations or ordinances for noise in Valley County.

There are guidelines for evaluating the compatibility of various land uses as a function of community noise exposure. These land use compatibility guidelines (EPA) are listed in Table 3.14-2

Table 3.14-2. Land Use Compatibility for Community Noise Environment

Land Use Category	Community Noise Exposure – Ldn or CNEL (dB)													
	50		55		60		65		70		75		80	
Residential Low Density, Single Family, Duplex, Mobile Home	A	A	A	A	A									
				B	B	B	B	B	B					
										C	C			
												D	D	D
Residential – Multi -Family	A	A	A	A	A	A	A							
						B	B	B	B					
										C	C			
												D	D	D
Transient Lodging -Motel, Hotel	A	A	A	A	A									
						B	B	B	B	B	B			
												C	C	
														D
Schools, Libraries, Churches, hospitals, Nursing Homes	A	A	A	A	A									
						B	B	B	B					
										C	C	C	C	
														D
Auditorium, Concert Hall, Amphitheaters														
	B	B	B	B	B	B	B	B	B					
								C	C	C	C	C	C	C
Sports Arena, Outdoor Spectator Sports	A	A	A	A	A									
	B	B	B	B	B	B	B	B	B	B	B			
										C	C	C	C	C
Playgrounds,Neighborhood Parks	A	A	A	A	A	A	A	A	A					
									C	C	C			
											D	D	D	D
Golf Courses, Riding Stables, Water Recreation, Cemeteries	A	A	A	A	A	A	A	A	A	A	A			
										C	C	C	C	
														D
Office Buildings, Business Commercial and Professional	A	A	A	A	A	A	A	A	A					
									C	C	C	C		
												D	D	D
Industrial, Manufacturing,Utilities, Agriculture	A	A	A	A	A	A	A	A	A	A	A			
										C	C	C	C	
												D	D	D
A	Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.													
B	Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design.													
C	Normally Unacceptable: New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirement must be made and needed noise insulation features included in the design.													
D	Clearly Unacceptable: New construction or development generally should not be undertaken.													

Source: Aviation Noise Effects, 1985.

Valley County

Noise contours are prepared in terms of either the Community Noise Equivalent Level (CNEL) or the Day-Night Average Level (L_{dn}) which are both descriptors of total noise exposure at a given location for an annual average day. There is no zoning ordinance pertaining to noise permits and there is no general plan for noise. The noise element of the General Plan is a mandatory component pursuant to state law. Since there are no ordinances the CNEL standards are offered as a benchmark for guidance.

Noise Sources

Gas Compressor Station. There is an isolated gas compressor station approximately 2 miles to the east. Noise from the gas compressor facility at the epicenter typically ranges from 85 to 122 dB(A).

Vehicular Traffic on U.S. Highway 2. US Highway 2 runs approximately in a northwest direction from the City of Glasgow. The proposed 230kV transmission line will run perpendicular to U.S. Highway 2.

Vehicular traffic on State Highway 24. State Highway 24 runs north from the city of Glasgow toward the Fort Peck Indian Reservation. The highway runs parallel and is approximately 6 miles from one of the proposed routes.

Burlington Northern Santa Fe Railroad**.** This railroad is located between the cities of Glasgow and Vandalia, Montana.

Glasgow International Airport. The airport is approximately one mile north of down town Glasgow, MT.

Although no background noise measurements have been made at the site, measurements from other locations suggest that the background noise level could be within 38 to 48 dBA. Natural noise sources include the wind, which are much more common than calm conditions, and are expected to be in the range of 45 to 55 dBA.

Sensitive Receptors

Noise-sensitive receptors are facilities or areas (e.g. residential areas, hospitals. schools, offices) where excessive noise may cause annoyance or loss of business (also refer to the land use section). These sensitive receptors are further discussed in the Housing and Urban Development (HUD) Noise Guidebook. There are no sensitive receptors close to the site for several miles.

3.14.1.3 Wind Farm

Presently, the Wind Farm property is vacant land and is surrounded by open space. To the east is the Buggy Creek section and Montana State Highway 24, which provides access to the site via Kerr Road. To the west is the Bitter Creek Wilderness Study Area. Typical ranges of common sounds are presented in Table 3.14-3.

Table 3.14-3. Typical Ranges of Common Sounds

Sources of Noise	Noise Level Ranges (dBA)
Threshold of Pain	130 - 140
Pneumatic Chipper	120 - 130
Chain Saw	100 - 120
Loud Automobile Horn (At 3 Feet)	110 - 120
Diesel Locomotive (At 50 Feet)	85 - 105
Motorcycle	80 - 110
Subway	80 - 110
Power lawnmower	80 - 95
Inside Motor Bus	80 - 90
Pleasure Motorboat	75 - 115
Passenger Train	70 - 90
Average Traffic on Street Corner	70 - 80
Home Shop Tools	65 - 110
Food Blender	65 - 85
Automobile (At 50 Feet)	60 - 90
Passenger in Automobile	60 - 90
Vacuum Cleaner	60 - 85
Air Conditioner (Window Units)	60 - 75
Conservational Speech	60 - 70
Clothes Dryer	50 -70
Typical Business Office	50 - 60
Washing Machine	45 - 80
Refrigerator	45 - 70
Living Room (Suburban Area)	40 - 50
Library	30 - 40
Bedroom at Night	20 - 30
Broadcasting Studio	10 - 20
Threshold of Hearing	0 - 10

Source: Noise Control for Engineers and EPA

3.14.1.4 230kV Transmission Line

Presently, the transmission line alternatives and property is vacant land and is surrounded by open space. The northern end of the proposed 230kV transmission line will traverse USDI Bureau of Land Management land and smaller sections will traverse local government land. The southern end of the proposed 230kV transmission line will be located on USDI Bureau of Land Management and private land. East of the area is the Buggy Creek section and Montana State Highway 24, which provides access to the site

via Kerr Road. West of the area is the Bitter Creek Wilderness Study Area. The Glasgow Air Force Base (decommissioned) exists along Alternative route A. This base is used by Boeing to conduct noise tests on the 777 jetliner and will more than likely overpower any noise associated with construction and certainly operations of the transmission line.

3.14.1.5 Antelope Creek Substation

The Antelope Creek Substation is proposed for construction adjacent to an existing substation. The property and vacant land and is surrounded by open space. The noise levels associated with existing substation should be within 3 dB of the current levels. It is expected that the combined increased level would still be below the 75 dB(A) EPA level at the fence.

3.14.1.6 Radio and Television Interference

Radio and television interference (denoted as RI and TVI and collectively referred to as Radio Noise or RN) is a phenomenon produced by both corona and sparking and can vary greatly based on weather conditions. Corona occurs when the electrical field at a particular point reaches a sufficiently high value to cause ionization of the surrounding air.

Corona is primarily a concern during foul weather because it is more likely to occur when water droplets are on or dripping off the transmission line conductors. The effect of corona on RN is most evident in the AM broadcast band of 0.535 to 1.605 MHz. Generally, only broadcast signals in weak signal areas show interference due to coronal activity during foul weather. Cable and satellite systems are not susceptible to corona. Properly designed transmission lines can greatly reduce the effects of corona. In addition, corona is primarily a concern for transmission lines operating at 345kV and higher. VCWEP would operate at 161kV and 50kV.

3.14.2 Environmental Consequences & Mitigation Measures

This section describes the noise associated with the construction and operation of the Wind Farm, a new 230kV, and Antelope Creek substation. (refer to Chapters 2 for specific details).

Short-term construction impacts and long-term operational noise impacts would potentially result from the VCWEP.. In this section, the potential incremental noise impacts associated with the construction and operation of VCWEP are analyzed.

Explanations:

- VCWEP operation would not expose persons to noise levels in excess of standards established by EPA. Temporary construction-related noise would occur, but would be within acceptable levels of OSHA and NIOSH standards and there are no ordinances or zoning requirements in Valley County.

- VCWEP operation would produce some ground borne vibration and noise. Temporary construction-related vibrations and noise would occur, but would not

be excessive compared to other construction work that has occurred on the pipeline compressor station and would be occurring in VCWEP Area.

- The 161kV lines would produce the maximum electric transmission line audible noise levels for VCWEP. This maximum level projected at the edge of the right-of-way is nominally 57 dBA which occurs only in foul weather conditions such as rain. This is neither a substantial nor a permanent increase in noise level.

- The noise from the transmission line would not be higher than the existing noise associated with a stiff breeze.

3.14.2.1 Assessment Methodology

Definition and Use of Significance Criteria

There are two criteria for measuring noise impacts. First, noise levels projected for VCWEP must comply with the relevant federal, state, or local standards or regulations. Noise impacts that can affect worker safety and health is enforced by OSHA, but effectiveness of such mitigation depends on the vigilance of supervisors in seeing that workers use protective gear in high noise environments. Noise impacts on the surrounding communities are enforced through local noise ordinances supported by nuisance complaints and subsequent investigation.

The second measure of noise impacts is the increase in noise levels above the existing ambient level as a result of the introduction of a new source of noise, the VCWEP.. A change in noise level due to a new noise source can create an impact on people and biota. The degree of impact is hard to assess because of the highly subjective character of individuals' and mammal reactions to changes in noise level.

Empirical studies have shown people begin to notice changes in environmental noise levels of around five dBA (U.S. EPA, 1974). Thus, average changes in noise levels less than five dBA can definitively considered as not producing an adverse impact. For changes in noise levels above five dBA, it is difficult to quantify the impact beyond the obvious: the greater the noise level change, the greater the potential impact.

A judgment commonly used in community noise impact analyses associates long-term noise increases of 5 to 10 dBA with "some impact." Noise level increases of more than 10 dBA are generally considered severe. In the case of short-term noise increases, such as those from construction, the 10 dBA threshold between "some" and "severe" impact is often replaced with a criterion of 15 dBA. These noise-averaged thresholds are to be lowered when the noise level fluctuates, the noise has an irritating character with considerable high frequency energy, or if it is accompanied by subsonic vibration. In these cases, the impact must be individually estimated.

Impact Assessment Methods

The calculation of audible noise and radio noise was based on techniques developed by the Bonneville Power Administration (BPA) for modeling corona and field effects. Guidance for these effects was also found in EPRI's "Red Book" (Transmission Line Reference Book, 1982).

The sound levels for the Wind Farm generation facility are based on proprietary GE technical specifications. These sound levels are based on rough estimates of the preliminary equipment and sound levels associated with one 1.5 MW SLE unit. The sound levels for compressor stations are based on previous Edison Electric Institute (EEI) measurements taken at various compressor station buildings, and are an average reading based on the type of equipment (gas turbines) used.

Based on a residence located greater than 2526 feet away, all of the resulting outdoor sound power levels combined at the Wind Farm due to the maximum operation of one facility resulted in a predicted noise level of 45 dBA. This was calculated in the software calculator for wind turbine noise (http://www.windpower.org/en/tour/env/db/dbcalc.htm).

All references in this report are designed around the "A" weighted scale that most closely approximates the way in which the human ear responds to the loudness of pure tones. This "A" weighted sound level correlates reasonably well with hearing damage risk in industry and with subjective annoyance for a wide category of industrial, transportation, and community noise. Noise levels are specified as "A" weighted sound levels in the Occupational Safety and Health Act (OSHA.

Criteria, in the OSHA Act of 1970, was revised in 1998 pertaining to updated construction and OSHA noise standards. The National Institute for Occupational Safety and Health (NIOSH) was charged with recommending occupational safety and health standards and describing exposure concentrations that are safe for various periods of employment. The NIOSH recommended exposure limit (REL) for occupational noise exposure is 85 decibels "A" weighted for an 8 hour time weighted average (TWA). At this level, the risk of developing a noise induced hearing loss (NIHL) is 8%.

Impact assessment methods for mechanical equipment are based on expected levels to be produced by the facility, determined on values in the literature from similar equipment and 'rules of thumb' such as a 6 dBA reduction for point sources and 3 dBA for line sources for each doubling of distance (Lord et al. 1987). A recent study on wind turbines commissioned by the Department of Energy (DOE) and performed by the National Renewable Energy Laboratory noted a variance in this rule of thumb. NREL's account of a doubling of distance downstream revealed a reduction of only 4 dB which is less than the 6 dB decrease expected from the behavior of a pure point source model.

Impact Assessment Results

There is no current plan regarding noise monitoring for the Wind Farm facility and the existing sound environment. The construction noise is expected to be from 54 to 84 dBA, due to construction machinery being taken into consideration. Consequently, existing sound levels may now be higher compared with natural background data. With a higher background sound level from an increased wind speed, the incremental increase in noise

associated with the VCWEP would be negligible a short distance downstream. There would be no incremental noise increases upstream of the wind direction. The Wind Energy Draft Programmatic Environmental Impact Statement (BLM 2004) states that at a wind speed of about 33 ft/sec (22.5 mph) wind generated noise is higher than aerodynamic noise. The report goes on to state that it is difficult to measure sound from modern wind turbines above a wind speed of 26 ft/sec (17.7 mph) because the background wind generated noise masks the wind turbine noise at that speed.

Acoustic estimates from GE are estimated at 104 dBA. The primary environmental noise sources are anticipated to include the items described in Table 3.14-4.

This impact analysis is focused on the loudest noise sources, in the area or nearby including gas compressor. Table 3.14-4 summarizes the predominant noise sources associated with this project. The maximum sound pressure level is estimated to be approximately 104 dBA at a distance of 77 meters from the wind turbine envelope. The wind turbine envelope is the smallest rectangle that encompasses the rotor diameter.

Table 3.14-4. Summary of Significant Power Plant Noise Sources

Source	Typical dBA @ 100 ft
Wind Turbine	104
Transformers	75
Nacelle HVAC/Ventilation (inlet filter house)	61

Source: Edison Electric Institute, 1984

The most significant noise sources are anticipated to be the gas compressor station nearby. At 2,526 feet from a wind turbine in a direction downstream of the wind direction, the sound pressure level is estimated to be approximately 45 dBA. These sound levels are based on calculated estimates according to results from the Danish Wind Industry Association Sound Map Calculator in conjunction www.windpower.org, using (DWIA 2004) To more accurately determine the potential facility noise emissions, detailed facility noise modeling would have to be conducted.

During the construction phase of VCWEP, noise from construction activities would add to the noise environment in the immediate vicinity of the site. Typical sound levels associated with such activities are displayed in Table 3.14-5.

Table 3.14-5. Typical Construction Equipment Noise

Activity	Type of Equipment	Range of Noise Levels at 200 feet
Material Handling	Concrete Mixers	62-75
	Concrete Pumps	69-71
	Cranes	64-76
Stationary Equipment	Pumps	57-59
	Generators	59-70
	Compressors	64-75
Pile Driving	Drop Hammer	69-76
	Vibratory Hammer	54-83
	Auger Boring	65-71
Land Clearing	Bulldozer	65-84
	Dump Trucks	70-82
	Grading Scraper	68-81

Source: Edison Electric Institute, 1984

Construction activities would be intermittent over the construction period and are expected to occur during normal daytime working hours and would be exempt from any regulation. Based on the typical attenuation of sound over distance (6 dBA per doubling of distance from the noise source), this reduction would render noise levels insignificant.

For this analysis, impacts from noise would be considered significant if any of the following occurred:

- Adopted local standards, noise element, or ordinance would be exceeded in noise level, timing, or duration;
- Ambient noise levels would be above 55 dBA limits per EPA promulgated noise guidelines;
- An increase in noise levels of 15 dB or more over a period of at least one-half day at a sensitive receptor with any ambient noise level;
- Permanent increases of 10 dB; or

- Noise increments to the ambient of 5 dB during quieter hours at night (between 10 p.m. and 7 a.m.). There is no precise threshold as the character of the noise is also important.

Noise generated by onsite noise sources was estimated from similar plants. The assumption considers the noise reductions or enhancements caused by distance, topography, ground surfaces, and atmospheric stability and absorption. Because sound energy spreads as it radiates away from a source, its apparent loudness also decreases. For an individual pure point-source noise, the sound level decreases at a rate of 6 dBA per doubling of distance away from the source (Beranek, 1992). At a certain distance, the Wind Farm would act as a point source of noise. In the absence of hills or berms, distance is the primary mechanism for decreasing noise from the site.

The atmosphere absorbs some of the energy propagated in a sound wave. The amount of absorption depends on the frequency of the sound and the temperature and relative humidity of the atmosphere. Because of the more effective absorption at higher frequencies, atmospheric absorption would also tend to lower the pitch of noise generated at the site.

The surfaces over which sound waves travel, affect the amount of sound at a distant receptor in a complex manner. Hard surfaces such as asphalt can reflect energy and increase the sound level at distant receptors. A soft surface would be expected to absorb sound energy. In addition, the surface can produce a reflected wave that interferes with the direct sound wave and actually reduces the sound level expected due to distance. These interactions are commonly referred to as “ground effects.” In addition to surface qualities, the magnitude of the ground effect depends on the height of the source and receiver and the frequency of the sound. In VCWEP area, most of the ground is “soft” and therefore tends to absorb rather than reflect sound.

If a wall or hillside obstructs the line-of-sight between a noise source and receiver, the sound waves must bend (or refract) around the obstruction in order to reach the receiver. Because VCWEP area is relatively flat, there is little natural topography that would serve as a noise barrier.

Sound propagation through the atmosphere is also affected by wind and by temperature change with height. With a temperature inversion, temperatures at the ground surface are lower than the temperatures aloft and the atmosphere is said to be stable. This causes sound waves to bend back toward the ground, which reduces distance attenuation. Sound traveling downwind also bends downward.

Whether the turbine noise is intrusive or not depends not only on its distribution of amplitude and frequency but also on the background noise, which varies with the level of human and animal activities and meteorological conditions (primarily wind speed). In general wind generated background noise tends to increase more rapidly with wind speed than aerodynamic noise from wind turbines. This equates to wind generated noise increasing at about 2.5 dB(A) per each 3 ft second of wind speed. The noise level of a wind turbine, however, would only increase by about 1 dB(A) per each 3 ft second of

wind speed. In general this means that if the background noise increases above 6 dB(A) the wind turbine would no longer contribute to a perceptible increase of noise. In addition, it is difficult to measure sound from modern wind turbines above the wind speed of 26 feet/ second according to the Wind Energy Draft Programmatic Environmental Impact Statement (BLM, 2004). This difficulty stems from the wind-generated noise masking the wind turbine noise at those speeds.

3.14.2.2 Impacts and Selective Mitigation

The following mitigation measures are recommended as ways to reduce potential short term affects due to noise impacts:

- Assess the background levels at the site for a benchmark associated with VCWEP area.
- Noisy construction activities should be limited to daytime hours only.
- Multiple noise activities should be scheduled at the same time as multiple sources do not generally add significantly to the overall amount of noise.
- All equipment used should be adequately muffled and contained.
- All stationary construction equipment should be as far as practicable from a sensitive receptor. Should blasting be necessary ensure prior warning is provided.

3.14.2.2 Wind Turbine Noise

The proposed wind turbines could potentially operate 24 hours per day during windy periods, and not at all when winds are calmer. Although the exact turbine model to be used for the VCWEP. scenario has not been determined, representative values for the type of equipment being considered for VCWEP have been used for this analysis. The selected turbines are expected to be warranted by the manufacturer not to exceed a maximum sound pressure level of 103 dBA with a wind speed of 18 mph at 33 feet from the base of the tower in accordance with the protocol established in International Electrotechnical Commission (IEC) 61400. This is approximately equivalent to a sound pressure level of 72 dBA at 50 feet from the turbine. However, a sound pressure level between 98 and 108 dBA is representative of the range of noise test data for all turbines under consideration for the VCWEP..

3.14.2.3 230kV Transmission Line

The noise associated for any alternative studied would be similar in the existing sound environment. The construction noise is expected to be from 54 to 84 dBA, due to construction vehicles and machinery being taken into consideration. Consequently, existing sound levels may be higher when compared with natural background data. No noise impacts are anticipated with the construction or operation of a transmission line**.** The transmission line is located in a very rural area with only a few dispersed residential dwellings in the area. Temporary construction-related vibrations and noise would occur, but would not be excessive in VCWEP Area. The Wind Energy Draft Programmatic

Environmental Impact Statement (EIS) (September 2004) points out that studies performed by the Bonneville Power Authority (BPA) found noise levels due to transmission lines at the edge of the ROW to be 39 dB(A). This study further concludes that the lower transmission line voltages associated with a wind energy development project would be lower than 230kV transmission line and associated substation and its potential noise impacts would be lower than the BPA estimated levels. Because of the remote location of the site, a highly detailed noise analysis was not warranted.

3.14.2.5 Antelope Creek Substation

The noise associated with the substation would be a combination of the existing substation and an increase of approximately 3 dB is expected to the existing sound environment. The construction noise is expected to be from 54 to 84 dBA, due to construction vehicles and machinery being taken into consideration. Consequently, existing sound levels may be higher when compared with natural background data.

3.14.2.6 No Action Alternative

There are no requirements for noise monitoring associated with the Wind Farm facility, transmission line or substation and the existing sound environment. Consequently, existing sound levels would be the natural background benchmark as the facility would not be built.

3.15. AIR QUALITY

3.15.1 Affected Environment

Air quality changes over time as economic development occurs and regulatory programs affect the emissions from sources. The affected environment can be characterized in terms of concentrations of the criteria pollutants carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter (PM), nitrogen dioxide ($N0_2$), ozone (0_3), and lead (Pb). The Environmental Protection Agency, (EPA) has established national ambient air quality standards (NAAQS) for these pollutants. Montana has established additional standards called Montana ambient air quality standards (MAAQS) in addition to the EPA's standards.

Areas where air quality exceeds these NAAQS are called non-attainment areas and states must develop plans for attaining and maintaining the NAAQS. There are emission reduction measures for stationary sources however a wind energy plant is not considered a combustion source. Mobile sources are regulated by the federal government and do not apply to this project. Class I areas are national parks and wilderness areas, but, again there is no generated pollution other than temporary construction dust expected, so this increment for Class I areas will not apply.

3.15.1.1 Study Methods

A number of sources were explored in order to inventory available air and climatic data for the Pipeline Project. The primary sources of information were the National Climatic

Data Center (NCDC), and Montana Department of Environmental Quality, (DEQ) contact via personal communication. Applicable sections of Title 17 of the Administrative Rules of Montana Chapter 8 Air Quality, Sub-Chapter 3 were consulted for Particulate Matter and Standard and Reasonable Precautions as well as opacity standards that may be required. The Valley county area, specifically Air Quality Control Region 143, is an attainment area for all priority pollutants.

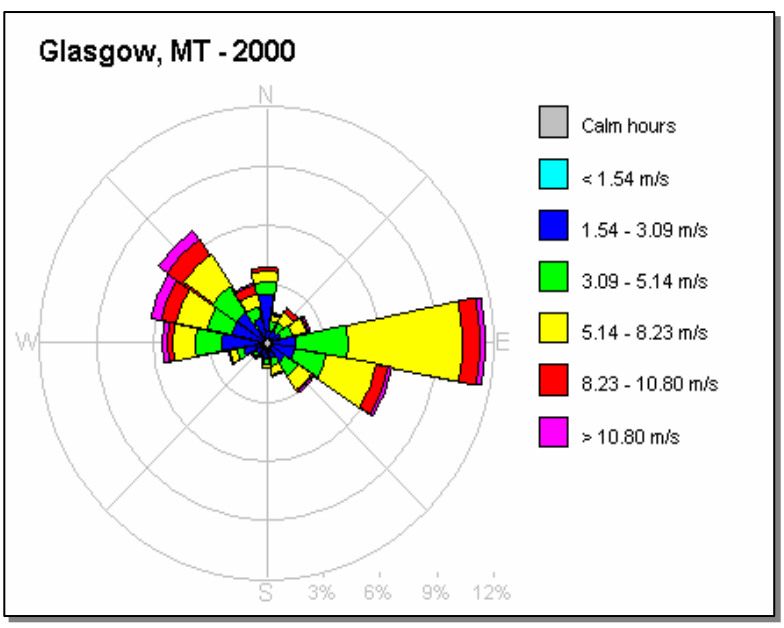
All of the Wind Project area and substation area sits on private land, and the short duration of this project will not require an air permit, as it does not qualify as a permanent source, and is in a rural area of Valley County. The transmission line will be crossing some Bureau of Land Management (BLM) land. There is no measured ambient air quality data for the area in Valley County. However, due to the location and nature of the affected Wind Project areas, it is expected that ambient concentrations will remain well below all Montana Ambient Air Quality Standards and National Ambient Air Quality Standards (MAAQS and NAAQS, respectively).

3.15.1.2 Study Area Overview

Climate

Climate is determined by the averages and variations of weather over a period of time. Montana's location near the center of North America results in a typical continental climate. The exception to that fact is that Pacific weather systems occasionally move over the mountains from westerly directions and provide varying amounts of moisture. Wind is the movement of air. Continental air masses move due to the earth's rotation and to surface heating from the sun (and nighttime cooling). Air movement (or wind) is common to the eastern slope of the Rocky Mountains and the nearby plains.

Figure3.15-1 Glasgow, MT Wind Rose



The proposed Wind Project location is east of the continental divide. Rolling glaciated plains typify the northern Great Plains area. Moisture to this area typically comes from the moist Pacific westerly systems. The eastern plains are characterized by relatively dry hot summers with cold dry winters. Chinooks occur, but are not frequent. Precipitation totals are generally low with thunderstorms producing a significant amount of the precipitation. Refer to the wind rose, Figure 3.15-1, developed from the weather station

in Oregon for the year 2000. The date indicates roughly 32% of the winds are comprised from a westerly direction The wind patterns are usually westerly. Visibility for the region is typically excellent. The main exceptions are the occasional dust storm during the hot summer months where winds entrain dust from lightly vegetated or plowed areas. Another exception is occasional winter fog, where warm air passes over cold, snow-covered ground (Montana Air Monitoring Network Review, 2003).

Air Quality

The EPA Office of Air Quality Planning and Standards (OAQPS) has set National Ambient Air Quality Standards (NAAQS) for six principal pollutants, which are called "criteria" pollutants. They are listed below in Table 3.15-1. Units of measure for the standards are parts per million (ppm) by volume, milligrams per cubic meter of air (mg/m^3), and micrograms per cubic meter of air ($\mu g/m^3$)

Table 3.15-1 National & State Ambient Air Quality Standards

Pollutant	National Primary Standards	MAAQ Standards	Averaging Times	Secondary Standards
Carbon Monoxide	9 ppm (10 mg/m3)	9 ppm	8-hour[1]	None
	35 ppm (40 mg/m3)	23 ppm	1-hour[1]	None
Lead	1.5 µg/m3	1.5 µg/m3	Quarterly Average	Same as Primary
Nitrogen Dioxide	0.053 ppm (100 µg/m3)	0.05 ppm	Annual (Arithmetic Mean)	Same as Primary
Nitrogen Dioxide	- - -	0.30 ppm	Hourly	- - -
Particulate Matter (PM10)	50 µg/m3	50 µg/m3	Annual[2] (Arithmetic Mean)	Same as Primary
	150 ug/m3	150 ug/m3	24-hour[1]	
Particulate Matter (PM2.5)	15.0 µg/m3	-------	Annual[3] (Arithmetic. Mean)	Same as Primary
	65 ug/m3	-------	24-hour[4]	
Settleable Particulate		10 g/m2	30 day average	
Ozone	0.08 ppm		8-hour[5]	Same as Primary
	0.12 ppm	0.10 ppm	1-hour[6]	Same as Primary
Sulfur Oxides	0.03 ppm	0.02 ppm	Annual (Arithmetic. Mean)	-------
	0.14 ppm	0.10 ppm	24-hour[1]	-------
	-------	-------	3-hour[1]	0.5 ppm (1300 ug/m3)
Sulfur Oxides	-------	0.50 ppm	1- hour	-------
Visibility	-------	3x10 –5/m	Annual Average	-------

1Not to be exceeded more than once per year.
[2] To attain this standard, the expected annual arithmetic mean PM10 concentration at each monitor within an area must not exceed 50 ug/m^3.
[3] To attain this standard, the 3-year average of the annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 ug/m^3.
[4] To attain this standard, the 3-year average of the 98th &ile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 ug/m^3.
[5] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
[6] (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is <= 1, as determined by appendix H. (b) The 1-hour NAAQS will no longer apply to an area one year after the effective date of the designation of that area for the 8-hour ozone NAAQS. The effective designation date for most areas is June 15, 2004. (40 CFR 50.9; see Federal Register of April 30, 2004 (69 FR 23996).)
Source: http://www.epa.gov/air/criteria.html
For notes on the MAAQS refer to:
http://www.deq.state.mt.us/AirQuality/Planning/Air_Standards/AIR_STANDARDS.pd

The NAAQS establish maximum pollutant levels that should not be exceeded. The state has adopted standards MAAQS, that are in addition to the NAAQS and are merged together above in Table 3.15-1. An operating wind energy development project would not be a source of criteria pollutants. There are no non attainment areas in the study area.

The EPA and the state also control air toxics or hazardous air pollutants (HAPs), judged to have adverse impacts on human health when present in the ambient air. Given that there is no combustion or formulation of pollutants from an operating wind energy project there would be no requirements or regulations for emissions of air toxics. (BLM, 2004)

3.15.1.3 Wind Farm

There exists no data to ascertain current and future air quality impacts at the construction site. There is no determining characteristics or conditions that would preclude building out in a phased approach from Phase I up to and including Phase IV. The closest monitoring station is in the Rosebud area and this data is not germane to the proposed study site encompassing the wind farm (MDEQ, 2003). The proposed site location is rural. There are no requirements other than to ensure standard and reasonable precautions are met along with proper dust control measures to ensure opacity limits are not exceeded. There are a limited number of dispersed rural residences along the Milk River valley along the route. There are a few sand and gravel quarries as well as agricultural sources in the study area that may contribute to particulate matter. There is a northern border pipeline company compressor station source in the area that may contribute to priority pollutants in the area.

3.15.1.4 230 kV Transmission Line

There exists no data to ascertain current and future air quality impacts along the construction line route. There are no differences or distinctions associated with alternative routes relating to air quality. The closest monitoring station is in the Rosebud area and this data is not germane to the proposed study route encompassing the transmission line MDEQ, 2003). The proposed and alternate route locations are rural. There are no requirements other than to ensure standard and reasonable precautions are met along with proper dust control measures to ensure opacity limits are not exceeded. There are a limited number of dispersed rural residences along the Milk River valley along the route.

3.15.1.6 Antelope Creek Substation

There exists no data to ascertain current and future air quality impacts at the construction site. The closest monitoring station is in the Rosebud area and this data is not germane to the proposed study route encompassing the substation (Montana Air Monitoring Network Review, 2003). The proposed location is rural. There are no requirements other than to ensure standard and reasonable precautions are met along with proper dust control measures to ensure opacity limits are not exceeded. There are a limited number of

dispersed rural residences along the Milk River valley. The proposed site is next to an existing substation about seven miles west of Glasgow.

3.15.2 Environmental Consequences and Mitigation Measures

3.15.2.1 Assessment Methodology

The activities involved in developing and constructing a wind energy development project would vary greatly among activities. Potential impacts would need to be addressed for each site build out and the anticipated extent and duration of the site monitoring, construction, operation, and decommissioning activities. On the basis of the limited first phase and short duration of activities, minimal air quality impacts are expected during monitoring, testing and operation. The assessment of sequential Phases of build out, up to Phase IV, will not present any problems to air quality as the time span between construction of the phases will be significant and not overlap. In addition, previous Phases of the wind farm would be in operation and present much less of an adverse air quality impacts to the environment because disturbances would be curtailed. The only activity would be a maintenance activity, which are less frequent and would not require new roads or facility development. Construction and decommissioning activities would have the greatest air quality impact due to a fugitive dust possibility.

3.15.2.2 Wind Farm

Vehicular traffic and erection would create dust from paved and unpaved roads and equipment lay down areas. Construction equipment would create fugitive dust from some earth moving equipment, cranes, and vehicle exhaust. A concrete batch plant would create particulates and any emergency generators would add to priority pollutants. There are no mobile source regulations that would apply to this project.

The operations of vehicles and construction vehicles would create fugitive dust from road travel and clearing as well as tail pipe emissions from exhausts, which would be a temporary impact. However, these activities are all limited in extent and duration. There should be no appreciable impact on air quality. Similar studies completed for transmission line and substation impacts in states like California and Nevada have shown that there are typically no impacts. (Harry Allen EA, 2002).

The Bitter Creek Wilderness Study Area (WSA) while not classified as a special area is directly to the west of the proposed Phase I wind farm and will not be affected by construction of any phases of the wind farm. The wind is out of the northwest and any fugitive dust that may be produced at the wind farm phased sites would be distributed away from the WSA. The sequential Phases following the initial Phase I construction, and continuing to Phase IV, would be further away from the WSA and present even less of a possibility of impairment to air quality.

There are no anticipated impacts expected from the construction, operation and decommissioning of the wind turbine facility. Emissions from any single construction site can be expected to have a definable beginning and ends, as well as varying substantially over different phases. Based upon AP-42 documentation Total Suspended Particle

concentrations of 1.2 tons/acre/month were developed for estimating emissions from construction activities scattered throughout a geographical area. This emission estimate is based upon construction activity taking place for 30 days a month and is somewhat conservatively high. The workday is expected to be less than 24 hours a day and there is much less traffic in this sparsely populated area, that would contribute much less pollutants than the AP-42 worst-case scenario envisions.

Although the air quality impacts from construction phases are anticipated to be less than significant, implementation of project protocols to eliminate fugitive dust and track out procedures would be considered best management practices.

Watering of areas that are disturbed would be considered a best management and mitigation measure of significance. Site construction, clearing and grade alterations for the wind turbine foundation would provide some fugitive emissions along with tailpipe emissions. Temporary roads and or access roads for the transmission line development along with the substation would be reviewed to ascertain the total acreage of disturbed land would be watered periodically to ensure dust mitigation measures are performed as best management practices. Mitigation measures can be broken down into the following:

- Access roads should be surfaced with aggregate wherever appropriate.
- Water spraying should be an abatement technique employed to minimize fugitive dust.
- Speed limits should be posted to reduce airborne fugitive dust.
- Disturbed areas should be minimized.
- Land should be watered as earth moving activities proceed.
- Disturbed areas should be re-vegetated as soon as possible after disturbance.

3.15.2.3 230 kV Transmission Line

There are no anticipated impacts expected from the construction, operation and decommissioning of the transmission line. Each of the proposed alternative routes would present the same minimal emissions, mainly due to equipment and access roads used for construction of the transmission towers and stringing of the lines. Emissions from any single construction site can be expected to have a definable beginning and ends, as well as varying substantially over different phases. The emissions associated with a linear project are usually expected to be minimal as VCWEP nears completion and then disappear entirely upon restoration. Based upon AP-42 documentation Total Suspended Particle concentrations of 1.2 tons/acre/month were developed for estimating emissions from construction activities scattered throughout a geographical area. This emission estimate is base upon construction activity taking place for 30 days a month and is somewhat conservatively high. The workday is expected to be less than 24 hours a day and there is much less traffic in this sparsely populated area, that would contribute much less pollutants than the AP-42 worst-case scenario envisions.

Temporary roads and or access roads for the transmission line development would be reviewed to ascertain the total acreage of disturbed land. The roads would be watered periodically to ensure dust mitigation measures are performed as best management practices.

3.15.2.4 Antelope Creek Substation

There are no anticipated impacts expected from the construction, operation and decommissioning of the substation facility. Emissions from any single construction site can be expected to have a definable beginning and ends, as well as varying substantially over different phases. This substation is adjacent to an existing substation so minimal impacts to air quality are expected. There would be no development of new roads and accesses, whereby, reducing the amount of fugitive dust and vehicular requirements for construction and clearing. Based upon AP-42 documentation Total Suspended Particle concentrations of 1.2 tons/acre/month were developed for estimating emissions from construction activities scattered throughout a geographical area. This emission estimate is base upon construction activity taking place for 30 days a month and is somewhat conservatively high. The workday is expected to be less than 24 hours a day and there is much less traffic in this sparsely populated area, that would contribute much less pollutants than the AP-42 worst-case scenario envisions.

3.15.2.5 No Action Alternative

There are no impacts to local air quality, because VCWEP would not be built.

3.16. CUMULATIVE IMPACTS

NEPA requires evaluation of a proposed action's potential to contribute to "cumulative" environmental impacts. A cumulative impact is defined as:

The impact on the environment which results from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Cumulative impacts can result from similar projects or actions, as well as from projects or actions that have similar impacts (40 CFR 1508.7).

The geographical area considered for the analysis of cumulative effects generally included the Valley County Wind Energy Project (VCWEP) area and selected portions outside of the VCWEP area. These selected areas varied in size and shape to reflect each evaluated environmental resource.

Existing conditions in the VCWEP area reflect changes based on past projects and activities. Much of the VCWEP area is rural and relatively undeveloped. However, changes to portions of the VCWEP area have resulted from activities related to agriculture, mining, oil and gas development, military bases, water and natural gas conveyance, transportation infrastructure, electrical power generation and transmission facilities, outdoor recreation, and residential/commercial development.

To address the contributions of wind energy development to cumulative impacts, an understanding and knowledge of existing and reasonably foreseeable future activities are essential. With the exception of oil and gas development, it is assumed that activities on the VCWEP area lands would continue into the future at current levels.

To support the cumulative impact assessment, the magnitude of wind energy development on VCWEP area lands under the Proposed Action was compared with other commercial (utility type) uses.

3.16.1 Land Use

The contribution to cumulative impacts of the VCWEP would likely be small unless a substantial permanent, uncompensated loss of the current productive use of land occurred, or if future uses were precluded. The VCWEP would generally be compatible with other land uses, including livestock grazing, recreation, wildlife habitat conservation, and oil and gas production activities. Much of the VCWEP area, however, has potential for gas production. Future exploration would most likely occur, as in the past, along the margins of existing fields as step-out wells. These exploratory wells would better delineate the boundaries of existing fields and would probably result in the discovery of new fields in the future. Given a sudden increase in the demand for natural gas, or a sharp increase in price, a large exploration or development effort could develop very rapidly. Surface disturbance associated with oil and gas activities, such as roads, well pads, and battery sites would remove those areas of agricultural production during the life of the road, well pad, or tank battery site. Removal of vegetation would reduce the acreage available for livestock grazing or crop production. The infrastructure associated with oil and gas production could also affect the movement or area available for livestock.

The small number of workers involved with the VCWEP at any given time (refer to Table 3.16-1) would not likely add to cumulative impacts to land use or land disturbance that are occurring or have occurred from ongoing and past activities.

Recreational uses would not be substantially affected, although off-road vehicle use could increase along some of the transmission line access roads.

Table 3.16-1: Estimates of Labor Personnel Associated With Project Construction

Personnel	Phase I	Phase II	Phase III	Phase IV
	2005-2006	2009-2010	2012-2013	2016-2017
Minimum	112	140	248	267
Maximum	131	147	253	272
EIS Assumption	115	140	248	267
Post-Phase O&M	5	8	12	16

Source: Zelus & Associates

3.16.2 Transportation

Localized impacts to traffic volume could occur on roadways during construction and decommissioning, especially during peak periods; however, these impacts would be

temporary. Multiple construction related projects (i.e., oil and gas exploration and production) on the same or overlapping schedules could collectively contribute to congestion on local roads and highways. The vehicles of workers and vehicles used to transport construction equipment, turbine components, and fill material to the VCWEP area would add to traffic volumes if common roads are used. Once the VCWEP was constructed, traffic volumes on nearby roads could increase by tourists wanting to drive by the turbines or visit the operation and maintenance facility.

Construction of the VCWEP would also result in the presence of additional structures for aircraft to avoid in the area.

3.16.3 Visual Resources

Visual resources could be impacted by the VCWEP. The heights, type, and color of turbines, together with their placement with respect to local topography (e.g., on a ridge) are factors that contribute to visual intrusion on the landscape. The 230kV transmission line can also contribute to cumulative impacts. Normally the first objects constructed in a natural setting cause the most noticeable change because of their contrast of form, line, color, and texture to the surroundings. However, each successive change becomes less noticeable than the first. The sum of all visual changes (e.g., form, line, color, and texture) are more evident to the casual observer. The wind farm would cumulatively contribute to the landscape change from mostly natural and agricultural, to a more industrial visual quality.

The potential for cumulative effects on the visual landscape is dependent on future above ground structures or facilities. Oil and gas exploration and production operations are anticipated to increase in the VCWEP area and vicinity. As such, visual resource impacts would be expected in varying degrees by these actions. Exploration would likely create minor visual impacts from clearing operations for access to exploratory sites. However, the majority of visual impacts would be expected to result from access road construction, site construction, drill rig operations, and on-site generator use. These would produce changes in landscape line, form, color, and texture.

As with the wind farm, it is normally the first transmission line in a natural area that causes the greatest incremental change. However, the cumulative visual impacts within the corridor increases with each new line. Therefore, a multi-line corridor would be more visible at greater distances because of the cumulative physical contrast with the natural landscape than a single transmission line.

Cumulative visual impacts from the transmission system construction and operation would be considered moderate because the transmission system would be sited away from most high sensitivity viewpoints. However, the width and cumulative effects of the corridors where they presently exist could increase over time as other linear facilities any be located along those corridors.

Cumulative visual impacts associated with the transmission system are expected to be minor in those areas where transmission currently exists, though may increase where the proposed Project use existing roadway corridors along U.S. Highway 2, State Highway

24, and Jensen Trail. Also, cumulative visual impacts would occur where the 230kV transmission line would run in close proximity to existing transmission lines. Included here are the entire length of Link 20, and from mile markers 3.0 through 3.2 along Link 22.

The construction of an additional transmission line and a new substation (Antelope Creek) near an existing one (Richardson Coulee) may also cause a cumulative effect.

3.16.4 Socioeconomics and Public Services

The VCWEP could potentially produce cumulative impacts on other commercial uses of lands and adjacent lands, including agriculture, forestry, oil and gas exploration and development, electric power generation and transmission line facilities, and recreation. In general, however, the relatively small amount of land required for the VCWEP and its isolated location means that the cumulative impact on other commercial uses of lands would likely be small. Consequently, potential conflicts with other traditional uses of lands, such as oil and gas exploration and development, as well as agriculture, would likely be minimized. In addition, many of the activities associated with traditional uses of lands have either existed for long periods of time, or the location of any potential new developments would be predictable given the distribution of natural resources. Conflicts with recreation could therefore also be minimized.

Beneficial cumulative impacts associated with the VCWEP would be likely. These benefits would include the creation of new jobs and increased area income, sales and income tax revenues, and ROW grant/easement income to federal, state and local governments.

3.16.5 Environmental Justice

Potential cumulative impacts on environmental justice as a result of the VCWEP could occur if the VCWEP produced environmental and health impacts similar to those that result from other activities on VCWEP lands and adjacent lands in the VCWEP vicinity. If these combined impacts were to result in impacts that would be high and adverse, environmental justice issues would arise if minority and low-income populations were affected disproportionately. Recommended mitigation measures and BMPs, however, should ensure that adverse impacts to populations are minimized. Therefore, cumulative impacts on environmental justice issues should be low.

3.16.6 Biological Resources

Oil and gas exploration and extraction are the only development activities that may be reasonably anticipated in the foreseeable future in the vicinity of the proposed project. Oil and gas activities have the potential to contribute to cumulative impacts upon biological resources in the area. Effects associated with the proposed project include loss and fragmentation of vegetation and wildlife habitats, direct mortality during construction and operation of the wind farm, and disturbance and behavioral disruption during construction, operation, and maintenance activities. Oil and gas development could potentially cause additional habitat loss and fragmentation as well as disturbance and displacement of wildlife in the area. The nature of these cumulative effects would largely

be determined by the amount and location of oil and gas development. Given the relatively low impact levels associated with the proposed project, cumulative effects associated with oil and gas development are not expected to be significant. Proper design and planning for such future development, including avoiding mule deer winter range and greater sage-grouse habitat, would minimize the potential cumulative effects to important habitats and sensitive species.

3.16.7 Water Resources and Wetlands

Cumulative impacts to water resources and wetlands are not expected to be substantial. The VCWEP includes BMPs to mitigate impacts to both surface water and ground water quality. On-site mixing of concrete during construction would require water as would some dust suppression activities, but these activities would be temporary. Operation of the VCWEP would use very small amounts of water and would not result in discharges to surface water. Occasional use of water to wash turbine blades could be needed during periodic maintenance

3.16.8 Geology and Geohazards

Cumulative impacts to geologic resources or seismic characteristics from the VCWEP are not expected to be substantial. The VCWEP includes BMPs to mitigate impacts from blasting, excavation, or earthmoving activities. Impacts that might occur would be minimal and largely limited to the VCWEP site.

The construction of new access roads, any improvements to existing roads and bridges, and installation of turbines and ancillary structures at the VCWEP site would involve cut and fill operations. If large amounts of fill material would be necessary, increased demands could occur to off-site supplies of sand, gravel, and crushed rock. If multiple construction projects were developed within a single area, local supplies of required fill material, particularly gravel or crushed rock, could be reduced to the point of impacting the needs of roadways and other construction projects. This demand could impact resource availability for other local or regional projects.

3.16.9 Soils

The wind farm, transmission line, and substation would add to potential wind and water soil erosion, stream bank degradation, and sedimentation loading, dependent on the mitigation implemented for each project.

Indirect and off-right-of-way impacts could result from increased OHV access into remote areas. OHV travel on and off access roads could result in greater ground disturbance over time depending upon control of public access (e.g., gates, road closures, etc.) by the utilities and the land managing agencies.

Cumulative impacts to soils are not expected to be substantial.

3.16.10 Paleontology

Disturbances from construction of the VCWEP, combined with other surface-disturbing development activities, could uncover or destroy fossils. New road cuts could accelerate erosion in some areas, exposing fossils that are degraded by weathering. Illegal collection

of fossils results in information loss and has the potential to degrade the quality of the resource overall.

However, mitigation measures and BMPs addressing paleontological resources would limit potential impacts at the VCWEP site so that any cumulative impacts would be low.

3.16.11 Cultural Resources

It is assumed that projects in the VCWEP area similar to those implemented in the past that have resulted in disturbance to cultural resources (e.g., chisel plowing, construction of impoundments, utility corridors, road improvements) will continue.

Because cultural resources are non-renewable, all activities that result in the loss of or damage to cultural resources contribute to cumulative impacts. Federal undertakings, undertakings on BLM and other public land, or undertakings funded or permitted by the federal government that adversely affect cultural resources may be mitigated through compliance with Section 106 of the NHPA. Cultural resources on state lands may be protected under the Montana Antiquities Act. As a consequence, many potential future undertakings may cause impacts to cultural resources that can be mitigated through a variety of measures. Other actions that disturb cultural resources may not be regulated under state or federal law.

Cumulative impacts to TCPs are difficult to estimate without additional information from affected Native American organizations.

3.16.12 Health and Safety

Increased risk to human health and safety could occur during VCWEP construction and operations on the basis of the inherent hazards associated with construction activities and maintenance of turbines; however, these risks would be minimized by mitigation measures and BMPs requiring a safety assessment, development of a comprehensive health and safety program and fire management strategy, safety setbacks to nearest residences, mitigation for EMF, and compliance with FAA regulations. In addition, EMF from transmission lines would decrease to background levels at distances of about 200 to 300 ft (60 to 90 m) from the edge of the ROW of a 230-kV line (BPA 1993). Cumulative impacts to human health and safety, therefore, would be low.

The VCWEP could require shipment, storage, use, and disposal of hazardous materials and generation of solid and hazardous wastes; however, mitigation measures and BMPs addressing these activities would effectively mitigate potential impacts. Waste volumes would likely be limited compared with other wastes generated regionally, particularly, if wastes generated during decommissioning of turbines and ancillary structures were recycled for other uses. As a result, cumulative impacts resulting from hazardous material use and waste generation would be low.

3.16.13 Noise

Noise levels generated by construction equipment would be variable and depend on the type, size, and condition of equipment used and the equipment operating schedule. The location of the VCWEP is at a distance far enough away from sensitive receptors that

noise levels would not likely increase above existing background levels at the receptor location. Construction equipment at a wind turbine site could generate noise levels of 80 to 90 dB(A) at a distance of about 50 feet.Because the estimated noise level of the two noisiest pieces of equipment operating simultaneously would not likely exceed the EPA noise guideline level of 55 dB(A) at a distance of about 1,640 feet from the source, cumulative impacts would not be expected to occur to local residents. Local residents near construction roads and turbine sites could experience intermittent noise from construction vehicles during the daytime period. Noise generated by turbines, substations, transmission lines, and maintenance activities during the operational phase would approach typical background levels for rural areas at distances of 2,000 feet or less and, therefore, would not be expected to result in cumulative impacts to local residents.

3.16.14 Air Quality

Construction of the VCWEP would be unlikely to result in air pollutant concentrations that would exceed NAAQS. Multiple construction projects at the same time could contribute to regional pollutant emission loads from construction and worker vehicle exhaust emissions. Localized incidences of fugitive dust emissions along unpaved roads could occur if multiple construction projects occurred simultaneously. Fugitive dust emissions from this volume of truck traffic, together with other sources of particulate emissions, could cause particulate concentrations to increase substantially above normal background levels, causing localized dust problems. However, mitigation measures and BMPs include mitigation measures to reduce airborne dust at the VCWEP site. Dust emissions would not contribute to cumulative impacts to regional air quality because they would be localized and temporary. Air emissions from vehicles involved in operational activities at the VCWEP site would be minimal because of the small number of employees needed on site at any one time. The small number of employees and associated trips during VCWEP operations would not have a noticeable effect on cumulative regional air quality. The use of wind-generated electrical power would avoid cumulative pollutant emissions from fossil-fired facilities that would be necessary to generate equivalent amounts of power.

3.17.IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Resources Committed to the VCWEP Would be material and nonmaterial, including financial, Irreversible Commitment of resources fo the purposes of this section has been interpreted to mean that those resources once committed to the VCWEP would continue to be committed throughout the 20 year life of VCWEP. Irretrievable commitment of resources has been interpret to mean that those resources used, consumed destroyed or degraded during construction, operation, maintenance and abandonment of the VCWEP could not be retrieved or replaced for the life of VCWEP or beyond. Irreversible and irretrievable commitments of resources for the VCWEP are summarized below in tabular form.

Resource	Type of Commitment Reason for Commitment	Irreversible	Irretrievable
Air	Construction Activities	No	Construction Phase
Soils	Soil loss and erosion Construction activities	Yes	Yes
Water	None (See Construction Materials)	–	–
Geological	None	–	–
Paleontological	Disturbance or removal of fossils. Construction Activities	–	–
Biological	Disturbance or removal of vegetation and wildlife species. Construction & operation	Yes	Yes
Land Use	Exclusion of future uses in project areas	Yes	Project life
Parks & Recreation	Increased vehicular access for construction & operations	Yes	Project life
Visual	Degradation of natural scenic quality, viewshed intrusion. Construction & operation.	Yes	Project life
Noise	Noise level exceeding ambient. Construction, and operation..	Project life	Project life
Archaeological	Disturbance or removal of sites. Construction, operation, maintenance & abandonment.	Yes	Yes
Historical	Disturbance or removal of sites. Interference with Construction, operation, maintenance & abandonment. visual setting.	Yes	Yes

Human Health	Potential adverse imports. Operation of electric & magnetic fields		Unknown	Unknown
Socioeconomic	Increased regional and local revenues. Construction & operation.		Yes	Project life
Construction Materials & Fuels	Use of	Aggreate	Yes	Yes
		Water	Yes	Yes
		Steel	Yes	No
		Aluminum	Yes	No
		Concrete	Yes	Yes
		Wood	Yes	No
		Fossil Fuels	Yes	Yes

3.18.UNAVOIDABLE ADVERSE IMPACT

Generic and selective mitigation measures presented in Section 2.5 have been applied to potentially adverse impacts to reduce or avoid the identified impact. However, even with implementation of generic and selective mitigation measures there is the potential for unavoidable adverse impacts resulting from implementation of the proposed action.

3.18.1 Land Use

The presence of meteorological towers, wind turbines and a transmission line can be hazardous to aerial crop spraying operations. In addition, there is a potential for lower effectiveness of aerial spraying and higher costs for materials and aircraft operations (i.e., additional amounts of pesticide application over these structures. Landowners will be consulted to determine which aerial applications cover agricultural lands within the vicinity of the wind farm and approved transmission line route. Written notification would be provided to aerial applications when these structures will be erected. Aerial applications will also be provided to aerial applicators when these structures will be erected. Aerial applications will also be provided with maps clearly showing the location of these structures. While these measures would likely reduce the level of impact, the safety hazard to aerial applicators would remain unavoidable.

3.18.2 Visual Resources

The presence of the wind turbines represents an unavoidable adverse impact for many viewers because it alters the appearance of the rural landscape over a large area. Flashing lights on the tops of turbines would similarly be considered an unavoidable adverse impact. How adverse these impacts become depends on the viewer's location and sensitivity and the impact on view quality.

3.18.3 Biological Resources

Some biological resources would be lost due to the construction, operation and maintenance of the VCWEP.. Construction of the wind farm, transmission line and substation will result in the permanent loss of between 115 and 195 acres of native vegetation and wildlife habitat, depending upon the transmission alternative selected. Small quantities of mule deer winter range and greater sage grouse and sharp-tailed grouse habitat would also be lost. Operation of the wind farm and transmission line would result in avian and bat mortalities, with specific levels largely determined by the number of turbines constructed. Mitigation measures will be implemented to minimize the loss of biological resources.

3.18.4 Paleontological Resources

Unavoidable adverse impacts to paleontological resources may occur as a result of VCWEP. Even though mitigation measures will be applied, it is still possible that fossils could be accidentally destroyed or damaged during the various activities that will occur during construction and operation. New roads would likely result in increased use of public and state lands in VCWEP area, and it is possible that fossils could be illegally collected or accidentally disturbed as a result. Inadvertent damage to fossils could occur with increased vehicle or foot traffic and would also be unavoidable.

3.18.5 Cultural Resources

Cultural resources can often be avoided by adjusting the locations of wind tower sites, transmission line routes and access roads. Because of the lack of inventory, most of the cultural resources in the study area have not been identified or evaluated for NRHP eligibility. Pending the results of a cultural resources inventory of the selected alternative, it is assumed that no adverse impacts to cultural resources are unavoidable.