FINDING OF NO SIGNIFICANT IMPACT

CONSTRUCT WIND FARM
F. E. Warren Air Force Base, Wyoming

ENVIRONMENTAL ASSESSMENT

DECISION

It is my decision to approve the Proposed Action as described in the Environmental Assessment (EA), which is attached and incorporated by reference. F. E. Warren Air Force Base will construct a wind farm on the base to offset the installation's consumption of electricity.

FINDING OF NO SIGNIFICANT IMPACT

The EA was prepared and evaluated pursuant to the National Environmental Policy Act (Public Law 91-190, 42 U.S.C. 4321 *et seq*) and Air Force Instruction 32-7061 (32 CFR 989, as updated July 6, 1999). I have concluded that the Proposed Action does not constitute a "major federal action significantly affecting the quality of the human environment" when considered individually or cumulatively in the context of the referenced Act, including both direct and indirect impacts. Therefore, an Environmental Impact Statement is not necessary.

Based on the analysis in the EA, the impacts to wildlife and other resources will not be significant.

BARRY D. KISTLER, Colonel, USAF
Chairman, Environmental Leadership Council
Francis E. Warren Air Force Base

30 Jun 04
Date

Report Documentation Page

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Final Environmental Assessment

F. E. Warren Air Force Base Wind Farm Project
Cheyenne, Wyoming

April 14, 2004

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1.0 Introduction

Francis E. Warren Air Force Base (F. E. Warren AFB), is proposing development of a wind farm project. This Environmental Assessment (EA) documents an analysis of the environmental effects of the proposed project and alternatives, as required by the National Environmental Policy Act (NEPA). The U.S. Air Force is the lead agency for the project.

F. E. Warren AFB encompasses approximately 5,866 acres and is located in the southeastern corner of Wyoming, in Laramie County, on the western edge of the city of Cheyenne. It is the oldest continuously active Air Force installation in the United States, and is dedicated to the operation of Intercontinental Ballistic Missiles (ICBMs). The host unit at F. E. Warren AFB is the 90th Space Wing, which operates 20 missile alert facilities and 200 launch facilities for Peacekeeper and Minuteman III nuclear ICBMs. The deployment area for the missiles comprises approximately 12,600 square miles in eastern Wyoming, western Nebraska, and northern Colorado.

The total base population (including dependents) was 5,878 in March 2002, which is a 13.9% increase from March 2000. The base has also experienced a 9.8% increase in personnel from March 2000 to March 2002. The only major mission change anticipated in the foreseeable future is the deactivation of the Peacekeeper Missile System. This deactivation will result in the loss of 610 personnel (559 military and 51 civilians) and is scheduled to be completed by 2007.

2.0 Purpose and Need for the Proposed Action

The purpose of the project is to generate electricity for F. E. Warren AFB and offset the base's consumption of fossil fuels with renewable wind power. Recent national and regional forecasts project increasing consumption of electrical energy to continue into the foreseeable future, requiring development of new generation sources to satisfy the increasing demand.

In addition to the overall demand for electricity, there is growing demand for wind energy in particular. Many of the larger utilities in the U.S. have implemented "green energy choice" programs, which allow utility customers to choose (for an additional charge) to have a portion of their electricity provided by renewable energy sources, such as wind. Much of the demand for renewable energy is being met by wind energy because of its low cost and ample supply in many parts of the U.S. The cost of energy from wind projects fell by 80 percent between the early 1980s and late 1990s, and real levelized costs are now about 4 to 6 cents per kilowatt-hour without any tax credits, which is competitive with many new coal or natural gas facilities.

Because of these and other factors, commercial wind energy plants have been constructed in 26 states (Anderson *et al*. 1999, AWEA 2002a), and total wind power capacity in the United States increased from 10 megawatts (MW) in 1981 to 4,261 MW in 2001, which is enough to supply the electricity needs of approximately 3.2 million homes (AWEA 2002b). Over 2,000 MW of new wind projects have been proposed for 2003 (AWEA 2002c). Demand for wind energy is likely to continue to grow, particularly if, as proposed in the U.S. Senate's version of a national energy bill being considered in early 2004, a national renewable portfolio standard requires all utilities to use renewables for 10 percent of their electric loads by the year 2020. The U.S.

Department of Energy seeks to grow wind generated power to 80,000 MW over the next 20 years. This initiative, called Wind Powering America, provides plans for wind energy to supply 5% of the nation's electricity by 2020. Demand for wind energy is also expected to grow as states (independent of the federal government) enact their own renewable portfolio standards. Expanding the domestic use of wind energy will result in substantial economic, environmental, and energy security benefits.

3.0 Decision to be Made

The decision to be made is to select among the alternatives analyzed in this document for a wind farm at F. E. Warren AFB, including the No Action alternative, where no wind farm would be constructed. The selected alternative must meet the purpose and need for the project described in Section 2.0. The alternatives are described in Section 5.0 and include:

- Alternative 1 – Proposed Action – construction of a 2-turbine 1.9 megawatt (MW) wind farm and associated facilities
- Alternative 2 – construction of a 5-turbine 4.75 MW wind farm and associated facilities
- Alternative 3 - No Action

The decision will take into consideration the analysis of environmental effects described in Section 7.0 for each alternative. The decision will also take into consideration comments, suggestions, and recommendations brought forward during the public and agency scoping process, as well as any requirements by other federal agencies that have jurisdiction over construction of a wind farm, such as the Federal Aviation Administration (FAA) and U.S. Fish and Wildlife Service (USFWS).

4.0 Scope of the Environmental Assessment

This EA is required by the Air Force Environmental Impact Analysis Process (32 CFR 989), NEPA (Public Law 91-190), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), and Air Force Instruction 32-7061, the Environmental Impact Analysis Process (1995). This EA identifies, describes, and evaluates the potential direct, indirect, and cumulative environmental impacts that could result from the construction of the proposed action or alternatives. This EA also identifies management practices to prevent or minimize environmental impacts.

5.0 Description of the Proposed Action and Alternatives

Alternative 1 – Proposed Action

Overview

F. E. Warren AFB proposes to construct and operate a small wind farm on the western side of the base in the south ½ of the southwest ¼ of Section 15, Township 14 North, Range 67 West (Figure 1). The Project would generate up to 1.9 megawatts (MW) of electricity for distribution to the base. The Project would consist of two wind turbines plus ancillary facilities including

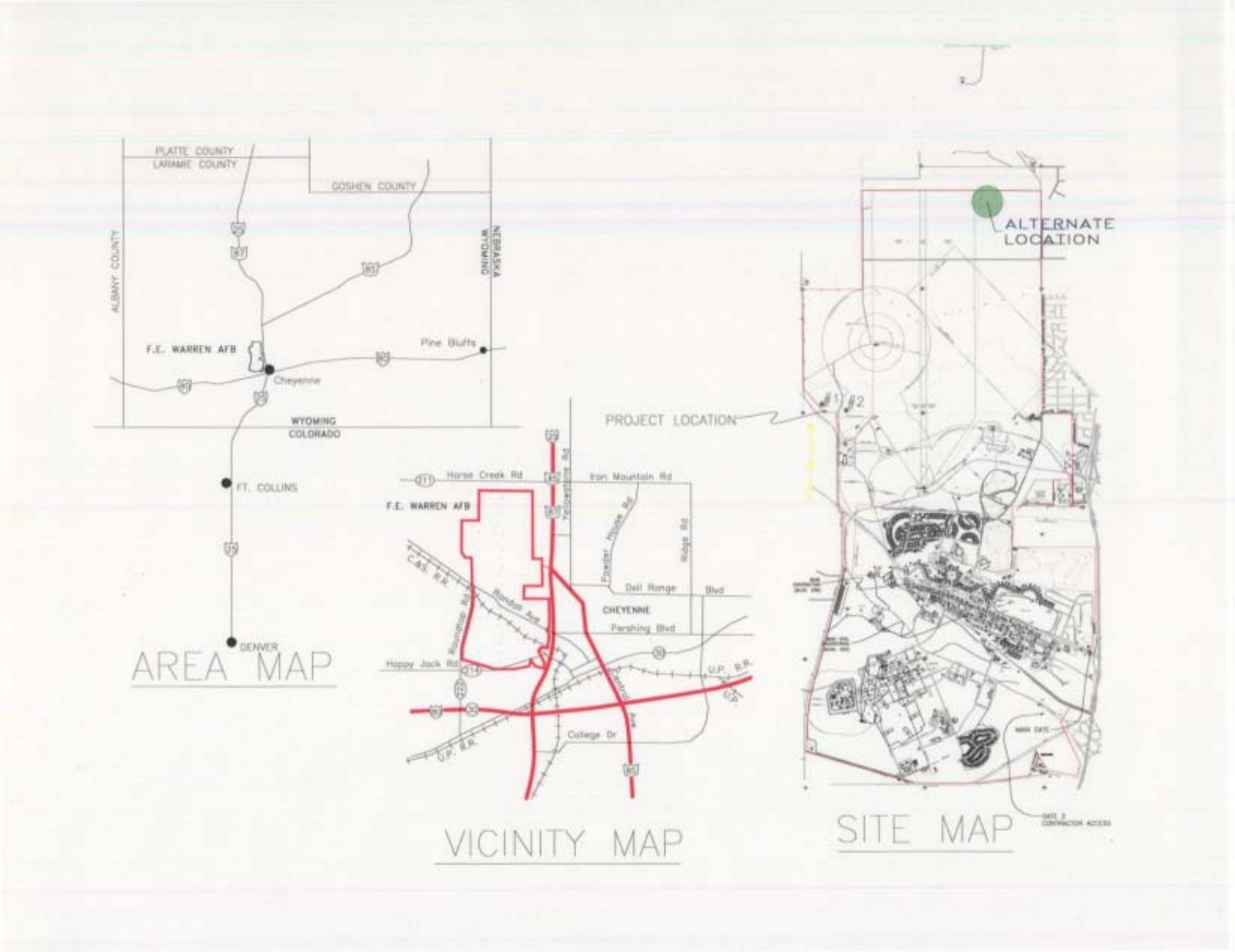

Figure 1. Vicinity map of Proposed Action and Alternate Action wind farms on F. E. Warren AFB

connecting roads and an underground electrical cable (Figure 2). Wind turbines are typically spaced 1.5 to 3 rotor diameters apart within a string. Given these constraints, only two turbines can be operated on the ridgeline at this location.

The Project would be connected to the service transformer on the north side of Building 1502. The 1.9 MW wind farm is capable of supplying the required electricity for approximately 600 average homes. It would produce approximately 5.66 million Kilowatt-hours (Kwh) of electricity per year, or approximately 13% of the base's annual use of 45 million Kwh. Construction of the project would require approval from the FAA and the State Historic Preservation Office (SHPO). It would also require that the contractor obtain a National Pollution Discharge Elimination (NPDES) permit from the Wyoming Department of Environmental Quality (WDEQ).

Facilities

The Project would consist of two 950 kilowatt (kw) or similar-sized wind turbines. The two turbines would be connected by an underground collector system. The wind turbines would be spaced approximately 1,000 feet apart along the crest of a low ridge. The electrical output of the

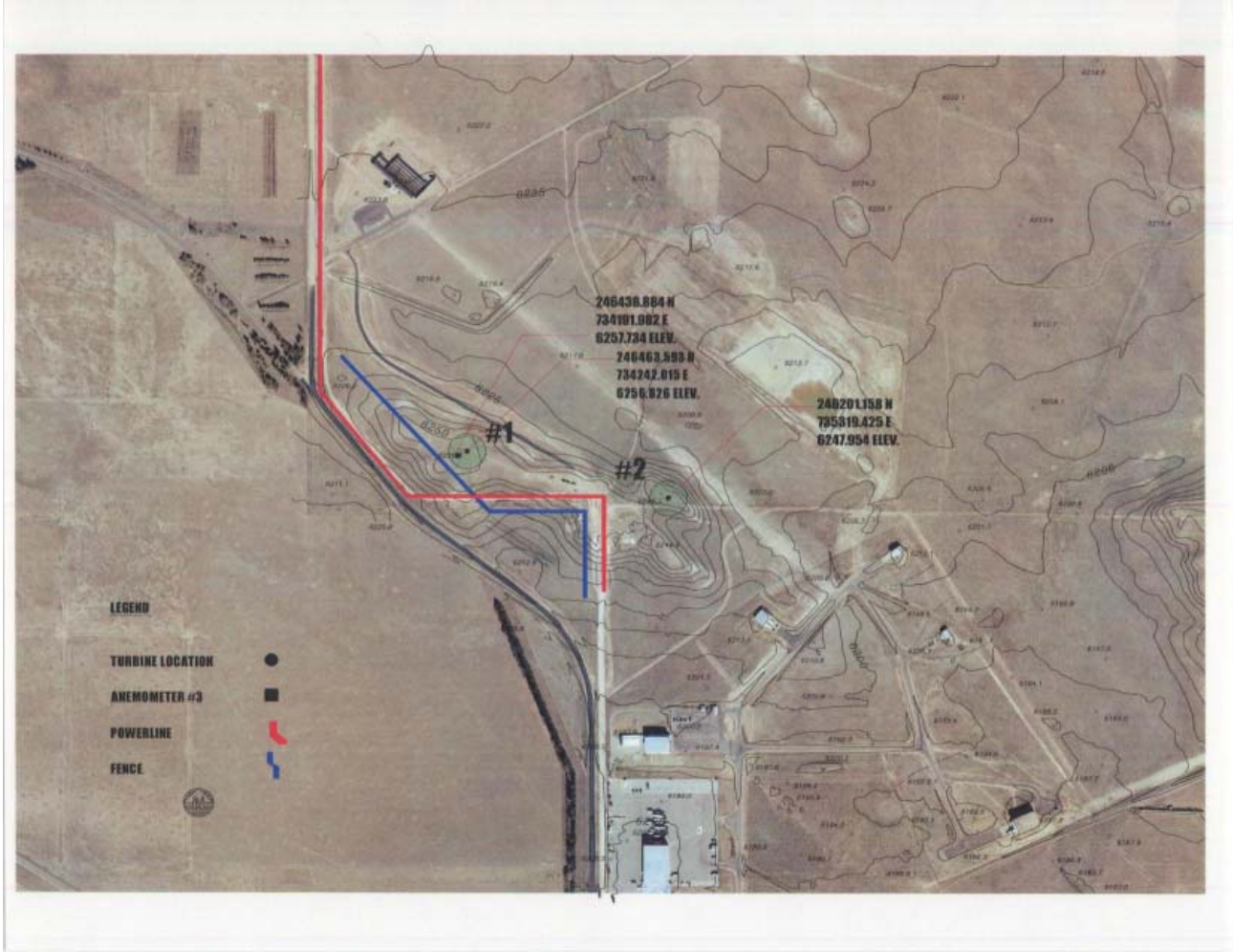

Figure 2. Location of the two wind turbines at the Proposed Action Site

wind turbines would be connected to the base electrical grid at the service transformer on the north side of Building 1502. The connection will be through an underground cable, and the trench line will run from the site southward adjacent to the asphalt roadway serving the firing range, then will run west approximately 310 feet to the loop-feed transformer. A 164-foot-tall meteorological (met) tower supported by guy wires will be constructed adjacent to the turbine string to monitor wind conditions at the site. The Project would not require an operations and maintenance (O&M) building. A new gravel road approximately 1,000 feet long will be constructed to provide access to the wind turbine locations during construction and for O&M.

Wind Turbines

The proposed wind turbines for the Project are NEG Micon NM54 950 kw turbines, although other similar-sized turbines or manufacturers may also be used. Wind turbines consist of two main aboveground components: the nacelle and the turbine tower. The nacelle is the portion of the wind turbine mounted at the top of the tower, which houses the wind turbine itself, the rotor and blades, hub, and gearbox. The turbine tower supports and provides access to the nacelle. The wind turbines operate at wind speeds from 8 to 56 miles per hour (mph), with a rotor speed of 15 - 22 revolutions per minute (rpm). The turbines operate on a variable pitch principal in which the rotor blades rotate to keep them at the optimum angle to maximize output for all wind speeds. At speeds exceeding 56 mph, the blades feather (rotate slightly on their axis) and the rotor stops turning; however, the wind turbines are not damaged by wind speeds of up to 130 mph. The turbines are equipped with a wind vane that signals wind direction changes to the electronic controller. Within the electronic controller, there is a yaw mechanism, which uses electrical motors to turn the nacelle and rotor so that the turbine faces into the wind. The turbines typically produce electricity at 34% of their rated capacity of 950 kw. Each blade is approximately 90 feet long, and the diameter of the circle covered by the rotors is approximately 179 feet. The maximum speed at the tip of the blades ranges from 96 to 140 mph at 15 – 22 rpm. The three turbine blades are made of laminated fiberglass.

Turbines would be approximately 164 feet tall at the turbine hub, and with the nacelle and blades mounted, the total height of the wind turbine (to the turbine blade tip) would be approximately 254 feet. The rotor-swept height will be from 74 to 254 feet above ground level, and the rotor-swept area is 25,434 square feet. The towers would be smooth, hollow steel structures. The towers would be painted a flat neutral white or gray color. A controller cabinet would be located at the base inside each tower. Cables and a ladder would ascend to the nacelle inside the tower to provide access for turbine maintenance. A locked door would provide access to the base of the tower. The towers would be furnished with blinking lights visible to aircraft. Each tower would be mounted on a concrete pad, within a cleared, compacted area of approximately 4,000 square feet.

Electrical System

The Project's electrical system would consist of a collector system that would collect energy generated from each wind turbine and deliver it to the transformer at Building 1502. A small transformer adjacent to each tower would transform the power generated by each turbine. Transformers would be located on a transformer pad approximately 8.5 feet by 8.5 feet square and 12 inches thick constructed approximately 5 feet away from the tower pad. From there, power would be transmitted via underground electric cables, buried directly in the soil approximately 3 to 4 feet below the ground surface, in a trench up to 5 feet wide. There would be approximately 1,700 feet (0.32 miles) of underground collector cable trenches.

Access Roads

Access to the Project area is currently provided by an extension of Randall Avenue just inside the base perimeter fence on the west side of the installation. This road bisects the proposed location for the two turbines. Constructing and operating the Project would require a new gravel road approximately 1,000 feet long to provide access for construction and O&M vehicles. Generally, this new road would be up to 20 feet wide.

Construction

Currently, construction is expected to begin in August 2004. Construction activities would be based at a construction staging area near the site. Construction of the Project would involve the following tasks (1) constructing roads and turbine pads, (2) constructing foundations for towers, (3) trenching for underground utilities, (4) placing underground electrical and communications cables in trenches, (5) connecting to the transformer, (6) transporting tower sections to the site and assembling the towers with a crane, (7) installing nacelle, rotor, and other turbine equipment, (8) final testing and (9) final road grading, erosion control, and site cleanup.

Operations and Maintenance

The base would subcontract operations and maintenance for the Project. Every turbine in the Project would be monitored by a computerized control system. Routine maintenance of the turbines would be necessary to maximize performance and detect potential difficulties. Any problems would be promptly reported to onsite O&M personnel for correction. O&M personnel would perform both routine maintenance and most major repairs. Most servicing would be performed "uptower" (that is, without using a crane to remove the turbine from the tower). Routine maintenance would include replacing lubricating fluids periodically, checking parts for wear, and recording data from data-recording chips in the met tower. All roads, pads, and trenched areas would be inspected regularly and maintained to minimize erosion.

Decommissioning

For financial evaluation and contractual purposes, the Project is expected to have a useful life of at least 30 years. The trend in the wind energy industry has been to "repower" older wind energy projects by upgrading equipment with more efficient turbines. It is likely that the Project would be upgraded with more efficient equipment and, therefore, have a useful life far longer than 30 years. However, if the Project were terminated, the Project would be decommissioned and all facilities would be removed to a depth of 3 feet below grade and unsalvageable material would be disposed of at authorized sites. The soil surface would be restored as close as reasonably possible to its original condition. Reclamation procedures would be based on site-specific requirements commonly employed at the time the area is to be reclaimed, and would include regrading, adding topsoil, and replanting of all disturbed areas. Decommissioned roads would be reclaimed.

Alternative 2 – Five Turbines at Alternate Location

Overview

The second alternative (the "Alternate Action") considered consists of constructing a 5-turbine wind farm along a ridgeline in the northeast ¼ of Section 10 and the northwest ¼ of Section 11, Township 14 North, Range 67 West (Figure 3). This project would generate up to 4.75 MW of electricity for distribution to the base. The project would consist of 5 wind turbines plus ancillary facilities including connecting roads and an overhead transmission line. Given the required spacing of turbines for maximum efficiency and topographic characteristics of this site, five turbines is the maximum number that can be accommodated in this area. The Project would be connected to the transformer at Building 4330. This 4.75 MW wind farm would be capable of supplying the electricity needs of approximately 1,500 average homes, and could produce 14.1 million Kwh of electricity per year, or 31% of the base's annual electricity needs. Construction

of this project would require approval from the FAA and the SHPO. It would also require the contractor to obtain a NPDES permit from the WDEQ.

Facilities

The Project would consist of five 950 kilowatt (kw) or similar-sized wind turbines. The five turbines would be connected by an underground collector system and the wind turbines would be spaced approximately 1,000 feet apart along the crest of a ridge. The electrical output of the wind turbines would be connected to the base electrical grid at the service transformer on Building 4330. The connection would be through an overhead, rather then a buried, transmission line that would run directly from the turbine string to Building 4330. A 164-foot-tall guyed met tower would also be constructed adjacent to the turbine string to monitor wind conditions. Approximately 1550 feet (0.29 miles) of new gravel access roads would be required to construct and maintain the turbines (Figure 3). This Project would also not require an O&M building.

Wind Turbines

The proposed turbines would also be NEG Micon NM54/950 turbines as described for the Proposed Action, although other similar-sized turbines or manufacturers may be used.

Electrical System

The Project's electrical system would consist of a collector system as described for the Proposed Action that would collect energy generated from each wind turbine and deliver it to the transformer at Building 4330. Power would be transmitted via a 13.8 kV overhead transmission line. The transmission line would be 40 feet tall. Approximately 9,800 feet (1.86 miles) of new transmission line would be required.

Access Roads

Currently, access to the Project area is provided by the existing perimeter road on the west and north sides of the installation. Each turbine would be accessed by constructing new gravel roads from the existing perimeter road to the turbine. Constructing and operating the Project would require five new gravel roads totaling approximately 1,550 feet (0.29 miles) in length to provide access for construction and O&M vehicles. These new roads would also be up to 20 feet wide.

Construction

The sequence and timing for construction would be similar to that described for the Proposed Action.

Operations and Maintenance

Operations and maintenance would be similar to that described for the Proposed Action.

Decommissioning

Decommissioning would be similar to that described for the Proposed Action.

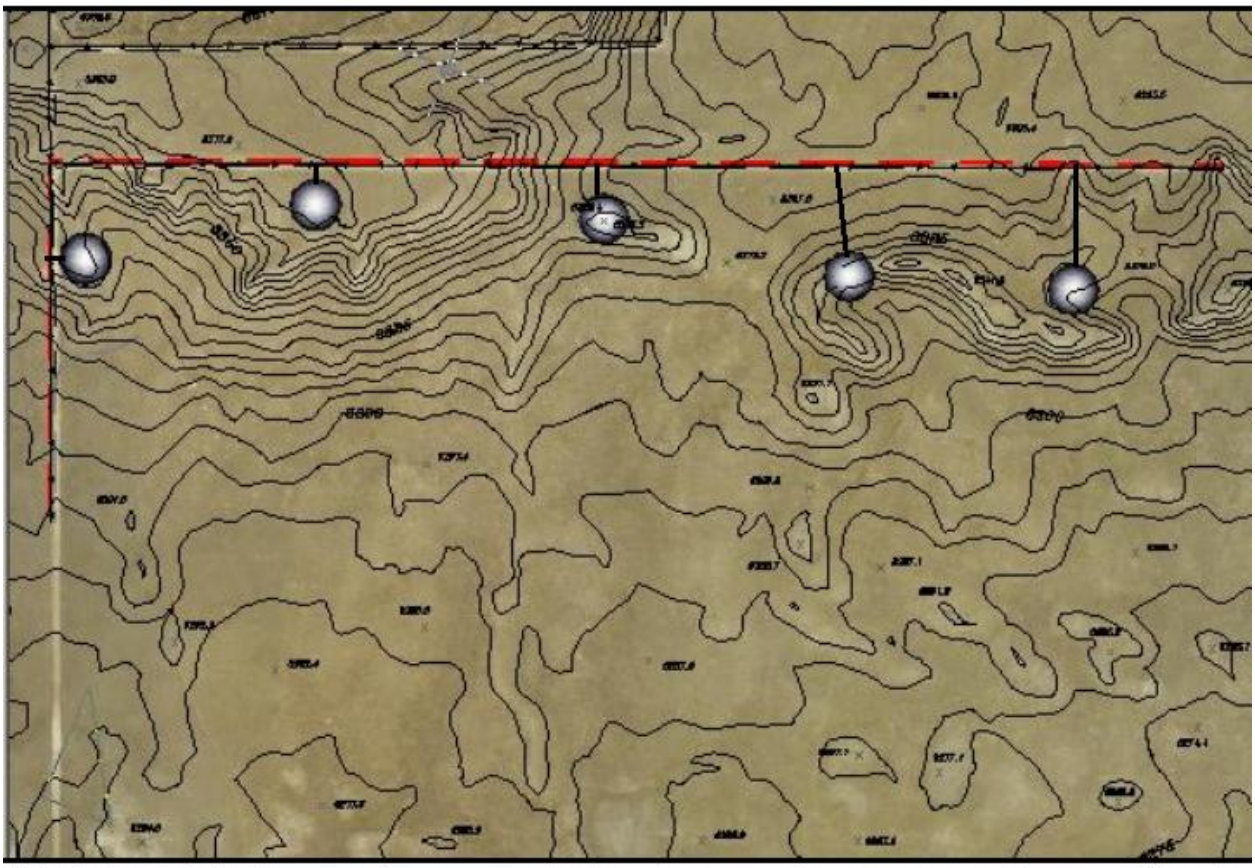

Figure 3. Location of the five turbines and access roads at the Alternate Action Site

Alternative 3 - No Action

The No Action alternative would mean that no wind farm would be constructed at F. E. Warren AFB. The No Action alternative does not meet the purpose and need for the project by generating electricity for F. E. Warren AFB and offsetting the base's consumption of fossil fuels with renewable wind power. If the proposed Project is not constructed, it is likely that the base's need for power would continue to be provided by the existing sources.

Alternatives Considered But Not Analyzed in Detail

Off-base Wind Farm

Another alternative considered was to develop a wind farm off-base to provide renewable energy for the base and eliminate any potential impacts associated with development of a wind farm on the base itself. The City of Cheyenne is considering development of a wind farm west of the City, energy from which might be made available to the base indirectly through existing suppliers or perhaps other suppliers. This alternative was not evaluated in detail because it did not meet the purpose and need of the project. The primary purpose of the project is to generate electricity for F. E. Warren AFB and offset the base's consumption of fossil fuels with renewable wind power. It is unlikely that any off-base facility could be economically connected directly to

the base grid. Therefore, the base would have to continue to purchase electricity from outside sources, and this scenario would not meet the stated purpose of offsetting the base's consumption of fossil fuels with renewable energy. In addition, pursuing an off-base facility would require that the project be re-certified by Congress because the current certification is only for a wind farm on the base.

Construction of a Wind Farm on the South Side of F. E. Warren AFB

Some consideration was also given to constructing a wind farm on the south side of the base. However, this alternative was not pursued for several reasons. There are no major ridgelines on the south side of the base, and the wind resource may not be adequate to support an economical wind farm. In addition, the south half of the base is located within the flight paths of planes departing the Cheyenne Municipal Airport and is much closer to helicopter flight paths used to escort missiles. The presence of Crow Creek in this area would also increase the likelihood of impacts to wildlife and other natural resources.

Constructing Smaller Wind Farms at Either Alternative Site

Wind farms using fewer turbines could be constructed at both sites (i.e., 1 turbine at the Proposed Action site and 1, 2, 3 or 4 turbines at the Alternate Action site). Alternatives involving fewer turbines were not analyzed in the EA because it was assumed that full build-out of both sites would constitute the maximum impact possible at each site. By including the maximum impacts in the EA analysis, if a future decision were made to build fewer turbines, additional environmental analysis would not be required.

6.0 Affected Environment

The base encompasses 5,866 acres and is oriented in a general north-south direction. The base is bounded on the east by Interstate 25, which separates the base from high-density residential areas of Cheyenne. The base is bounded on the west by Roundtop Road, low-density residential development and the U.S. Department of Agriculture High Plains Grassland Research Station. The base is bounded on the north by generally open rangeland, and on the south by State Highway 210, low-density residential development, and open rangeland.

Land Use

F. E. Warren AFB is divided into three general land use planning sub-areas (FEWAFB 2000):

- Historic District/Landmark Area
- Area South of Crow Creek
- Area North of Historic District

The Historic District is located in the central base core and contains over 200 historic buildings. Various community facilities are mixed-in with other functions in and near the Historic District. The area south of Crow Creek consists of large tracts of open space, an industrial operations and maintenance/mission complex, and isolated clusters of housing and community facilities. The area north of the Historic District is also dominated by large open space areas, along with outdoor recreation, accompanied housing, industrial, and operations/mission facilities.

Both wind power projects are located in the area north of the Historic District. Both sites are currently classified as "open space." There is an area reserved for a Veterans Administration (VA) National Cemetery on the north end of the base (Darren Horstmeier, Chief of Base Development, pers. commun.). However, none of the turbines at the Alternate Action site are within this area.

Aviation

The wind farm at the Proposed Action site is located approximately 3 miles and the wind farm at the Alternate Action site is located approximately 3.1 miles from the west end of the runways at the Cheyenne Airport. The Cheyenne Airport has two runways. Runway 8/26 is the primary runway, and is oriented east-west. It is 9,400 feet long. The secondary runway (Runway 12/30) is 6,690 feet long and is oriented northwest to southeast.

The Cheyenne Airport is used by commercial aircraft, of which Great Lakes is the primary carrier. Great Lakes aircraft arrive or depart to and from Denver, Colorado 66 times per week. Most of their aircraft are Beechcraft 1900 19-passenger aircraft, although they also make one round trip a day with an Embraer 120 30-passenger plane. In addition, the Wyoming Air National Guard uses the Cheyenne airport for its C-130 fleet. The C-130s are used locally for training, to fight wildlfires, and to respond to federal and state disaster relief efforts. The Wyoming Army National Guard also uses the Cheyenne Airport for its fleet of 8 UH60 Blackhawk helicopters and one C12 fixed-wing airplane. The Army Guard conducts training, search and rescue, fire fighting, and other support missions from the Airport. Although the Army Guard is currently based out of the Cheyenne Airport, there are plans to move the operation to F. E. Warren AFB sometime between 2006 and 2009 (Lt. Colonel Scott Schofield, State Army Aviation Officer, pers. commun.). The Cheyenne Airport is also used by many private aircraft. On average, there are approximately 70,000 takeoffs and landings per year for all commercial, military and private aircraft combined at the Cheyenne Airport (Barry Dishman, Air Traffic Manager, Wyoming Air National Guard, pers. commun.). Most (~75- 90%) airplanes taking off from the Cheyenne Airport head west over F. E. Warren AFB due to the prevailing westerly winds in Cheyenne (Scott Hinderman, Airport Manager, and Lt. Colonel Steve Anderson, Wyoming Air National Guard, pers. commun).

There are no airport runways on F. E. Warren AFB, and aircraft use of the base is limited to helicopters. The base currently has 7 Huey UH1N helicopters, although this number may be increased to 15 in the future. Helicopter operations on the base include escorting missile convoys along Central Avenue to Gate 5, which involves low level flying, and travel to and from off-base missile sites, which can involve low-level flying during adverse weather conditions (Captain Anne-Marie Contreras, Chief of Flight Safety, pers. commun.). The helicopter pad on base is located approximately 2.1 miles south of the Proposed Action site and 3.8 miles south of the Alternate Action site.

Geology and Soils

F. E. Warren AFB lies within the High Plains section of the Great Plain Physiographic Province (F. E. Warren AFB 2000a). The age of rocks in this geologic division range from the pre-

Cambrian period of the Paleozoic era, approximately 500 million years ago, to the quaternary period of the Cenozoic era, the present age (Hausel 1986), and are composed primarily of shale with small amounts of sandstone, siltstone, and limestone. The base is in Seismic Zone 1, which means there is a minor seismic event probability. The topography on base is characterized by broad plateaus that are nearly flat in the historic core, and increase in slope along the ridgelines and along Crow Creek. Elevation ranges from 6,080 feet in the southeastern portion of the base to 6,375 feet in the northern portion. Most areas with slopes 10 percent or greater are located in the undeveloped northern third of the base.

Under the Proposed Action, the two turbines will be located on a ridgeline at an elevation of approximately 6,250 feet (Figure 2). Under the Alternate Action, the 5 turbines would be located on a ridgeline at an elevation of approximately 6,330 to 6,370 feet (Figure 3).

The predominant soil series on the base is classified texturally as loamy, with an average topsoil depth ranging from four to six inches. The subsoil is primarily alluvial clay that extends from a depth of approximately 6 to 36 inches. Based on information from the U.S. Department of Agriculture, Soil Conservation Service, soils on F. E. Warren AFB fall into two primary groups: Poposhia-Trimad Complex and Evanston Loam (Stevenson 1996). For much of the base these are qualified with an Urban Land designation.

Both alternative project sites are located on soils in the Poposhia-Trimad complex. These soils occur on 3-15% upland slopes and are generally 50% Poposhia silt loams and 40% Trimad gravelly loams. Poposhia soils occur on fans, knolls, and valley floors. The Poposhia soil is very deep (up to 60 inches) and is well drained. It formed in silty alluvium derived from mixed sources. Permeability of the Poposhia soil is moderate, runoff is medium, and the hazard of both water and wind erosion is moderate. Trimad soils occur on knolls and ridges. These soils are also generally well drained and very deep. It formed in very gravelly loamy alluvium derived from mixed sources. Permeability is moderate, runoff is medium, the hazard of water erosion is severe, and the hazard of wind erosion is moderate.

Aquatic Systems

F. E. Warren AFB is located within the Crow Creek Watershed, which is part of the South Platte River Basin. Two reservoirs, four small ponds, portions of three perennial streams, and one ephemeral stream are present on F. E. Warren AFB. Lake Pearson reservoir, constructed in two parts in 1957 and 1970, is made up of two basins connected by a culvert used to control water flow between the basins. Each basin contains approximately 12 acres of surface water. Water levels are maintained by storm water runoff, raw water from the City of Cheyenne, and pumped well water. The south lake also receives flow from a spring. Lake Centennial is a flood control basin intended to hold storm water runoff from the City of Cheyenne. The lake maintains approximately 4.5 acres of surface water and is managed as a warm water fishery. One of the small, unnamed ponds is located along the main stem of Crow Creek adjacent to the base campground. The other small ponds are off-channel ponds constructed in 2000 adjacent to the Crow Creek riparian corridor.

Crow Creek flows from west to east across the southern half of the base. Diamond Creek, a perennial tributary of Crow Creek, flows from southwest to northeast across the southwest portion of the base. An unnamed ephemeral tributary of Crow Creek roughly parallels Diamond Creek flowing from southwest to northeast across the south-central portion of the base. Dry Creek is located in the north half of the base and flows west to east across the eastern side of the base. While mapped as a perennial stream by the U.S. Department of Interior, Geological Survey (North Cheyenne topographic map), the portion of Dry Creek on F. E. Warren AFB does not flow in all years. There are no water bodies, streams or floodplains present within either wind farm development area or along any of the transmission routes for the Proposed Action or Alternate Action.

Climate and Air Quality

Climate in Cheyenne is classified as semi-arid. The mean annual temperature is 45.6 ^{0}F. Mean maximum temperatures range from 37.7 ^{0}F in January to 82.8 ^{0}F in July, while mean minimum temperatures range from 15.2 ^{0}F in January to 54.6 ^{0}F in July. The record low is –34 ^{0}F and the record high is 100 ^{0}F. On average, 106 days of each year are clear, 127 are partly cloudy, and 133 are cloudy. Mean annual precipitation is 14.4 inches, with most precipitation occurring from May through July. Precipitation of 0.1 inches or more occurs an average of 100.7 days each year, while 1.0 inches or more of snow occur an average of 17.1 days each year. Thunderstorms occur on average 51.1 days each year. Cheyenne has a relatively low incidence of heavy fog (defined as visibility < 0.25 miles), with an average of 23.5 days each year.

Southern Wyoming has the most consistent high wind speeds in the continental U.S. (BLM 1995). The mean wind speed in Cheyenne is 12.9 mph. The lowest mean wind speed (10.4 mph) occurs in July and August, and the highest mean wind speed (15.3 mph) occurs in January. Winds are predominantly from the west-northwest. The highest wind gust recorded in Cheyenne was 94 mph.

F. E. Warren AFB is located in Laramie County, within the Metropolitan Cheyenne Intrastate Air Quality Control Region (AQCR). The U.S. Environmental Protection Agency has designated the air quality in the vicinity of the base as in attainment for all criteria air pollutants. Although air quality in the Cheyenne area is acceptable, emissions from burning fossil fuels to produce energy are degrading air quality in other portions of the U.S. as well as around the world. These emissions are known to negatively impact human health, impact the health of forests and watersheds through acid deposition, and are suspected to cause global warming.

Vegetation

There are five primary habitat types found on F. E. Warren AFB. These include prairie grasslands, riparian areas, wetlands, aquatic habitats, and urban/disturbed areas. The prairie grasslands are predominantly shortgrass and mixed grass grasslands. Riparian areas on the base are primarily confined to Crow Creek and tributaries and consist of willow shrub communities interspersed with areas of cottonwood overstory. Wetlands on the base include wet meadows dominated by mesic grasses, sedges, and rushes along the riparian corridors and wetland fringes around the lakes and perennial streams. The aquatic habitats of the base include six lakes/ponds,

three perennial streams, and one ephemeral stream. The disturbed/urban areas include the areas developed with buildings, parking lots, roads, railroad tracks, landfills, golf courses and other associated structures. The urban areas are characterized by scattered trees (cottonwoods, evergreens) with manicured lawns and ornamental plants (shrubs, flowers). Portions of the north part of the base were historically used as artillery practice ranges. When these areas were reclaimed they were plowed and then planted with crested wheatgrass.

The three habitat types that consist of vegetation communities are: (1) mixed-grass prairie grassland; (2) wet (mesic) meadow wetlands; and (3) riparian areas - cottonwood and willow (Block 1995). Based on previous reports and vegetation surveys for F. E. Warren AFB (e.g., USGS 1993, Block 1995, Easter and Douglas 1996, Barlow and Knight 1999), the mixed-grass prairie grassland is dominated by blue grama, western wheatgrass, needle-and-thread grass, and fringed sagewort. Wet meadows on the base are dominated by foxtail barley, Kentucky bluegrass, tall wheatgrass, baltic rush, tufted hairgrass, bluejoint grass, and sedges. The riparian areas are dominated by a shrub scrub community of sandbar willow, strap willow, and crack willow, with scattered cottonwood and green ash trees and a herbaceous understory similar to the mesic meadows. Much of the previously disturbed and reclaimed areas on the base (e.g., artillery impact area) are dominated by crested wheatgrass, which was planted as part of the restoration effort.

Developed areas of the base have a woody vegetation component that, while not originally present, is extremely important for wildlife, aesthetic, cultural, and social values. Cottonwood, Colorado blue spruce, Ponderosa pine, and green ash are the most important woody vegetation species on base. There are no wooded areas of five acres or greater on the base. The urban forest is an intrinsic component of the Historic District; the base has been awarded "Tree City USA" status for 12 consecutive years.

Vegetation at the site of the Proposed Action and Alternate Action is mixed grass prairie. The habitat along the transmission lines for both alternatives is also mixed grass prairie.

Wetlands

The base contains approximately 127 acres of wetlands delineated by the USFWS National Wetland Inventory. Most wetlands on the base are associated with riparian areas and the Pearson Reservoirs; however, some wetlands are located away from Crow and Diamond Creeks. Plants common to wetlands on the base include horsetail, Nebraska sedge, blackcreeper sedge, common spikerush, common threesquare bulrush, and Torrey's rush (Easter and Douglas 1996). There are no wetlands at the site of either wind farm development or along the transmission lines for either development.

Invasive Noxious Weeds

Several weedy species are known to occur on the base. Of these species, Canada thistle, dalmation toadflax and leafy spurge are the most abundant. Most weed infestations occur along riparian areas and disturbed areas on the base; the mixed grass prairies, including the areas surrounding both alternative wind farm sites, have a much lower incidence of noxious weed infestations.

Fish and Wildlife

Fish and wildlife that occur on F. E. Warren AFB are species common to the high plains ecosystems that have evolved in shortgrass prairie habitats. However, diversity of habitats available on F. E. Warren AFB (i.e., shortgrass prairie bisected by riparian communities) support a variety of terrestrial birds, mammals, reptiles, amphibians, fish, and invertebrates. Most species present are somewhat tolerant of human disturbance. Currently, management of the fish and wildlife resources on F. E. Warren AFB focuses on protecting, conserving, and appreciating the natural resources on the base and maximizing public benefits from these resources (see Prann *et al*. 1999, Roselund 1992). A Fish and Wildlife Management Plan has been utilized on F. E. Warren AFB since the 1950s (WEST 2001a). That plan includes information specific to F. E. Warren AFB regarding fish and wildlife on the base, fisheries management, game and non-game wildlife management, urban wildlife management, fish and game law enforcement, and control of problem wildlife. The management plan is designed to provide public benefit as well as enhance fish and wildlife conservation on the base.

Information regarding wildlife on the base was obtained from a variety of sources. The most comprehensive information on birds at F. E. Warren AFB is the publication "Warren Air Force Base Checklist of Birds." This checklist contains all species identified on the base, and provides information on their abundance during the breeding, migration, and winter seasons. It is considered the best information on bird use of F. E. Warren AFB by local ornithologists who have been involved with monitoring birds on the base and the adjacent High Plains Grasslands Research Station (Robert Dorn, author of "Wyoming Birds" and member of the Cheyenne High-Plains Audubon Society, pers. commun.; Ronald Ryder, Colorado State University, pers. commun.). Additional information was obtained from the F. E. Warren AFB Fish and Wildlife Management Plan (WEST 2001a) and the F. E. Warren AFB Threatened and Endangered Species Management Plan (WEST 2001b). Additional records of wildlife were obtained from the University of Wyoming, Wyoming Natural Diversity Database and the Wyoming Game and Fish Department Wildlife Observation System.

Birds

Although generally considered environmentally friendly, wind power development has been associated with the death of birds that collide with turbines and other wind farm structures (Erickson *et al*. 2001). Raptors are of special concern due primarily to the large numbers of dead raptors found at the Altamont, California wind farm (Orloff and Flannery 1992).

Periodically since the 1980's, bird surveys have been conducted on F. E. Warren AFB and adjoining lands such as the U.S. Department of Agriculture High Plains Grasslands Research Station. A total of 218 species of birds have been recorded on the base (see Appendix A). All of these species with the exception of rock dove, house sparrow, and European starling are protected under the Migratory Bird Treaty Act. Sixteen species of diurnal raptors have been identified on base. Of these, only three species are considered common, including Swainson's hawk and American kestrel during the summer breeding season and red-tailed hawk during spring and fall migration. Four raptors occur uncommonly at certain times of the year, including turkey vulture, northern harrier, ferruginous hawk, and rough-legged hawk. The remaining nine species are classified as rare or accidental on the base. Six species of owl have also been

documented. The great-horned and burrowing owls are considered uncommon, the barn owl is considered rare, and the other three species (long-eared owl, short-eared owl, and northern saw-whet owl) are considered accidental. With the exception of the ubiquitous red-tailed hawk, which is a common migrant on the base, the other raptor species have relatively low occurrence on the base during the spring and fall migration seasons.

Seventy-three species of waterbirds (i.e., loons, grebes, pelicans, cormorants, herons, waterfowl, gulls, shorebirds) have been documented on the base; however, only two species (Canada goose and mallard) are considered abundant. Four waterbirds are considered common breeders on the base, including eared grebe, American coot, killdeer, and spotted sandpiper. An additional 40 species are considered uncommon to accidental summer residents on the base. The other 27 species occur only during migration. Most of the waterbirds occur primarily in lakes and associated wetlands, as well as along Crow Creek. The most important habitat for waterbirds is the Lake Pearson area, although Canada geese often use the base golf course and associated ponds. Two species of shorebirds (upland sandpiper and long-billed curlew) are not associated with water during the breeding season, but instead occur in grasslands.

Most of the bird species identified on the base are passerines (song birds), of which 107 species have been documented. Sixty-two species of passerines occur in the summer and likely breed on the base; the other 45 species only migrate through the base in the spring and/or fall. Species of passerines considered abundant during the breeding season include cliff swallow, European starling, red-winged blackbird, and house sparrow. An additional eight species are considered common breeders, and the remaining species occur uncommonly to rarely during the breeding season. Common migrants that do not breed on the base are Swainson's thrush, yellow-rumped warbler, Wilson's warbler, and chipping sparrow.

The other birds documented on the base include doves, nightjars, hummingbirds, belted kingfisher, and woodpeckers. Of these, the rock dove is considered abundant year round, the mourning dove, common nighthawk, and broad-tailed hummingbird are considered common summer residents, and the other species are considered uncommon to rare.

Most of the birds identified on the base are not typically found in shortgrass prairie habitats associated with the turbine development areas. Areas with the highest bird densities and diversity are likely those associated with the Crow Creek riparian corridor, lakes and wetlands, and mature trees on the base. Based on habitat, the most common birds present within the turbine development areas are likely horned lark, western meadowlark, vesper sparrow, lark bunting, and McCown's longspur.

Migrating raptors are known to use north-south oriented flight corridors such as rivers, mountain ranges, lake shores, and perhaps other features. F. E. Warren AFB does not appear to be a migratory funnel for raptors. Most raptor migration corridors are along large, prominent ridgelines (e.g., Goodrich 1997), whereas topography of the base is relatively flat. Several studies of North American songbird migration have found that nocturnal migrants follow a broadfront migration pattern, flying at high altitudes where they are not affected by variation in surface topography (e.g., Lowery and Newman 1966, Able 1972, Richardson 1972). Some more recent evidence, however, suggests that nocturnal migrants flying at lower altitudes may also

utilize topographic features to aid in navigation and that low level nocturnal migrants may not follow the typical broadfront pattern (Williams *et al.* 2001).

Both wind farm sites on the base are situated on low east-west oriented ridges that would not tend to funnel migrating birds over the turbines. The only other primary linear feature in the project area that might attract migrating birds (Crow Creek) is also oriented from east to west and should not funnel migratory birds over the project area. Therefore, it is not likely that either wind farm site is located in a migratory corridor for raptors, songbirds, or other bird species.

Bats

Wind turbines have also been associated with bat collision mortality (Johnson 2003, Johnson *et al*. 2003a, 2003b, Williams 2003). Based on range maps in Clark and Stromberg (1987), 11 of the 16 species of bats in Wyoming have been documented in Laramie County and may occur on F. E. Warren AFB (Table 1). None of the bat species in Wyoming receive federal or state protection. Very little is known about the bat populations at F. E. Warren AFB and in Wyoming. Due to increasing concern for bat populations and the ecological benefits associated with bats (e.g., insect control), bats are included in the current F. E. Warren AFB Fish and Wildlife Management Plan (WEST 2001a). Bats have been observed foraging on the base (Prann *et al*. 1999), and bats have been removed from some buildings (Tom Smith, former Natural Resources Program Manager, pers. commun.). The Wyoming Natural Diversity Database (WYNDD) has two records of silver-haired bat on the base, one from 1965 and one from 1982. Within a township buffer of the township containing both projects, the WYNDD has three records for long-eared myotis, 2 records for fringed myotis, and 8 records of hoary bat. No records for bats were found on the Wyoming Game and Fish Department Wildlife Observation System in the township both projects are located in.

Bats are described in the *F. E. Warren AFB Integrated Pest Management Plan* (FEWAFB 2000b) as a pest that can cause damage to buildings; however, the Fish and Wildlife Management Plan provides guidance in dealing with bats found in buildings to avoid trapping bats inside buildings and disrupting maternal colonies.

Bat roost sites are varied and may include cliffs, rock crevices, caves, buildings, bridges, and trees. Typical roost sites in and near F. E. Warren AFB likely include riparian areas along Crow Creek, Diamond Creek and Lake Pearson, the arboretum at the nearby High Plains Grasslands Research Station, mature trees on the base, and perhaps certain bridges and buildings. Bat foraging areas on the base would include riparian zones, ponds, and wetlands.

The colonial species either remain in the general area or make short-distance migrations to hibernate in caves and underground mines during the winter. Migratory bats are the most common fatalities at wind plants (Johnson 2003), and the four migratory species (hoary, eastern red, silver-haired, and Mexican free-tailed bat) likely move through the area from late July through September (see Johnson *et al*. 2003a). The silver-haired bat is considered abundant in Wyoming. There is only one record of a Mexican free-tailed bat in Wyoming (Laramie County), and only three red bats have been documented in the state (Clark and Stromberg 1987). At the time Clark and Stromberg (1987) published their book on mammals of Wyoming, there were fewer than a dozen records of hoary bat over the previous 120 years. However, this species may

be a common migrant through the state based on observations of hoary bat mortalities at the Foote Creek Rim Wind plant in Carbon County, Wyoming and the Ponnequin Wind Plant in Colorado, located just across the Wyoming state line south of Cheyenne. There are no known cave locations used by hibernating bats on F. E. Warren AFB or within the greater Cheyenne area. Surveys for bats have not been conducted in the area.

Table 1. Bat species documented in Laramie County, Wyoming and a summary of preferred habitat

Common Name (Scientific Name)	**Typical Habitat**
Small-footed Myotis (*Myotis ciliolabrum*)	Varied arid grass/shrublands, ponderosa pine and mixed forests; roosts in crevices and cliffs; hibernates in caves, mines
Long-eared Myotis *(Myotis evotis)*	Primarily forested habitats and edges, juniper woodland, mixed conifers, riparian areas; roosts in snags, crevices, bridges, buildings, mines
Little Brown Bat *(Myotis lucifugus)*	Closely associated with water; riparian corridors; roosts in buildings, caves, hollow trees; hibernates in caves
Fringed Myotis *(Myotis thysanodes)*	Primarily forested or riparian habitats; roosts in buildings, trees; hibernates in mines and caves
Long-legged Myotis *(Myotis volans)*	Coniferous and mixed forests, riparian areas; roosts in caves, crevices, buildings, mines
Eastern Red Bat (*Lasiurus borealis*)	Forested habitats, closely associated with trees; roosts in trees; migratory species
Hoary Bat *(Lasiurus cinereus)*	Forested habitats, closely associated with trees; roosts in trees; migratory species
Silver-haired Bat *(Lasionycteris noctivagans)*	Forested habitats; generally coniferous forests; roosts under bark; believed to be a migratory species
Big Brown Bat *(Eptesicus fuscus)*	Generally deciduous forests; buildings; roosts in buildings, trees, crevices; hibernates in caves, mines
Townsend's Big-eared Bat *(Corynorhinus townsendii)*	Varied habitats – forests to desert scrub; roosts in buildings, caves, mines, bridges; hibernates in caves
Mexican free-tailed Bat (*Tadarida brasiliensis*)	Forages in agricultural areas, open fields, riparian areas; roosts in caves. Migratory species.

Many species of bats also make extensive use of linear features in the landscape while migrating (Strelkov 1969, Humphrey and Cope 1976, Timm 1989). As with birds, the low east-west oriented ridges where either wind farm would be built would not tend to funnel migrating bats over the areas, and neither area is likely in a bat migration corridor.

Other Wildlife

A relatively large herd of pronghorn antelope (*Antilocapra americana*) inhabits the base. Although the pronghorn on the installation are a part of the larger Iron Mountain herd, the recent construction of a chain link perimeter fence has permanently enclosed approximately 300 pronghorn on the installation. Pronghorn are occasionally trapped and removed from the installation by the Wyoming Game and Fish Department (WGFD) to control their population. The pronghorn are free ranging and occur throughout the base, including the developed areas, where they have become accustomed to human use and facilities. In addition to pronghorn, small populations of mule and white-tailed deer also inhabit the base.

A wide variety of other mammals inhabit the base, including predators such as coyote, badger, and fox, rabbits, and numerous species of rodents and other small mammals (e.g., mice, squirrels, voles, shrews). According to the Fish and Wildlife Management Plan (WEST 2001a), a total of 49 species of mammals may inhabit the base. Other wildlife that may occur on base includes five species of amphibians and 10 species of reptiles.

Mammalian species that are most likely to occur within the shortgrass prairie habitats of the turbine development area and transmission lines for both alternatives include badgers, foxes, coyotes, jackrabbits, pocket gophers, Ord's kangaroo rat, and several species of mice, voles, and ground squirrels. Of the reptiles and amphibians possibly occurring on base, suitable habitat at the development areas is present for several species of lizards and snakes.

Threatened and Endangered Species

Two species listed as threatened species under the Endangered Species Act (ESA) native to the Front Range of the Rocky Mountains are known to occur at F. E. Warren AFB; Preble's meadow jumping mouse (*Zapus hudsonius preblei*) and Colorado butterfly plant (*Gaura neomexicana ssp. coloradensis*). Both inhabit riparian habitats along Crow Creek and Diamond Creek. Populations of these species on the base are currently monitored on an annual basis. The USFWS, in cooperation with F. E. Warren AFB, operates a pre-release conditioning facility on the base for the endangered black-footed ferret (*Mustela nigripes*).

The only other listed species recorded at the base is bald eagle, which is federally threatened. According to the F. E. Warren Air Force Base checklist of birds, bald eagles occur rarely on the base during the winter and migration seasons. Observations have occurred from mid-October through early May. Bald eagles have not been documented to breed on the base.

A *Threatened and Endangered Species Management Plan* prepared for the base (WEST 2001b) provides a detailed discussion of listed or rare fish and wildlife species that are known to occur or potentially occur on F. E. Warren AFB and management actions designed to safe guard these species against adverse effects from operation of F. E. Warren AFB.

Fish

Fish occur in North and South Lake Pearson, Lake Centennial, Diamond Creek, and Crow Creek. Several species have been stocked in the Pearson Lakes, including rainbow trout, brown trout, and Snake River cutthroat trout. Lake Centennial was stocked in the early 1990's with bluegill, largemouth bass, and crappie. Brook trout breed within Crow Creek and Diamond Creek, as do several species of nongame fish. According to the Fish and Wildlife Management Plan (WEST 2001a), up to 18 species of fish may inhabit the base. There are no waterbodies containing fish in or near the development areas for either wind farm alternative.

Cultural Resources

F. E. Warren AFB has approximately 214 impressive brick structures listed on the National Register of Historic Places. The majority of these facilities are located within the central core of the base, designated as a Historic District in 1969 under the provisions of the National Historic Preservation Act, and designated the Fort D. A. Russell National Historic Landmark in 1972.

The northern border of the Historic District is 1.27 miles from the Proposed Action site and 2.69 miles from the Alternate Action site.

The base also contains 131 archaeological sites. Seventy-one of these sites are eligible or potentially eligible for inclusion in the National Register of Historic Places. There are three sites present within the proposed turbine development area for the Proposed Action. There are also three sites within or near the proposed development area for the Alternate Action. All of these sites have been evaluated by the State Historic Preservation Office and found to not be eligible for the National Register of Historic Places. There are no cultural sites present along the proposed transmission line for the Proposed Action. There are scattered cultural sites along the potential overhead transmission line route for the Alternate Action.

Visual Resources

The visual setting for the Proposed Action consists of a low ridgeline within relatively undeveloped shortgrass prairie at the site of the wind farm. The visual setting within a mile of the turbines at the preferred site consists of several Air Force operations buildings located south, east and northwest of the site, an F. E. Warren AFB residential development southeast of the site, and the USDA High Plains Grasslands Research Station to the west of the site. The High Plains Research Station is characterized by open pastures and grasslands as well as a large arboretum containing deciduous and coniferous trees and shrubs used for research purposes many years ago. The larger viewshed consists of the developed and undeveloped portions of F. E. Warren AFB, the City of Cheyenne, and surrounding areas comprised of undeveloped pastures and rural residences.

The Alternate Action site is also characterized by low ridges within undeveloped shortgrass prairie. There is also undeveloped prairie to the north, south and west of the site. The Western Hills housing subdivision is present off-base east of the site. The larger viewshed for the Alternate Action site also consists of the developed and undeveloped portions of F. E. Warren AFB, the City of Cheyenne, and surrounding areas comprised of undeveloped pastures and rural residences.

Noise

There are no known studies of ambient noise levels in the project area. Currently, noise in both the Proposed Action and Alternate Action project areas is typical of a rural setting. Sources of ambient noise include vehicular traffic, weather disturbances, occasional aircraft, and natural sources (e.g., wildlife, wind). Training with weapons by Air Force personnel can also occasionally be heard from both project areas, although noise from this source is likely louder at the Proposed Action site due to its closer proximity to the firing range. Because both project sites and surrounding areas are relatively rural, sources of loud noises are few most of the time, and ambient noise levels are likely between 40 and 50 decibel A-weighted sound level (dBA) under calm wind conditions. These noise levels are similar to those experienced in libraries or residential living rooms and are characterized as being very quiet.

There are no sensitive human noise receptors such as schools, hospitals, or daycare centers in the vicinity of either project area. Noise-sensitive receptors in the project area are limited primarily to on-base residential developments located approximately 5,000 feet (0.95 miles) from the Proposed Action site and off-base residential developments located approximately 4,300 feet (0.8 miles) from the Alternate Action site.

Hazardous Materials, Hazardous Waste and Solid Waste

F. E. Warren AFB uses a variety of hazardous materials to conduct operations on the base. The base utilizes a hazardous materials pharmacy, known as the HazMart, to track distribution and use of hazardous materials on the installation. F. E. Warren AFB is a large quantity generator of hazardous waste. Hazardous wastes generated on base are transferred to the installation's Hazardous Waste Characterization Site (Building 944), where they are categorized and prepared for shipment.

There are no active landfills on the installation. Solid waste (trash) is collected, weighed, and taken to the Cheyenne Landfill by a commercial contractor. The base also runs a Recycling Program that provides curbside pickup of recyclable materials from all housing areas. The program also provides a consolidated Recycling Center with collection bins for cardboard, aluminum, steel/tin, newspaper, magazines, and plastic. F. E. Warren AFB has a Qualified Recycling Program that recycles scrap metal, brass ammunition shells, and lead acid batteries. A compost facility is also available for use by base personnel.

F. E. Warren AFB is a National Priorities List (NPL) cleanup site. To comply with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the signed Federal Facilities Agreement among the EPA, Wyoming and the Air Force, the installation has initiated the Installation Restoration Program (IRP) to identify, evaluate, and where appropriate, remediate environmental contamination resulting from past DoD activities. Under the program, twenty sites have been identified on F. E. Warren AFB for potential environmental cleanup. Investigation and remediation of these sites is ongoing. Both wind farm alternatives are situated on Operable Unit 7, the closed firing range IRP site. During the base's history much of the north end of the base has been used for range activities and may contain unexploded ordnance that must be considered when proposing new projects. Both the Proposed and Alternate Action sites likely have some unexploded ordnance. Both proposed sites should also be sampled for the presence of metals, semivolatile organic compounds and energetics. The Alternate Action site likely has more unexploded ordnance present than the Proposed Action Site (John Wright, F. E. Warren AFB Installation Restoration Program, pers. commun.).

Utilities

F. E. Warren AFB (not including the dispersed missile sites) uses 45 million kilowatt-hours (Kwh) of electricity per year and 400,000 dekatherms (Dth) of gas. The base receives its gas and a very small portion of its electricity from Xcel Energy. Most of the electricity comes from the Western Area Power Authority (WAPA) and Rocky Mountain Generation Corporation. The base also uses approximately 420,000,000 gallons of water per year, but has implemented steps to reduce water consumption on the base.

Socioeconomics

F. E. Warren AFB has a positive economic effect on the surrounding community. It is the second-largest employer in the area, with the base payroll and expenditures infusing over $300,000,000 into the local economy in fiscal year 2002. The base currently employs 952 civilians and 3,471 military personnel, totaling 4,423 persons. Environmental impacts from the base, such as noise, are considered minimal to surrounding communities since the only aircraft that land occasionally at the installation are helicopters. Ground water contamination resulting from past activities presents some concern. However, these concerns are being addressed through cooperative efforts by the Base, the Wyoming Department of Environmental Quality and the U.S. Environmental Protection Agency.

7.0 Environmental Consequences

Land Use

Under the No Action Alternative, no impacts would occur to land uses on F. E. Warren AFB. Under Alternatives 1 and 2 (Proposed Action and Alternate Action) the following impacts are anticipated.

Direct and Indirect Impacts
If either wind farm were to be built, the land use classification would be changed from "open space" to "industrial." The projects would not affect land use classifications anywhere else on the base. Due to the relatively small area affected by the change in land use classification, construction of either the Proposed Action or Alternate Action would not cause a significant impact on land use of F. E. Warren AFB.

Proposed Management Practices
No management practices are proposed for land use.

Cumulative Impacts
Either of the action alternatives, in combination with future projects, would result in the conversion of existing land uses to other uses. However, since there are no major mission changes in the foreseeable future that would result in increased development or population on the base, no cumulative impacts are anticipated.

Aviation

Under the No Action alternative, no impacts would occur to aviation at F. E. Warren AFB or in the Cheyenne area. Under the Proposed Action or Alternate Action, the following impacts are anticipated.

Direct and Indirect Impacts
As with other tall structures, wind turbines of the height proposed for use on F. E. Warren AFB present a potential hazard to aircraft taking off and landing. This hazard extends well beyond the boundaries of an airport. The FAA sets guidelines for how tall structures can be in the vicinity

of public use airports without jeopardizing safe use of the airport. These guidelines are based on keeping objects out of airspace used for arriving, departing, and maneuvering aircraft, and are based on a set of complex slopes from various points on the airport. The overhead powerline associated with the Alternate Action would be only 40 feet in height and should therefore not pose a risk to aircraft.

According to the Wyoming Air National Guard, no structures are allowed which might interfere with aircraft climbing at the rate of 200 feet per nautical mile from the runway. Both wind farm locations are approximately 2.6 nautical miles from the Cheyenne airport runway, so the prohibition on obstacle height at this distance is 520 feet, well above the 254-foot height of the turbines. Construction of either wind farm will not have a significant impact on Wyoming Air National Guard operations involving C-130 aircraft (Lt. Colonel Steve Anderson, Operations Officer, pers. commun.). Neither wind farm would significantly impact Wyoming Army National Guard operations involving Blackhawk helicopters (Lt. Colonel Scott Schofield, State Army Aviation Officer, pers. commun.). Great Lakes Aviation also did not see any problems with the turbines at either proposed location (Bruce Gunberg, Great Lakes Aviation, pers. commun.).

Due to the proximity of the wind turbines to the Cheyenne Municipal Airport, a waiver for construction of the turbines will be required from the FAA. After reviewing the FAA application, the Cheyenne Airport believes that the proposed wind turbines at both sites may penetrate the protected airspace and prohibit future instrument landing systems to the Cheyenne Airport (Scott Hinderman, Cheyenne Airport Manager, letter dated November 5, 2003 [see Appendix B]).

In their response to the application, the FAA made an initial "Determination of Presumed Hazard" for wind turbines at both alternative sites. However, the FAA left open the possibility of a favorable determination pending results of further studies. F. E. Warren AFB is currently working with the FAA to determine what further studies are required so that a favorable determination can be made.

The area in and near the wind farm at the site of the Proposed Action is not within any flight paths typically used by helicopters on the base, and no impacts to helicopter aviation on the base are anticipated with this alternative. However, the area considered for developing the Alternate Action wind farm is within a heavily used helicopter flight path between the helipad on base and missile sites north and east of Cheyenne. Helicopters often fly at low levels in this area, and presence of turbines would represent a potential safety hazard to base helicopters. If this alternative were selected, the helicopter flight path would have to be shifted to the east, which would put the flight path over residential housing along the Interstate 25 corridor. As a result, the F. E. Warren AFB Chief of Flight Safety is opposed to development of a wind farm at the Alternate Site (Captain Anne-Marie Contreras, Chief of Flight Safety, pers. commun.).

Proposed Management Practices

The turbines would be equipped with airplane warning lights according to FAA specifications to minimize hazards to aircraft. Construction of the wind farm at the Alternate Action site would present a significant safety hazard to helicopter operations on the base that could not be

adequately managed for. If it is determined by the FAA that the proposed wind turbines at either site would significantly impact Cheyenne Airport operations, potential management practices may include lowering the height of the structures to avoid penetrating protected airspace.

Cumulative Impacts

Construction of either alternative wind farm would result in the presence of additional structures for aircraft to avoid in the area. No additional tall structures are proposed for F. E. Warren AFB since there are no major mission changes in the foreseeable future that would result in increased development or population on the base. However, other tall structures such as communication structures are likely to be constructed in the Cheyenne area, especially given the increased demand for digital television. These additional structures in combination with the wind turbines may result in a cumulative impact to aviation, although the small area affected by construction of either wind farm would not likely cause a substantial cumulative impact to aviation in the Cheyenne area.

Geology and Soils

Under the No Action alternative, no impacts would occur to geology and soils at F. E. Warren AFB. Under the Proposed Action or Alternate Action the following impacts are anticipated.

Direct and Indirect Impacts

Minor impacts to topography would occur under both wind farm alternatives due to cut and fill activities used to level turbine pads and construct access roads. Drainage patterns may change slightly due to the altered topography of the site during construction and following completion of the turbine pads and access roads. The topography of the surrounding area will remain unchanged. No impacts to geologic resources are anticipated from construction under either alternative. The primary impact to the soil resource will be compaction due to movement of heavy machinery and construction equipment.

Under the Proposed Action, the total area permanently disturbed will be approximately 0.18 acres for the two turbine pads and 0.46 acres for the access road (total = 0.64 acres). For Alternative 2, the total area permanently disturbed will be approximately 0.46 acres for the five turbine pads and 0.71 acres for the access roads (total = 1.17 acres). There will also be some areas temporarily disturbed for construction of the turbine pads, access roads and transmission lines. Soils at the site will be subject to erosion upon removal of vegetation. The soils present at both wind farm sites are susceptible to wind and water erosion. Soils within the construction corridor are not unique and impacts will be minimal.

Proposed Management Practices

To reduce soil losses, reclamation methods on temporarily disturbed areas will release compaction prior to reseeding. Erosion control measures will be employed during construction to retard loss of soil. Measures taken will be consistent with storm water runoff management practices and statutes of the State of Wyoming. Reclamation of disturbed areas will begin as soon as possible during and/or following construction to reduce the possibility of erosion. Topsoil removed from disturbed areas will be stockpiled, protected from erosion, and reused in reclamation. Ground cover will be established immediately following construction to reduce

erosion. Permanent storm water control measures will also be installed. If any spills of lubricants, diesel fuel or other hazardous materials occur during construction, the contractor would be required to clean up the spills immediately. If any fluid leaks are detected at operational turbines, the defect causing the leak will be repaired immediately, and the O&M contractor would be required to clean up any spills immediately.

Cumulative Impacts

The total area of ground disturbance required to construct either project is minor. Since there are no major mission changes in the foreseeable future that would result in increased development or population on the base, no cumulative impacts are anticipated to the geology and soils resources.

Water Quality

Under the No Action alternative, no impacts would occur to water quality at F. E. Warren AFB. Under the Proposed Action or Alternate Action the following impacts are anticipated.

Direct and Indirect Impacts

There is the potential for project construction to impact water quality if construction-related sediment-laden runoff or petroleum products enter drainages near the project. However, this potential is very slight, as the nearest perennial stream (Crow Creek) is located 1.2 miles from the Proposed Action and 3.0 miles from the Alternate site. There is also an intermittent drainage located 0.4 miles northeast of the Alternate Site.

Proposed Management Practices

Management practices will include implementation of standard erosion control measures, where practical, including (1) sediment detention ponds intercepting discharges where construction-related sediment-laden runoff will occur, (2) timely reclamation of disturbed areas, and (3) compliance with the NPDES permit. If any spills of lubricants, diesel fuel or other hazardous materials occur during construction, the contractor would be required to clean up the spills immediately. If any fluid leaks are detected at operational turbines, the defect causing the leak will be repaired immediately, and the O&M contractor would be required to clean up any spills immediately.

Cumulative Impacts

There is little potential for the project to impact water quality. Since there are no major mission changes in the foreseeable future that would result in increased development or population on the base, no cumulative impacts are anticipated to water quality on the base.

Climate and Air Quality

Under the No Action alternative, no negative or beneficial impacts would occur to climate or air quality at F. E. Warren AFB or the region. Under both wind farm alternatives, the following impacts are anticipated.

Direct and Indirect Impacts

Both negative and beneficial impacts to air quality are likely to be associated with development of either wind farm alternative. Air quality will be lowered slightly in the project area during construction due to dust and exhaust from construction equipment. Fugitive dust from ground disturbance would be generated during construction of the turbine pads, access roads, and buried transmission line. The amount of fugitive dust would depend largely on weather conditions during construction, with windy weather generating the most fugitive dust. Increases in fugitive dust would be temporary and not likely to significantly affect air quality. Cheyenne and the surrounding area are currently in attainment and either action alternative would not affect this status. After construction, air quality is expected to return to near pre-construction levels.

It is assumed that if either wind farm were not built, the power produced by the wind farm would be replaced by power produced from burning fossil fuels. Use of wind power rather than fossil fuels to generate electricity would have beneficial effects on air quality because greenhouse gases and other pollutants emitted by conventional fossil fuel combustion would not be produced. In the U.S., annual emissions due to fossil fuel burning total 5.7 billion tons of carbon dioxide, 15.6 million tons of sulfur dioxide, and 8 million tons of nitrous oxide. These pollutants are known to cause human health hazards and acid deposition. Based on calculations of the American Wind Energy Association (undated), over the 30-year life of the project, construction of two wind turbines under the Proposed Action can be expected to displace 129,024 tons of carbon dioxide, 679 tons of sulfur dioxide, and 416 tons of nitrogen oxides. Construction of 5 turbines at the Alternate Action site would result in the displacement of 322,560 tons of carbon dioxide, 1,698 tons of sulfur dioxide, and 1,040 tons of nitrogen oxides. CO^2 emissions associated with burning fossil fuels may also be responsible for global warming. The United States has experienced a long-term warming trend of 0.9 ^{0}F per century, with a substantial portion of the warming occurring since the mid 1970's. Global temperatures have been rising during the 20th century at a rate of 0.11 ^{0}F per decade. Increased use of renewable energy sources such as wind energy may reduce global warming associated with burning fossil fuels.

Proposed Management Practices

The construction contractor will be required to provide erosion and sediment control measures in accordance with federal, state, and local laws and regulations, including obtaining an NPDES permit. The area of bare soil exposed at any one time by construction operations will be kept to a minimum, and water spreaders will be used when necessary to reduce fugitive dust. Other proposed management practices include maintenance of construction equipment and heavy machinery during construction to minimize exhaust emissions and revegetation of disturbed areas as soon as practical. No management practices are required for operation of the wind plant as there will be no air emissions.

Cumulative Impacts

Temporary impacts to air quality resulting from construction of either alternative would be short term and minor. Therefore, no cumulative impacts to air quality are expected from construction of the project. Operation of the wind plant would displace several tons of pollutants over the life of the project, which would result in a cumulative beneficial effect on air quality in the region.

Vegetation

Under the No Action alternative, no impacts would occur to vegetation at F. E. Warren AFB. Under the Proposed Action or Alternate Action the following impacts are anticipated.

Direct and Indirect Impacts

Of the three primary vegetation communities on base, construction of either the Proposed Action or the Alternate Action would affect only mixed grass prairie vegetation. The total area of vegetation permanently lost under the Proposed Action will be approximately 0.18 acres for the two turbine pads and 0.46 acres for the access road (total = 0.64 acres). For the Alternate Action, the total area permanently lost will be approximately 0.46 acres for the five turbine pads and 0.71 acres for the access roads (total = 1.17 acres). The grassland habitats on F. E. Warren AFB are extensive and the small loss of vegetation associated with either alternative would not be significant. Neither project would affect habitat occupied by the threatened Colorado Butterfly Plant. No wetlands occur within either turbine development area or along any of the transmission lines, and no impacts to wetlands would occur. Either of the action alternatives could result in the introduction of noxious weeds or the spread of existing weedy species found on base by creating a favorable environment (i.e., disturbed soil) and by spreading seed via construction equipment.

Proposed Management Practices

Reclamation of disturbed areas with native plant species adapted to the site will begin as soon as possible during and/or following construction to reduce the possibility of erosion and to replace vegetation impacted by construction. To minimize the impact of the introduction or spread of noxious weeds, construction equipment should be thoroughly washed before entering the base. Any temporarily disturbed areas that need to be revegetated should be re-seeded with native species in a timely manner and the seed mix should be certified weed-free. Any straw used for mulch should be certified weed-free. Following construction, O&M personnel will monitor the turbine pads, access roads, and transmission line routes for noxious weeds and control any infestations that may occur.

Cumulative Impacts

Due to the small area of vegetation lost to construction, vegetation impacts will be minimal. Since there are no major mission changes in the foreseeable future that would result in increased development or population on the base, no cumulative impacts are anticipated to the vegetation resources.

Fish and Wildlife

Under the No Action alternative, no impacts would occur to wildlife at F. E. Warren AFB. Under the Proposed Action or Alternate Action, the following impacts are anticipated.

Direct and Indirect Impacts

Birds

Although generally considered environmentally friendly, windpower has been associated with the deaths of birds colliding with turbines and other wind plant structures, especially at Altamont

Pass, California, the first large-scale commercial wind energy facility built in the U.S. (Erickson *et al*. 2001). Wind plant design has changed significantly since the first large wind plants were developed in California; many of these changes have appeared to reduce risk to birds. Turbines are now typically installed on tubular steel towers instead of lattice towers and without open platforms at the top of the tower, eliminating perching opportunities for raptors and other birds. Electrical lines between turbines and from the turbine strings to substations in new-generation wind plants are often buried underground to eliminate perching opportunities, collisions with wires, and electrocutions. Collisions with wires and electrocutions have been a common source of mortality at Altamont Pass (Orloff and Flannery 1992) and other older wind projects. Overhead lines within new wind plants are often designed to be raptor safe and anti-perching devices are often installed. Turbines are much larger, with blades moving at slower revolutions per minute (rpm) and are therefore presumably more visible than blades on the smaller, older turbines. For example, the blades of the 950 kw turbines proposed for this project turn at 15 to 22 rpm's, contrasted to greater than 60 rpm's for the Kenetech 56-100 downwind turbine, the most common turbine at the Altamont Pass wind farm where raptor mortality is substantial. Blade tip speeds of both large and small turbines are still fast. The blade tip speed of the 950 kw turbine proposed for this project will range from 96 to 140 mph.

Primarily due to the avian collision concerns, baseline avian use, raptor nesting and operational fatality monitoring data (Erickson *et al.* 2001, 2002) have been collected at many of the new developments. Outside of California, diurnal raptor fatalities comprised only 2% of the wind plant-related fatalities. Passerines (excluding house sparrows and European starlings) were the most common collision victims, comprising 82% of the 225 fatalities documented. No other group (e.g., waterbirds, waterfowl) comprised more than 5% of the fatalities. Throughout the entire U.S., the average number of avian collision fatalities per turbine is 2.19 per year (Erickson *et al.* 2001).

Raptor mortality has been absent to very low at all newer generation wind plants studied in the U.S. This and other information regarding wind turbine design and wind plant/wind turbine siting strongly suggests that the level of raptor mortality observed at Altamont Pass is quite unique (e.g., unique in the number and arrangement of turbines in a small area, turbine types, prey availability, raptor use), and can be avoided at other locations. Studies in California have found that large prey bases (e.g., ground squirrels) within the wind plants play a significant role in the mortality (Hoover *et al*. 2001, Thelander and Rugge 2000). At both wind farm sites on F. E. Warren AFB, no high-density prairie dog or ground squirrel colonies are present. Therefore, use of the site by foraging raptors should be relatively low compared to other habitats, which sharply reduces the possibility for raptor collision mortality to occur.

Passerines comprise a large proportion of the fatalities at new wind plants, and involve both resident and migrant species. Studies of nocturnal migration at several wind plants suggest that the mortality compared to the number of birds passing through the area appears low (Johnson *et al*. 2002, Mabee and Cooper 2002, McCrary *et al.* 1984). Many species of songbirds migrate at night and have collided with other tall man-made structures. Large numbers of songbirds have collided with lighted communication towers and buildings when foggy conditions occur during spring or fall migration. To date, no large mortality events have been documented at wind plants in North America (Erickson *et al*. 2001). The total height of the turbines at the tip of the blade

will be approximately 254 feet. Most nocturnal migrants fly at altitudes well above the turbine blades (Kerlinger 1995) and would not be susceptible to turbine collisions. Although substantial avian collision mortality has been documented at some communication towers, few incidents have been reported for communication towers less than 500 feet in height (Kerlinger 2000, Albert Manville, United States Geological Survey Biological Resources Division, pers. commun.), and guy wires used to support most communication towers are considered a major source of the mortality problem. The proposed 950 kw turbines are much less than 500 feet in height and will not use guy wires for support. These features will greatly minimize the potential for collision mortality of migrant birds.

Wind plants with year-round waterfowl use have shown the highest waterfowl mortality, although the levels of waterfowl/waterbird mortality appear insignificant compared to the use of the sites by these groups. For example, only two Canada goose fatalities were documented at the Klondike, Oregon wind plant, although several thousand Canada goose were observed flying over the area during preconstruction surveys (Johnson *et al*. 2003c). Other U.S. wind farm sites within native landscapes have shown very low waterfowl use, except when significant water sources are in close proximity to the wind farm. The area with the highest concentration of waterfowl and other waterbirds at F. E. Warren AFB are the Pearson Lakes. The Proposed Action site is 1.3 miles and the Alternate Action site is 1.5 miles from these lakes. At these distances, it is unlikely waterfowl from Pearson Lakes would frequently traverse either wind farm site.

The two closest wind projects to F. E. Warren AFB are the Ponnequin Wind Plant in Colorado approximately 10 miles south of F. E. Warren AFB, which currently has over 40 turbines, and the Foote Creek Rim Wind Plant near Arlington, Wyoming, approximately 100 miles west of F. E. Warren AFB, which has over 100 turbines. Both projects are also situated in shortgrass prairie habitats. Monitoring of mortality at the Ponnequin site has been ongoing for 7 years, and very few birds (20-30 total) have been found during this time period. Only one raptor fatality (an American kestrel) has been found. Most of the mortality has involved common songbirds such as horned lark, McCown's longspur, lark bunting, blackbirds, and warblers (Ron Ryder, Colorado State University, pers. commun.). At the Phase 1 Foote Creek Rim wind plant, avian mortality averaged 1.5 per turbine per year (Young *et al*. 2003). Most (92%) of the carcasses found were songbirds. Only five raptors (3 American kestrels, 1 northern harrier, 1 short-eared owl) were found during the 3.5-year study. The remaining casualties included a western grebe, lesser scaup, mourning dove, common poorwill, and common nighthawk.

Assuming that avian collision mortality at wind turbines situated in grassland habitats at F. E. Warren AFB would be similar to other regional wind plants in similar habitats, then expected avian collision mortality would likely average 1 to 2 birds per turbine, or up to 4 per year at the Proposed Action and up to 10 per year at the Alternate Action site. As with most other windplants, most of this mortality would likely be comprised of songbirds. Mortality of other birds such as raptors and waterfowl is expected to be very low given the relatively few turbines and the low mortality of these groups observed at other new wind plants. This predicted level of avian collision mortality is not likely to have any population consequences for bird

populations inhabiting F. E. Warren AFB or surrounding areas, and no significant impacts to birds are likely.

In addition to collision with wind turbines, raptors and other birds have been known to collide with power lines or electrocute themselves on power lines. There will be no overhead lines associated with the Proposed Action, but the potential exists for collision mortality or electrocution on the overhead powerline considered as part of the alternate project.

In Europe, wind plant-related displacement effects are considered to have a greater impact on birds than collision mortality (Gill *et al*. 1996). Avian displacement associated with windpower development has not received as much attention in the U.S. At a large wind plant on Buffalo Ridge, Minnesota, abundance of several groups of birds was lowered primarily within 100 m of the turbines (Johnson *et al*. 2000a). Other studies have reported that birds may avoid flying in areas with turbines (Osborne *et al*. 1988). Also at Buffalo Ridge, Leddy *et al*. (1999) found that densities of male songbirds were four times higher in Conservation Reserve Program (CRP) grasslands without turbines than in CRP grasslands with turbines. Reduced avian use near turbines was attributed to avoidance of turbine noise and maintenance activities and reduced habitat effectiveness due to the presence of access roads and large gravel pads surrounding turbines (Leddy 1996, Johnson *et al*. 2000a).

The only report of avoidance of wind plants by raptors occurred at Buffalo Ridge, Minnesota, where raptor nest density was lower than expected near a small wind plant (Usgaard *et al*. 1997). Similar numbers of raptor nests were found before and after construction of Phase 1 of the Montezuma Hills, California windplant (Howell and Noone 1992). At the Foote Creek Rim wind plant in southern Wyoming, one pair of red-tailed hawks successfully nested within 0.3 miles of the turbine strings, and seven red-tailed hawk, one great horned owl, and one golden eagle nests located within 1 mile of the wind plant were successful (Johnson *et al*. 2000b). A Swainson's hawk nested within 0.5 miles of a small windplant in Oregon (Johnson *et al*. 2003c). Anecdotal evidence indicates that raptor use of the Altamont Pass, California wind resource area (WRA) may have increased since installation of wind turbines (Orloff and Flannery 1992, American Wind Energy Association 1995). Some birds apparently do become accustomed to turbines, as Osborn *et al*. (1998) reported a mallard nest within 31 m of a turbine in Minnesota.

Both wind farm projects on F. E. Warren AFB will likely displace some birds. The Alternate Action would likely have greater displacement effects due to its larger size; however, the total area affected by both wind farms is relatively small, and displacement of birds should not result in any population effects because shortgrass prairie habitats are not limited in this area. Although displacement of birds by wind plants is not desirable where important habitats may be limited, if other suitable habitats are available, one potential benefit of avian avoidance of turbines is the reduced potential for collision mortality to occur (Crockford 1992).

Bats

An unexpected outcome of several avian monitoring studies at wind plants has been the discovery of bat collision fatalities. In the United States, significant numbers of bat fatalities have been found at several wind plants. In many cases the number of bat fatalities at wind plants has exceeded the number of avian fatalities (Johnson 2003). The estimated number of annual

fatalities per turbine where bat mortality occurs has ranged from 0.1 at the Buffalo Ridge, Minnesota Phase 1 wind plant to 28.5 at the Buffalo Mountain, Tennessee wind plant (Johnson *et al*. 2003a).

Available evidence indicates that bat mortality would be confined primarily to the migratory species. Of 45 species of bats in North America (Wilson and Ruff 1999), only nine species comprise all known wind plant fatalities, despite the fact that wind plants have been constructed in several regions in a variety of habitats. Most (87.5%) of the identified bat fatalities documented at wind plants have been migratory tree bats. Of 1,044 bat wind plant collision victims identified to species, hoary bats comprised 53.9%, eastern red bats comprised 24.5%, and silver-haired bats comprised 9.1%. The remaining identified fatalities were comprised primarily of eastern pipistrelle (5.4%), little brown bat (4.7%), and big brown bat (2.1%) (Johnson and Strickland 2003). Most bat mortality documented at U.S. wind plants occurred in late summer and early fall. Data are available for 1,021 bat collision fatalities in the U.S. where the approximate date of the collision was reported, and nearly 90% of the fatalities occurred from mid-July through mid-September, with over 50% occurring in August (Johnson and Strickland 2003). At several wind plants evaluated to date in the U.S., bat collision mortality during the breeding season was virtually non-existent, despite the fact that relatively large populations of resident bats of several species were documented breeding in close proximity to the wind plant (see Johnson 2003). Based on these studies, it appears that windplants would pose little risk to non-migratory bat populations in the study area.

Thirty-nine bat fatalities have been found at the Ponnequin, Colorado wind farm over the last 7 years, including 36 hoary bats, 2 silver-haired bats, and 1 unidentified bat (Ron Ryder, Colorado State University, pers. commun.). Bat mortality at the Foote Creek Rim, Wyoming wind farm has averaged 1.3 per turbine per year (Johnson *et al*. 2000b, Young *et al*. 2002, 2003, Gruver 2002), and has been comprised of hoary bat (90%), little brown bat (4%), silver-haired bat (4%), and big brown bat (1.5%). Assuming mortality of bats at F. E. Warren AFB would be similar, then expected bat collision mortality would likely be similar to avian mortality and would average 1 to 2 bats per turbine, or up to 4 per year at the Proposed Action and up to 10 per year at the Alternate Action site. Most of this mortality would likely be comprised of migrating hoary bats; this species is a rather abundant widespread bat in the U.S. This predicted level of bat collision mortality is not likely to have any population consequences for migratory bat populations, and no significant impacts to bats are likely.

As with birds, wind plant development may also impact bats indirectly through loss of habitat. The shortgrass prairie habitats where the turbines would be built are not preferred bat habitats, and construction of the windplant will not reduce bat habitats on the base.

Threatened and Endangered Species

The turbine development areas and transmission corridors do not affect any habitat areas for the threatened Preble's meadow jumping mouse and Colorado butterfly plant. In addition, neither wind farm alternative would affect the black-footed ferret facility on base. Therefore, no impacts to these species are likely under either wind farm alternative. Bald eagles, another threatened species, have occasionally been observed on the base. Bald eagles typically forage for fish and waterfowl in or near waterbodies, none of which occur near either turbine development area.

However, they will also scavenge carcasses, and could forage near the development areas on road-killed wildlife or other wildlife carcasses. The risk of bald eagle collision appears very low, as no bald eagle fatalities have been found at any U.S. wind plant (Erickson *et al*. 2001). Eagles have been known to collide with power lines or electrocute themselves on power lines. There will be no overhead lines associated with the Proposed Action, but the potential exists for collision mortality or electrocution on the overhead powerline considered as part of the Alternate Action. The USFWS has reviewed both alternative projects, and concluded that it is unlikely that the project will affect any threatened, endangered, candidate, or proposed species (letter from Brian Kelly, USFWS, Cheyenne, Wyoming dated 10-24-03).

Other Wildlife

There is little information on wind plant effects on big game. The only study to address effects of a wind plant development on pronghorn was at the Foote Creek Rim Wind Plant near Arlington, Wyoming. Pronghorn observed within 800 m of 6 observation points in and near the wind plant were recorded the year prior to construction, the year of construction, and one-year post construction. The mean number of pronghorn observed per survey at the six points averaged 1.07 prior to, 1.59 during, and 1.14 the year following construction. There was no significant difference in pronghorn abundance between years, indicating that the wind plant did not displace pronghorn (Johnson *et al*. 2000b). A similar response to the wind farms at F. E. Warren AFB is also expected, as pronghorn would likely become accustomed to the project facilities and maintenance vehicles, and would use areas in and around the facilities, as they do much of the developed area on base. Development of the turbine pads and access roads will slightly reduce the amount of available habitat for pronghorn, but due to the small area disturbed this impact would be insignificant. Overall, no significant impacts to pronghorn are expected for either action alternative.

Another potential concern is with pronghorn management on base. Periodically, pronghorn are trapped on base to manage population sizes. In the past, cloverleaf traps have been set at the north end of the base, and pronghorn have been driven into the traps with helicopters. Presence of the turbines at the alternate location may interfere with this trapping (Rich Guenzel, WGFD District Biologist, pers. commun.). The WGFD also expressed concern that if pronghorn were displaced by the wind farm, then they may increase their use of the more-developed areas of the base, which would lead to additional vehicle collisions with pronghorn. Available information suggests that neither wind farm would displace pronghorn. Other than their concerns regarding pronghorn, the WGFD does not have any concerns over the wind farm projects as long as practices are taken to prevent or minimize avian collision mortality (Martin Hicks, WGFD District Biologist, pers. commun., Mark Nelson, WGFD Game Warden, pers. commun).

Construction of the wind project may affect smaller mammals on site through loss of habitat and direct mortality of individuals occurring in construction zones. Excavation for turbine pads, roads, or other wind project facilities could kill individuals in underground burrows. Road and facility construction will result in loss of foraging and breeding habitat for small mammals. Ground-dwelling mammals will lose the use of the permanently impacted areas; however, they are expected to repopulate the temporarily impacted areas. Some small mammal fatalities can be expected from vehicle activity. Impacts are expected to be very low and not significant. Construction of the Project may also affect reptiles on site through loss of habitat and direct

mortality of individuals occurring in construction zones. The level of mortality associated with construction would be based on the abundance of the species on site. Some mortality may be expected as reptiles such as lizards often retreat to underground burrows for cover or during periods of winter dormancy. Excavation for turbine pads, roads, or other wind project facilities could kill individuals in underground burrows. Impacts are expected to be very low and not significant due to the small area impacted.

Fish

Because neither wind farm project would directly affect any live waterbody on base, and because water quality is not expected to change during or following construction of the project, there would be no impacts to fish resources on the base.

Proposed Management Practices

Several management practices have been developed to reduce impacts to wildlife associated with wind plants (e.g., Johnson *et al*. in press). The USFWS (2003) has provided several guidelines to avoid and minimize wildlife impacts from wind turbines. Both proposed wind farm alternatives have been sited to generally satisfy these guidelines as follows:

- The prairie habitats where both wind farm alternatives occur likely have far lower densities of birds than other areas such as the lakes, riparian areas, and developed areas on base with mature trees;
- Post-construction monitoring will include reporting of any bird and bat fatalities observed for the life of the project to the WGFD and USFWS;
- Neither wind farm is sited in a known major bird migration corridor or flyway;
- Neither wind farm site is in an area where birds are highly concentrated such as wetlands, refuges, staging areas, rookeries or landfills;
- Neither wind farm site is in an area with a high incidence of fog, mist, low cloud ceiling or low visibility;
- None of the turbines are located on features that appear to attract raptors to the area;
- Habitat disturbed during construction activities will be restored to its original condition to avoid negative impacts and to prevent attracting high densities of prey animals such as rodents and rabbits;
- All carcasses of big game and other large animals that may attract foraging bald eagles or other raptors will be removed from within the Project area;
- The turbines will be spaced 1,000 feet apart to provide ample room for raptors and other birds to move through the area;
- None of the turbines are near a known bat hibernation, breeding, daily flight path or migration area;
- Neither wind farm will be sited in habitats of any species of wildlife, fish, or plant protected under the Endangered Species Act;
- The proposed turbines will use a tubular tower, rather than a lattice tower, to minimize bird perching and nesting opportunities, and will not use guy wires for support;
- Bird flight diverters will be placed on guy wires used to support the permanent met tower at either wind farm to minimize potential for avian collisions with guy wires;
- The minimum amount of lighting required for aviation safety by the FAA will be placed on the turbines;

- Powerlines associated with the Proposed Action will be buried to avoid collision mortality and electrocution of birds, and the aboveground powerline required for the Alternate Action would be constructed following guidelines of the Avian Powerline Interaction Committee (APLIC 1994, 1996).

In addition to the above measures recommended by the USFWS, other proposed management practices for the wind farm on F. E. Warren AFB are as follows:

- Choice of turbines with low RPM to minimize risk of bird collision with turbine blades;
- Establishment and enforcement of reasonable driving speed limits during construction to minimize potential for vehicle collisions with wildlife;
- Require construction personnel to avoid driving over or otherwise disturbing areas outside the designated construction areas;
- Designation of an environmental monitor during construction to monitor construction activities and ensure compliance with management practices;
- Develop alternate locations for trapping pronghorn or other methods to manage pronghorn populations on base if the Alternate Action site were constructed.

Cumulative Impacts

Many species of birds as well as bats are declining, and any increase in collision mortality associated with wind power development may result in a cumulative impact (Johnson *et al*. 2002). Given the very small numbers of collision mortalities expected for either base wind farm, however, cumulative impacts are expected to be minor.

Since there are no major mission changes in the foreseeable future that would result in increased development or population on the base, no significant cumulative impacts to local wildlife are anticipated on F. E. Warren AFB. F. E. Warren AFB is currently enhancing fish habitat at Pearson Lakes. The project involves excavation of up to 40 percent of both lakes to a depth of 12 feet and other lake modifications that should benefit waterfowl, fish, and other wildlife on the base.

Cultural Resources

Under the No Action alternative, no impacts would occur to cultural resources found at F. E. Warren AFB. Under the Proposed Action or Alternate Action the following impacts are anticipated.

Direct and Indirect Impacts

Although both the Proposed Action and Alternate Action may disturb identified cultural resources, these resources have been evaluated and determined to not be eligible to the National Register of Historic Places. The Wyoming State Historic Preservation Office has concurred with these determinations (Richard Bryant, F. E. Warren AFB Cultural Resource Manager, pers. commun.). Therefore, no impacts to eligible cultural resources will occur at either wind farm development area. There are no cultural resources identified along the proposed underground transmission line for the Proposed Action. There are scattered cultural sites near the proposed overhead transmission line for the Alternate Project. Most of these are also not eligible for the

National Register of Historic Places. Those that are eligible can be avoided when micrositing the location of the line. Under either action alternative, negative direct impacts could occur if ground disturbance due to construction uncovers or destroys a previously unknown cultural site.

In addition to direct impacts to cultural resources, the Advisory Council on Historic Preservation (ACHP) also has regulations to prevent an action that may, directly or indirectly, diminish the integrity of any historic property's location, design, setting, materials, workmanship, feeling, or association. Among those actions that may cause an adverse impact includes the introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features. The primary concern associated with wind power development on base is the potential to impact the Historic District of the base. The nearest boundary of the Historic District is located approximately 1.27 miles from the Proposed Action site and 2.69 miles from the Alternate Action site. At these distances noise from the turbines will be inaudible. The presence of buildings and mature trees associated with the Historic District will tend to obscure the turbines from most vantage points within the Historic District. Although turbines at both project sites may be visible from some portions of the Historic District, the turbines are far enough away that their presence should not significantly diminish the integrity of the Historic District's significant historic features. The Wyoming State Historic Preservation Office has reviewed the wind farm project at the Proposed Action site and has determined that no impacts are likely to occur (Appendix B).

Proposed Management Practices

F. E. Warren AFB will coordinate with the State Historic Preservation Office for review and approval of the Proposed Action or Alternate Action. If the Alternate Action is selected, the overhead powerline would be sited to avoid any eligible cultural resources. The construction contractor will be put on notice that their activities may uncover additional historic or prehistoric cultural or archaeological features. They will be provided with and required to follow defined procedures in the event that historical, archaeological, or other cultural resources are found. If artifacts are found during project activities, a work stoppage will occur until the base Historic Preservation Officer can examine the artifacts. The base Historic Preservation Officer will determine what management practices are required and when project activities may resume.

Cumulative Impacts

Cumulative impacts could occur if the wind farm and future projects result in the destruction of cultural resources on the base. In order to comply with the National Historic Preservation Act, future projects would undergo an evaluation of impacts to cultural resources so cumulative impacts are expected to be minimal. However, since there are no major mission changes in the foreseeable future that would result in increased development or population on the base, no cumulative impacts are anticipated.

Visual Resources

Under the No Action alternative, no impacts to visual resources would occur at F. E. Warren AFB. Under the Proposed Action or Alternate Action the following impacts are anticipated.

Direct and Indirect Impacts

For both wind farm alternatives, short-term visual impacts will result from ground disturbance associated with construction of the turbine pads, access roads, and transmission lines. However, successful reclamation of disturbed areas will remove these visual impacts.

Under both alternatives, the wind turbines will be placed on low ridges in open areas where there is little interference to wind flow and wind speeds are greatest. The turbines will be 254 feet tall at the tip of the blades. As a result, the turbines will be visible for up to several miles from some locations. A photograph with the turbines superimposed was developed to depict the wind farm development area at the Proposed Action site (Figure 4). The photograph showing turbines at the Proposed Action site was taken from Building 1502, located approximately 1,600 feet (0.3 miles) south of the site. The turbines at the Alternate Action site would look similar to those at the Proposed Action site from the same distance, although there would be five turbines. Relative to other types of utility projects and facilities, the wind towers would present clean, graceful lines that would not overpower the landscape or obstruct views as do large industrial buildings. Because they would be spaced 1,000 feet apart, they would be much less of a focal point on the landscape than many other large structures (Walla Walla County Regional Planning Department 2000). However, because the landscape within the project area is predominantly flat, the turbines would introduce a strong vertical element into the landscape and create strong contrasts (BLM 1995).

The perceived dominance of the turbines on the landscape depends on the angle of the sunlight striking the turbines, and would vary during the time of day, time of year, and weather conditions. During times of the day and year when the angle of the sun is lower, sunlight striking at a lower angle on the side of the turbines would tend to make them more visible and more prominent than when the sun is more directly overhead.

Due to the proximity of the Cheyenne Municipal Airport, the turbines will have lights on top of the nacelle for aircraft safety. These lights are typically white flashing lights in the daytime and red flashing lights at night. Although aircraft warning lights are designed to be more visible to aircraft than from the ground, the presence of the lights would cause a change in views from nearby residential areas and roadways.

Under the Proposed Action, visual impacts would be greatest for residences on the base, residences in the Rolling Hills subdivision southwest of the base, and residences on the High Plains Grassland Research Station. Under the Alternate Action, visual impacts would be greatest for off-base residences in the Western Hills and Northwestern Hills subdivisions east of the site, residences on the base, and rural residences along Horse Creek Road north of the site. Alternative 2 would have greater visual impacts than the preferred alternative due to presence of more wind turbines, use of an overhead, rather then buried, distribution line, and somewhat closer proximity to residential areas.

Visual impacts are greatly reduced with distance from the wind farm. Although the turbines will likely be visible to residences on higher elevations along the west and north sides of Cheyenne, they will not be visible from most of the City, including the downtown area, because topography and presence of mature trees and buildings would obscure the turbines.

Figure 4. Visual simulation of wind turbines at the Proposed Action site from 0.3 miles south of the site. View to northeast. The large building at left is Building 1501 in the Stage Storage Area. The trees and buildings behind the left wind turbine are the Cheyenne Wastewater Treatment Plant.

Reactions to the turbines would likely vary. Some people would prefer the setting as it now exists without the turbines. Other people, however, may find them to be an interesting and even aesthetic point of visual interest upon the landscape. A survey of people living within 12 miles of wind farms in Scotland found that three times as many residents reported the local wind farm has had a positive impact on the area (20%) than say it had a negative impact (7%). Most (73%) felt that it has had neither a positive or negative impact or expressed no opinion. People living closest to the wind farms (i.e., <3.1 miles) tended to be most positive about them, and those who most frequently see the wind farms in their day-to-day lives were most favorable towards them (Braunholz 2003).

Proposed Management Practices

The turbines will be painted with a flat gray or white, non-reflective paint. This color scheme would cause the wind turbines to recede more quickly as viewing distance increases. To reduce short-term visual resource impacts, vegetation disturbance and the number of cuts and fills for access roads would be minimized. The landscape would be reshaped to its original contour and disturbed areas would be revegetated promptly.

Cumulative Impacts

Since there are no major mission changes in the foreseeable future that would result in increased development or population on the base, no additional changes further impacting visual resources are anticipated on F. E. Warren AFB.

Noise

Under the No Action alternative, no impacts to noise would occur at F. E. Warren AFB. Under the Proposed Action or Alternate Action the following impacts are anticipated.

Direct and Indirect Impacts

Noise impacts in the project area during construction will be temporary and will consist of increased noise levels associated with construction activities. Construction activities associated with development of the wind farm would generate maximum noise levels of 85 to 88 dBA at a distance of 50 feet (BLM 1995). Noise would also be generated by increased traffic on area roadways. The nearest residential developments are located 5,000 feet from the Proposed Action and 4,300 feet from the Alternate Action, and construction noise should be virtually inaudible.

The two sources of noise from operational wind turbines are mechanical noise from the gearbox and aerodynamic noise from the rotor blades. Mechanical noise has virtually disappeared from modern wind turbines due to engineering designs that minimize vibrations. Aerodynamic noise results from turbine blades moving through the air. Blade tips and back edges are currently designed to minimize aerodynamic noise. Noise from moving blades is low frequency, and is therefore less obvious to the human ear. Noise caused by the NEG Micon 950 kw turbine varies with wind speeds. At a distance of approximately 328 feet, noise levels range from 50 dBA at wind speeds of 7 mph to 55 dBA at wind speeds of 22 mph. At 3,280 feet, these levels fall to 28 dBA at wind speeds of 7 mph and to 32 dBA at wind speeds of 22 mph (Jesper Michaelsen, NEG Micon USA, Inc., pers. commun.). To put this noise level into perspective, noise levels of 30 dBA are comparable to a soft whisper, while noise levels of 40 dBA are typical of those in a library (Tipler 1991). The nearest residential developments are located 5,000 feet from the Proposed Action and 4,300 feet from the Alternate Action. At these distances noise from the turbines would be inaudible and no impacts would occur.

If the Alternative Action was selected, helicopter flight paths between the base and missile sights north and east of the base would have to be moved eastward to avoid the turbine development area (Captain Anne-Marie Contreras, pers. commun.). This would place the flight path over residential areas along the Interstate 25 corridor, which would increase noise levels for area residences.

Proposed Management Practices
Regular maintenance and upkeep of construction equipment will reduce noise impacts to some extent. Construction noise may result in a temporary, minor impact to some residences that cannot be eliminated. To minimize impacts, construction will occur during regular business hours to the extent possible.

Cumulative Impacts
Since there are no major mission changes in the foreseeable future that would result in increased development or population on the base, no cumulative impacts are anticipated regarding noise levels on F. E. Warren AFB.

Hazardous Materials, Hazardous Waste and Solid Waste

Under the No Action alternative, there would be no potential to increase hazardous materials at F. E. Warren AFB. Under the Proposed Action or Alternate Action the following impacts are anticipated.

Direct and Indirect Impacts
Although unexploded ordnance is potentially present at both wind farm sites, the presence of ordnance is not sufficient to prohibit development of either site (John Wright, F. E. Warren AFB Installation Restoration Program, pers. commun.). Both areas would have to be cleared of any unexploded ordnance, metals above EPA/State standards, and semivolatile organic compounds and energetics that pose an unacceptable health or environmental risk, prior to commencing construction activities. Any trenching for underground distribution lines within the closed range area would also be required to undergo the same clearance.

During the construction of either wind farm, there is potential for vehicles and construction equipment to spill fuels, oils, and lubricants that could impact soils. The contractor would rent dumpsters from a local sanitation company to collect and dispose of waste materials that could not be reused. A final site cleanup would be made before shifting responsibilities to O&M crews. Because no fuel is burned to power the wind turbines, there will be no spent fuel, ash, sludge or other process waste generated. Several lubricants are used in wind turbines, including gearbox oil, hydraulic fluid, and gear grease. All fluids are contained in the turbine structure, and turbines are designed to limit lubricant leaks. Therefore, spills are not expected.

Proposed Management Practices
If any spills of lubricants, diesel fuel or other hazardous materials occur during construction, the contractor would be required to clean up the spills immediately. If any fluid leaks are detected at operational turbines, the defect causing the leak will be repaired immediately, and the O&M contractor would be required to clean up any spills immediately.

Cumulative Impacts
Any spills of hazardous materials during construction or operation of the wind farm would be minor and would be cleaned immediately. Since there are no major mission changes in the foreseeable future that would result in increased development or population on the base, no cumulative impacts are anticipated regarding hazardous materials on F. E. Warren AFB. Current

remediation of contaminated sites by the base will result in a long-term decrease of hazardous materials on the base.

Utilities

Under the No Action alternative, no impacts to utilities would occur at F. E. Warren AFB. Under the Proposed Action or Alternate Action the following impacts are anticipated.

Direct and Indirect Impacts
Construction and operation of either wind farm alternative would not affect water use on the base. The Proposed Action 1.9 MW wind farm is capable of supplying the required electricity for approximately 600 average homes, and it would produce approximately 5.66 million Kilowatt-hours (Kwh) of electricity, or approximately 13% of the base's annual use of 45 million Kwh. The 4.75 MW wind farm under the Alternate Action would be capable of supplying the electricity needs of approximately 1,500 average homes, and could produce 14.1 million Kwh of electricity, or 31% of the base's annual electricity needs. Construction of either wind farm would reduce the need to purchase electricity from current suppliers.

Proposed Management Practices
No management practices are required for utilities.

Cumulative Impacts
Since there are no major mission changes in the foreseeable future that would result in increased development or population on the base, no cumulative impacts are anticipated regarding utilities on F. E. Warren AFB.

Socioeconomics/Environmental Justice

Under the No Action alternative, no impacts would occur to the social or economic conditions at F. E. Warren AFB. Under the Proposed Action or Alternate Action the following impacts are anticipated.

Direct and Indirect Impacts
Construction of the project will result in the commitment of resources including capital, manpower, and materials. It costs approximately $1 million to purchase and install each turbine; therefore, construction of the Proposed Action would cost approximately $2 million, while construction of the Alternate Action would cost approximately $5 million. Annual maintenance costs average $20,000 per turbine, or $40,000 for the Proposed Action and $100,000 for the Alternate Action. The cost to produce electricity is approximately 5 cents per KWh, which provides a cost savings to the base, after adjustments for maintenance expenditures, of approximately $127,840 per year per turbine, or $256,000 per year for the Proposed Action and $639,200 per year for the Alternate Action. The turbines will pay for themselves after 7.8 years, and the total lifetime cost savings to the base will be approximately $3.8 million per turbine, or $7.67 million for the Proposed Action and $19.0 million for the Alternate Action. The savings to the Air Force associated with the Project will also result in a decrease in profits for utility

companies currently supplying electricity to the base if other markets cannot be found to replace the loss of income.

Several workers would be employed during the construction period for either build alternative. Most construction workers would be employees of the various construction and equipment manufacturing companies under contract to the base. It is likely that construction workers would include a mix of locally hired workers for road and turbine foundation construction, and specialized staff from outside the area for specialized construction (for example, electrical collector system construction, turbine erection, turbine testing). Construction of the project would require use of concrete, fuel, and other equipment and supplies, most of which would be purchased locally. After the Project has been constructed and tested, it is anticipated that a small staff of part-time employees would be required for O&M. Both action alternatives would therefore have a direct impact to the local economy, especially during the construction period.

There is a substantial economic cost associated with pollutants produced by burning fossil fuels to produce electricity in the form of additional health care, development and use of pollution prevention devices, and programs to reduce emissions (BLM 1995). Based on calculations provided in BLM (1995), development of 1.9 MW of electricity under the Proposed Action could result in a cost savings to society of $99,000 to $1.25 million per year over oil, gas and coal fired power plants, and development of 4.75 MW of wind-generated electricity under the Alternate Action could result in cost savings of $247,000 to $3.1 million per year.

On February 11, 1994, President Clinton issued Executive Order 12989 requiring federal agencies to incorporate environmental justice considerations into the NEPA process. The purpose of this order was to ensure that low-income households, minority households, and minority businesses do not experience a disproportionate share of adverse environmental effects resulting from any given federal action. There are no known minority households, minority businesses, or low-income households that would be disproportionately affected by either the Proposed Action or Alternate Action.

Proposed Management Practices

No management practices are proposed for socioeconomics.

Cumulative Impacts

Construction and operation of the project would result in a substantial cost savings to the Air Force over the lifetime of the project and a decrease in profits of area utility companies. The planned deactivation of the Peacekeeper Missile System will result in the loss of approximately 10% of the base population, which will further reduce base expenditures into the local economy. However, the amounts involved are not large enough to significantly change the socioeconomic conditions of the base or region.

8.0 Consultation and Coordination

Agencies contacted concerning this project included the U.S. Fish and Wildlife Service, Federal Aviation Administration, Wyoming Game and Fish Department, and Wyoming State Historic Preservation Office. A notice announcing the availability of the EA for inspection by the public

was placed in the Wyoming Tribune-Eagle on January 26 and 27, 2004. The EA was made available for public inspection at the Laramie County Public Library in Cheyenne, Wyoming for a 30-day period. No responses were received from the public.

The following individuals were contacted, consulted, and/or interviewed during preparation of this environmental assessment or provided relevant information for previous projects that were included in this EA:

Lt. Colonel Stephen Anderson, Operations Officer, Wyoming Air National Guard, Cheyenne, Wyoming
Cheryl Krieger Brown, Specialist, Federal Aviation Administration, Renton, Washington
Richard Bryant, Cultural Resource Manager, F. E. Warren AFB, Cheyenne, Wyoming
Melissia Carter, U.S. Fish and Wildlife Service, Cheyenne, Wyoming
Captain Anne-Marie Contraris, Chief of Flight Safety, F. E. Warren AFB, Cheyenne, Wyoming
Richard Currit, State Historic Preservation Officer, State Historic Preservation Office, Cheyenne, Wyoming
Kenneth Davis, Electrical Engineer, F. E. Warren AFB, Cheyenne, Wyoming
Barry Dishman, Air Traffic Manager, Wyoming Air National Guard, Cheyenne, Wyoming
Robert Dorn, Environmental Consultant and Cheyenne High-Plains Audubon, Cheyenne, Wyoming
Tessa Dutcher, Assistant Data Manager, Wyoming Natural Diversity Database, University of Wyoming, Laramie, Wyoming
Richard Guenzel, District Biologist, Wyoming Game and Fish Department, Laramie, Wyoming
Bruce Gunberg, Operations, Great Lakes Aviation, Cheyenne, Wyoming
Bonnie Heidel, Botanist, Wyoming Natural Diversity Database, University of Wyoming, Laramie, Wyoming
Martin Hicks, District Biologist, Wyoming Game and Fish Department, Wheatland, Wyoming
Scott Hinderman, Cheyenne Airport Manager, Cheyenne, Wyoming
Darren Horstmeier, Chief of Base Development, F. E. Warren AFB, Cheyenne, Wyoming
Kenneth Johnston, Mechanical/Utility Engineer, F. E. Warren AFB, Cheyenne, Wyoming
Doug Keinath, Zoologist, Wyoming Natural Diversity Database, University of Wyoming, Laramie, Wyoming
Brian Kelly, U.S. Fish and Wildlife Service, Cheyenne, Wyoming
Lt. Colonel Scott Kofield, State Army Aviation Officer, Wyoming Army National Guard, Cheyenne, Wyoming
Albert Manville, U.S. Fish and Wildlife Service Biological Resources Division, Arlington, Virginia
Jesper Michaelsen, NEG Micon USA, Inc., Rolling Meadows, Illinois
Mark Nelson, Game Warden, Wyoming Game and Fish Department, Cheyenne, Wyoming
Cathryn Pesenti, Natural Resources Program Manager, F. E. Warren AFB, Cheyenne, Wyoming
Doug Reed, Contracting Specialist, F. E. Warren AFB, Cheyenne, Wyoming
Dr. Ron Ryder, Colorado State University Professor Emeritus, Fort Collins, Colorado
Tom Smith, former Natural Resources Program Manager, F. E. Warren AFB, Cheyenne, Wyoming
Allesa Thomas, Biological Services Administrative Clerical Specialist, Wyoming Game and Fish Department, Cheyenne, Wyoming

Shawn West, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho
John Wright, F. E. Warren AFB Installation Restoration Program, Cheyenne, Wyoming

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Appendix A. Checklist of Birds for F.E. Warren AFB

Appendix B. Correspondence from local, state and federal agencies

STAFF SUMMARY SHEET

	TO	ACTION	SIGNATURE (Surname), GRADE AND DATE		TO	ACTION	SIGNATURE (Surname), GRADE AND DATE
1	90 CES/ CEV	Coord	Villegas GS-12 11 May 04	6	90 SW/ CCE	Coord	Chandler, CAPT, 22 MAY 04
2	90 CES/ CD	Coord	Jarrell GS-14 12 May 04		90 SW/ CCS	Coord	McConnon, 24 MAY
3	90 SW/ JA	Coord	Warnken GS-13 14 May 2004	8	90 SW/ CV	Sign	Kristen Arnold 2 Jun 04
4	90 MSG/ CC	Coord	Whitehead, Col	9	90 CES/ CEV	File	C Pesenti GS-11 8 Jun 04
5	90 SW/ CCEA	Coord	Gaertner #170 5/21	10			

SURNAME OF ACTION OFFICER AND GRADE	SYMBOL	PHONE	TYPIST'S INITIALS	SUSPENSE DATE
Pesenti, GS-11	90 CES/CEVP	5494	CP	

SUBJECT: Final Environmental Assessment and Finding of No Significant Impact, Wind Farm

DATE: 11 May 04

SUMMARY

1. ISSUE: F. E. Warren AFB is proposing to construct a wind farm on the installation. An Environmental Assessment (EA) has been prepared and made available for public review. No comments were received from the public.

2. SUMMARY: The National Environmental Policy Act (NEPA) requires that federal agencies examine the environmental impacts of proposed actions prior to taking those actions. The law also requires federal agencies to allow time for the public to review EAs and submit comments. The environmental impacts of the proposed wind farm have been examined in accordance with NEPA, and the draft assessment was made available for public review from 26 January through 24 February 2004. The public did not submit any comments on the proposed wind farm.

3. The Final Environmental Assessment is located at Tab 1.

4. RECOMMENDATION: 90 SW/CV sign the Finding of No Significant Impact.

V/R

Steve Ditmer

STEVEN W. DITMER, Lt Col, USAF
Commander, 90th Civil Engineer Squadron

1 Tab
Final Environmental Assessment