# PrairieWinds – ND 1 Project
# Basin Electric Power Cooperative
# Ward County, North Dakota

## Application to the North Dakota Public Service Commission for a Certificate of Site Compatibility

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# 1.0 INTRODUCTION

Basin Electric Power Cooperative (Basin Electric) is submitting this application for a Certificate of Site Compatibility (Certificate) to construct the PrairieWinds – ND 1 Project (the Project). The Project is located in Ward County, North Dakota (Figures 1 and 2) and would be approximately 115.5 megawatts (MW) in size. The Project would consist of up to 77 wind turbine generators. Basin Electric will own 77 General Electric (GE) 1.5-MW turbines totaling 115.5 MW. Throughout the application, the 115.5-MW Project will be referred to as PrairieWinds – ND 1. Infrastructure to be constructed or installed includes a substation, operations and maintenance (O&M) building, temporary laydown yard, access roads, meteorological tower, and underground collector lines. Power will be delivered to the grid by an existing Western Area Power Administration (Western) transmission line that runs through the Project area. Western is a federal power marketing agency with the U.S. Department of Energy (DOE).

Basin Electric is a consumer-owned, regional wholesale power supplier headquartered in Bismarck, North Dakota. Basin Electric services 126 member rural electric systems in nine states: Colorado, Iowa, Minnesota, Montana, Nebraska, New Mexico, North Dakota, South Dakota, and Wyoming. These member systems distribute electricity to more than 2.6 million customers. Basin Electric operates a total of 3,508 MW of electric generating capacity, of which 136 MW is wind energy.

## 1.1 COMPLIANCE WITH THE ENERGY CONVERSION AND TRANSMISSION FACILITY SITING ACT CHAPTER 49-22

The North Dakota Energy Conversion and Transmission Facility Siting Act requires an application for a Certificate to meet the criteria set forth in North Dakota Century Code (NDCC) 49-22. The siting of an energy conversion facility is to be made in "an orderly manner compatible with environmental preservation and the efficient use of resources" (NDCC 49-22-02).

To the extent available, Basin Electric has presented information required by the North Dakota Energy Conversion and Transmission Facility Siting Act in this document. Basin Electric considered exclusion and avoidance areas in the selection criteria, and the policy criteria in the design of the Project. In addition, sufficient project design, wind resource, and technical information have been provided for a thorough evaluation of the Project Site. Table 1 outlines the information required to fulfill the requirements for a Certificate with the North Dakota Public Service Commission (Commission or PSC) and where these requirements are addressed in this document.

Basin Electric will submit an application for Conditional Use Permits from Ward County for the wind project. The proposed Project Substation that connects the wind farm collection system to the new substation is an improvement associated with the transmission system and therefore does not require the submission of a Certificate of Corridor Compatibility (Corridor Certificate) or a Route Permit based on its 115 kV size. Power will be delivered to the grid via an existing Western transmission line that runs through the Project Area.

**TABLE 1**

**CERTIFICATE COMPLETION CHECKLIST**

| STATE AUTHORITY | DESCRIPTION | SECTION |
|---|---|---|
| Chapter 49-22 | PSC Guidelines: Energy Conversion and Transmission Facility Siting | 1.1 |
| Section A | Description | 1.2, 1.3, 1.5, 4.4, 6.0-6.6, 9.0 |
| 1. | Type | 1.0, 4.1, Figure 6 and 7 |
| 2. | Product | 1.3.2, 6.1, 6.3 |
| 3. | Size and Design | 1.3.2, 4.1, 4.2, 4.3, 6.0 |
| *a.* | *Gross design capacity* | *1.3.2* |
| *b.* | *Net design capacity* | *1.3.2* |
| *c.* | *Estimated thermal efficiency of the energy conversion process and assumptions* | *N/A* |
| *d.* | *Number of acres the proposed facility will occupy* | *1.3.1, 4.3, 5.1* |
| *e.* | *One (1) copy of all design data reports separate from the application* | *Appendix B* |
| 4. | Time Schedule | 1.4 |
| *a.* | *Certificate of Site Compatibility* | *1.4* |
| *b.* | *Land acquisition complete* | *1.4* |
| *c.* | *Construction start date* | *1.4* |
| *d.* | *Construction complete* | *1.4* |
| *e.* | *Test operations* | *1.4* |
| *f.* | *Commercial production date* | *1.4* |
| *g.* | *100 percent capacity factor* | *1.4* |
| *h.* | *Any expansion or additions* | *1.4* |
| Section B | Studies | Appendix C |
| 1. | Copy of any evaluative studies or assessments of the environmental impact of the proposed facility submitted to any federal, regional, state or local agency | Appendix C |

**TABLE 1**

**CERTIFICATE COMPLETION CHECKLIST**

**(CONTINUED)**

| STATE AUTHORITY | DESCRIPTION | SECTION |
|---|---|---|
| Section C | Need for Facility | 2.0 |
| 1. | An analysis of the need for the proposed facility, including the most recent system studies supporting the analysis of the need | 2.1 |
| 2. | A description of any feasible alternative methods of serving the need | 2.2 |
| 3. | A statement justifying any deviations from the most recent Ten-Year Plan | 2.3 |
| Section D | Location | 1.3.1 |
| 1. | Description of study area | 1.3.1, 1.3.2, 10.0-10.11, Figures 2 and 3 |
| 2. | Utility's policies and commitments to limit the environmental impact of its facilities | Appendix A |
| 3. | Criteria that led to the proposed facility location within the study area | Figures 2 and 3, 1.2, 3.0 |
| 4. | Relative value of each criteria and how the proposed facility location was selected giving consideration to all criteria | 3.0 |
| 5. | Evaluation criteria | 3.0 |
| *a.* | *Exclusion areas* | *3.1, Figures 3 and 15* |
| *b.* | *Avoidance areas* | *3.2, Figures 3 and 17* |
| *c.* | *Selection criteria* | *3.3* |
| *d.* | *Policy criteria* | *3.4* |
| *e.* | *Design and construction limitations* | *3.5* |
| *f.* | *Economic considerations* | *3.6* |
| 6. | Mitigative measures to minimize adverse impacts | 7.2.3, 7.3.3, 7.4.3, 7.5.3, 7.6.3, 7.7.3, 7.8.3, 7.9.3, 7.10.3, 7.11.3, 7.12.3, 7.13.3, 7.14.3, 7.15.3, 7.16.3, 7.17 |
| 7. | Qualifications of the people who contributed to the facility site location study | 11.0 |
| 8. | Maps | Figures |
| *a.* | *Criteria within the study area showing the proposed facility location* | *Figures* |
| *b.* | *One Mylar map showing the same basic features as the criteria maps, including the study area, but not the proposed facility location* | *Figures (Mylar map not required per PSC)* |

**TABLE 1**

**CERTIFICATE COMPLETION CHECKLIST**

**(CONTINUED)**

| STATE AUTHORITY | DESCRIPTION | SECTION |
|---|---|---|
| NDCC 49-22-09 | Factors to be considered in evaluating applications and designation of sites, corridors, and routes | 10.0 |
| 1. | Available research and investigations relating to the effects of the location, construction, and operation of the proposed facility on public health and welfare, natural resources, and the environment | 10.1 |
| 2. | The effects of new energy conversion and transmission technologies and systems designed to minimize adverse environmental effects | 10.2 |
| 3. | The potential for beneficial uses of waste energy from a proposed energy conversion facility | 10.3 |
| 4. | Adverse direct and indirect environmental effects which cannot be avoided should the Project Site or route be designated | 10.4 |
| 5. | Alternatives to the Project Site, corridor or route which are developed during the hearing process and which minimize adverse effects | 10.5 |
| 6. | Irreversible and irretrievable commitments of natural resources | 10.6 |
| 7. | The direct and indirect economic impacts of the proposed facility | 10.7 |
| 8. | Existing plans of the state, local government, and private entities for other developments at or in the vicinity of the Project Site, corridor, or route | 10.8 |
| 9. | Effect of the proposed site or route on existing scenic areas, historic sites and structures, and paleontological or archaeological sites | 10.9 |
| 10. | Effect of the Project Site or route on areas which are unique because of biological wealth or because they are habitats for rare and endangered species | 10.10 |
| 11. | Problems raised by federal agencies, other state agencies, and local entities | 10.11 |

## 1.2 FLEXIBILITY IN SITING

Wind facility siting is a process in which input is considered from several different entities, including local, state and federal agencies and landowners. When considering where to locate the wind farm in North Dakota, Basin Electric identified the current PrairieWinds – ND 1 project area (Project Site) for further investigation because of the pre-existing infrastructure and the expected wind resource and transmission availability. Basin Electric subsequently conducted environmental desktop and field studies of the Project Site, the results of which are embodied in the appropriate sections of this application. The Project Site was identified as an optimal site from environmental, wind resource, transmission, and economic perspectives.

The next step in the development process was to secure the site by entering into agreements with landowners that were interested in having Basin Electric place wind turbines and associated facilities on their property. Once the site was selected and secured, the next step in the process was to identify preliminary turbine locations based on initial site inspection, topographic maps, known environmentally sensitive areas, review of North Dakota's power plant siting exclusion and avoidance areas, review of County Siting requirements, and communications with local, state and federal agencies. These preliminary turbine locations are presented in this application for a Certificate (Figure 2). This preliminary site plan is the commonly accepted standard for applications in other jurisdictions. Basin Electric is not seeking a permit for each wind turbine indicated on the map. Instead, the preliminary layout indicates areas of the site with good wind resource and no known siting issues.

Basin Electric suggests that the Certificate define the site, maximum number of turbines, and structures related to wind generation to be located within the site. Within the permitted site, Basin Electric proposes to locate turbines and other structures related to wind generation subject to appropriate setbacks from environmentally sensitive areas, roads, and residences.

Once the Commission issues the Certificate, Basin Electric will complete the additional studies required by the Certificate or Basin Electric's siting process including appropriate wetland, biological, and cultural resource surveys. Basin Electric will also further evaluate the site based on efficient construction of the Project. In addition, Basin Electric will seek further input from landowners regarding the location of wind facilities. Once these additional studies and communications are completed, preliminary turbine locations are re-evaluated for their appropriateness with the Certificate conditions and buffers. A final

site plan for the Project will be submitted to the Commission prior to construction and a pre-construction meeting held with Commission staff to ensure that the site plan conforms to the Certificate requirements.

Wind project siting is unique in that the project occupies a large area and must not only conform to Certificate conditions but must also optimize the wind resource at the site. Ideally, the Certificate provides the parameters within which the developer may optimize the site. With Certificate conditions in place, the developer is able to proceed with planning and development. Basin Electric believes that this siting process is consistent with North Dakota siting rules and provides Basin Electric the flexibility necessary to develop a timely, cost-effective project in an environmentally responsible manner.

## 1.3 PROJECT SUMMARY

Basin Electric studied potential wind resources in North Dakota for siting an approximately 115.5-MW wind generation facility. Based on this review, Basin Electric selected a Project Site south of Minot, North Dakota (Project Site) for additional study and preparation of an application for a Certificate. Four other alternative project areas were considered during the initial project planning but were not selected based on the economic advantages and available transmission interconnectivity of the Proposed Project Site. Figure 2 identifies the selected Project Site.

The Project Site was identified as optimal from wind resource, transmission interconnection, environmental, and economic perspectives. The proposed Project Site was selected considering the exclusion and avoidance criteria outlined in North Dakota Administrative Code (NDAC) 69-06-08 and was chosen as the location for the proposed wind generation site.

### 1.3.1 Proposed Site

The Project study area is the location within which leases from landowners have been obtained for the Project. The Project Site was selected to include all areas within the Project study area so Basin Electric can optimize wind resources, transmission interconnection opportunities, and economic factors, while avoiding and minimizing impacts to the environmental resources. The Project Site is located in Ward County within the following Township, Range, and Sections (Table 2).

**TABLE 2**

**PROJECT SITE LOCATION**

| TOWNSHIP | RANGE | SECTIONS |
|---|---|---|
| 152N | 83W | 13-15, 20-30, 33-36 |
| 152N | 82W | 19-21, 28-33 |
| 151N | 83W | 1-5, 8-17, 20-22, 27 |
| 151N | 82W | 4-9, 18-19 |

The Project Site is approximately 30,000 acres (47 square miles) and the northern border of the site is located approximately 15 miles south of the City of Minot. The turbines will be placed throughout the Project Site. However, the Project Site will generally occupy less than 1/2 of one percent of the total Study Area acreage. The Project Site location and preliminary layout is shown on Figures 1 through 5.

### 1.3.2 Projected Output

The Project will have a nameplate (gross) capacity of up to 115.5 MW. Assuming a net capacity factor of 39 percent, the projected average annual output is estimated to be 45 MW based on 39 percent capacity factor (c.f.). As with all wind projects, output is dependent upon wind resource, final design, site-specific features, and equipment.

## 1.4 PROJECT SCHEDULE

The commercial operation date is dependent upon permitting, equipment deliveries, and other development activities. Basin Electric is targeting construction for May 2009 provided all pre-construction permits and approvals have been obtained.

1. Certificate of Site Compatibility: Basin Electric anticipates the Certificate will be approved in late spring 2009.
2. Land Acquisition: Basin Electric completed initial acquisition of sufficient easements from landowners in June 2008.
3. Permits: Basin Electric is responsible for undertaking all required environmental studies and will obtain all permits and licenses that are required. Completing permits is on the "critical path" for the Project and will allow Basin Electric to move forward with other commitments on the Project.

4. Equipment Procurement, Manufacture and Delivery: Basin Electric has ordered the wind turbine components.
5. Construction: Construction is scheduled to begin in late spring 2009, subject to road restrictions and weather. The engineering, procurement, and construction (EPC) contractor will be responsible for completing all Project construction, including roads, wind turbine assembly, electrical, and communications work. The construction is projected to be complete in December 2009 assuming construction begins in late spring.
6. Test and Operations: Basin Electric anticipates testing and operations to begin September 2009 and be complete by December 2009.
7. Commercial Operation: Basin Electric anticipates commercial operation of PrairieWinds – ND 1 to begin January 2010.

As discussed in Section 1.3.2, the capacity factor is dependent upon the final design, equipment and site-specific features. The capacity factor is projected to be 39 percent. No expansions or additions to the facility are planned.

## 1.5 PROJECT OWNERSHIP

It is anticipated that Basin Electric will manage the construction of all equipment and associated facilities related to the Project. Basin Electric will own all potential 115.5 MW. Basin Electric will likely select a third-party contractor to perform the majority of the engineering and construction (E&C) of the wind farm. Basin Electric will procure the turbine/tower package directly from a manufacturer for their respective projects.

# 2.0 NEED FOR FACILITY

The need for this facility was analyzed based on present and projected demand for wind energy. This section contains a discussion of the need analysis, alternatives, and the ten-year plan.

## 2.1 NEED ANALYSIS

Basin Electric was formed in 1961 by member cooperatives after the U.S. Department of the Interior announced that the Federal hydropower system would not be able to meet the additional energy requirements of consumers of the U.S. Bureau of Reclamation beyond the winter of 1965. Basin Electric was formed as a wholesale power supplier to plan, design, construct, and operate generating facilities necessary to meet the growing electrical demands of its member systems.

Basin Electric established renewable energy goals in 2005 to meet Basin Electric established internal Renewable Portfolio Standards (RPS). Wind is the most viable renewable technology based on availability and economics. Solar resources in the region are limited and while solar economics are improving, costs are still not competitive with wind. Geothermal and bio-based resources are in some cases cost effective, but are either restricted to limited or distant locations, available in only small quantities, or cause other environmental concerns. In contrast, potential wind resources in the Basin Electric member service territory are generally recognized as excellent, and limited mainly by land use and transmission. A 115.5 MW wind project was determined to be the best available, least-cost renewable resource option to satisfy future load and RPS requirements.

Many areas served by Basin Electric in the project region are experiencing population growth. Basin Electric is experiencing load growth throughout their system in every consumer class (residential, commercial, and industrial).

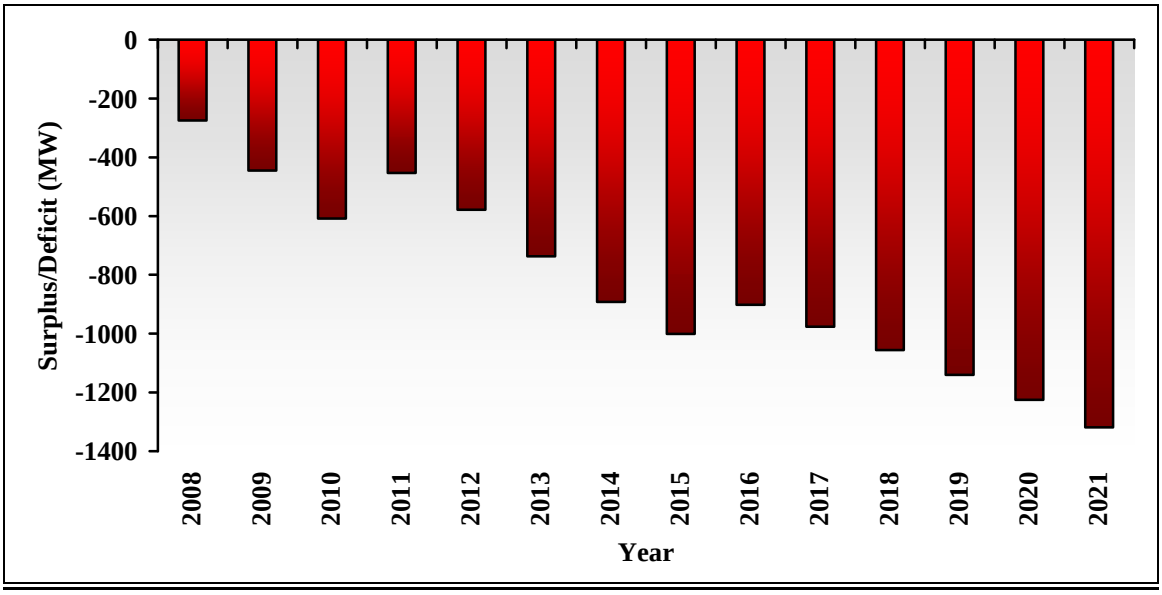
Between 1999 and 2006, Basin Electric system peak demand increased 752 MW from 1,195 to 1,947 MW, or approximately 107 MW per year. Basin Electric system energy sales increased 5.3 million megawatt-hours (MWh) (from 6.5 million MWh to 11.8 million MWh), or approximately 760,000 MWh per year. Basin Electric forecasts peak demand on its system to grow by 1,834 MW from 2006 through 2021, or approximately 122 MW per year. Basin Electric forecasts energy consumption on its system to grow by approximately 12 million MWh from 2006 through 2021, or approximately 800,000 MWh per year. The average expected increase in energy sales compared to the average expected increase in peak

demand results in a 75% annual load factor for the forecasted load growth. Demand is forecasted to double in the next 15 years, with 1,947 MW in 2006 projected to grow 1,834 MW by 2021, and 2006 energy usage at 11.8 million MWh forecasted to grow 12 million MWh by 2021. The load growth is driven mainly by commercial sector growth, which includes energy-related development in the form of coal, oil, and gas development, and also increased loads in the residential sector, mainly located on the outskirts of larger cities within the service territory (Basin Electric 2007).

Basin Electric's total system deficit is 275 MW in 2008 and is forecasted to increase steadily over time. The two periods that do not produce additional deficits from one year to the next are when the Dry Fork Station in Wyoming is anticipated to go commercial in 2011 and when a long-term power supply obligation ends in early 2016 (Basin Electric 2008).

**EXHIBIT 1**

**TOTAL SYSTEM LOAD AND CAPABILITY DURING THE SUMMER SEASON**




According to the Department of Energy, coal generation is the primary energy source in the State of North Dakota (DOE 2008a). According to the report "Wind Energy in North Dakota", prepared for the State of North Dakota Division of Community Services, "North Dakota is motivated to become a leading state in non-polluting wind generated electricity. North Dakota's goals are as follows: general economic development, new wind project investments and construction, new landowner income, and new long-term jobs from broad professional services (such as wind project design, wind resource monitoring, legal and

accounting services), from commercial project O&M (operations and maintenance), and from the manufacturing of wind turbine components" (PanAero Corporation 1999).

Construction of PrairieWinds - ND 1 is required to meet the growing needs for power in Basin Electric's service territory. Basin Electric has established the need to add a renewable energy resource to serve projected member load growth. This project was established on the basis of an ongoing need to address reliability and to supply low cost power to Basin Electric members, including renewable energy sources.

North Dakota has been identified as having more available wind for development than any other state (PanAero Corporation 1999). In recent years, the Mid-Continent Area Power Pool (MAPP) has consistently reinforced the regional need for increased generating capacity in the coming decade. Cost fluctuations and reliability problems serve to reinforce the need for sufficient capacity, low-cost energy, and diverse generation sources. Power producers such as Basin Electric are widely recognized as essential to meeting regional energy needs, stabilizing energy costs, and enhancing energy reliability. The Project offers North Dakota and the Mid-Continent Area Power Pool (MAPP)/Midwest Independent System Operator (MAPP/MISO) region the opportunity to add to capacity adequacy requirements, to stabilize wholesale power prices, and to provide electricity from a clean, cost-effective renewable energy generation facility.

There is a critical need for additional energy production in the MAPP/MISO region. The 2003 MAPP Load and Capability Report stated that, under the minimum reserve requirements, deficits were expected as soon as 2008 (MAPP 2003). MAPP members were urged to build additional capacity in order to maintain reserve levels higher than the MAPP minimum. The most recent MAPP report indicates that deficits are now expected by 2010 (MAPP 2007). Table 3 outlines the MAPP surplus/deficit forecasts through 2016.

**TABLE 3**

**MAPP SUMMER SEASON SURPLUS/DEFICIT***

| YEAR | SURPLUS (+) / DEFICIT (-) (MW) | RESERVE MARGIN PERCENTAGE |
|---|---|---|
| 2007 | +1754 | +5.0% |
| 2008 | +725 | +2.0% |

**TABLE 3**

**MAPP SUMMER SEASON SURPLUS/DEFICIT***

**CONTINUED**

| YEAR | SURPLUS (+) / DEFICIT (-) (MW) | RESERVE MARGIN PERCENTAGE |
|---|---|---|
| 2009 | +82 | +0.2% |
| 2010 | -751 | -2.1% |
| 2011 | -1392 | -3.8% |
| 2012 | -1855 | -5.0% |
| 2013 | -2436 | -6.5% |
| 2014 | -3019 | -8.1% |
| 2015 | -4625 | -12.4% |
| 2016 | -5455 | -14.3% |

* From Pages III-3 and III-4 of the MAPP 2007 Load and Capability Report (MAPP 2007)

While the deficits have been identified, the new sources to fill these voids have not. North Dakota has a unique opportunity to begin providing capacity to meet those forecasted deficits with clean, efficient, renewable energy. The Project intends to be a significant source of energy for meeting the region's needs over the next 30 years.

## 2.2 ALTERNATIVES

Basin Electric recently completed a detailed power supply analysis. The 2007 Power Supply Analysis (PSA) (Basin Electric 2007) provides an in depth look at Basin Electric's current operating system, future load growth, and the framework for future expansion, including both supply-side and demand-side resource expansion. The most economical way to supply power to a load that varies every hour on an electric power system is to have three basic types of generating assets available for use. These generation assets are commonly referred to as baseload[1], intermediate[2], and peaking capacity[3].

[1] Baseload capacity runs at its full capacity continuously throughout the day and night, throughout the year. The output of baseload-type plants cannot be rapidly decreased or increased in response to load. Baseload units are designed to optimize the balance between high capital/installation cost and low fuel cost, resulting in the lowest overall production cost under the assumption that the unit will be heavily loaded for most of its life. Typically, baseload capacity units are operated around 80 percent capacity factor or more. Coal-fired power plants, nuclear plants, and hydroelectric plants are examples of baseload generation capacity; however, hydroelectric plants that respond to load are not considered baseload units.

Twelve resource expansion portfolios were created to meet the anticipated needs of Basin Electric and were evaluated with respect to cost, performance, and risk. All portfolios included some component of wind energy development. The twelve portfolios ranged from emphasizing nearly all baseload development to all peaking development, with various combinations in between. A number of demand-side and supply-side resource alternatives have been considered as a means of meeting the forecasted electrical need for Basin Electric. The alternatives evaluated include:

- Demand Side Management
- Renewable Energy Sources
    - Wind
    - Solar
    - Hydroelectric
    - Geothermal
    - Biomass Power
    - Biogas
    - Municipal Solid Waste
- Fossil Fuel Generation
    - Simple Cycle Combustion Turbines
    - Combined Cycle Combustion Turbines
    - Microturbines
    - Coal Facility
- Nuclear Power
- Repowering/Uprating of Existing Generating Units
- Participation in Another Utility's Generation Project
- Purchased Power / Request for Proposals
- New Transmission Capacity

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[2] Intermediate capacity units are designed to be cycled at low-load periods, such as evening and weekends. The units are loaded up and down rapidly to handle the load swings of the system while the unit is online. Typically, intermediate capacity units are operated between a 20 and 80 percent capacity factor, or between baseload and peaking. Technologies for intermediate-load plants include oil or gas-fired steam cycle plants, combined cycle plants, some hydroelectric plants, and internal combustion engine generators. While not an on-call resource, wind facilities typically have capacity factors ranging from 30 to 40 percent and may be classified as intermediate resources.

[3] Peaking capacity is only operated during peak load periods and during emergencies. Very low capital/installation costs are important because these units are typically not operated very often. The production costs are relatively high due to the high cost and volatility in the price of fuel. Types of peaking capacity power plants include combustion turbines, internal combustion engine plants, and pumped-storage hydroelectric facilities. Typically, peaking resources are operated under a 20 percent capacity factor.

Of the twelve resource expansion portfolios analyzed in the PSA, the preferred portfolio included 300 MW of wind, 200 MW of peaking generation, 250 MW of intermediate generation, and 600 MW of baseload coal generation.

With members in nine states, Basin Electric recognizes the need for additional renewable energy capacity to service forecasted member load growth demands and to meet state mandated Renewable Portfolio Standards (RPS). The PrairieWinds – ND 1 project is proposed as the lowest-cost renewable resource option to satisfy future load and RPS requirements and will meet a portion of Basin Electric's projected wind generation requirement.

## 2.3 TEN-YEAR PLAN

This project will be in the current Ten-Year Plan.

# 3.0 SITE SELECTION CRITERIA

Basin Electric is evaluating the proposed approximately 30,000-acre site to determine the best locations for up to 77 wind turbines. Siting turbines is a process in which input from several different entities is considered, including local, state and federal agencies and landowners. PrairieWinds - ND 1 emerged as an optimal site from an environmental, wind resources, and economic perspective (Figure 2), as discussed below.

Basin Electric secured voluntary wind option agreements with landowners and then identified preliminary turbine locations based on site inspection, topographic maps, known environmentally sensitive areas, review of North Dakota's power plant siting exclusion and avoidance areas, review of Ward County and State of North Dakota wind siting requirements, and communications with local, state, and federal agencies. With this process, Basin Electric not only addresses environmental issues that commonly arise during project development, but also works within the parameters of State rules. North Dakota has several site selection criteria that are considered by the Commission to determine suitability of the site. Basin Electric has reviewed the criteria in Chapter 69-06-08 and has factored these criteria into site design. These criteria are discussed in this section.

## 3.1 EXCLUSION AREAS

Per NDAC 69-06-08-01-1, Table 4 shows geographical areas that must be excluded in the consideration of a site for an energy conversion facility. A buffer zone of a reasonable width must be included to protect the integrity of the area. Exclusion areas are mapped for the Project Site on Figure 3.

## 3.2 AVOIDANCE AREAS

Per NDAC 69-06-08-01-2, Table 5 presents geographical areas that shall not be approved as a site for an energy conversion facility unless the applicant shows that under the circumstances there is no reasonable alternative. In determining whether an avoidance area should be designated for a facility, the Commission may consider: the proposed management of adverse impacts; the orderly siting of facilities; system reliability and integrity; the efficient use of resources; and alternative sites. Avoidance areas are also mapped for the Project Site on Figure 3.

**TABLE 4**

**EXCLUSION AREAS**

| EXCLUSION AREA | PRESENT WITHIN PROJECT SITE? | PROPOSED BUFFER | SECTION(S) ADDRESSED |
|---|---|---|---|
| Designated or registered national areas (parks; memorial parks; historic sites and landmarks; natural landmarks; historic districts; monuments; wilderness areas; wildlife areas; wild, scenic, or recreational rivers; wildlife refuges; and grasslands) | Present | Basin Electric proposes a 0.25 mile buffer around Waterfowl Production Areas. | 7.7, 7.9, 7.13, 7.14, 7.15, Figures 2, 3 and 11 |
| Designated or registered state areas (parks; forests; forest management lands; historic sites; monuments; historical markers; archaeological sites; grasslands; wild, scenic, or recreational rivers; game refuges; game management areas; management areas; and nature preserves) | None | | 7.7, 7.8, 7.9, 7.15, 7.17, Figure 3 |
| County parks and recreational areas; municipal parks; parks owned or administered by other governmental subdivisions; hardwood draws; and enrolled woodlands | None | | 7.8 |
| Prime farmland and unique farmland, as defined in 7 CFR 657 (if the Commission finds that the prime farmland and unique farmland that will be removed from use for the life of the facility is of such small acreage as to be of negligible impact on agricultural productions, such exclusion shall not apply) | Present | No buffer is proposed. Prime farmland has been avoided to the extent practicable. | 7.9, 7.10, Figures 16 and 17 |
| Irrigated land | None | | 7.9, Figure 16 |
| Areas critical to threatened or endangered animal or plant species | None | | 7.16 |
| Areas where animal or plant species that are unique or rare to this state would be irreversibly damaged | None | | 7.13, 7.14, 7.15, 7.16 |

**TABLE 5**

**AVOIDANCE AREAS**

| AVOIDANCE AREA | PRESENT WITHIN PROJECT SITE? | PROPOSED BUFFER | SECTION(S) ADDRESSED |
|---|---|---|---|
| Historical resources which are not designated as exclusion areas | None | Basin Electric conducted a cultural resource survey and will avoid any identified resources. | 7.7, Appendix C |
| Areas within the city limits of a city or the boundaries of a military installation | None | | 7.3, Figures 2 and 3 |
| Areas within known floodplains as defined by the geographical boundaries of the 100-year flood | None | | 7.12 |
| Areas that are geologically unstable | None | | 7.11 |
| Woodlands and wetlands | Present | Basin Electric proposed a 0.25 mile buffer around Waterfowl Production Areas. Wetland resources would be avoided. Woodland area impacts are not anticipated. | 7.13, 7.14, Figures 3, 14 and 19 |
| Areas of recreational significance which are not designated as exclusion areas | None | | 7.8 |

## 3.3 SELECTION CRITERIA

Per NDAC 69-06-08-01-3, a site shall be approved in an area only when it is demonstrated to the Commission by the applicant that any significant adverse effects resulting from the location, construction, and operation of the facility in that area, as they relate to the selection criteria, will be at an acceptable minimum, or that those effects will be managed and maintained at an acceptable minimum. Selection criteria for this project are listed in Table 6.

## 3.4 POLICY CRITERIA

Per NDAC 69-06-08-01-4, the Commission may give preference to an applicant that will maximize benefits that result from the adoption of the following policies and practices, and in a proper case may require the adoption of such policies and practices. Policy criteria for this project are listed in Table 7.

**TABLE 6**

**SELECTION CRITERIA**

| SELECTION CRITERIA | POTENTIAL ADVERSE EFFECTS | SECTION ADDRESSED |
|---|---|---|
| ***Impact on Agriculture:*** | | |
| Agricultural production | The placement of 77 turbines will impact approximately 4 acres of land. Improvements to existing roads and construction of new roads will impact approximately 69 acres of land. Construction of the substation and O&M building will impact approximately 2 acres of land. The Project will not result in significant adverse effects to agriculture. | 7.3, 7.9 |
| Family farms and ranches | No turbines will be placed within 1000 feet of occupied residences. Land area may be lost for roads and turbines. Basin Electric will compensate landowners for the use of their land. | 7.2, 7.3, 7.10; Figures 3, 4, and 5 |
| Land which the owner demonstrates has soil, topography, drainage, and available water supply that cause the land to be economically suitable for irrigation | No irrigation is occurring in the project area. Affected landowners have not communicated concerns. | 7.9, 7.10; Figures 16 and 17 |
| Surface drainage patterns and ground water flow patterns | The project will be constructed to have no adverse effects on surface drainage or groundwater flow. | 7.11, 7.12, 7.13; Figure 17 |
| Agricultural quality of the cropland | No adverse impacts to cropland are anticipated. | 7.9, 7.10 |
| ***Impact on Availability and Adequacy of:*** | | |
| Law enforcement | No adverse effects are expected. | 7.4 |
| School systems and education programs | No adverse effects are expected. | 7.4 |
| Governmental services and facilities | No adverse effects are expected. | 7.4 |
| General and mental health care facilities | No adverse effects are expected. | 7.4 |
| Recreational programs and facilities | No adverse effects are expected. | 7.4 |
| Transportation facilities and networks | Minor impacts to transportation may occur during construction. No adverse impacts are expected during project operation. | 7.4; Figures 4 and 10 |
| Retail service facilities | No adverse effects are expected. | 7.4 |

**TABLE 6**

**SELECTION CRITERIA**

**CONTINUED**

| SELECTION CRITERIA | POTENTIAL ADVERSE EFFECTS | SECTION ADDRESSED |
|---|---|---|
| Utility services | No adverse effects are expected. Basin Electric is cooperating with Western who will provide transmission. | 2.0, 6.0, 7.4 |
| ***Impact on:*** | | |
| Local institutions | No adverse effects are expected. | 7.4 |
| Noise sensitive land uses | No adverse effects are expected. Turbines will be sited more than 1,000 feet from occupied residences. | 7.6, Figures 3, 4, 5 |
| Rural residences and businesses | No adverse effects are expected. Turbines will be sited more than 1,000 feet from occupied residences. | 7.2, 7.3, 7.10, Figures 3, 4 and 5 |
| Aquifers | No adverse effects are expected. | 7.11 |
| Human health and safety | No adverse effects are expected. | 6.3, 6.5.2, 6.5.3, 7.5 |
| Animal health and safety | Mitigative measures will be taken to protect and monitor wildlife. No adverse impacts to livestock are likely to occur. | 7.10, 7.16, 7.15, Appendix C.2 |
| Plant life | The placement of 77 turbines will impact approximately 4 acres of land. Improvements to existing roads and construction of new roads will impact approximately 69 acres of land. Construction of the substation and O&M building will impact approximately 2 acres of land. The Project will not result in significant adverse effects to plant life. | 7.9, 7.14, Figure 14 |
| Temporary and permanent housing | No adverse effects are expected. | 7.2 |
| Temporary and permanent skilled and unskilled labor | No adverse effects are expected. Construction and operation will result in increased employment in the project area. | 7.2 |
| The cumulative effect of the location of the facility in relation to existing and planned facilities and other industrial development | No adverse effects are expected. | 7.3 |

**TABLE 7**

**POLICY CRITERIA**

| POLICY CRITERIA | SUITABLE POLICY OR PRACTICE OF APPLICANT | SECTION ADDRESSED |
|---|---|---|
| Recycling of the conversion byproducts and effluents | Not Applicable | Not Applicable |
| Energy conservation through location, process, and design | Basin Electric will develop a site layout that optimizes wind resource while minimizing the impact on land resources and any potentially sensitive areas. Wind-powered electric generation is entirely dependent on the availability of the wind resource at a specific location. The energy available from the wind increases at the third power of the wind speed. A doubling of the wind speed will increase the available energy by a factor of eight times. Design of the turbine array and collection system will minimize energy loss due to wind turbine wakes and turbulence and electrical line losses. | 4.2 |
| Training and utilization of available labor in this state for the general and specialized skills required | Basin Electric anticipates using local labor for the project. | 7.2 |
| Use of a primary energy source or raw material located within the state | North Dakota has large areas of wind power Classes 4 and 5, indicting the potential for good to excellent wind energy resource development. PrairieWinds – ND 1 proposes to use this resource. | 5.2 |
| Non-relocation of residents | No residents will be relocated. | 6.5, 7.2, 7.3, 7.9 |
| The dedication of an area adjacent to the facility to land uses such as recreation, agriculture, or wildlife management | The Project will not interfere with recreation, agriculture, or wildlife management. | 7.3, 7.8, 7.9, 7.15, Figure 9 |
| Economies of construction and operation | Basin Electric will employ local labor to construct and operate the Project. | 7.2 |
| Secondary uses of appropriate associated facilities for recreation and enhancement of wildlife | Not Applicable | Not Applicable |
| Use of citizen coordinating committees | Basin Electric has and will coordinate with the local citizenry. | 8.0 |

**TABLE 7**

**POLICY CRITERIA**

**CONTINUED**

| POLICY CRITERIA | SUITABLE POLICY OR PRACTICE OF APPLICANT | SECTION ADDRESSED |
|---|---|---|
| A commitment of a portion of the energy produced for use in this state | Energy produced by PrairieWinds – ND 1 would be used and transmitted by Western. | 2.1, 6.1 |
| Labor relations | No labor relations will be impacted. The Project will increase employment. | 6.5, 7.2 |
| The coordination of facilities | Existing transmission corridors, facilities, and resources were considered in siting the Project. | 3.0, 3.6 |
| Monitoring of impacts | Basin Electric proposes to implement mitigative measures and best management practices (BMP) to minimize any potential impacts. Basin anticipates implementing post-construction wildlife monitoring. | 7.11, 7.15, 7.16 |

## 3.5 DESIGN AND CONSTRUCTION LIMITATIONS

In general there are two design and construction limitations when building any wind farm: wind resources and landowner easements. The wind resource is essential to selecting and designing a wind farm. Basin Electric conducts a thorough analysis of sites they select to ensure that the site has ample wind energy to generate revenue for the wind farm. Easements are another limitation to the design and construction of the Project. Basin Electric secured or will secure voluntary land agreements with landowners necessary to develop the wind project.

Specific to the Project, there are several additional items that are limiting factors when designing and constructing the Project. Ward County has its own regulations affecting turbine placement. These setbacks limit the amount of land available for wind development.

As noted in Section 3.6, proximity to adequate transmission is imperative to wind project siting.

The U.S. Fish and Wildlife Service (USFWS) administers fee title Waterfowl Production Areas (WPA) and wetland and grassland easements on private property as part of their National Wildlife Refuge System. There are limitations to construction on these lands. Basin Electric proposes setbacks from WPAs and plans to avoid wetlands, including those within easements. Any direct impacts to USFWS wetland or grassland easements will result in a compatibility assessment by local USFWS staff. The process considers the magnitude of the impact, the type or quality of the habitat that is impacted, and the feasibility of avoiding the impact. If compatibility is found, a right-of-way (ROW) permit will be issued for the impact. Figure 3 identifies the USFWS WPAs and wetland easements within the Project Site.

## 3.6 ECONOMIC CONSIDERATIONS

Economics were considered when selecting a location for the Project. As discussed above, it is important to select a site with a wind resource capable of generating sufficient energy. The PrairieWinds ND 1 project has ample wind resources in the area. Information on the wind resource at the site is discussed in Sections 5.2 and 5.3.

Another factor that is considered in relation to economics is the availability of a transmission system in the vicinity of the Project Site. Furthermore, having permission to interconnect into an existing transmission system is essential. If no transmission system is present, the cost of interconnection increases due to the need of constructing a lengthy transmission line and large substation to an existing electricity service provider. In the Project Site, there is currently adequate transmission capacity. Power from the Project Site would be supplied to Basin Electric's customers through an interconnection with the Integrated System (IS), of which Western is the control area operator.

# 4.0 GENERAL DESCRIPTION OF THE PROPOSED FACILITY

This section contains a discussion of the wind project proposed in this application. The description includes a general discussion of wind power technology and a summary of the project layout, associated facilities, and land rights.

## 4.1 WIND POWER TECHNOLOGY

Wind turbines convert the power in wind into electricity by utilizing a turbine to extract the kinetic energy of moving air and to produce the mechanical power used to turn an electrical generator**.** As the wind passes over the blades of a wind turbine, it creates lift and causes the rotor to turn. The rotor is connected by a hub and main shaft to a system of gears, which are connected to a generator. Exact turbine models employed on this project are subject to change to ensure selection of a turbine that is both cost effective and optimizes land and wind resources. Basin Electric is proposing to use up to seventy-seven 1.5 MW turbines. This application uses GE 1.5 MW machines, model 1.5sle, as a representative turbine for the 1.5 MW Class (GE 2005). Basin Electric may elect to select turbines by other turbine vendors.

The GE Wind Energy 1.5 MW utility-grade wind turbine, model 1.5sle, has a nominal nameplate rating of 1,500 kilowatts (kW). Each turbine will have an 80 meter (262-foot) hub height and a rotor diameter (RD) of 77 meters (253 feet) (Figure 6). The GE 1.5 MW turbine has a minimum operational wind speed of 3.5 meters per second (m/s), or 7.8 miles per hour (mph), and reaches its rated capacity (1,500 kW) at a wind speed of 14 m/s (31.3 mph). The cutout wind speed is approximately 25 m/s (55.9 mph).

Each tower will be anchor-bolted to an underground spread footing or concrete shell design. The base would be up to 40 feet in diameter underground with up to 20 feet in diameter of concrete exposed at the surface. The foundation thickness depends on the geologic conditions. A control panel inside the base of each turbine tower houses communication and electronic circuitry. Each turbine is equipped with a wind speed and direction sensor that communicates to the turbine's control system to signal when sufficient winds are present for operation. These turbines feature variable-speed control and independent active blade pitch control to ensure aerodynamic efficiency.

The electricity generated by each turbine is brought to a pad-mounted transformer where the voltage is raised (stepped up) to power collection line voltage of 34.5 kilovolts (kV). The electricity is collected by a system of underground power collection lines within the Project Site. Both power collection lines and

communication cables will be direct-buried on private property or public ROW. Typically, this infrastructure is run adjacent to the Project access roads or along public ROWs or easements. In cases where such infrastructure must be sited on property that is not governed by the existing wind easement and land lease options, Basin Electric will obtain easements for the necessary property.

Each wind turbine will be accessible via all-weather aggregate-surfaced roads up to 20 feet in width providing access to the turbines from public roads. At the point where the access and public roads meet, the communication and power lines will continue as underground feeder lines. Figure 7 is a diagram of the path of energy from the wind farm to energy users. Figure 8 shows a typical wind farm facility layout. The feeder system delivers power to the Project Substation. At the Project Substation, the power will be transformed to 115 kV and transmitted to an existing overhead 115-kV transmission line.

### 4.1.1 PrairieWinds Project Layout

Basin Electric will develop a site layout that optimizes wind resource while minimizing the impact on land resources and any potentially sensitive areas. Wind-powered electric generation is entirely dependent on the availability of the wind resource at a specific location. The energy available from the wind increases at the third power of the wind speed. A doubling of the wind speed will increase the available energy by a factor of eight times. Design of the turbine array and collection system will minimize energy loss due to wind turbine wakes and turbulence and electrical line losses.

Ward County has established setbacks of the maximum tower height for wind towers from road rights-of-way, and occupied residences. Based on experience with other wind farms, Basin Electric proposes setbacks of 0.25 miles from USFWS WPAs, 500 feet from any large (greater than 50 acre) wetland complex, the height of the wind turbine from any developed road or transmission line; and 1,000 feet from occupied residences. The towers are multi-coated conical tubular steel with a hub height of 80 meters (262 feet). Table 8 identifies the minimum setbacks applicable to the Project. Basin Electric will request a building permit for the project.

**TABLE 8**

**SETBACK DISTANCES FOR WIND TURBINES**

| SETBACK TYPE | DISTANCE |
|---|---|
| Road Right of Way | 390 feet |
| Occupied Residence | 1,000 feet |
| USFWS WPA | 1320 feet |
| Overhead Transmission and Distribution Lines | 390 feet |

## 4.2 ASSOCIATED FACILITIES

Infrastructure to be constructed or installed includes a substation, access roads, O&M building, and buried collector lines. Power will be delivered to the grid via an existing Western transmission line that runs through the site.

An O&M building will be constructed within the Project Site near the Project Substation. See Section 6.5.3 for a description of the O&M building.

## 4.3 LAND RIGHTS

Basin Electric has obtained or will obtain easements for an approximate 115.5 MW project. Land rights will encompass the proposed wind farm and all associated facilities, including but not limited to wind and buffer easements, wind turbines, access, underground collector and feeder lines, and overhead transmission lines located on public roads when necessary.

# 5.0 PROPOSED SITE

This section contains a discussion of wind resources at the proposed Project Site. The discussion includes a summary of Project Site selection criteria, a general description of wind resource areas, and wind characteristics at the Project Site.

## 5.1 IDENTIFICATION OF THE PROJECT SITE

In addition to wind resource considerations, the Project Site was selected based on its proximity to existing transmission infrastructure and landowners' interest in participating in the Project. Land use patterns and environmentally sensitive features were factored into the site selection criteria. The site boundary encompasses an area of approximately 30,000 acres. However, the land occupied by the wind farm will be less than ½ of 1 percent of this area, assuming up to seventy-seven 1.5 MW capacity turbines with access roads. It is anticipated that the area of direct land use for the turbines and associated facilities will be approximately 75 acres, including aggregate-surfaced access roads up to 20 feet wide for the 1.5-MW turbines. Section 7.0 presents a detailed description of the Project Site impacts. Figures 4 and 5 show preliminary turbine locations, which are subject to change during micrositing. Micrositing is the process of determining exactly where each turbine will stand in a wind project. Many factors influence engineers during the micrositing process.

## 5.2 WIND RESOURCE AREAS - GENERAL

As a renewable resource, wind is classified according to wind power classes, which are based on typical wind speeds. These classes range from Class 1 (the lowest) to Class 7 (the highest). In general, wind power Class 4 or higher can be useful for generating wind power with large (utility-scale) turbines. Figure 9 is a map of the United States showing general wind power classes.

Wind Powering America within the U.S. Department of Energy National Renewable Energy Laboratory (U.S. DOE NREL) is a commitment to dramatically increase the use of wind energy in the United States. Wind Powering America indicates that North Dakota has wind resources consistent with utility-scale production, with good to excellent wind resource areas located throughout North Dakota. The American Wind Energy Association estimated the annual wind electricity generation potential in North Dakota to be 1,210 billion kWh.

The DOE and the North Dakota Division of Community Services have conducted wind resource assessment studies in North Dakota. The May 2004 DOE wind map for the state of North Dakota indicates that the wind resources within the Project vicinity are Class 5 winds or greater (DOE 2008b). The average wind speed for Class 5 areas ranges from 16.8 to 17.9 mph (Figure 10).

Basin Electric reviewed and analyzed meteorological information for North Dakota and the Project Site. This information is described in Section 5.3.

## 5.3 WIND CHARACTERISTICS IN PROJECT SITE

To ensure economic feasibility of a wind energy facility, it should be located in an area with the high potential for power production. As such, the focus for a potential site should narrow to areas of wind power Class 5 (excellent wind resource potential) within North Dakota. North Dakota has large areas of wind power Classes 4 and 5, indicting the potential for good to excellent wind energy resource development. Areas of excellent wind resource potential are located along portions of the northwest to southeast trending Missouri Coteau, in the vicinity of the Turtle Mountains located in the extreme north-central portion of the state, and in smaller areas scattered throughout western North Dakota (Figure 10).

Basin Electric utilized wind data from meteorological towers on the Project Site for siting purposes. In addition, Basin Electric has secured information from other long-term references to aid in correlating the wind data on site.

The resulting local wind climate was applied in conjunction with the Project Site effects to predict the spatial wind variations at the Project Site. Various site layouts and wind turbine generator parameters can be tested to predict the energy production and array efficiency to optimize the site layout and turbine selection.

# 6.0 ENGINEERING AND OPERATIONAL DESIGN ANALYSIS

This section provides a summary description of the Project, which includes a description of the Project layout, turbines, electrical system, and associated facilities. A summary of this information is included in the Design Data Report (Appendix B). Additional information addressed in this section is project construction, schedule, operation, and decommissioning of the site. Currently, Basin Electric wishes to preserve the right to evaluate and select turbine equipment of varying sizes and outputs. There are other turbines that are feasible choices for the PrairieWinds – ND 1 site that are available from various manufacturers. Turbine type may affect the number and configuration of the turbine array. The currently proposed turbine array proposed utilizes up to 77 wind turbines. Details for the GE 1.5 MW turbines, model 1.5sle, are presented below (GE 2005).

## 6.1 PRAIRIEWINDS PROJECT LAYOUT AND ASSOCIATED FACILITIES

The Project will consist of an array of wind turbines and transformers. The turbines will be interconnected by underground communication and 34.5 kV power collection lines.

Land will be graded on-site for the turbine pads. Drainage systems, access roads, storage areas, and O&M facilities will be installed as necessary to fully accommodate all aspects of Project construction, operation, and maintenance.

The electrical system design and interconnection details will be determined as a result of studies and discussions with Western. The Project includes a computer-controlled communications system that permits automatic, independent operation, and remote supervision, thus allowing the simultaneous control of many wind turbines. Basin Electric will be responsible for Project operation and maintenance for the life of the Project. Basin Electric will contract with the most appropriate supplier of operations and maintenance services at the time of operation, to assure timely and efficient operations.

## 6.2 DESCRIPTION OF WIND TURBINES

Basin Electric anticipates using up to seventy-seven GE 1.5 MW turbines. Basin Electric seeks the flexibility to select the most appropriate technology at the time for the Project to ensure optimization of wind and land resources and cost efficiency. Basin Electric will update the site layout, consistent with the

parameters laid out in the Certificate, when equipment is selected and if information regarding the wind resource identifies opportunities to further optimize the site.

### 6.2.1 Turbine

In this application, Basin Electric provides information on the GE 1.5-MW machine, model 1.5sle, as a proxy for the 1.5 MW class of turbine (GE 2005). Figure 6 represents the components of a typical wind turbine. The GE 1.5 MW turbine has a minimum operational wind speed of 3.5 m/s (7.8 mph) and reaches its rated capacity (1,500 kW) at a wind speed of 14 m/s (31.3 mph). The cutout wind speed is approximately 25 m/s (55.9 mph) for 10-minute average.

The 1.5 MW turbines have active yaw and pitch regulation and asynchronous generators. The turbines use a bedplate drive train design where all nacelle components are joined on common structures to improve durability.

The 1.5 MW turbines have Supervisory Control and Data Acquisitions (SCADA) communication technology to control and monitor the wind farm. SCADA communications system permits automatic, independent operation and remote supervision, thus allowing the simultaneous control of many wind turbines. The computerized data network will provide detailed operating and performance information for each wind turbine. Basin Electric will maintain a computer program and database for tracking each wind turbine's operational history. Other specifications of the turbines include:

- rotor blade pitch regulation;
- gearbox with three-step planetary spur gear system;
- doubly fed three-phase asynchronous generator (575-volt) and an asynchronous 4-pole generator with a wound rotor;
- a braking system for each blade (three self-contained systems) and a hydraulic parking brake (disc brake); and
- electromechanically-driven yaw systems.

### 6.2.2 Rotor

The rotor consists of three blades mounted to a rotor hub. The hub is attached to the nacelle, which houses the gearbox, generator, brake, cooling system, and other electrical and mechanical systems. The

preliminary 1.5 MW turbine design identifies a 77 meter (253 feet) RD, with a swept area of 4,657 square meters (50,128 square feet). The rotor speed will be 11.0 to 20.4 revolutions per minute (rpm) for the 1.5 MW turbines.

### 6.2.3 Tower

The towers are multi-coated conical tubular steel with a hub height of 80 to 100 meters (262 to 328 feet). The turbine towers, on which the nacelle is mounted, consist of three to four sections manufactured from certified steel plates. All welds are made in automatically-controlled power welding machines and are ultrasonically inspected during manufacturing per American National Standards Institute (ANSI) specifications. All surfaces are sandblasted and multi-layer coated for protection against corrosion. Access to the turbine is through a lockable steel door at the base of the tower.

### 6.2.4 Lightning Protection

Each turbine is equipped with a lightning protection system. The turbine is grounded and shielded to protect against lightning. The grounding system will be installed during foundation work and must be designed for local soil conditions. The resistance to neutral earth must be in accordance with local utility or code requirements. Lightning receptors are placed in each rotor blade and in the tower. The electrical components are also protected.

## 6.3 DESCRIPTION OF ELECTRICAL SYSTEM

At the base of each turbine, a step-up transformer will be installed to raise the voltage to power collection line voltage of 34.5 kV. Power will be run through an underground collection system to the Project feeder system that will feed power to the Project Substation. The electrical lines will be buried in trenches adjacent to the Project access roads. At the point where the access and public roads meet, the collection system will continue as underground lines. All utility protection and metering equipment will meet Basin Electric and National Electric Safety Code (NESC) standards. The construction manager will ensure that proper interconnection protection is established.

## 6.4 PRAIRIEWINDS PROJECT CONSTRUCTION

Several activities must be completed prior to the proposed commercial production date. The majority of the activity relates to equipment ordering lead time and design and construction of the facility. Below is a preliminary schedule of activities necessary to develop the Project. Pre-construction, construction, and post-construction activities for the Project include:

- ordering all necessary components including towers, nacelles, blades, foundations, and transformers;
- finalizing turbine locations;
- complete survey to microsite locations of structures and roadways;
- soil borings, testing and analysis for proper foundation design and materials;
- complete construction of access roads to be used for construction and maintenance;
- construction of underground feeder lines;
- design and construction of the Project Substation;
- installation of tower foundations;
- installation of underground cables;
- tower placement and wind turbine setting;
- acceptance testing of facility; and
- commencement of commercial production.

Private turbine access roads will be built adjacent to the towers, allowing access to the turbines during and after construction. These roads may be up to 20 feet wide and have an aggregate surface as cover. They will be adequate to support the size and weight of maintenance vehicles. The specific turbine placement will determine the amount of private roadway that will be constructed for the Project.

During the construction phase, several types of light-, medium-, and heavy-duty construction vehicles will travel to and from the site, as will private vehicles used by the construction personnel. Basin Electric estimates that there will be approximately 50 vehicle trips per day in the area during peak construction periods. That volume will occur during the peak time when the majority of the road, foundation, and tower assembly are taking place. At the completion of each construction phase, this equipment will be removed from the site or reduced in number.

### 6.4.1 Construction Management

An EPC contractor will be primarily responsible for the construction management of the Project. The EPC contractor will use the services of local contractors, where possible, to assist in Project construction. The EPC contractor, in coordination with Basin Electric and local contractors, will undertake the following activities:

- securing building, electrical, grading, road, and utility permits;
- performing detailed civil, structural, and electrical engineering;
- scheduling execution of construction activities;
- completing surveying and geotechnical investigations; and
- forecasting Project labor requirements and budgeting.

The EPC contractor also serves as key contact and interface for subcontractor coordination. The EPC contractor will oversee the installation of communication and power collection lines and the substation. The EPC contractor will also oversee the installation of roads, concrete foundations, towers, machines, and blades, and the coordination of materials receiving, inventory, and distribution. The Project will be constructed under the direct supervision of the on-site construction manager with the assistance of local contractors. The construction consists of the following tasks:

- site development, including roads
- foundation excavation
- installation of concrete foundations
- electrical and communication system installation
- tower assembly and machine erection
- system testing

The construction team will be on site to handle materials purchasing, construction, quality control, testing, and startup. The EPC contractor will manage local subcontractors to complete aspects of construction. Throughout the construction phase, ongoing coordination occurs between the Project development and the construction teams. The on-site project construction manager helps to coordinate all aspects of the Project, including ongoing communication with local officials, citizens groups, and landowners. Even before the Project becomes fully operational, the O&M staff is integrated into the construction phase of

the Project. The construction manager and the O&M staff manager work together continuously to ensure a smooth transition from construction through wind farm commissioning and, finally, operations.

### 6.4.2 Foundation Design

The pad would be excavated with a backhoe, and the excess material would be transported off-site for disposal or disposed of according to landowner wishes and according to applicable regulations. Concrete forms would be placed into the excavation, and concrete poured. Each tower will be anchor-bolted to an underground spread footing or concrete shell design. The base would be up to 40 feet in diameter underground with up to 20 feet in diameter of concrete exposed at the surface. The foundation thickness depends on the geologic conditions**.** During construction, a minimum of a 135-ft radius from the tower foundation would be required for the crane pad, rotor lay down and construction area, and various construction related activities.

### 6.4.3 Substation

Basin Electric proposes to construct a new substation on approximately 2 acres in the SW 1/4 of the NW1/4 of Section 1 Township 151 North Range 83 West 5$^{th}$ Principal Meridian. Access to the proposed substation is from existing county roads. The substation would connect the new 34.5 kV underground collection lines to Western's 115 kV transmission line. The substation would be located adjacent to the existing Western 115 kV transmission line. Initial construction would include site grading and construction of a soil pad.

The substation would consist of concrete foundations, steel structures, electrical insulators, and outdoor electrical equipment such as transformers, switches, circuit breakers, and capacitor banks. The site would be secured with fencing and access would be limited. Associated with the substation would be an approximate 4,000 square foot O&M building.

### 6.4.4 Access Roads

Access to the wind project area would be along existing gravel or paved county roads. Existing roads may be upgraded by Basin Electric to accommodate the construction vehicles and haul equipment. Construction of additional roads may be necessity to access specific turbine locations. Any news roads would likely be 16 – 20 feet wide and constructed of gravel. The road network is presented on Figure 4.

In some instances, larger turnaround areas may be need for trucks and equipment hauling project components. The entire project is estimated to require 19.3 miles of new roads, 8.93 miles of upgrades to existing roads, and several acres of turnaround and temporary staging areas. Areas that are disturbed by construction of temporary roads or turnaround areas are expected to recover naturally with vegetative reestablishment or will be reseeded with native vegetation after the temporary roads are permanently removed.

### 6.4.5 Civil Works

Completion of the Project will require various types of civil works and physical improvements to the land. These civil works may include the following:

- improvement of existing public access roads to the Project Site;
- construction of roads adjacent to the wind turbine strings (turbine access roads) to allow for construction and continued servicing of the wind turbines;
- clearing and grading for wind turbine tower foundation installations;
- trenching for underground cabling for connecting the individual wind turbines;
- installation of an on-site feeder system to connect wind turbine strings for delivery to the electricity collection/metering location;
- clearing and grading for the O&M building;
- installation of any site fencing and security; and
- restoration and re-vegetation of disturbed land when construction activities are completed.

Any improvements to existing public access roads will consist of regrading and filling of the surface to allow access even in inclement weather. No asphalt or other paving is anticipated. Turbine access roads will be constructed along turbine strings or arrays. These roads will be sited in consultation with local landowners and completed in accordance with local building requirements where these roads interface with public roads. They will be located to facilitate both construction (cranes) and continued operation and maintenance. Siting roads in areas with unstable soil will be avoided wherever possible. All roads will include appropriate drainage and culverts while still allowing for the crossing of farm equipment. The roads may be up to 20 feet wide and will be covered with road base designed to allow passage under inclement weather conditions. The roads will consist of graded dirt and will be covered with an aggregate surface. Once construction is completed, the roads will be regraded, filled, and dressed as needed.

### 6.4.6 Commissioning

The Project will be commissioned after completion of the construction phase. The Project will undergo detailed inspection and testing procedures prior to final turbine commissioning. Inspection and testing will be conducted for each component of the wind turbines, as well as the communication system, obstruction lighting, collection and feeder system, and the SCADA system.

## 6.5 PROJECT OPERATION AND MAINTENANCE

Each wind turbine in the Project will communicate directly with the SCADA system for the purposes of performance monitoring, energy reporting and trouble-shooting. Under normal conditions each wind turbine operates autonomously, making its own control decisions. The Project will be operated and maintained by Basin Electric.

Basin Electric and the appropriate supplier will control, monitor, operate, and maintain the Project by means of a SCADA computer software program. In addition to regularly scheduled on-site visits, the wind farm may be monitored via computer.

The SCADA system offers access to wind turbine generation or production data, availability, meteorological, and communications data, as well as alarms and communication error information. Performance data and parameters for each machine (generator speed, wind speed, power output, etc.) can also be viewed, and machine status can be changed. There is also a "snapshot" facility that collects frames of operating data to aid in diagnostics and troubleshooting of problems. The primary functions of the SCADA system are to:

- monitor wind farm status;
- allow for autonomous turbine operation;
- alert operations personnel to wind farm conditions requiring resolution;
- provide a user/operator interface for controlling and monitoring wind turbines;
- collect meteorological performance data from turbines;
- monitor field communications;
- provide diagnostic capabilities of wind turbine performance for operators and maintenance personnel;
- collect wind turbine and wind farm material and labor resource information;

- provide information archive capabilities;
- provide inventory control capabilities; and
- provide information reporting on a regular basis.

### 6.5.1 Maintenance Schedule

Basin Electric will remotely monitor the Project on a daily basis. This monitoring will be accompanied by a visual inspection by the on-site operating staff. Several daily checks will be made in the first three months of commercial operation to ensure the Project is operating within expected parameters. Once installed, the Project service and maintenance is carefully planned and divided into the following intervals:

(1) First service inspection

The first service inspection will take place one to three months after the turbines have been commissioned. At this inspection, particular attention is paid to the tightening up of all bolts by 100 percent, a full greasing, and filtering of gear oil.

(2) Semi-annual service inspection

Regular service inspections commence six months after the first inspection. The semi-annual inspection consists of lubrication and a turbine safety test.

(3) Annual service inspection

The annual service inspection consists of a semi-annual inspection plus a full component check. Bolts are checked with a torque wrench. The check covers 10 percent of every bolt assembly. If any bolts are found to be loose, all bolts in that assembly are tightened 100 percent and the event is logged.

(4) Two years service inspection

The two years service inspection consists of the annual inspection, plus checking and tightening of terminal connectors.

(5) Five years service inspection

The five years inspection consists of the annual inspection, an extensive inspection of the wind braking system, checking and testing of oil and grease, balance check, and tightness of terminal

connectors.

### 6.5.2 General Maintenance Duties

The O&M field duties comprise performing all scheduled and unscheduled maintenance, including periodic operational checks and tests; and regular preventive maintenance on all turbines, related plant facilities and equipment, safety systems, controls, instruments, and machinery, including:

- maintenance on the wind turbines and the mechanical, electrical power, and communications system;
- performance of all routine inspections;
- maintenance of all oil levels and changing oil filters;
- maintenance of the control systems, all Project structures, access roads, drainage systems, and other facilities necessary for the operation;
- maintenance of all O&M field maintenance manuals, service bulletins, revisions, and documentation for the Project;
- maintenance of all parts, price lists, and computer software;
- maintenance and operation of Project Substation;
- supplying all labor, services, consumables, and parts required to perform scheduled and unscheduled maintenance on the wind farm, including repairs and replacement of parts and removal of failed parts;
- cooperation with avian and other wildlife studies as may be required to include reporting and monitoring;
- management of lubricants, solvents, and other hazardous materials as required by local and/or state regulations;
- maintenance of appropriate levels of spare parts in order to maintain equipment
- ordering and maintenance of spare parts inventory;
- providing all necessary equipment including industrial cranes for removal and reinstallation of turbines;
- hiring, training, and supervising a work force necessary to meet the general maintenance requirements; and
- implementing appropriate security methods.

### 6.5.3 Operations and Maintenance Facility

The final location and layout of the O&M facility will be adjacent to the Project Substation and will be provided prior to construction. Typically, buildings used for this purpose are approximately 5,000 square feet and house all the necessary equipment to operate and maintain the Project. Generally, an associated septic system and a well are installed near the O&M building.

## 6.6 DECOMMISSIONING AND RESTORATION

Basin Electric has a contractual obligation to the landowners to remove the wind facilities, including foundations (NDAC 69-09-09). Basin Electric is responsible for decommissioning PrairieWinds – ND1 and for all costs associated with decommissioning that facility and associated facilities.

Decommissioning and site restoration would include dismantling and removal of all towers, turbine generators, transformers, and overhead cables; removal of underground cables to a depth of twenty-four inches; removal of foundations, buildings, and ancillary equipment to a depth of three feet and removal of surface road material and restoration of the roads and turbine sites to substantially the same physical condition that existed immediately before construction of the commercial wind energy conversion facility or wind turbine (NDAC 69-09-09).

The site will be restored and reclaimed to the same general topography that existed just prior to the beginning of the construction. Areas disturbed by the construction of the facility and decommissioning activities would be graded, topsoiled, and reseeded according to natural resource conservation service technical guide recommendations and other agency recommendations (NDAC 69-09-09).

Prior to commencement of operation of the Project Basin Electric shall file for commission review, the estimated decommissioning cost per turbine for the proposed facility and a comprehensive decommissioning plan that describes how the facility or turbine owner or operator plans to pay for decommissioning.

Basin Electric also reserves the right to explore alternatives regarding Project decommissioning at the end of the Project Certificate term.

# 7.0 ENVIRONMENTAL ANALYSIS

This section provides a description of the environmental conditions that exist within the Project Site. Consistent with North Dakota Energy Conversion and Transmission Facility Siting Act, the exclusion and avoidance criteria, as well as selection and policy criteria, were considered in the selection and design of the site. To support this siting process, maps of the site were generated that indicate the presence or absence of many of the criteria highlighted in NDCC 69-06-08. Basin Electric's Policies And Commitments To Limit Environmental Impact are included in Appendix A.

## 7.1 DESCRIPTION OF ENVIRONMENTAL SETTING (INTRODUCTION)

The Project Site is located in Ward County in North Dakota, a primarily rural agricultural area located east and west of U. S. Highway 83 and north and south of North Dakota Highway 23. With the exception of the City of Minot, land within Ward County is primarily agricultural with scattered farmstead residences.

In 2006, Ward County had a population of 55,270, a decline of 6.0 percent from the 2000 census level (Census 2008). Cities and small unincorporated towns near the Project Site include Minot (36,567), Sawyer (population 196), Max (population 278), Des Lacs (population 209), Berthold (population 450), and Benedict (population 53) (Census 2001).

The closest city with services is Max, located seven miles south of the Project Site. The community of Max has an economy focused on agriculture, ranching, and recreation. Max has a post office, two mini-marts, cafe, elevator, automotive repair, bank, insurance agency, realtor, car dealership, hair salons, museum, four churches, lounges, funeral chapel, gas station, bulk gas and fuel and a fertilizer plant, along with several types of construction businesses. Max is also considered the gateway to Lake Audubon and Lake Sakakawea, with only 15 miles to fishing and water sports. The nearest hospital is Trinity Hospital in Minot, North Dakota.

Schools in the vicinity are encompassed by the Max School District 50 (in Max city limits), School District 70 with South Prairie Elementary School located five miles north of the Project Site, and the Minot Public School District located within the city limits of Minot, North Dakota.

## 7.2 DEMOGRAPHICS

The Project is located within a sparsely populated rural area in northern North Dakota. There is no indication of any new residential construction on the site. Information on demographics and housing for this section was taken from the 2000 U.S. Census (Census 2001). This section includes a description of resources, impacts, and mitigative measures.

### 7.2.1 Description of Resources

The site is located in portions of Gasman, Newman, Rushville, and Iota Flats Townships in Ward County, North Dakota. The population of Ward County was estimated to be 55,270 in 2006 and populations of the Townships within the Project are listed in Table 9. The per capita income and poverty levels in these townships vary in comparison to the County average. Table 9 summarizes the population and economic characteristics within the Project Site. According to the 2000 U.S. Census, the largest industries employing residents of Ward County are Retail Trade and Educational, Health, and Social Services. The Three Affiliated Tribes – Hidatsa, Arikara, and Mandan (the Three Affiliated Tribes) is located approximately 30 miles west of the Project Area. This reservation may represent the closest minority or low-income populations in the region

**TABLE 9**
**POPULATION AND ECONOMIC CHARACTERISTICS**

| LOCATION | POPULATION | PER CAPITA INCOME | PERCENTAGE OF POPULATION BELOW POVERTY LEVEL |
|---|---|---|---|
| North Dakota | 619,197 | $17,769 | 11.8 |
| Ward County | 56,580 | $16,926 | 10.8 |

### 7.2.2 Impacts

Short-term impacts to socioeconomic resources will be relatively minor. Under the 1.5 MW turbine development scenario (for up to 77 turbines), up to 75 acres of agricultural land will be removed from production due to conversion to turbine sites and associated access roads. Landowner compensation will be established by individual lease agreements. In general, agricultural areas surrounding each turbine can

still be farmed. In addition, in an environment of uncertain and often declining agricultural prices and yields, the supplemental income provided to farmers from wind energy leases will provide stability to farm incomes and thus will help assure the continued viability of farming in the Project Area. Project construction will not cause additional impacts to leading industries within the Project Site. There is no indication that any minority or low-income population is concentrated in any one area of the Project, or that the wind turbines will be placed in an area occupied primarily by any minority group.

To the extent that local contractors are used for portions of the construction, total wages and salaries paid to contractors and workers in Ward County will contribute to the total personal income of the region. Additional personal income will be generated for residents in the County as well as the State by circulation and recirculation of dollars paid out by the applicant as business expenditures and state and local taxes. Expenditures made for equipment, energy, fuel, operating supplies and other products and services benefit businesses in the counties and the state.

It is likely that general skilled labor is available either in the County or the State to serve the basic infrastructure and site development needs of the Project. Specialized labor will be required for certain components of the wind farm development; it is likely that this labor will be imported from other areas of the State or from other states as the relatively short duration of construction does not warrant special training of local or regional labor. Balancing the use of local contractors and imported specialized contractors will likely alleviate any labor relation issues.

No effects on permanent housing are anticipated. During construction, out-of-town laborers will likely use lodging facilities in and around the City of Minot. Operation and maintenance of the facility will require few laborers; sufficient permanent housing is available within the County to accommodate these laborers.

Overall, socioeconomic impacts of the construction of the Project Site would be slightly positive as a result of associated food, lodging and other expenditures, with an expected influx of temporary workers for several months during installation of the wind project. During operation and maintenance of the facility (25 years or more), managerial staff and full time skilled technicians would be hired based on the skill set of the employee. Also, land on which facilities would be located is primarily leased private land. This would provide an extra income to landowners within the Project Site and would compensate for any potential farmland losses due to surface disturbance as a result of wind turbines and other infrastructure. Basin Electric can expect to pay approximately $675,000 annually for property taxes associated with the

wind project. This amount includes the property tax assessed to Prairie Winds-ND 1 and the additional gross receipts tax paid by Basin Electric on the sale of the energy purchased from Prairie Winds-ND 1.

Long-term beneficial impacts to the County's tax base as a result of the construction and operation of the wind farm will contribute to improving the local economy in this area of North Dakota. The development of wind energy in this region will be important in diversifying and strengthening the economic base of northern North Dakota. Continuing to establish the north central region of North Dakota as an important producer of renewable energy sources, such as wind, may spur the development of wind-related businesses in the area, in turn contributing to the economic growth in the region.

### 7.2.3 Mitigative Measures

Socioeconomic impacts associated with the Project will be primarily positive with an influx of wages and expenditures made at local businesses during the Project construction and an increase in the County's tax base from the construction and operation of the wind turbines and associated infrastructure. In addition, the lease payments paid to landowners will offset potential financial losses associated with removing the land from agricultural production.

## 7.3 LAND USE

The Project will be located in Ward County, east and west of U.S. Highway 83 and north and south of North Dakota Highway 23. The Project proposes to install approximately 115.5 MW of wind power, consisting of up to 77 wind turbines within the 30,000-acre Project Area. The current land use within the Project Area is rural agricultural land used for crops and livestock grazing. This section includes a description of resources, impacts, and mitigative measures regarding land use.

### 7.3.1 Description of Resources

The land in Ward County within the Project Area boundary is primarily agricultural with scattered farmstead residences. According to the North Dakota County Tax Auditor, Ward County has retained zoning rights at the county level.

The Project Area is not within the Minot city limits or within an area of known military installation. The development of the PrairieWinds – ND 1 Project will not displace any residences or existing or planned industrial facilities. Wind turbines will be sited a minimum of 1,000 feet from occupied residences.

Based on a review of aerial photographs, land use database information, and visits to the Project Site, it was determined that the majority of the land area at the site is crop land use. Table 10 identifies current land use in the Project Site based on the USFWS database. Over fifty (50) percent of the Project Site is used for agricultural purposes. Native cover forms approximately fourteen (14) percent of the Project Site and are primarily used for grazing livestock. Native grasslands include remnant native prairie of various quality dependent on grazing pressure and herbicide applications to control weed species.

**TABLE 10**

**MAJOR HABITATS AND THEIR RELATIVE ABUNDANCE IN THE PROJECT SITE**

| HABITAT | ACREAGE | PERCENT OF PROJECT SITE |
|---|---|---|
| Native cover | 4,331 | 14% |
| Wetlands | 4,729 | 16% |
| Developed lands | 67 | 0.2% |
| Agricultural lands | 16,093 | 53% |
| Barren lands | 451 | 1.5% |
| Planted | 4,526 | 15% |

### 7.3.2 Impacts

The development of the wind project will not result in a significant change in land use. The area will retain the rural sense and remote characteristics of the vicinity. Wind turbines will be sited a minimum of 1,000 feet from occupied residences. At other wind developments in the upper Midwest, landowners frequently plant crops and/or graze livestock to the edge of the access roads and turbine pads. The access roads are likely 20 feet wide and low profile, so they are easily crossed while farming. Basin Electric will work closely with the landowners in locating access roads to minimize land use disruptions to the extent possible. Consideration will be taken in locating access roads to minimize impact on current or future row crop agriculture and environmentally sensitive areas. During the construction of the wind power

facilities, additional areas may be temporarily disturbed for contractor staging areas and underground power lines. These areas will be graded to original contour and if necessary reseeded with appropriate vegetation.

The permanent site layout has not been determined, but installation of an approximately 115.5 MW facility will result in the conversion of approximately 4 acres of land assuming seventy-seven 1.5 MW turbines. Basin Electric is planning approximately 8.9 miles of road improvements and an additional 19.3 miles of new access roads. The Project facilities will also include an O&M facility, and Project Substation. These areas will be permanently converted from agricultural land use into wind facilities. Approximately 2 acres will be converted for the Project Substation and O&M facility. Approximately 5 acres of land will be temporarily impacted for contractor staging and lay down areas and approximately 4 acres of land will be impacted by the turbines.

At other wind farms, the public has expressed concerns over potential devaluation of property in and adjacent to proposed wind projects. A study published in 2002 evaluated the potential economic impacts of constructing and operating the wind plants in Kittitas County, Washington. The report concluded that, "Views of wind turbines will not negatively impact property values. Based on a nationwide survey conducted of tax assessors in other areas with wind power projects, we found no evidence supporting the claim that views of wind farms decrease property values" (ECONorthwest 2002).

### 7.3.3 Mitigative Measures

Basin Electric is working closely with the landowners, the USFWS, and other agencies in locating wind turbines and access roads to minimize land use disruptions and impacts to environmentally sensitive areas to the extent possible. Operation of the wind farm will not change the land use in the Project Area. The proposed land use will not involve any ongoing industrial use of non-renewable resources or emissions into the environment.

## 7.4 PUBLIC SERVICES

The Project is located in a lightly populated, rural area in northern North Dakota. The closest major town to the Project Site is the City of Minot, which is the Ward County seat. This section includes a description of resources, impacts, and mitigative measures regarding public services available in the City of Minot.

### 7.4.1 Description of Resources

Six resources were analyzed for this section. These resources include: Local Services; Electrical Service; Roads, Traffic; Water Supply; and Telephone, Fiber Optic, and Microwave Communications.

Local Services

There is an established transportation and utility network that provides access and necessary services to the light industry, small cities, homesteads, and farms existing near the Project Site. The City provides sanitary sewer, water, utility services, educational facilities, and recreational facilities such as an auditorium and parks. Additionally, the City's local services include an airport, emergency services, police services, and a hospital. There are also several local retail service facilities and organizations.

Electrical Service

Existing 115-kV transmission lines and lower voltage distribution lines exist in the project area.

Roads

County and township (section line) roads characterize the existing roadway infrastructure in and around the Project Site. There are two State Highways within and adjacent to the Project Site. Highway 83 runs through the eastern portion of the Project Site north to south. Highway 23 runs through the northern portion of the Project Site east to west.

Traffic

The existing traffic volumes on the area's county highways are documented in Table 11 and Figure 12. Determining the specific capacity of any highway is a complex process; however, general estimates are used for planning purposes. For purposes of comparison, the functional capacity of a two-lane paved rural highway is approximately 5,000 vehicles per day, or Average Daily Traffic (ADT).

Additional county and township roads run through the Project Site, but have no count data available. In general, the North Dakota Department of Transportation (NDDOT) indicated that roads under 100 ADT are rarely counted. Table 11 shows the existing ADT and commercial truck traffic for roads near the Project Site (NDDOT 2005).

**TABLE 11**

**EXISTING DAILY TRAFFIC LEVELS**

| ROADWAY SEGMENT | EXISTING AVERAGE ANNUAL DAILY TRAFFIC (ADT)/COMMERCIAL TRUCK TRAFFIC |
|---|---|
| Highway 83 4-lanes through eastern portion of Project Area | 4,250/650 |
| Highway 23 2-lanes through northern portion of Project Area | 975/130 |

Water Supply

Townships have limited public infrastructure services, which is typical of most townships. Homes typically utilize septic systems and water wells for their household needs.

Telephone, Fiber Optic, and Microwave Communications

Potential impacts of proposed construction and operation of the Project on existing telecommunications infrastructure within Ward County were assessed. Comsearch identified 48 microwave paths in the search area, including several that intersect the Project Site. Proposed turbine locations were not provided to Comsearch; therefore, potential obstructions between proposed turbines and microwave systems could not be determined. Basin Electric will evaluate final turbine locations to identify areas where potential conflicts with turbine locations exist or to identify a vertical height clearance to be obtained if a turbine is located within a Worst Case Fresnel Zone (WCFZ) (Comsearch 2007).

### 7.4.2 Impacts

The Project is expected to have a minimal effect on the existing services and infrastructure. The following text provides a brief description of the impacts that may occur during the construction and operation of the Project.

Local Services

No impact is expected to local services.

Electrical Service

The Project will require service from the local electric provider when the wind project is not generating electricity.

Roads

Constructing the Project will require up to 19.3 miles of new aggregate-surfaced access roads assuming seventy-seven 1.5 MW turbines. During operation of the Project, the access roads will be used by operation and maintenance crews while inspecting and servicing the wind turbines. The access roads will be between towers, offset as necessary to allow for adequate crane access. One road will be required for each string. The permanent access roads will be approximately 20 feet wide and low profile to allow cross-travel by farm equipment.

Traffic

The maximum construction workforce is expected to generate approximately 50 additional vehicle trips per day. Using any combination of State and County highways and other township roads throughout the Project Site, the traffic impacts are considered negligible. Since many of the area roadways have minimal ADT currently, the addition of 25 vehicle trips represent a large percentage increase (and likely will be perceptible), but will still be less than seasonal variations such as autumn harvest. The capacity of any route and Level-of-Service to the traveling public will not be impacted.

Water Supply

Construction and operation of the Project will not significantly impact the water supply. The abandonment of any wells is not required for the Project. The Project will not require appropriation of surface water or permanent dewatering; temporary dewatering of groundwater may be required during construction of turbine foundations. It is likely that the Project will require a single domestic-sized well for the O&M facility.

Telephone, Fiber Optic, and Microwave Communications

Construction and operation of the Project will not impact the telephone and/or fiber optic service to the Project Site. Basin Electric will evaluate final turbine locations to identify specific microwave telecommunications paths and areas where potential conflicts with turbine locations exist. Mitigative measures are discussed below regarding microwave communications. Land mobile telecom system impacts are not anticipated.

### 7.4.3 Mitigative Measures

Construction and operation of the Project will be in accordance with all associated local, federal, and state permits and laws, as well as industry construction and operation standards. Because of the minor impacts expected on the existing infrastructure during Project construction and operation, extensive mitigation measures are not anticipated.

Local Services

With the addition of the substation no impact to local services is anticipated, and no mitigation is required.

Electrical Service

Basin Electric will purchase service from a local electrical utility. Western will suggest appropriate configurations for the electrical system and Basin Electric will abide by the recommendations to prevent impacts to the transmission system. Basin Electric has established a setback of 390 feet from existing transmission lines. No additional mitigation is necessary.

Roads

Basin Electric is working closely with the landowners to locate access roads to minimize land-use disruptions to the extent possible. A map depicting the preliminary layout of the turbines and access roads is shown in Figures 4 and 5.

Traffic

No impacts are anticipated; as such no mitigation is necessary.

Water Supply

In the event wells are abandoned, they will be sealed as required by North Dakota law. If temporary dewatering of groundwater is required during construction activities, discharge of dewatering fluid will be conducted under the requirements of the National Pollutant Discharge Elimination System (NPDES) permit and Storm Water Pollution Prevention Plan (SWPPP).

Telephone, Fiber Optic, and Microwave Communications

Utilities Underground Location Center will be contacted prior to construction to locate and avoid underground facilities. To the extent Project facilities cross or otherwise affect existing telephone or fiber

optic lines or equipment, Basin Electric will enter into agreements with service providers so as to avoid interference with their facilities. Turbines will be sited to avoid WCFZ areas identified by Comsearch.

## 7.5 HUMAN HEALTH AND SAFETY

This section includes a description of resources, impacts, and mitigative measures regarding human health and safety.

### 7.5.1 Description of Resources

Four resources were analyzed for this section. These resources include: Air Traffic; Electromagnetic Fields; Hazardous Materials / Hazardous Waste; and Security.

Air Traffic

Minot International Airport is located approximately 2 miles north of the central business district of the City of Minot in Section 12, Township 155 North, Range 83 West. The airport is located approximately 20 miles north of the Project boundary. There are two paved runways at an elevation of approximately 1,716 feet above mean sea level. This airport supports small commercial aircraft.

Electromagnetic Fields

The term electromagnetic fields (EMF) refers to electric and magnetic fields that are present around any electrical device. Electric fields arise from the voltage or electrical charges and magnetic fields arise from the flow of electricity or current that travels along transmission lines, power collection (feeder) lines, substation transformers, house wiring, and electrical appliances. The intensity of the electric field is related to the voltage of the line and the intensity of the magnetic field is related to the current flow through the conductors (wire). EMF can occur indoors and outdoors. However, there are no known discernible health impacts from power lines. Turbines will be no closer than 1,000 feet from occupied residences where EMF will be at background levels, and collector lines would be buried.

Hazardous Materials / Hazardous Waste

The site is located in a relatively rural area of North Dakota. Hazardous wastes from large industrial or commercial activities are not likely. Potential hazards may exist in rural areas from old gasoline facilities, landfill sites, and private activities.

Potentially hazardous materials associated with the Project include fluids found in association with turbines and substation/transformer equipment. There will be three types of fluids used in the operation of the wind turbines that are petroleum products: gear box oil, hydraulic fluid, and gear grease. These fluids are necessary for the operation of each turbine. The transformers contain mineral oil.

Security

The Project Site is located in an area that has a low population density. Construction and operation of the Project will have minimal impacts on the security and safety of the local populace.

### 7.5.2 Impacts

The Project is expected to have a minimal effect on human health and safety. The following text provides a brief description of the impacts that may occur during the construction and operation of the Project.

Air Traffic

The installation of wind turbines creates a potential for air traffic collision. The wind turbines will be visible from a distance and will have lighting and markings that comply with Federal Aviation Administration (FAA) requirements. In addition, the FAA's review will include evaluation of any potential interference with air traffic.

Electromagnetic Fields

While the general consensus is that electric fields pose no risk to humans, the question of whether exposure to magnetic fields potentially can cause biological responses or even health effects continues to be the subject of research and debate. Based on the distance between any turbines or buried collector lines and houses, the Project is not expected to impact public health and safety as a result of EMF.

Hazardous Materials / Hazardous Waste

Significant findings are not anticipated due to the known historic uses of the property. The Applicant does not anticipate generating any hazardous wastes.

Security

Project construction and operation will have minimal impacts to security and safety of the local community.

### 7.5.3 Mitigative Measures

Construction and operation of the Project will be in accordance with all associated local, federal, and state permits and laws, as well as industry construction and operation standards. Because of the minor impacts expected on the existing infrastructure during Project construction and operation, extensive mitigation measures are not anticipated.

Air Traffic

Basin Electric is coordinating with FAA on the Project layout and lighting and will seek approval from FAA. Wind turbines and meteorological towers will have lighting and markings according to FAA requirements that minimize any potential for air traffic impacts.

Electromagnetic Fields

The Project is not expected to have EMF impacts. No mitigation is proposed.

Hazardous Materials / Hazardous Waste

Since no significant findings are anticipated, no mitigation is proposed at this time. All petroleum fluids will be contained within the wind turbines and electrical equipment. Any petroleum wastes generated will be handled and disposed of in accordance with local, state and federal regulations.

Security

Several security measures will be taken to reduce the chance of physical and property damage, as well as personal injury, at the site. First, the towers will be placed approximately 390 feet from road ROW and 1,000 feet from occupied residences. These distances are considered to be safe based on developer experience and are consistent with the required local setbacks. They also serve to reduce noise. Next, security measures will be taken during the construction and operation of the Project, including temporary and permanent (safety) fencing, warning signs, and locks on equipment and wind power facilities. Also, turbines will sit on solid steel enclosed tubular towers in which all electrical equipment will be located, except for the pad-mounted transformer. Access to the tower is only through a solid steel door that will be locked when not in use. Where necessary or requested by landowners, Basin Electric will construct gates or fences.

## 7.6 NOISE

This section includes a description of resources, impacts, and mitigative measures regarding noise impacts.

### 7.6.1 Description of Resources

The Project Area is located in a rural, predominantly agricultural area. As a result, sources of background noise to rural residents and occasional visitors to the area include wind, agricultural activity, recreation (primarily hunting), and vehicles traveling on Highways 83 and 23, county roads, and low-traffic gravel roads. As such, the background noise levels are relatively low at about 38 - 43 A-weighted decibels (dBA) except during periods of high wind when the turbines would be operating (Figure 13).

### 7.6.2 Impacts

Basin Electric is proposing to install up to 77 wind turbines over an approximate 47 square mile Project area near Minot, North Dakota. GE has committed to providing the project with 1.5 MW turbines that will result in a mean A-weighted sound power level of < 104 dBA at wind speeds from 9 m/s to cutout speed (about 25 m/s) at hub height when measured using standard procedures. The primary source of noise from the GE turbines is from the wind interacting with the rotor blades producing a swishing sound that is relatively constant over the wind speed range indicated above. However, the level of background noise created by the wind continues to increase as the speed increases. At these higher wind speeds, the turbine noise is masked by the wind-generated noise.

The equipment located in the nacelle of the turbines also produces noise, but it is controlled through design features and is well contained by the nacelle housing. It is of less significance than the swishing sound from the rotor blades.

Noise generated by construction activities would occur intermittently over the construction period and would be generated by an increase in traffic on local roads, as well as heavy equipment operation. Available estimates from other wind project construction projects indicate that the maximum noise levels from heavy equipment would be 85 to 88 dBA at a distance of 50 feet (Western 2007). During construction some noise creating activities will be closer to residences as heavy equipment for turbines are moved and as collector lines are buried. Construction noise in any one location would be limited to

working hours and for the short period that construction would occur in any one area (generally a week or less). Given that the distance to residences from any turbine is expected to be greater than 1,000 feet, noise levels from turbines are not expected to be a concern

### 7.6.3 Mitigative Measures

The primary mitigation measure used for wind turbines is setback distance. Basin Electric is committed to the 1,000-foot setback distance from occupied residences. This setback distance has proven sufficient and acceptable to the communities in North Dakota.

Special conditions can occur which are difficult to predict such as periods of high wind shear events where there is little masking wind noise at surface level but at hub-height there is sufficient wind for energy generation. Residents in homes that are poorly insulated or highly exposed without any vegetation nearby may perceive a higher indoor noise level than those in a typical well insulated home. It should be noted that the noise model predicts outdoor noise levels only and assumes no shielding by trees or other vegetation.

## 7.7 CULTURAL AND ARCHAEOLOGICAL IMPACTS

This section includes a description of resources, impacts, and mitigative measures regarding cultural and archaeological impacts.

### 7.7.1 Description of Resources

Cultural resources are the locations of past human activity defined by artifacts, features or architectural structures. These sites allow us to develop a better understanding of the lifeways and behaviors of early societies. Some sites may contain information important for research, public interpretation, and use by future generations.

In compliance with regulations established in the 1966 National Historic Preservation Act (NHPA), 36 CFR Part 800, 12 cultural resource surveys have been conducted in the Project Site (Table 12). These projects recorded eight sites and one isolate. Site types include stone rings, a lithic scatter, a road, a town hall, and homesteads and farmsteads. Of these sites, one is recommended eligible to the National Register of Historic

Places (NRHP), three are potentially eligible, one is recommended as not eligible, and the eligibility of the remaining three sites is undetermined.

A Class III cultural resource inventory was performed at the Project Area. The inventory examined 83 turbine locations (including alternate locations), access roads and underground collector lines which totaled 1,484 acres. This inventory identified 31 sites and three isolated finds. Of the 31 sites, 19 are prehistoric sites, 11 are historic sites and one is a multi-component site. The prehistoric sites include 18 stone feature sites and one depression site. The historic sites include two architectural sites and nine archaeological sites. The multi-component sites consist of historic architectural features, historic archaeological remains and a prehistoric stone feature. The three isolated finds consist of two lithic tools and one lithic flake, all of which are made of Knife River Flint. Of these sites, one is recommended eligible to the NRHP, 10 are not recommended eligible and the eligibility of the remaining 20 sites is undetermined (Ethnoscience 2008).

**TABLE 12**

**CULTURAL RESOURCE PROJECTS IN THE PROJECT AREA**

| Reference | Project Description and Location |
|---|---|
| Franke, N. 1976 | Right-of-way from Stanton to Kenmare; Sec. 4, 9, T151N R82W and Sec. 21, 28, T152N R82W. |
| Snortland, J. 1978 | Hwy 83 Survey; Sec. 3, 4, 9, 10, N1/2 of 15, S1/2 and S1/2N1/2 of 16, N1/2 of 21, S1/2 of 22, N1/2 of 27, T151N R83W; N1/2 of Sec. 22, 27, 28, 33, 34, T152N R83W. |
| O'Brien, L. 1979 | Test Excavation at 32WD117 and 32WD119, Sec. 3, 15, T151N R83W |
| Good, K. and J. Dahlberg, 1981 | Mitigation Plan for Transmission Line; Sec. 3, T151N R83W. |
| Gregg, M. and P. Picha, 1990 | Erosion Control Survey; NE1/4 of Sec. 31 and SE1/4 of Sec. 32, T152N R82W. |
| Blikre, L. and J. Borchert, 1991 | Surfacing Survey of County Rd. No. 20; S edge of Sec. 13, 14, 15 and the N edge of Sec. 22, 23, 24, T152N R83W. |
| Stine, E., 2000 | US Hwy 2 and 83 and ND Hwy 3 and 5 Survey; along those portions of Sec. 3, 4, 9, 10, N1/2 of 15, S1/2 and S1/2N1/2 of 16, N1/2 of 21, S1/2 of 22, N1/2 of 27, T151N R83W; N1/2 of Sec. 22, 27, 28, 33, 34, T152N R83W that the highways run. Survey corridor ranged from 33 to 75 ft on each side of the highway centerline. |
| Morrison, J. 2002 | Water Pipeline Survey; Portions in S1/2 of Sec. 15 and the N1/2 of Sec. 22, T152N R83W. |
| Bluemle, W. 2003 | Water Pipeline Survey; Portions in Sec. 22, 27, 34, T152N R83W; and Sec. 3, 9, 10, 15, 22, 27, T151N R83W. |
| Jennings, S. and J. Lee 2005 | Evaluative Testing of 32WD1548; WSWSW of Sec. 22, T151N R83W. |

**TABLE 12**

**CULTURAL RESOURCE PROJECTS IN THE PROJECT AREA**

**CONTINUED**

| Reference | Project Description and Location |
|---|---|
| Kinney, J. 2006 | Survey of DOT Borrow Areas; SWNENW of Sec. 33, T152N R83W. |
| Fandrich, B. and L. Peterson, 2006 | Hwy 23 Survey; S edge of Sec. 13, 14, 15, and the N edge of Sec. 23, 24, T152N R83W. |

### 7.7.2 Impacts

To comply with Section 106 of the NHPA, an area of potential effect (APE) for cultural and historical resources must be defined that is specific to the proposed undertaking. Areas of direct effect would be associated with turbine and substation construction, laydown areas, access roads and underground collector lines. The APE is 988 acres.

One National Register eligible property (32WD1637) is present in The Project Site. This site is recommended eligible based on Criteria A and C. Measures would be taken to ensure this site is avoided and protected during construction. The layout for The Project Site has been revised to avoid impacts on all cultural and historical features identified in the Class III survey, therefore, no effects would occur.

Twenty sites (32WD1636, 32WD1638, 32WD1641-32WD1646, 32WD1649-32WD1655, 32WD1658, 32WD1659, 32WD1664-32WD1666) located in the Project Site have not been evaluated for their eligibility for the NRHP. These sites also would be avoided and therefore there would be no impacts. Cultural resources will not be obscured by the construction or operation of the project.

### 7.7.3 Mitigative Measures

Mitigation for project-related impacts on NRHP-eligible archaeological resources may include adjustment of the array during the micrositing phase of the project if necessary to minimize Project impacts on a resource and/or additional documentation through data recovery. Should previously unknown archaeological resources or human remains be inadvertently encountered during Project construction and/or operation, the discoveries will be reported to the SHPO. With regard to a discovery of human

remains, procedures would be followed to ensure that the appropriate authorities would become involved quickly and in accordance with local and state guidelines.

The following mitigation measures are proposed to address impact to the APE of the Project Area:

- Encourage avoidance: Basin Electric shall make a reasonable effort to design the project in such a manner as to avoid National Register eligible properties.
- Address impacts to National Register properties located inside the APE: No surface disturbance shall occur within the boundary of National Register eligible property 32WD1637 prior to completion of the field phase of a data recovery plan that has been reviewed and approved by the State Historical Society of North Dakota.
- Address the eligibility of unevaluated sites inside the APE: No surface disturbance shall occur within the boundary of sites 32WD1636, 32WD1638, 32WD1641-32WD1646, 32WD1649-32WD1655, 32WD1658, 32WD1659, 32WD1664-32WD1666 until their National Register eligibility has been determined. If one or more of these sites is determined to be National Register eligible, no surface disturbance shall occur within the boundary of sites prior to completion of the field phase of a data recovery plan that has been reviewed and approved by the State Historical Society of North Dakota.
- Contact The Three Affiliated Tribes (Mandan, Hidatsa and Arikara Nation) if archaeological resources or other properties of Tribal interest are identified prior to or during construction: Contact Elgin Crows Breast, Tribal Cultural Preservation Officer (TCPO) of the Three Affiliated Tribes (Phone: 701-627-4781)
- Contact the North Dakota Intertribal Reinternment Committee and the North Dakota State Historical Society if a burial site is encountered during construction: The Native American Graves Protection and Repatriation Act of 1990 allows Tribes to protect American Indian graves and to repatriate human remains. The proponent must comply with this act if a burial site is encountered as the aforementioned Act applies to all developments regardless of the funding source. Any burial site identified, including Tribal or pioneer, must be referred to the North Dakota Intertribal State Historical Society, North Dakota Reinternment Committee, Mr. Paul Picha, Chief Archeologist, 612 East Boulevard Avenue, P.O. Box 620 Bismarck, ND 58505-0830 Belcourt, ND 58301, ppicha@state.nd.us

## 7.8 RECREATIONAL RESOURCES

This section includes a description of resources, impacts, and mitigative measures regarding recreation.

### 7.8.1 Description of Resources

Recreational opportunities in Ward County include hiking, hunting, fishing, and nature observation. Review of state and federal databases indicates that no registered national wildlife refuges, state wildlife management areas, state game refuges, game management areas, nature preserves, county parks, or formal recreational areas are present within or near the Project Site. No lakes with public boat access are located on or within 4 miles of the Project Site.

### 7.8.2 Impacts

In general, recreational impacts will be visual in nature and limited to individuals using public or private property in the Project Site for hiking, hunting, fishing, or nature observation.

### 7.8.3 Mitigative Measures

Since it is not anticipated that any significant recreational resources will be removed from service by implementation of the Project, it is unlikely adjacent land will be converted or dedicated to recreational use. No mitigation is anticipated to be necessary.

## 7.9 EFFECTS ON LAND-BASED ECONOMICS

This section includes a description of resources, impacts, and mitigative measures regarding the effects on land-based economics.

### 7.9.1 Description of Resources

Agriculture/Farming

The majority of the site is cultivated cropland, pasture, and grasslands as shown in the Land Use Map, Figure 16. Cultivated land comprises approximately 16,093 acres of the Project Site. Native cover comprises 4,331 acres of the land. Approximately 50 percent of the land in the Project Site is utilized for agricultural purposes.

According to the 2002 Census of Agriculture, wheat is the most widely grown crop within the Project Site. Corn, barley, sunflowers, and oats corn are additional crops in the Project Site. Ward County has approximately 966 farms, of which the primary commodity is crops, predominantly wheat. Cattle are the primary livestock in the County. According to the 2002 Census of Agriculture, the amount of land in farms decreased eight percent in Ward County from 1997. The market value of agricultural products from Ward County in 2002 was approximately $94,127,000. Crop sales account for approximately 83 percent of the total value of agricultural products sold.

Since crops comprise a large percentage of the value and the land, areas identified as prime farmland are important to production. Prime farmland is the land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops. The National Resource Conservation Service (NRCS) has two classifications for prime farmland. The first classification is where all areas of the soil series are classified prime farmland. The second classification is where only the drained areas of the soil series are prime farmland. The NRCS also identifies farmland of statewide and local importance, which is land that is important for the production of food, feed, fiber, forage and oilseed crops. Generally, additional farmlands of statewide or local importance include those that are nearly prime and that produce high yields of crops in an economic manner when treated and managed according to acceptable farming methods. Some nearly prime farms may produce as high a yield as prime farmland soils if conditions are favorable. Table 13 lists the soils considered Prime Farmland and soils of statewide or local importance within the Project Site. Figure 17 shows the prime farmland soil distribution in the Project Site.

Congress enacted the Farmland Protection Policy Act (FPPA) to implement programs and policies to protect farmland and combat urban sprawl and the waste of energy and resources that accompanies sprawling development. This act resulted in creating a farmland use classification system which includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be currently used for cropland. Projects are subject to FPPA requirements if they may irreversibly convert farmland (directly or indirectly) to nonagricultural use and are completed by a federal agency or with assistance from a federal agency. The FPPA does not authorize the Federal Government to regulate the use of private or nonfederal land or, in any way, affect the property rights of owners.

The NRCS Soil Survey Geographic (SSURGO) Database (NRCS 2008) shows 1,986 acres of prime farmland (7 percent of the Project Area) and 14,032 acres of farmland of statewide importance (47 percent of the Project Area. No prime forestland or prime rangeland is located within The Project Site.

According to the North Dakota State Water Commission, Water Permit Retrieval System, there is one property with an irrigation permit near the Project Site in Township 151N Range 82W. However, No irrigation permits or irrigation systems were identified within the Project Site.

Woodlands

Economically important forestry resources are not found in the Project Area. Woodlands are primarily associated with homes in the form of woodlots and windbreaks within the Project Area. Woodlands within the Project Area are depicted on Figure 3 and 14.

**TABLE 13**

**PRIME FARMLANDS IN THE PROJECT SITE**

| MAP SYMBOL | SOIL UNIT | PRIME FARMLAND CLASS | ACRES |
|---|---|---|---|
| **BoB** | Bowbells loam, gently sloping | Prime Farmland | 1150 |
| **Hf** | Hamerly loam | Prime Farmland | 159 |
| **SgB** | Wildrose Silty clay loam, gently sloping | Prime Farmland | 389 |
| **SnA** | Wildrose silty clay, level | Prime Farmland | 288 |
| **MmD** | Max-Willaims loams, strongly sloping | Farmland of local importance | 898 |
| **WmD** | Williams clay loam, strongly sloping | Farmland of local importance | 186 |
| **LhB** | Lihen-Telfer fine sandy loams, till substratum, undulating | Farmland of statewide importance | 52 |
| **MmB** | Max-Williams loam, undulating | Farmland of statewide importance | 157 |
| **MmC** | Max-Williams loams, rolling | Farmland of statewide importance | 4956 |
| **WIA** | Williams loam, level | Farmland of statewide importance | 1231 |
| **WIB** | Williams loam, gently undulating | Farmland of statewide importance | 953 |
| **WIC** | Williams loam, undulating | Farmland of statewide importance | 4390 |
| **WID** | Williams loam, sloping | Farmland of statewide importance | 268 |
| **WmA** | Williams clay loam, level | Farmland of statewide importance | 79 |
| **WmB** | Williams clay loam, undulating | Farmland of statewide importance | 1149 |
| **WmC** | Williams clay loam, rolling | Farmland of statewide importance | 789 |
| **WrB** | Williams-Hamerly loams, undulating | Farmland of statewide importance | 10 |
| **Af** | Arveson fine sandy loam | Prime farmland if drained | 27 |
| **Bn** | Marysland loam, 0-1 percent slopes | Prime farmland if drained | 31 |
| **Br** | Bowbells-Tonka complex | Prime farmland if drained | 292 |
| **Fc** | Fargo silty clay | Prime farmland if drained | 11 |
| **Ls** | Ludden silty clay loam | Prime farmland if drained | 67 |
| **To** | Tonka silt loam | Prime farmland if drained | 112 |

### 7.9.2 Impacts

Agriculture/Farming

No impacts are anticipated to animal health and safety due to the construction or operation of the wind farm and associated facilities. Except for the physical locations of the turbines and access roads, all the land surrounding the facility will be available for grazing.

Actual impacts to agriculture production will be determined once turbine and road locations are finalized. Seventy-seven turbines will impact approximately 4 acres of land due to turbine placement. Roads will be 20 feet wide and will vary in length. Currently, road impacts are estimated at approximately 69 acres assuming seventy-seven 1.5-MW turbines. Approximately 5 acres of land will be temporarily impacted for contractor staging and lay down areas. It is possible that some of this land is not used for agricultural purposes, thus the actual impacts to agriculture production cannot be determined until turbine and road locations are finalized.

Small areas of prime farmland are located throughout the Project Site. Most of the soil considered prime farmland within the Project Site is located in the central, southern, and eastern portions of the site (Figure 17). Approximately 1986 acres (< 7 percent) of the site is comprised of prime farmland and 541 acres ( < 2 percent ) prime farmland if drained. The preliminary layout includes no turbines in prime farmland. Assuming all seventy-seven 1.5 MW turbines and associated facilities were placed within prime farmland areas, approximately 6 acres (4 acres for turbines, and 2 acres for substation and O&M building) of prime farmland will be impact percent of prime farmland in the Project Site. Using the scenario with all turbines and facilities located in prime farmland, a maximum 0.3 percent impact to the prime farmlands in the Project Site will be a small percentage of prime lands in the County and will be a negligible impact to agricultural production

As noted earlier, wind lease payments will provide farmers with a supplemental source of income, helping assure that farmers can continue to operate financially viable farms, and thus helping to assure the continuation of farming in Ward County.

No turbines will be placed within 1,000 feet of occupied homes. Other impacts to homes are discussed throughout Section 7.0. Family farms will be impacted due to the loss of land associated with the construction of the turbines and access roads. The extent of the impact will not be known until final

turbine locations are determined in conjunction with the landowner, but the impact is expected to be negligible.

Woodlands

No significant impacts are anticipated to woodlands. Since a majority of the woodlands are associated with homesteads and windbreaks, and the acreage of woodlands in the Project Area are negligible, no impacts are anticipated.

### 7.9.3 Mitigative Measures

Agriculture/Farming

The wind turbines and access roads will be located so that the most productive farmland (prime farmland) will be avoided as much as possible. Only land for the turbine and access roads will be unavailable for crop production. Basin Electric will work with landowners to minimize impacts to their land. Once the wind turbines are constructed, land surrounding the turbines can still be farmed or grazed. All construction areas will be separated from grazing animals by temporary or permanent fencing. For projects that have the potential to convert important farmland to non-farm use, the NRCS must be contacted. NRCS uses a land evaluation and assessment system to establish a farmland conversion impact rating score for a proposed project, and this score is used as an indicator for the project sponsor to consider alternative sites if the potential adverse impacts on the farmland exceed the recommended allowable level (NRCS 2007).

Woodlands

No significant impacts are anticipated to woodlands and no mitigation is necessary.

## 7.10 SOILS

This section includes a description of resources, impacts, and mitigative measures regarding area soils.

### 7.10.1 Description of Resources

The Missouri Coteau is characterized by a hummocky, glaciated landscape that resulted from collapse of superglacial sediment. The landscape of the Missouri Coteau formed when glaciers were forced to advance up a steep escarpment before they flowed onto the uplands. As glaciers advanced over the escarpment, sediment from the base of the glacier was forced up to the surface. When the climate

moderated and the glaciers stagnated, sediment melting out of the ice accumulated at the surface, insulating the ice so that it took several thousand years to melt completely. As it melted, sediment slumped and slid, forming the hummocky topography. The result is poorly integrated stream drainage and numerous prairie pothole wetlands between mounds of glacial till (Bryce et al. 1998).

Soils within the Project Area consist of the Zahl-Williams-Vida-Bowbells, Williams-Bowbells, and Williams-Nutley associations. The soils formed in glacial till deposits and are generally well drained, loamy soils. Topography is generally level to undulating with local relief ranging from 25 to 200 feet and slopes ranging from three to 60 percent (NRCS 2006).

### 7.10.2 Impacts

The impact to soils in the site will be limited to areas removed from agricultural production and road construction. Both of these impacts will be relatively minor. Turbine foundations are comparatively small, and access roads will be single lane aggregate-surfaced roadways. In isolated cases, grading may be required for roadway construction. Exact impact acreages will not be known until turbine siting is finalized, but expected impacts will be approximately 4 acres for turbines and turbine foundations. The total impact assuming seventy-seven 1.5-MW turbines, is expected to be four acres. Approximately 5 acres of land will be temporarily impacted for contractor staging and lay down areas and 2 acres for the substation and O&M building. Since land immediately adjacent to the turbines and access roads can be used for pasture or row crops, the Project will only impact those lands used directly for turbine foundation or roadway construction. A discussion of impacts to prime farmland soils is in Section 7.9.

Impacts on soil resources occur in would two separate stages; during, and after turbine and ancillary equipment construction. Short term impacts resulting from the initial construction activities include increased soil compaction and soil structure destruction. Chemical changes would also result from mixing surface soil with subsoil during salvage activities.

Impacts on physical characteristics of soil during salvage, stockpiling, and redistribution would include compaction, and destruction of soil structure as a result of soil handling and surface traffic. These impacts could impede root growth and result in decreased infiltration rates and permeability. Decreased infiltration rates and permeability would result in increased surface runoff and potentially more erosion from impacted sites. If conducted to adequate depth and spacing, additional tillage would eliminate the majority of subsoil compaction.

Short-term surface soil loss by wind erosion associated with the Proposed Actions would be greater than normal until vegetation becomes reestablished. Potential for loss of subsoil would be greatest between initial disturbance and redistribution of cover soil. Water erosion potential is influenced by the extent of disturbance, surface soil texture, soil cover, and steepness of slope and could be significant during heavy precipitation events.

Due to the relatively short construction period and prompt replacement of salvaged soils, reduction in soil biological activity is expected to be short-term. After soil redistribution, biological activity would increase and eventually reach pre-salvage levels.

Construction practices will minimize soil erosion during and after turbine construction, and impacts are not expected to be measurable.

### 7.10.3 Mitigative Measures

Basin Electric will use BMPs during construction and operation to protect topsoil and adjacent pothole and wetland resources and to minimize soil erosion. Practices may include containing excavated material, use of silt fences, protecting exposed soil, stabilizing restored material, and revegetating disturbed areas.

Construction sites will maintain sediment control practices in accordance with the SWPPP. Since turbines will not be located on significant slopes, only non-structural practices should be required. These practices include: temporary seeding, permanent seeding, mulching, filter strips, erosion blankets, and sod stabilization. Top soil will be segregated if cuts are made during construction and reapplied after final contours have been graded.

## 7.11 GEOLOGIC AND GROUNDWATER RESOURCES

This section includes a description of resources, impacts, and mitigative measures pertaining to geologic and groundwater resources.

### 7.11.1 Description of Resources

Ward County is covered by glacial drift deposits of Pleistocene age. The Northwestern Glaciated Plains Ecoregion is near the westernmost extent of continental glaciation. Within the ecoregion is the Coteau du Missouri physiographic region of the Missouri River basin. The Coteau du Missouri region is characterized as a

relatively youthful glacial moraine landscape with significant surface irregularity and, as a consequence, a moderately high concentration of semi-permanent and seasonal wetlands (Bryce et al. 1998). The Coteau du Missouri was formed during the last ice age as a stagnation moraine. Near surface groundwater, hummocky terrain, and poorly draining glacial till deposits result in a region of numerous small lakes, wetlands and sloughs, referred locally as prairie potholes. The Coteau du Missouri highlands are underlain by a thick sequence of undifferentiated glacial drift (up to several hundred feet thick). In the project area, bedrock underlies glacial drift at depths ranging from 75 to greater than 350 feet below ground surface (bgs).

Bedrock consists of Cretaceous-aged siltstone and shales of the Tongue River Member of the Fort Union Formation. Topographically, the praire potholes region are highlands, forming a surface water divide from the Souris River basin to the northeast and the Missouri River located approximately 25 miles to the southwest.

Groundwater is the major source of drinking water in North Dakota. Sixty percent of the state's total population utilize groundwater to supply their drinking water needs, while 97 percent of the state's rural population use groundwater for drinking water purposes. Agriculture and industry in North Dakota also rely heavily on groundwater.

Shallow groundwater is prevalent across much of the Coteau du Missouri due to the nature of the low permeability glacial till deposits. About 90 percent of the glacial drift on the Coteau du Missouri is glacial till, and the remainder is largely glacial outwash and lake sediments (Sloan 1972). Groundwater movement in glacial till is controlled by its lithology and structure. This till, being a poorly sorted, largely unstratified mixture of clay, silt, sand, and gravel, is not highly permeable, so groundwater moves most readily along the fractures. Because fractures in glacial till are most numerous near the land surface, the most active ground-water flow systems are shallow and localized in the vicinity of potholes.

The water table in the glacial deposits is continuous with the water surface in prairie potholes: therefore, the hydraulic gradient adjusts to the water surface elevation of the potholes. In cross section the water table is represented by a nearly straight line which connects potholes. The potentiometric surface of the water table around a pothole determines the direction of groundwater flow with respect to the pothole. Groundwater flows toward the pothole (gaining) if the adjacent water table is higher than the pothole water surface and flows away from the pothole (losing) if the adjacent water table is lower than the pothole water surface.

As mentioned previously, shallow groundwater is present at or near ground surface in the vicinity of pothole lakes and wetlands. Very few well logs are recorded within the vicinity of the project areas. Based on

information provided by a USGS observation well in The Project Site (T151N, R83W, Section 26), groundwater is present from 3 to 13 feet bgs and varies by as much as nine feet seasonally (NDSWC 2008).

The first bedrock aquifer occurs within the Tongue River Member, Fort Union Formation at depths greater than 200 feet bgs. This deeper groundwater resource is contained within aquifers comprised of water-bearing sandstone and lignite coal (Paulson 1983). Water quality from these aquifers is often poor, with high concentrations of total dissolved solids.

### 7.11.2 Impacts

Impacts to groundwater resources are not anticipated as water supply needs will be limited. It is probable that operations and maintenance water requirements will be satisfied with a single domestic-sized water well. Depending on the location of wind turbines and supporting infrastructure, it is possible that sand and gravel resources could be made unavailable for development.

### 7.11.3 Mitigative Measures

Wind turbine locations will not impact the use of existing water wells because the turbines will not be sited within 1,000 feet of occupied residences. Wind turbines will be sited so as to avoid sand and gravel resources identified in the Project Area. Where sand and gravel resources cannot be avoided, Basin Electric will coordinate with landowners regarding impacts and any necessary mitigation. No other mitigation is anticipated to be necessary.

## 7.12 SURFACE WATER AND FLOODPLAIN RESOURCES

This section includes a description of resources, impacts, and mitigative measures regarding surface water and floodplain resources.

### 7.12.1 Description of Resources

SURFACE WATER

The Project Area is located in the prairie pothole country of north central North Dakota and surface drainages are limited. Oak Creek, a tributary to the Souris River, flows north along the eastern portion of The Project Site. No other named surface water drainages are found within the project area. The Missouri

River is located approximately 25 miles to the southwest the Project Area; however surface topography slopes northeast towards the Souris River.

The dominant geomorphological features of either area are the numerous pothole lakes, wetland features, and ephemeral drainages (i.e., drainages that only flow for short periods of time during the year). These drainages typically maintain flows in the spring of the year or in response to precipitation events and are limited in length due to undulating topography in the project area. Open water is almost exclusively available within the project areas in the form of prairie potholes. Pothole lakes are present throughout both project areas and range in size up to a maximum of approximately 100 acres in size but are generally less than 1 acre.

Water quality in prairie potholes in North Dakota varies both temporally and spatially. The salinity of water in potholes is extremely varied, ranging from potholes in which the water is quite fresh to others containing brines that are several times more concentrated than sea water. Salinity is a measure of the quantity of total dissolved solids in water. Water is supplied to the potholes by precipitation on the water surface, basin runoff, and seepage inflow of groundwater. Depletion of pothole water results from evapotranspiration, overflow, and seepage outflow. Since potholes generally do not overflow, seepage outflow is the principal way in which dissolved salts can be removed. Salinity of pothole water is therefore a good indication of the seepage balance. Net seepage outflow results in fresh to brackish waters that constitute ephemeral to semipermanent ponds, whereas net seepage inflow results in brackish to saline waters that constitute semipermanent to permanent ponds (Sloan 1972).

FLOODPLAINS

According to the Ward County Department of Tax Equalization no floodplains are mapped by the Federal Emergency Management Agency (FEMA) in the project area (Siebert 2008). As a result, potential floodplains have not been identified. In addition, no major drainages exist within the Project Site.

### 7.12.2 Impacts

SURFACE WATER

Construction of the wind turbines, transformer pads, and access roads will disturb land within the Project Site. The wind turbines will be built on uplands; thus, intermittent streams located in the lower positions

in the landscape will be avoided. Access roads to the turbines will be built to avoid impacts to surface waters. Sediment and runoff during construction would be controlled.

FLOODPLAINS

The Project will not impact floodplain areas.

### 7.12.3 Mitigative Measures

Access roads constructed adjacent to intermittent streams and drainageways will be designed in a manner so that runoff from the upper portions of the watershed can flow unrestricted to the lower portion of the watershed. An application (Notice of Intent) to obtain coverage under the NPDES general permit for storm water discharges associated with construction activity will be submitted to the North Dakota Department of Health (NDDOH) prior to construction of the Project.

## 7.13 WETLANDS

This section includes a description of resources, impacts, and mitigative measures pertaining to wetlands.

### 7.13.1 Description of Resources

Wetlands and riparian areas are important resources because they provide habitat that is utilized by both resident and migratory wildlife. Wetlands also perform a variety of hydrologic (flood attenuation and groundwater recharge) and water quality (sediment attenuation and nutrient removal) functions. Numerous wetlands are present within the Project Area. Many of these wetlands occur within linear drainages which may be considered jurisdictional under "navigable waters" of the United States. Some wetlands within areas of agricultural production appear to have been converted to vegetated, grassed waterways. Some wetland depressions have cool season grasses planted that are then harvested for hay.

Many other wetlands are subject to heavy cattle grazing and many have been excavated to provide more permanent water sources for cattle. According to the National Wetlands Inventory (NWI) database, wetlands comprise approximately one percent of the land in the Project Area, which includes both isolated and potentially jurisdictional wetlands located within the Project Area. Private properties over which the USFWS has easements for protection of wetland resources are also present within the Project

Area. In the case of USFWS wetland easements, the landowner cannot drain, fill, or burn the wetlands within the easement.

Within the Project Area, there are also areas of land designated federal WPAs and are managed through the Audubon Wetland Management District (WMD). WPAs and wetland easements are depicted on Figures 3 and 16.

### 7.13.2 Impacts

Proposed access roads and buried collectors may also result in impacts to wetlands regulated under the jurisdiction of the U.S. Army Corps of Engineers (USACE)-Bismarck District. Only the USACE can make a jurisdictional determination and such determinations are generally not made until a permit application is filed or potential compliance issue exists. Basin Electric has committed to avoiding all wetlands; therefore, there would be no direct impacts on wetlands. No detrimental effects that could cause an indirect effect on wetlands would occur.

Potential wetlands in relation to the proposed turbine array and transmission line are shown on Figure 19. On-site delineation of these features prior to construction will help identify those sites which should be avoided where practicable. Final access road and collector line route placement prior to construction will avoid potential wetland sites. Based on the Site visit and review of available cartographic information, impacts to wetlands in the proposed Project Area are largely avoidable through minor modification to the Project layout and avoidance of these habitats during the construction phase. All wetlands identified in these figures should be considered areas to be avoided. All proposed turbine locations have been sited to take advantage of higher elevations and, therefore, avoid low-lying areas.

### 7.13.3 Mitigative Measures

Wetlands will be avoided to the extent practicable during the construction phase of the Project. If impacts to USACE jurisdictional waters are unavoidable, then Basin Electric will seek coverage under a Section 404 USACE Nationwide Wetland Permit. Permanent impacts to jurisdictional waters will be mitigated according to USACE requirements.

Wetlands within USFWS easements on private property are under USFWS jurisdiction. If wetland impacts in USFWS easements cannot be avoided, Basin Electric will work with the USFWS to obtain

permits for the impact and create required mitigation. The USFWS requires a compatibility assessment for any wetland impacts on easement land (see Section 10.11.2).

Wind turbines will be located a minimum of 0.25 miles from all WPAs. Basin Electric will use BMPs during construction and operation of the Project to protect topsoil and adjacent wetland resources and to minimize soil erosion. Practices may include containing excavated material, use of silt fences, protecting exposed soil, stabilizing restored material, and revegetating disturbed areas with native species.

## 7.14 VEGETATION

This section includes a description of resources, impacts, and mitigative measures regarding vegetation.

### 7.14.1 Description of Resources

The region's native vegetation is classified as the Northern Wheatgrass – Needlegrass Plains (Johnson and Larson 1999). Agropyron sp. and Hesperostipa sp. are the most common indicators of the vegetative classification of the region. Dominant plant species include western wheatgrass (Pascopyrum [Agropyron] smithii), thickspike wheatgrass (Elymus lanceolatus [Agropyron dasystachyum]), needle and thread grass (Hesperostipa [Stipa] comata), green needle grass (Hesperostipa [Stipa] viridula), bluebunch wheatgrass (Psuedoroegneria spicata [Agropyron spicatum]), blue grama (Bouteloua gracilis), and threadleaf sedge (Carex filifolia) (Johnson and Larson 1999). The relatively short growing season and high productivity of these grasslands has kept much more of the native rangeland intact compared with more southern areas in the northern Great Plains (Johnson and Larson 1999). However, most of the relict rangeland is intensively grazed by livestock, and the natural fire regime has been absent for decades, causing a strong shift in historical vegetative composition. Areas with more favorable soils have been converted to agricultural lands for cropping, pastureland, or hayground (USDA 1974). Agricultural cropland is the most prevalent vegetation cover within the Project Area.

Table 14 lists the most common planted crops in Ward County, North Dakota (NDSU Extension Services 2008).

**TABLE 14**

**COMMON AGRICULTURAL CROPS IN WARD COUNTY, ND**

| | | | | |
|---|---|---|---|---|
| Alfalfa | Barley | Buckwheat | Canary | Canola |
| Chickpea | Corn | Crambe | Dry bean | Durum |
| Field pea | Flax | Forages | Spring Wheat | Lentil |
| Lupin | Millet | Mustard | Oats | Potato |
| Safflower | Soybean | Specialty Crops | Sunflower Non-Oil | Sunflower Oil |
| Triticale | Winter Rye | Winter Spelt | Winter Wheat | White Wheat |

The most abundant land cover type in the Project area is agricultural land, covering 53 percent An additional 15 percent is characterized as tame grassland (USGS 2004). In addition, the Project Area contains 2 percent that is barren or developed. The remaining land within the Project Area is native cover types such as: native prairie, shrublands, woodlands, and wetlands. The Project Area contains 30 percent of native cover types. Native prairie cover includes grasslands, shrublands, and woodlands. Based on the observations and data collected during October 2007 and June 2008 field surveys, the condition of many of these native communities appeared to have been degraded as a result of long-term, heavy livestock grazing pressure.

### 7.14.2 Impacts

The Project Area contains significant amounts of agriculture. Within the Project Area, potential impacts to plant communities due to construction activities were analyzed during the site visit. Proposed turbine locations, collector and transmission line routes, and access roads were visually inspected during the site visit.

Access road construction will result in the greatest effects to native vegetation resulting in permanent loss of these habitats where they occur along selected routes. Installation of the proposed buried collector system will result in some temporary effects to native and non-native grasslands. Where disturbance is significant, effects can be mitigated by reseeding of the trenched areas with native grasses and legumes following completion of construction activities.

### 7.14.3 Mitigative Measures

Basin Electric will work closely with the USFWS and North Dakota Game and Fish Department (NDGFD) during micrositing to minimize impacts to vegetation within the Project Area. Basin Electric will conduct a pre-construction inventory of existing wetlands, native prairie, and woodlands.

The following mitigation measures would be implemented to avoid and reduce impacts to vegetation and sensitive plants:

- Temporarily disturbed areas would be reclaimed by replacement of topsoil and seeding;
- Revegetation would occur as soon as possible to establish vegetative cover and avoid establishment of weeds. Agricultural lands will be returned to their original use;
- Noxious weeds would be controlled using appropriate weed control measures;
- Annual post-construction monitoring and treatment for as long as determined by involved parties; and,
- Minimize dust emissions during clearing, grading, and other construction activities to avoid adversely affecting vegetation.

## 7.15 WILDLIFE

This section includes a description of resources, impacts, and mitigative measures concerning wildlife.

### 7.15.1 Description of Resources

Information on the existing wildlife in the wind farm site was obtained from a variety of sources including observations during a Site visits, communication with local residents and information from the NDGFD, North Dakota Parks and Recreation Department (NDPRD), North Dakota Natural Heritage Inventory (NDNHI), University of North Dakota (UND) Extension Office and USFWS.

Four general types of habitat have been identified in the Project Area. They include: agricultural land, tame grass land, native prairie, and wetlands. Agricultural lands are identified as land planted to annual crops such as wheat and similar small grains. Tame grasslands are lands that are seeded with a mixture of

native and non-native grass and forb species. Native prairie is defined as those areas that are not currently used, or in the past were used, for agricultural or forage production, and are predominately comprised of native grass and forb species.

Wildlife in the Project Site consists of birds, mammals, fish, reptiles, amphibians, and insects, both resident and migratory, which utilize the Project Site habitat for forage, migratory stopover, breeding and/or shelter. Species present in the Project vicinity are associated with agricultural fields, pasture grasslands, and wetland areas. Table 15 identifies common mammals in the project vicinity.

The project areas are located approximately 10 miles north of the Audubon National Wildlife Refuge (ANWR). The ANWR's wildlife list was reviewed and cross referenced with the habitat available within and adjacent to the project areas in order to determine which species potentially occur within the project areas.

**TABLE 15**

**MAMMALS WITH THE POTENTIAL TO OCCUR WITHIN THE PROJECT AREA**

| Common Name | Scientific Name | Common Name | Scientific Name |
|---|---|---|---|
| Badger | *Taxidea taxus* | Deer Mouse | *Peromyscus maniculatus* |
| Beaver | *Castor canadensis* | Northern Grasshopper Mouse | *Onychomys leucogaster* |
| Raccoon | *Procyon lotor* | Meadow Vole | *Microtus pennsylvanicus* |
| Coyote | *Canis latrans* | Prairie Vole | *Microtus ochrogaster* |
| White-tailed Deer | *Odocoileus virginianus* | Muskrat | *Ondatra zibethicus* |
| Muskrat | *Ondatra zibethica* | Norway Rat | *Rattus norvegicus* |
| Pronghorn Antelope | *Antilocapra americana* | House Mouse | *Mus musculus* |
| Masked Shrew | *Sorex cinereus* | Meadow Jumping Mouse | *Zapus hudsonius* |
| Little Brown Myotis | *Myotis lucifugus* | Red Fox | *Vulpes vulpes* |
| Silver-haired Bat | *Lasionycteris noctivagans* | Long-tailed Weasel | *Mustela frenata* |
| Big Brown Bat | *Eptesicus fuscus* | Short-tailed Weasel | *Mustela erminea* |
| Eastern Cottontail | *Sylvilagus floridanus* | Least Weasel | *Mustela nivalis* |
| White-tailed Jackrabbit | *Lepus townsendii* | Striped Skunk | *Mephitis mephitis* |
| Richardson's Ground Squirrel | *Spermophilus richardsonii* | Moose | *Alces alces* |

**TABLE 15**

**MAMMALS WITH THE POTENTIAL TO OCCUR WITHIN THE PROJECT AREA**

**CONTINUED**

| Common Name | Scientific Name | Common Name | Scientific Name |
|---|---|---|---|
| Thirteen-lined Ground Squirrel | *Spermophilus tridecemlineatus* | Fox Squirrel | *Sciurus niger* |
| Franklin's Ground Squirrel | *Spermophilus franklinii* | | |

Source: USFWS. 2001. Audubon National Wildlife Refuge Wildlife List

### 7.15.2 Impacts

Construction activities associated with the Project Area would result in both short term and long term impacts to wildlife species. In addition, activities such as road construction and minimal tree clearing can destroy or disrupt habitats and allow for the introduction of unwanted invasive plants. Installation of buried collector lines would result in a temporary loss of wildlife habitat. Displaced wildlife would likely relocate to nearby unaffected areas within the project area until construction activities have been completed. Temporarily disturbed habitat would be reseeded. The overall impacts on wildlife of the construction and operation and maintenance of The Project Site are summarized below in Table 16.

Assessing the full range of impacts to bats is challenging given the limited research indicating how bats respond to disturbances within their habitat. Mortality is the easiest response to monitor and there is growing research indicating that wind energy projects can result in increased mortality of bats. A number of monitoring studies have been completed over recent years resulting in bat mortality estimates for wind energy projects (TRC 2008; Erickson et al. 2002, 2003a,b; Johnson et al. 2003; Strickland et al. 2001a,b; Young et al. 2003a,b). Collision mortality appears to be most significant for tree-dwelling migratory bat species, based on studies done thus far (Kuvlesky, Jr. et al. 2007). The Buffalo Ridge wind energy project was used in comparison since it is closest in vicinity and habitat to the Project Area. Bat annual mortality estimated for PrairieWinds-ND 1 based on monitoring data from the Buffalo Ridge project indicate a potential bat range of mortality of 5 to 179 per year.

Most bat casualties at wind farms have been species that conduct long migrations between summer roosts and winter hibernacula. The proposed site does not contain topographic features that may funnel bats during migration.

The impact of the proposed Project on wildlife is expected to be minimal. There is potential for avian and bat collisions with facility turbines or meteorological towers. Additional impacts may include a small reduction in the available habitat that some of the wildlife uses for forage or cover. Operation of the wind farm will not change the existing land use.

### 7.15.3 Mitigative Measures

Basin Electric has conducted environmental studies of the Project Site to aid in the initial placement of turbines, roads, and associated facilities to avoid or minimize impacts to wildlife and habitat. Also, Basin Electric is coordinating with USFWS and NDGFD regarding avian monitoring and minimization of impacts to whooping cranes, WPAs and easement areas. The following measures will be used, to the extent practicable, to help avoid potential impacts to wildlife and rare and unique in the Project Site during selection of the turbine locations and subsequent development and operation:

- Basin Electric proposes buffers of 0.25 miles around USFWS WPAs and avoidance of wetland easements.
- Project personnel will be trained to identify whooping cranes in the field;
- Observations of whooping cranes by project personnel made as a result of monitoring or other incidental sightings in the project area and surrounding vicinity shall be immediately reported to the USFWS;
- During the construction phase, Basin Electric would require contractors to modify or curtail construction activities within one mile of the observation of a whooping crane, leaving birds undisturbed until they are no longer observed within the wind project boundaries to minimize the potential for disturbance, displacement, and harm of roosting and foraging whooping cranes.
- For three years post-construction, trained personnel acceptable to the USFWS will be on site during spring and fall migration seasons to observe whooping cranes (Spring: April 1 to May 15; Fall: September 10 to October 31). During that period, turbines located within one-half mile of the observation of a whooping crane will be shut down until such time as the whooping cranes are no longer observed in the area.
- During the construction phase and for three years post-construction, trained personnel acceptable to the USFWS will document avian migration use of the project area during the spring and fall migrations;
- Monitoring and training procedures will be developed in coordination with the USFWS.
- Prior to surface disturbance activities during the breeding season (February through July), a qualified biologist would survey potentially suitable habitat for nesting activity and other evidence of nesting (e.g., mated pairs, territorial defense, birds carrying nest material, transporting food). If active nests are located, or other evidence of nesting is observed, appropriate protection measures, including establishment of buffer areas and constrain periods, would be implemented until the young have fledged and dispersed from the nest area.

- If construction is to occur during the breeding season for raptors (January through August; prior to construction activities, raptor breeding surveys will be conducted by a qualified biologist through areas of suitable nesting habitat to identify any potentially active nest sites within 0.5 mile from the project area. If applicable, appropriate protection measures, including seasonal constraints and establishment of buffer areas will be implemented at active nest sites until the young have fledged and have dispersed from the nest area. Basin Electric will develop bat mortality monitoring procedures in coordination with the USFWS.
- Basin Electric has designed the project to avoid the construction of new overhead power lines. All collector lines will be buried with the exception of the line that ascends from the substation.
- Basin Electric will avoid or minimize disturbance of individual wetlands or drainage systems during construction and operation of the Project.
- Basin Electric will protect existing trees and shrubs where practicable. If impacts are unavoidable, Basin Electric will replace existing trees and shrubs at a 2:1 ratio unless directed otherwise by the landowner.
- Basin Electric will maintain sound water and soil conservation practices during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. To minimize erosion during and after construction, BMPs for erosion and sediment control will be utilized. These practices include: temporary seeding, permanent seeding, mulching, filter strips, erosion blankets, grassed waterways, and sod stabilization.
- Basin Electric will revegetate non-cropland and pasture areas with seeding mix as recommended by USFWS and NRCS.
- Basin Electric will inspect and control noxious weeds in the vicinity of the turbines, access roads, and associated facilities immediately after construction and periodically for the life of the Project.

Basin Electric is committed to minimizing wildlife impacts within the Project Area. Basin Electric will design their facility to minimize avian impacts, using tubular towers to minimize perching, placing electrical collection lines underground and minimizing infrastructure.

## 7.16 RARE AND UNIQUE NATURAL RESOURCES

This section includes a description of resources, impacts, and mitigative measures regarding rare and unique natural resources.

### 7.16.1 Description of Resources

The USFWS, NDGFD, and NDPRD departments were contacted to review the Project Site for threatened and endangered species and unique habitats. In response to a request for a project review, the USFWS identified the following federally-listed threatened and endangered (T&E) species for Ward County:

- Whooping Crane (Endangered)
- Gray Wolf (Endangered)

- Piping Plover (Threatened)

The whooping crane (Grus americana) is known to migrate through the west and central counties of North Dakota during the spring and the fall. It prefers to roost on wetland and stockdams with good visibility. Young adults have been known to summer in North Dakota in 1989, 1990 and 1993. The total population is estimated to be approximately 270 birds.

The Gray wolf (Canis lupis) is only known to be an occasional visitor to the Dakotas. It is most frequently observed in the Turtle Mountain area.

The Piping Plover (Charadrius melodus) nests on shoreline and island sandy beaches with sparse vegetation and the presence of small stones, however informal consultation with the USFWS has indicated that there is no piping plover habitat within the Project Area (USFWS 2008).

**T**he North Dakota Natural Heritage Program was launched by the state in cooperation with The Nature Conservancy, a private nonprofit organization dedicated to the identification and protection of ecologically significant lands. The main purpose of the Natural Heritage Inventory is to identify North Dakota's natural features and establish priorities for their protection. Information from the Heritage Inventory has been used to identify high quality natural areas and potential nature preserves. Three ecological communities (grasses and sedges) identified by the North Dakota Natural Heritage Inventory are located in the northwest portion of the Project Site.

### 7.16.2 Impacts

Impacts to Rare and Unique Resources are unlikely. The three T&E species listed by the USFWS may be occasional visitors to the area and the determination of affect will be evaluated with the USFWS. Based on the locations of turbines, access roads, and collector lines, impacts to ecological communities identified by the North Dakota Natural Heritage Inventory are not anticipated.

### 7.16.3 Mitigative Measures

No impacts are anticipated to Rare and Unique Resources. Basin Electric will avoid the resources identified to the extent practicable. Basin Electric will strive to minimize impacts to high quality prairie areas and implement the mitigation measures described in Section 7.15.3

## 7.17 SUMMARY OF IMPACTS

Table 16 summarizes the resources that will be impacted as a result of the Project and the appropriate mitigation.

**TABLE 16**

**SUMMARY OF IMPACTS AND MITIGATION**

| RESOURCE | IMPACT | MITIGATION |
|---|---|---|
| Demographics | Socioeconomic impacts associated with the Project will be primarily positive with an influx of wages and expenditures made at local businesses during the Project construction and an increase in the County's tax base from the construction and operation of the wind turbines and associated infrastructure. Lease payments paid to landowners will offset potential financial losses associated with removing the land from agricultural production | No adverse impacts are anticipated. |
| Land Use | Basin Electric is planning approximately 8.9 miles of road improvements and an additional 19 miles of new access roads. Approximately 2 acres of will be converted for the Project Substation and O&M facility. Approximately 5 acres of land will be temporarily impacted for contractor staging and lay down areas and approximately 4 acres of lands will be impacted by the turbines. | Basin Electric is working closely with the landowners, the USFWS, and other agencies in locating wind turbines and access roads to minimize land use disruptions and impacts. Operation of the wind farm will not change the land use in the Project Area. |

**TABLE 16**

**SUMMARY OF IMPACTS AND MITIGATION**

**CONTINUED**

| RESOURCE | IMPACT | MITIGATION |
|---|---|---|
| Public Services | The Project is expected to have a minimal effect on the existing services and infrastructure. | Construction and operation of the Project will be in accordance with all associated local, federal, and state permits and laws, as well as industry construction and operation standards. Because of the minor impacts expected on the existing infrastructure during Project construction and operation, extensive mitigation measures are not anticipated. |
| Human Health and Safety | The Project is expected to have a minimal effect on human health and safety. | Construction and operation of the Project will be in accordance with all associated local, federal, and state permits and laws, as well as industry construction and operation standards. |
| Noise | The primary source of noise from the GE turbines is from the wind interacting with the rotor blades producing a swishing sound that is relatively constant over various wind speeds. However, the level of background noise created by the wind continues to increase as the speed increases.<br>Noise generated by construction activities would occur intermittently over the construction period and would be generated by an increase in traffic on local roads, as well as heavy equipment operation. | The primary mitigation measure used for wind turbines is setback distance. Basin Electric is committed to the 1,000-foot setback distance. This setback distance has proven sufficient and acceptable to the communities in North Dakota. |

**TABLE 16**

**SUMMARY OF IMPACTS AND MITIGATION**

**CONTINUED**

| RESOURCE | IMPACT | MITIGATION |
|---|---|---|
| Cultural and Archaeological | One National Register historic property is present in the Project Site. Twenty other sites located in the Project site have not been evaluated and will be avoided. | Mitigation for project-related impacts on NRHP-eligible archaeological resources may include adjustment of the array during the micrositing phase of the project if necessary to minimize Project impacts on a resource and/or additional documentation through data recovery. Should previously unknown archaeological resources or human remains be inadvertently encountered during Project construction and/or operation, the discoveries will be reported to the SHPO. With regard to a discovery of human remains, procedures would be followed to ensure that the appropriate authorities would become involved quickly and in accordance with local and state guidelines. |
| Recreational Resources | In general, recreational impacts will be visual in nature and limited to individuals using public or private property in the Project Site for hiking, hunting, fishing, or nature observation. | Since it is not anticipated that any significant recreational resources will be removed from service by implementation of the Project, no mitigation is anticipated to be necessary. |
| Land Based Economics | No impacts are anticipated to animal health and safety or woodlands from construction or operation of the wind farm and associated facilities. Actual impacts to agriculture production will be determined once turbine and road locations are finalized. | Wind turbines and access roads will be located so prime farmland will avoided as much as possible. Basin Electric will work with landowners to minimize impacts to their land. All construction areas will be separated from grazing animals by temporary or permanent fencing. |

**TABLE 16**

**SUMMARY OF IMPACTS AND MITIGATION**

**CONTINUED**

| RESOURCE | IMPACT | MITIGATION |
|---|---|---|
| Soils | Impacts to soil resources will be limited to areas removed from agricultural production and road construction. Impacts to soils would occur in two stages: during and after turbine and facility construction. Impacts include compaction, chemical change of the soil, and destruction of soil structures. These impacts are anticipated to be minor due to the small areas impacted | Basin Electric will use BMPs during construction and operation to protect soil resources and to minimize soil erosion. Construction sites will maintain sediment control practices in accordance with the SWPPP. |
| Geologic and Groundwater Resources | Impacts to groundwater resources are not anticipated as water supply needs will be limited. It is probable that operations and maintenance water requirements will be satisfied with a single domestic sized water well. Depending on the location of wind turbines and supporting infrastructure, it is possible that sand and gravel resources could be made unavailable for development. | Wind turbine locations will not impact the use of existing water wells because the turbines will not be sited within 1,400 feet of occupied structures. Wind turbines will be sited so as to avoid sand and gravel resources identified in the Project Area. Where sand and gravel resources cannot be avoided, Basin Electric will coordinate with landowners regarding impacts and any necessary mitigation. No other mitigation is anticipated to be necessary. |
| Surface Water and Floodplain Resources | Construction of the wind turbines, transformer pads, and access roads will disturb land within the Project Site. The wind turbines will be built on uplands; thus, intermittent streams located in the lower positions in the landscape will be avoided. Access roads to the turbines will be built to avoid impacts to surface waters. Sediment and runoff during construction would be controlled. | Construction of the wind turbines, transformer pads, and access roads will disturb land within the Project Site. The wind turbines will be built on uplands; thus, intermittent streams located in the lower positions in the landscape will be avoided. Access roads to the turbines will be built to avoid impacts to surface waters. The project would not impact floodplain areas. |

**TABLE 16**

**SUMMARY OF IMPACTS AND MITIGATION**

**CONTINUED**

| RESOURCE | IMPACT | MITIGATION |
|---|---|---|
| Wetlands | Basin Electric has committed to avoiding all wetlands; therefore, there would be no direct impacts on wetlands. No detrimental effects that could cause an indirect effect on wetlands would occur. | Wetlands will be avoided to the extent practicable during construction. If impacts are unavoidable, Basin Electric will work with the USACE and, if necessary, the USFWS, to obtain permits. Basin Electric will use BMPs to protect topsoil and adjacent wetlands and to minimize soil erosion. |
| Vegetation | Access road construction will result in the greatest effects to native vegetation resulting in permanent loss of these habitats where they occur along selected routes. Installation of the proposed buried collector system will result in some temporary effects to native and non-native grasslands. | Basin Electric will work closely with the USFWS and North Dakota Game and Fish Department (NDGFD) during micrositing to minimize impacts to vegetation within the Project Area. Basin Electric will conduct a pre-construction inventory of existing wetlands, native prairie, and woodlands. |
| Wildlife | Construction activities associated with the Project Area would result in both short term and long term impacts to wildlife species. In addition, activities such as road construction and minimal tree clearing can destroy or disrupt habitats and allow for the introduction of unwanted invasive plants. Installation of buried collector lines would result in a temporary loss of wildlife habitat. Displaced wildlife would likely relocate to nearby unaffected areas within the project area until construction activities have been completed. Temporarily disturbed habitat would be reseeded. | Basin Electric has conducted environmental studies of the Project Site to aid in the initial placement of turbines, roads, and associated facilities to avoid or minimize impacts to wildlife and habitat. Also, Basin Electric is coordinating with USFWS and NDGFD regarding avian monitoring and minimization of impacts to WPAs and easement areas. |
| Rare and Unique Natural Resources | No impacts are anticipated to Rare and Unique Resources. Based on the locations of turbines, access roads, and collector lines, impacts to ecological communities identified by the North Dakota Natural Heritage Inventory are not anticipated. | Basin Electric will avoid the resources identified to the extent practicable. Basin Electric will strive to minimize impacts to high quality prairie areas. |

# 8.0 PUBLIC COORDINATION

Keeping the public informed on the status of the Project is key component to its success. Principal stakeholders in the Project are landowners that have entered into agreements with Basin Electric to provide wind rights for the Project. Basin Electric will continue to meet with County officials as the Project moves forward and Basin Electric seeks a building permit and required zoning approvals from the County.

Basin Electric and their representatives have been working with key state and federal agencies including the Department of Commerce, the USFWS and the NDGFD to inform them of the Project and to address areas of interest particular to each department. Basin Electric is committed to keeping key stakeholders engaged in the Project as it moves forward.

## 9.0 IDENTIFICATION OF POTENTIAL PERMITS/APPROVALS

The federal and state permits or approvals that have been identified as potentially being required for the construction and operation of the Project are shown in Table 17. Permits dependent on the final site layout will be applied for after receiving PSC approval, but prior to construction.

**TABLE 17**
**POTENTIAL PERMITS AND APPROVALS REQUIRED FOR CONSTRUCTION AND OPERATION OF THE PROPOSED FACILITY**

| AGENCY | TYPE OF APPROVAL | STATUS | NEED |
|---|---|---|---|
| **Federal Approvals** | | | |
| **USACE** | **Section 404 CWA Permit** | **3** | Permit required for fill in jurisdictional waters of the US. Further investigation is required to determine USACE jurisdiction of wetlands within the Project area. |
| **EPA** | **Spill Prevention Control and Countermeasures (SPCC) Plan** | **3** | SPCC Plans are required for non-transportation facilities that have a total aboveground oil storage capacity of 1,320-gallons. |
| **USFWS** | **Special Use Permit (SUP), Right of Way Permit, Compatibility Analysis of Disturbed Easements.** | **3** | If use is compatible or constructing in wetland or grassland easements, then a Permit or analysis is required for temporary disturbance. |
| **FAA** | **Form 7460-1. Noticed of Proposed Construction** | **1** | Notice and approval are required for structures over 200 feet in height. FAA approval of lighting and marking of turbines is required. |

**TABLE 17**

**POTENTIAL PERMITS AND APPROVALS REQUIRED FOR CONSTRUCTION AND OPERATION OF THE PROPOSED FACILITY**

**CONTINUED**

| AGENCY | TYPE OF APPROVAL | STATUS | NEED |
|---|---|---|---|
| **State of North Dakota** | | | |
| **NDDH** | **NPDES General Construction Stormwater** | **2** | Required for disturbance of over 1 acre of land. Must prepare a Storm Water Pollution Prevention Plan (SWPPP). |
| **NDDH – First District Health Unit** | **Septic Tank** | **2** | Required for septic system associated with O&M facility. |
| **Public Service Commission** | **Certificate of Site Compatibility** | **1** | Required for construction of generation facility. |
| **North Dakota Highway Patrol** | **Overheight/Overweight Permit** | **2** | Permit required for hauling construction equipment and materials on State Highways. |
| **North Dakota Department of Transportation** | **Road Approach/Access Permit, Utility Permit Risk Management Documents** | **2** | Permits required for construction of access roads on State Highways and utility crossings on State Highway ROW. |
| **Local Permits** | | | |
| **Ward County** | **Zoning, conditional use authorization and related building permits** | **1** | Permits required for project construction. |

* Status Explanation: 1 – Applied, Decision Pending; 2 – Will Apply Once Certificate Is Received; 3 – Final Layout Will Determine Whether Permit/Approval Is Needed

# 10.0 FACTORS CONSIDERED

The North Dakota Energy Conversion and Transmission Facility Siting Act lists eleven factors to guide the Commission in the evaluation and designation of the site of the facility. These factors are discussed below.

## 10.1 PUBLIC HEALTH AND WELFARE, NATURAL RESOURCES, AND THE ENVIRONMENT

The preceding sections discuss the research and investigations relating the effects of the proposed facility on public health and welfare, natural resources, and the environment. These effects and the proposed mitigation to minimize these effects are summarized in Section 7.17.

## 10.2 TECHNOLOGIES TO MINIMIZE ADVERSE ENVIRONMENTAL EFFECTS

Basin Electric will utilize the most recent technologies that minimize impacts to the environment. Current wind turbine technologies, including the equipment and siting tools, optimize the wind and land resources.

## 10.3 POTENTIAL FOR BENEFICIAL USES OF WASTE ENERGY

This factor is not applicable to this Project. No waste energy is created using wind energy.

## 10.4 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

Unavoidable adverse environmental effects may include the visual impacts associated with the Project as well as those impacts related to the placement and use of the land within the site. The visual character of the site will be changed due to the construction of the Project. In order to construct the facility, access roads and turbine pads are necessary for the operation and maintenance of the facility. The preliminary turbine and access road layout is expected to impact approximately 73 acres of land assuming all turbines are 1.5 MW. Approximately 2 acres of land will be acquired for the O&M facility and Project Substation. Approximately 4 acres of land will be impacted by turbine placement.

## 10.5 ALTERNATIVES TO THE PROPOSED SITE

One other alternative project area was considered during the initial project planning but was not chosen based on economic considerations and transmission connectivity. Basin Electric believes that the proposed site is the most viable alternative. Basin Electric is committed to being flexible on the preliminary site layout and will work closely with landowners and regulatory agencies to examine all reasonable alternatives to the preliminary site layout.

## 10.6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF NATURAL RESOURCES

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources have on future generations. Irreversible effects primarily result from use or destruction of a specific resource that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action. There are few commitments of resources associated with this Project that are irreversible and irretrievable, but include those resources primarily related to construction.

Construction resources that will be used include aggregate resources, concrete, steel, and hydrocarbon fuel. Each steel turbine requires the construction of a concrete base approximately 20 feet across and up to 10 feet thick. Access roads will require aggregate resources for their construction and maintenance. During construction vehicles will be traveling to and from the site, utilizing hydrocarbon fuels.

## 10.7 DIRECT AND INDIRECT ECONOMIC IMPACTS

Direct economic impacts include the short-term impacts associated with up to 75 acres of agricultural land being removed from production due to conversion to turbine sites, associated access roads, and associated facilities. In general, agricultural areas surrounding each turbine can still be farmed, and landowners will be compensated for the land occupied by the wind turbines and associated facilities.

The remaining direct and indirect economic impacts are primarily positive. To the extent that local contractors are used for portions of the construction, total wages and salaries paid to contractors and workers in Ward County will contribute to the total personal income of the region. Additional personal income will be generated for residents in the county and the state by circulation and recirculation of

dollars paid out by the Applicant as business expenditures and state and local taxes. Expenditures made for equipment, energy, fuel, operating supplies, and other products and services benefit businesses in the county and the state.

Long-term beneficial impacts to the county's tax base as a result of the construction and operation of the wind farm will contribute to improving the local economy in this area of North Dakota. The development of wind energy in this region will be important in diversifying and strengthening the economic base of north central North Dakota. Additional revenues are expected from property and income taxes.

Continuing to establish the north central region of North Dakota as an important producer of alternative energy sources may spur the development of wind-related businesses in the area, in turn contributing to the economic growth in the region.

## 10.8 EXISTING DEVELOPMENT PLANS OF THE STATE, LOCAL, GOVERNMENT, AND PRIVATE ENTITIES AT OR IN THE VICINITY OF THE SITE

No conflicts are anticipated with existing state and local government and private entities' development plans.

## 10.9 EFFECT OF SITE ON CULTURAL RESOURCES

Tetra Tech completed a Class I file and literature search for Basin Electric. The Project Site consists of approximately 30,000 acres. The Class I literature search revealed that 12 cultural resource projects have been conducted in The Project Site. The file search identified eight previously recorded sites and one isolate in The Project Site. Site types include stone rings, a lithic scatter, a road, a township hall and homesteads/farmsteads. Of these sites, one is recommended eligible to the National Register of Historic Places (NRHP), three are potentially eligible, one is recommended as not eligible, and the eligibility of the remaining three is undetermined.

A Class III cultural resource inventory was also performed at the Project Area. The inventory examined 83 turbine locations (including alternate locations), access roads and underground collector lines which totaled 1,484 acres. This inventory identified 31 sites and three isolated finds. Of the 31 sites, 19 are prehistoric sites, 11 are historic sites and one is a multi-component site. The prehistoric sites include 18 stone feature sites and one depression site. The historic sites include two architectural sites and nine

archaeological sites. The multi-component sites consist of historic architectural features, historic archaeological remains and a prehistoric stone feature. The three isolated finds consist of two lithic tools and one lithic flake, all of which are made of Knife River Flint. Of these sites, one is recommended eligible to the NRHP, 10 are not recommended eligible and the eligibility of the remaining 20 sites is undetermined (Ethnoscience 2008).

Currently, no impacts are anticipated to known cultural resources in the site. Basin Electric is committed to minimize impacts to these cultural resources and will avoid these resources and any additional cultural resources identified throughout the life of the Project. If avoidance is not possible, Basin Electric will work with the North Dakota SHPO to mitigate potential impacts.

## 10.10 EFFECT OF SITE ON BIOLOGICAL RESOURCES

Basin Electric will implement measures to avoid and minimize effects to biological resources at the proposed site. The impact of the Project on wildlife is expected to be minimal. There is potential for avian and bat collisions with facility. The site will be designed to minimize impacts to those species.

## 10.11 AGENCY COMMENTS

Agencies were contacted to comment on the Project. Basin Electric sent letters requesting comments and received no response from the following agencies:

- North Dakota Forest Service
- North Dakota Department of Commerce
- Natural Resources Conservation Service
- North Dakota State Legislature
- Federal Emergency Management Agency
- Federal Highway Administration
- North Dakota Indian Affairs Commission
- North Dakota Congressional Delegation
- North Dakota Public Service Commission
- North Dakota Transmission Authority
- North Dakota State Land Department
- North Dakota Department of Agriculture
- Federal Aviation Administration
- Environmental Protection Agency, Region 8
- Farm Service Agency
- Ward County Zoning Department

The following summaries of comments received apply to the proposed PrairieWinds – ND 1 Project. Appendix D contains the list of agencies scoping letters were sent to, examples of the letters sent, and the agency response letters.

### 10.11.1 North Dakota Game and Fish Department

The North Dakota Fish and Game Department is concerned that the proposed project has the potential for disturbance to native prairie from construction of turbines, access roads, and transmission lines. It requests that work within the native prairies be avoided to the extent possible and the development of the USFWS Wind Turbine Siting Guidance to reduce these impacts. It also recommends avoidance of siting and construction of turbines in wetlands. For wetlands areas that cannot be avoided, it recommends above ground appurtenances not be placed in wetlands and that no alteration be made to existing drainage patterns. The North Dakota Fish and Game Department requested that they be kept informed as the project progresses and that GPS locations for each of the wind turbines be provided to them as each individual site has been established.

### 10.11.2 U.S. Fish and Wildlife Service

A review of Fish and Wildlife Service realty records indicates that Fish and Wildlife Service property interests are located in the planning area. The Fish and Wildlife Service recommends that the Audubon Wetland Management District be contacted for more specific information relative to Service easements and up to date realty records. The Fish and Wildlife Service has a goal of reasonable accommodation for wind power development on wetland and grassland easements. The Fish and Wildlife Service's primary responsibility in protecting these easements is to review all proposed uses to ensure that the requests are compatible with Fish and Wildlife Service easement regulations and various laws and policies. With this in mind the Fish and Wildlife Service will attempt to accomplish three goals in reviewing proposed projects with regard to their impacts to easements: 1) avoid impacts to Fish and Wildlife Service grassland and wetland easements in the project area as much as possible; 2) if impacts are unavoidable, ensure that any proposed turbine and associated infrastructure impacts on any Fish and Wildlife Service easement areas are kept to a minimum; and 3) investigate potential alternatives to eliminate or reduce impacts to easement areas to protect the integrity of the easement. The Fish and Wildlife Service will not consider wind projects located on fee title tracts such as Waterfowl Production Areas which are known to be present in the project study area. If the proposed project will have impacts on Fish and Wildlife Service administered lands the Fish and Wildlife Service will be required to conduct an analysis of impacts and alternatives under NEPA.

### 10.11.3 North Dakota SHPO

The State Historical Society of North Dakota noted that there is a potential for recorded and unrecorded properties in a variety of physiographic settings within the study area. They requested a Class I Cultural Resources Inventory be prepared and reviewed by federal agencies and the State Historic Preservation Officer.

### 10.11.4 North Dakota Parks and Recreation Department

The North Dakota Parks and Recreation Department commented that it has identified the following species of concern within a one-mile radius of the project area:

- Needle and Thread Mixed Grass Prairie
- Western Porcupine Grass Hillside
- Bullrush Freshwater Marsh
- Southern Watermeal
- Saline Wetland
- Piping Plover

The project has the potential for habitat disturbance and recommends that in reclaiming affected areas that they be revegetated with species native to the project area. The proposed project also has the potential to threaten nesting and feeding patterns of migratory birds and bats in the area. It recommends that all efforts be made to avoid impacts to wildlife species and their habitats, and to identify and assess adverse impacts to wildlife.

### 10.11.5 North Dakota Department of Health

The North Dakota Department of Health commented that possible environmental health impacts from the proposed project will be minor and can be controlled by proper construction measures including:

1. Minimization of fugitive dusts;
2. Minimization of noise by ensuring that construction equipment has a muffler in good working order. Construction activities should not be conducted during early morning or late evening.

### 10.11.6 North Dakota Department of Transportation

The proposed project will have no adverse impacts on the North Dakota Department of Transportation. However, if the project requires highway right of way, then appropriate permits and risk management documentation will need to be obtained.

### 10.11.7 U.S. Army Corps of Engineers

The Department of the Army, Corp of Engineers requested that an application for permit under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Rivers Act be submitted if the project will affect navigable waters or if it will require dredging or filling in waters of the United States.

### 10.11.8 Ward County Commissioners

Basin Electric sent a letter to the Ward County Commissioners requesting comments. No response has been received. However, Ward County Commissioners were present during the April 3 public meeting.

### 10.11.9 Northern Cheyenne Tribe

The Northern Cheyenne Tribe commented that there is a potential for areas that have traditional cultural properties. In a follow up call they responded that they wish to review the cultural resource survey when it is completed.

## 11.0 QUALIFICATIONS OF CONTRIBUTORS TO SITING STUDY

| NAME | PROJECT ROLE | EDUCATION AND PROFESSIONAL EXPERIENCE |
|---|---|---|
| Ron Rebenitsch, Basin Electric | Project Manager | B.S. Civil Engineering<br>M.B.A.<br>Graduate work – Environmental Engineering.<br>Registered Professional Engineer - ND, WY, CO<br>**34 Years Experience** |
| Amanda Wangler, Basin Electric | Project Engineer | B.S. Electrical Engineering<br>Registered Professional Engineer - ND<br>**5 Years Experience** |
| Kevin Solie, Basin Electric | Environmental Analyst | M.S. Geology<br>B.S. Geological Engineering<br>B.S. Geology<br>**17 Years Experience** |
| Jason Brekke, Basin Electric | GIS Analyst | B.S. Geography<br>**7 years Experience** |
| Jack Holt, Basin Electric | Right-of-Way | A.A. Marine Technology<br>SR/WA (Senior Right of Way Agent designation)<br>**25 years experience** |
| Amy Spilman, Basin Electric | Right-of-Way | Various Courses through International ROW Assoc.<br>SR/WA (Senior Right of Way Agent designation)<br>**20 years experience** |
| Curt Pearson, Basin Electric | Corporate Communications | B.S. Business Administration<br>M.B.A.<br>Certified Cooperative Communicator<br>**30 Years Experience** |
| Robert Farnes, Tetra Tech | Document Manager | B. A. Geography<br>**18 Years Experience** |
| Melissa Weakley, Tetra Tech | Environmental Engineer | B.S. Chemical Engineering<br>M.S. Civil and Environmental Engineering<br>**11 Years Experience** |

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## 13.0 DEFINITIONS

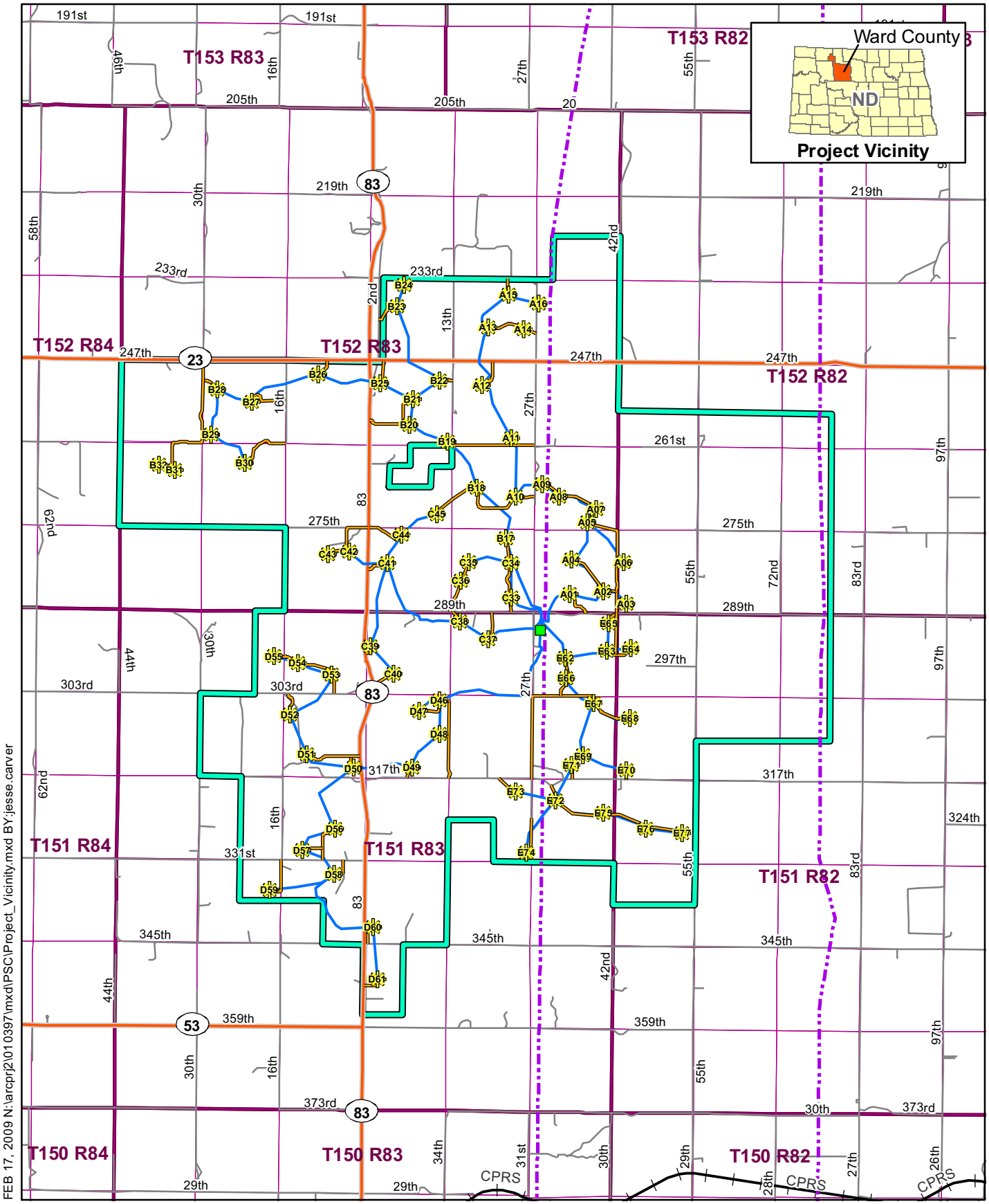
| | |
|---|---|
| ADT | Average Daily Traffic |
| Aggregate Surface | Road cover used for proposed access roads |
| ANSI | American National Standards Institute |
| APE | Area of Potential Effect |
| Asynchronous Generator | A cage-wound generator, also called an induction generator, used to generate alternating current |
| BMP | Best Management Practice; prevents soil erosion and sedimentation |
| Capacity | The capability of a system, circuit, or device for storing electronic charge |
| Certificate | Certificate of Site Compatibility |
| c.f | Capacity factor |
| Commission or PSC | North Dakota Public Service Commission |
| Corridor Certificate | Certificate of Corridor Compatibility |
| dBA | A-weighted decibel |
| Distribution | Relatively low-voltage lines that deliver electricity to the retail customer's home or business |
| DOE | U.S. Department of Energy |
| E&C | Engineering and construction |
| Electromechanical | Of, relating to, or being a mechanical process or device actuated or controlled electrically; especially being a transducer for converting electrical energy to mechanical energy |
| EMF | Electric and Magnetic Field |
| EPC | Engineering, procurement, and construction |
| ESA | Environmental The Project Sitessessment |
| FAA | Federal Aviation Administration |
| FEMA | Federal Emergency Management Agency |
| FIRM | Flood Insurance Rate Maps |
| FPPA | Farmland Protection Policy Act |
| GE | General Electric |
| Gearbox | An assembly of parts including the speed-changing gears and the propeller shaft by which the power is transmitted from an |

| | |
|---|---|
| | automobile engine to a live axle; the speed-changing gears in such an assembly |
| Generator | A machine by which mechanical energy is changed into electrical energy |
| Geotechnical | A science that deals with the application of geology to engineering |
| Hub | The central part of a circular object (as a wheel or propeller) |
| Interconnection | To be or become mutually connected |
| IS | Integrated System |
| kV | kilovolt |
| kW | kilowatt |
| kWh | kilowatt-hour |
| MW | megawatt |
| MWh | megawatt-hour |
| m/s | meter per second |
| MAPP | Mid-Continent Area Power Pool |
| Micrositing | The process in which the wind resources, potential environmentally sensitive areas, soil conditions, and other site factors, as identified by local, state and federal agencies, are evaluated to locate wind turbines and associated facilities |
| MISO | Midwest Independent System Operator |
| mph | miles per hour |
| Nacelle | A streamlined enclosure (as for an engine), which houses the gearbox, generator, brake, cooling system and other electrical and mechanical systems |
| NDAC | North Dakota Administrative Code |
| NDCC | North Dakota Century Code |
| NDDOH | North Dakota Department of Health |
| NDDOT | North Dakota Department of Transportation |
| NDGFD | North Dakota Game and Fish Department |
| NDNHI | North Dakota Natural Heritage Inventory |
| NDPRD | North Dakota Parks and Recreation Department |
| NESC | National Electric Safety Code |
| NHID | Natural Heritage Inventory Database |

| | |
|---|---|
| NPDES | National Pollutant Discharge Elimination System |
| NRCS | National Resource Conservation Service |
| NREL | National Renewable Energy Labotatory |
| NRHP | National Register of Historic Places |
| NWI | National Wetlands Inventory |
| O&M | Operations and maintenance |
| Pitch | The action or a manner of pitching; especially an up-and-down movement |
| Project | PrairieWinds – ND 1 |
| PSC or Commission | North Dakota Public Service Commission |
| PSA | Power Supply Analysis |
| Resistance | The opposition offered by a body or substance to the passage through it of a steady electric current |
| Rotor | The rotor consists of three blades mounted to a rotor hub |
| RD | Rotor Diameter: Diameter of the rotor from the tip of a single blade to the tip of the opposite blade |
| ROW | Right-of-Way |
| rpm | Revolutions per minute |
| RPS | Renewable Portfolio Standards |
| SCADA | Supervisory Control and Data Acquisitions (communications technology) |
| SHPO | North Dakota State Historic Preservation Office |
| Step-up Transformer | A transformer that increases voltage |
| Substation | A subsidiary station in which electric current is transformed |
| SWPPP | Storm Water Pollution Prevention Plan |
| T&E | Threatened and endangered |
| Torque | A force that produces or tends to produce rotation or torsion; also a measure of the effectiveness of such a force that consists of the product of the force and the perpendicular distance from the line of action of the force to the axis of rotation; a turning or twisting force |
| Transformer | An electrical device by which alternating current of one voltage is changed to another voltage |

| | |
|---|---|
| Transmission | An assembly of parts including the speed-changing gears and the propeller shaft by which the power is transmitted |
| THPO | Tribal Historic Preservation Officer |
| TCPO | Tribal Cultural Preservation Officer |
| UND | University of North Dakota |
| USACE | U.S. Army Corps of Engineers |
| USFWS | U.S. Fish and Wildlife Service |
| Western | Western Area Power Administration |
| WCFZ | Worst Case Fresnel Zone |
| WMD | Wetland Management District |
| WPA | Waterfowl Protection Area |
| WRB | Water Resource Board |
| Yaw | To deviate erratically from a course or to turn by angular motion about the vertical axis |

# FIGURES




**Legend**

- Project Area
- **Proposed Site Layout**
- Project Roadway
- Proposed Substation Site
- Proposed Wind Turbine
- Proposed Collector Line
- Existing Transmission Line
- Railway
- Highway
- County Road

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FEB 17, 2009

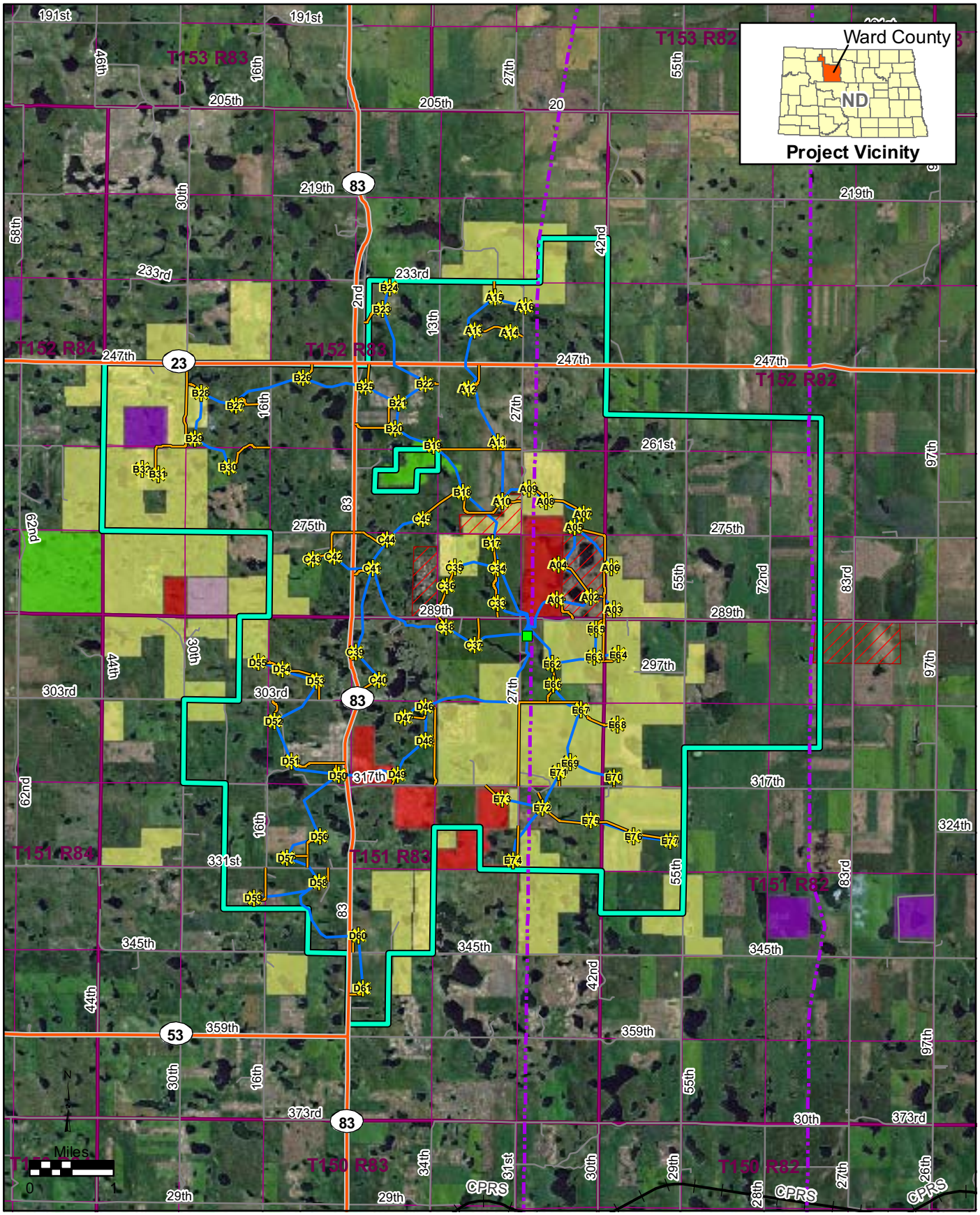
**Figure 1**

**Project Vicinity Map**

**PrairieWinds – ND 1**

**Basin Electric Power Cooperative**

**Ward County, North Dakota**

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**Legend**

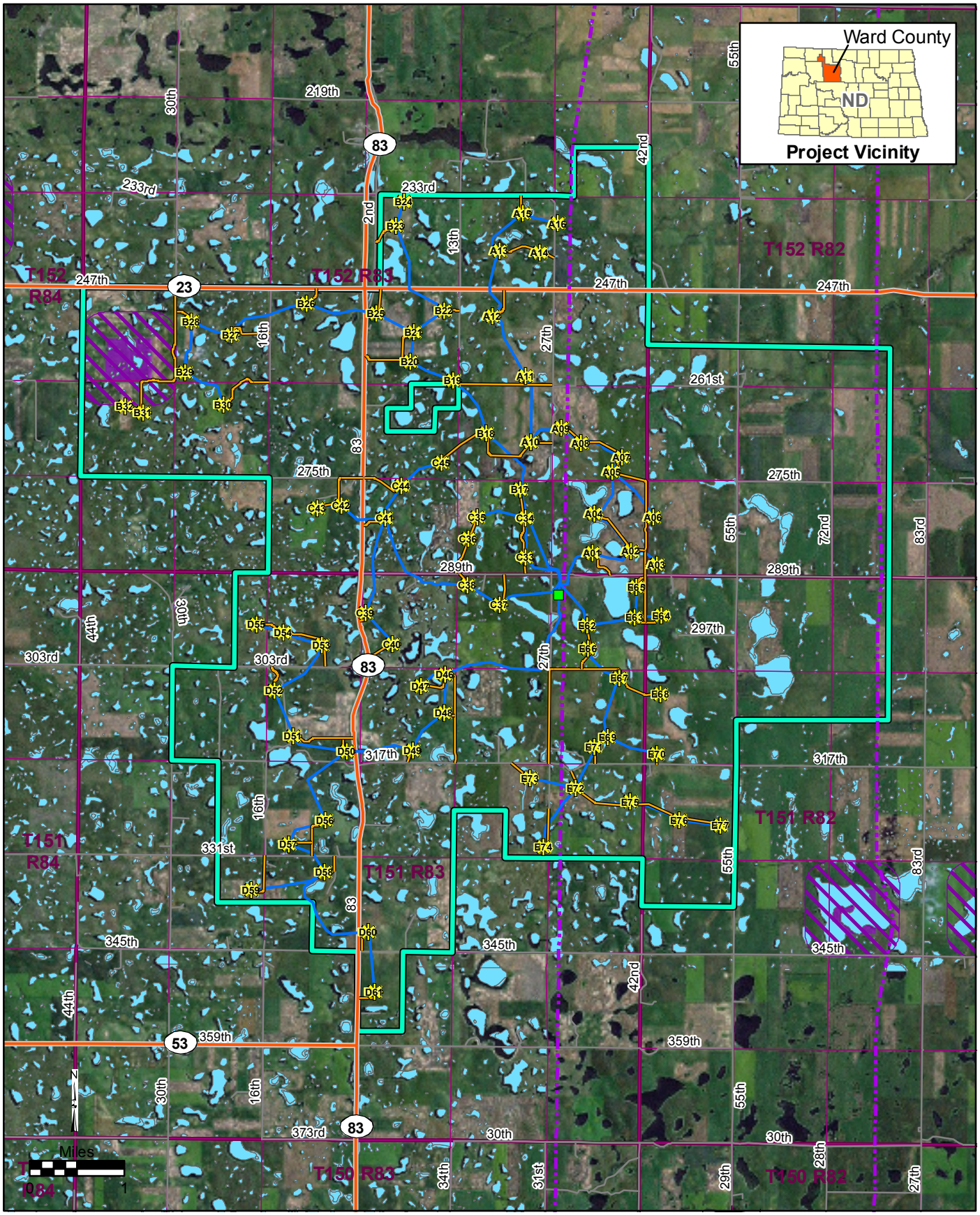
- Project Area
- **Proposed Site Layout**
- Project Roadway
- Proposed Substation Site
- Proposed Wind Turbines
- Proposed Collector Line
- Existing Transmission Line
- Railway
- Highway
- County Road
- USFWS Grassland Easement
- USFWS Waterfowl Production Area
- USFWS Wetland & Grassland Easement
- USFWS Wetland Easement
- ND State Land Department
- ND Game & Fish PLOTS Locations

JAN 14, 2009

**Figure 2**

## Project Area Map

**PrairieWinds – ND 1**
**Basin Electric Power Cooperative**
**Ward County, North Dakota**

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DEC 10, 2008

**Legend**

- Project Area
- **Proposed Site Layout**
- Project Roadway
- Proposed Substation Site
- Proposed Wind Turbine
- Proposed Collector Line
- Existing Transmission Line
- Railway
- Highway
- County Road
- **Avoidance Areas**
- National Wetlands Inventory
- USFWS Waterfowl Production Area (WPA)
- WPA .25 Mile Bufffer

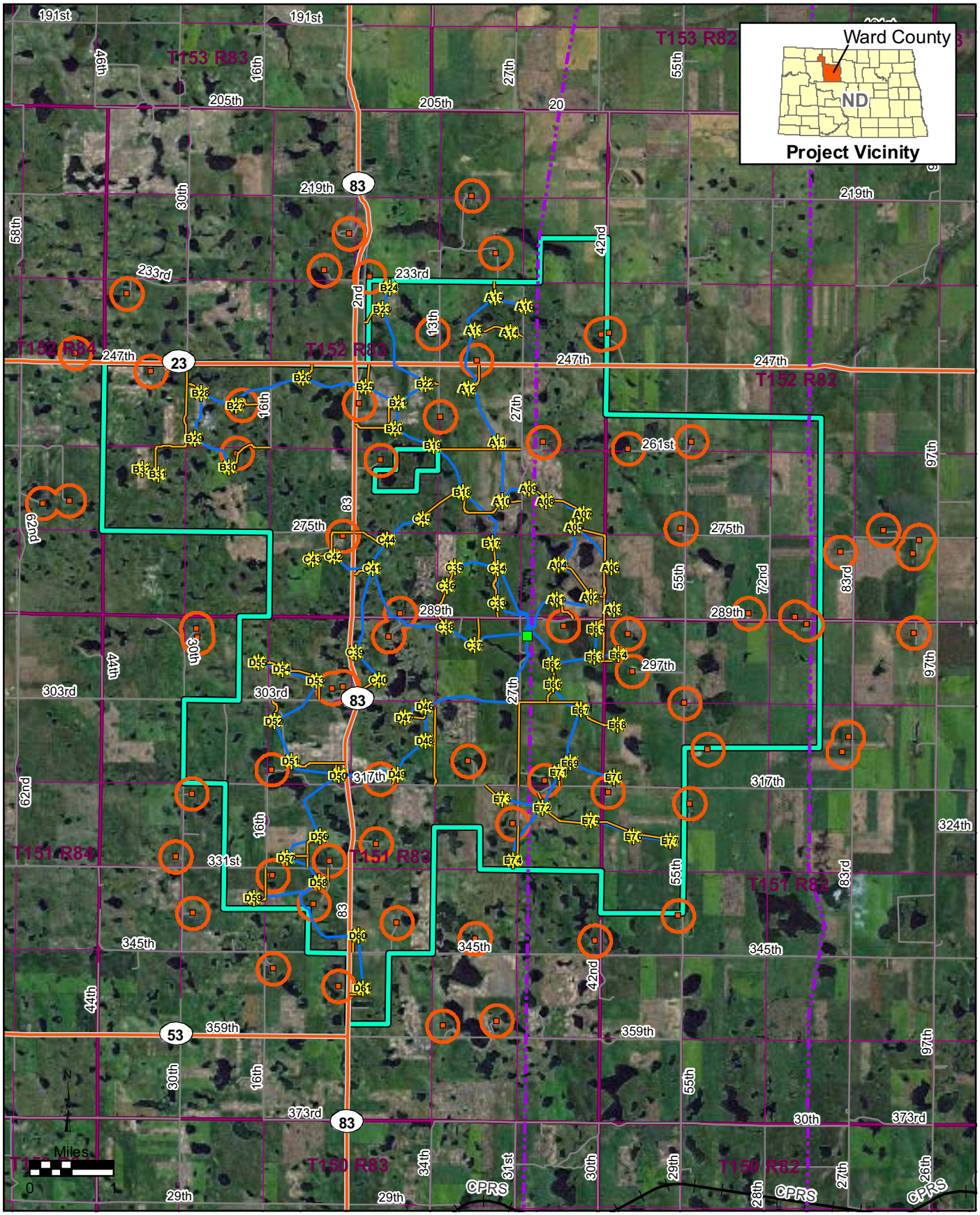
**Figure 3**

**Exclusion and Avoidance Areas**

**PrairieWinds – ND 1**

**Basin Electric Power Cooperative**

**Ward County, North Dakota**

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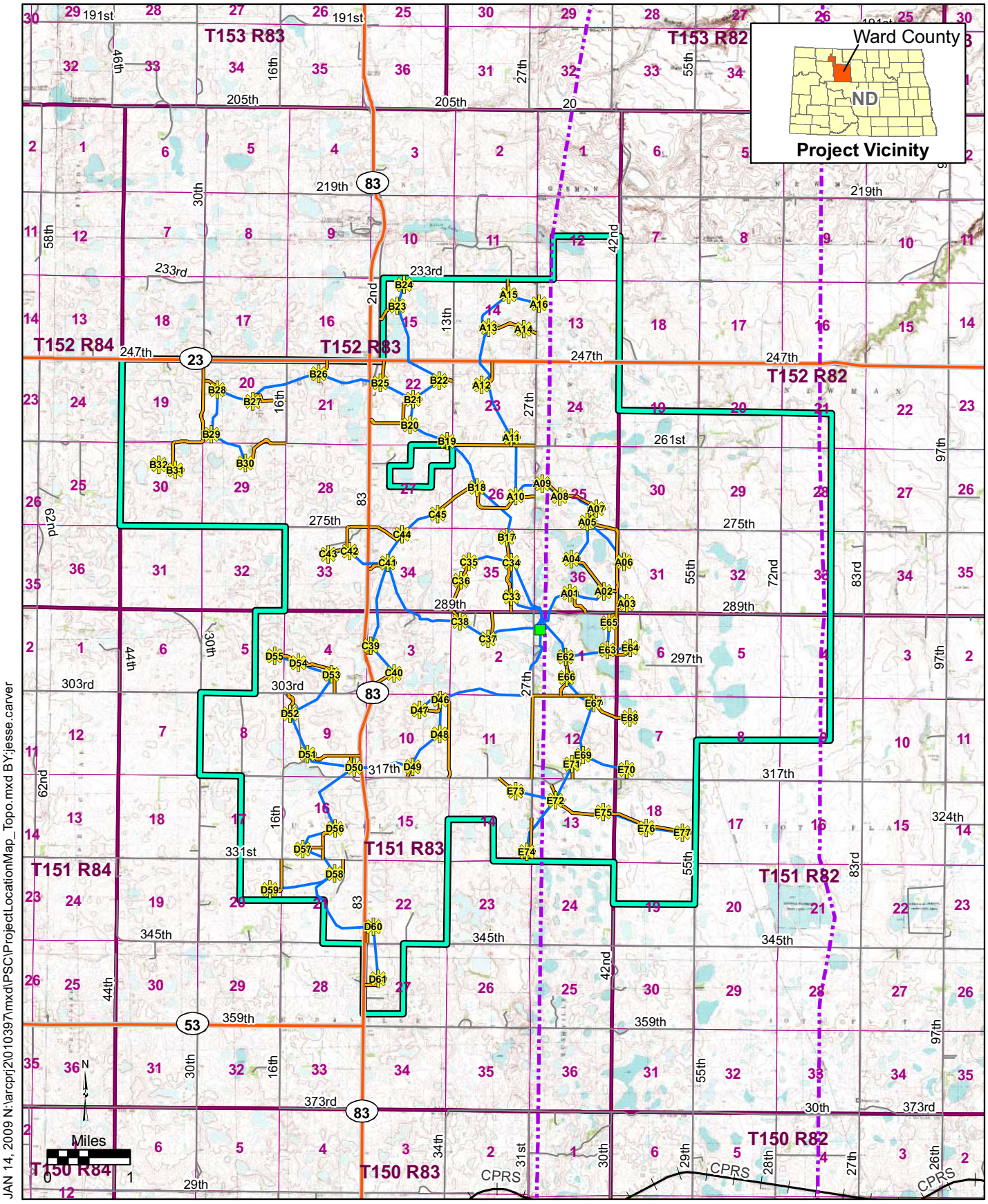
**Legend**

- Project Area
- **Proposed Site Layout**
- Project Roadway
- Proposed Substation Site
- Proposed Wind Turbines
- Proposed Collector Line
- Existing Transmission Line
- Railway
- Highway
- County Road
- Residences (Digitized from Aerial)
- Residences 1000 ft Buffer

JAN 14, 2009

**Figure 4**

**Project Location Map**
**PrairieWinds – ND 1**
**Basin Electric Power Cooperative**
**Ward County, North Dakota**

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**Legend**

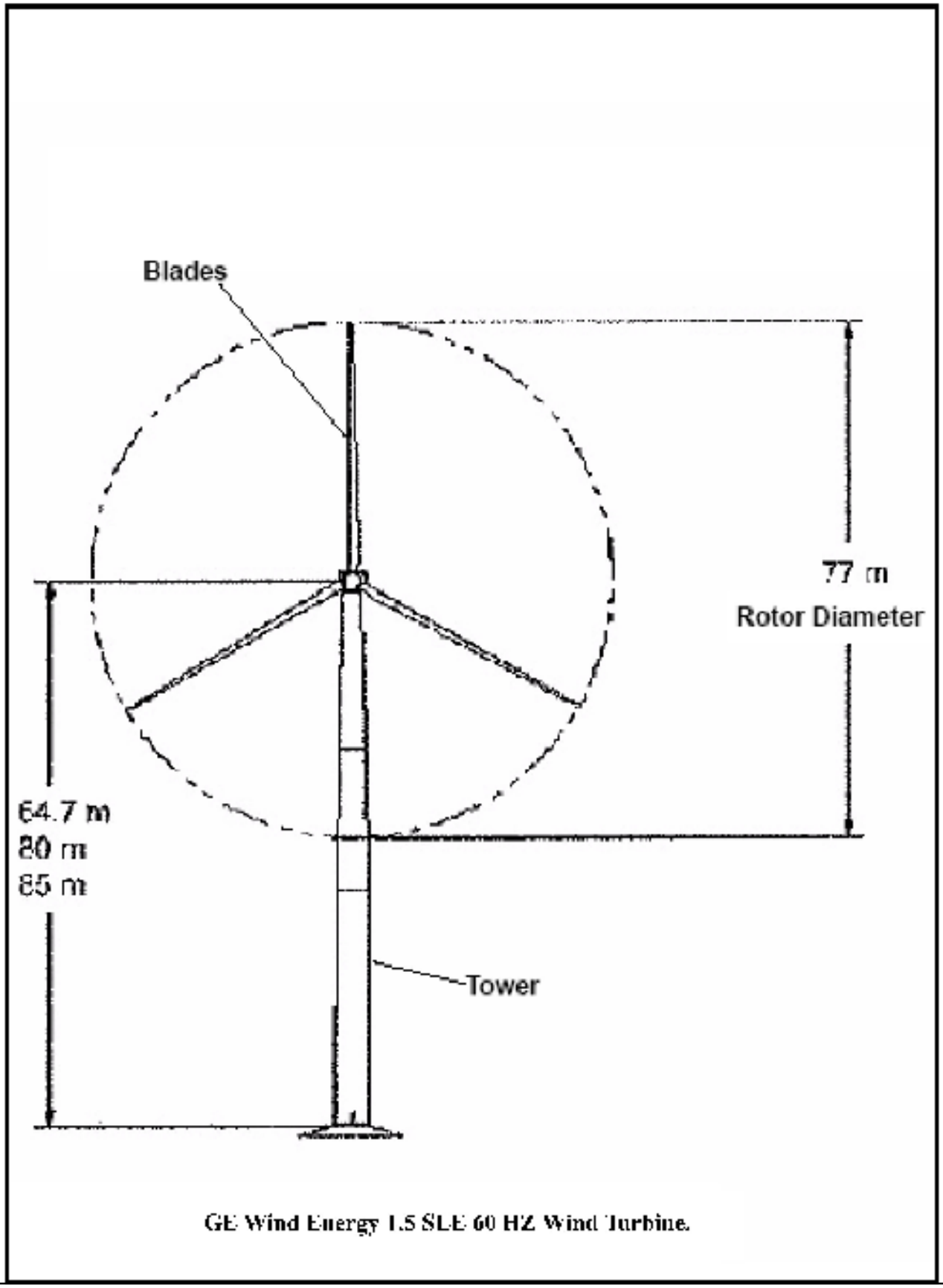
- Project Area
- **Proposed Site Layout**
- Project Roadway
- Proposed Substation Site
- Proposed Wind Turbines
- Proposed Collector Line
- Existing Transmission Line
- Railway
- Highway
- County Road

JAN 14, 2009

**Figure 5**

**Project Location Map (Topographic)**

**PrairieWinds – ND 1**
**Basin Electric Power Cooperative**
**Ward County, North Dakota**




GE Wind Energy 1.5 SLE 60 HZ Wind Turbine.

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FEB 17, 2009

**Figure 6**

**Wind Turbine Design Features**

**PrairieWinds – ND 1**
**Basin Electric Power Cooperative**
**Ward County, North Dakota**

Source:
Landon Wind Energy Center
PSC Application; Figure 6

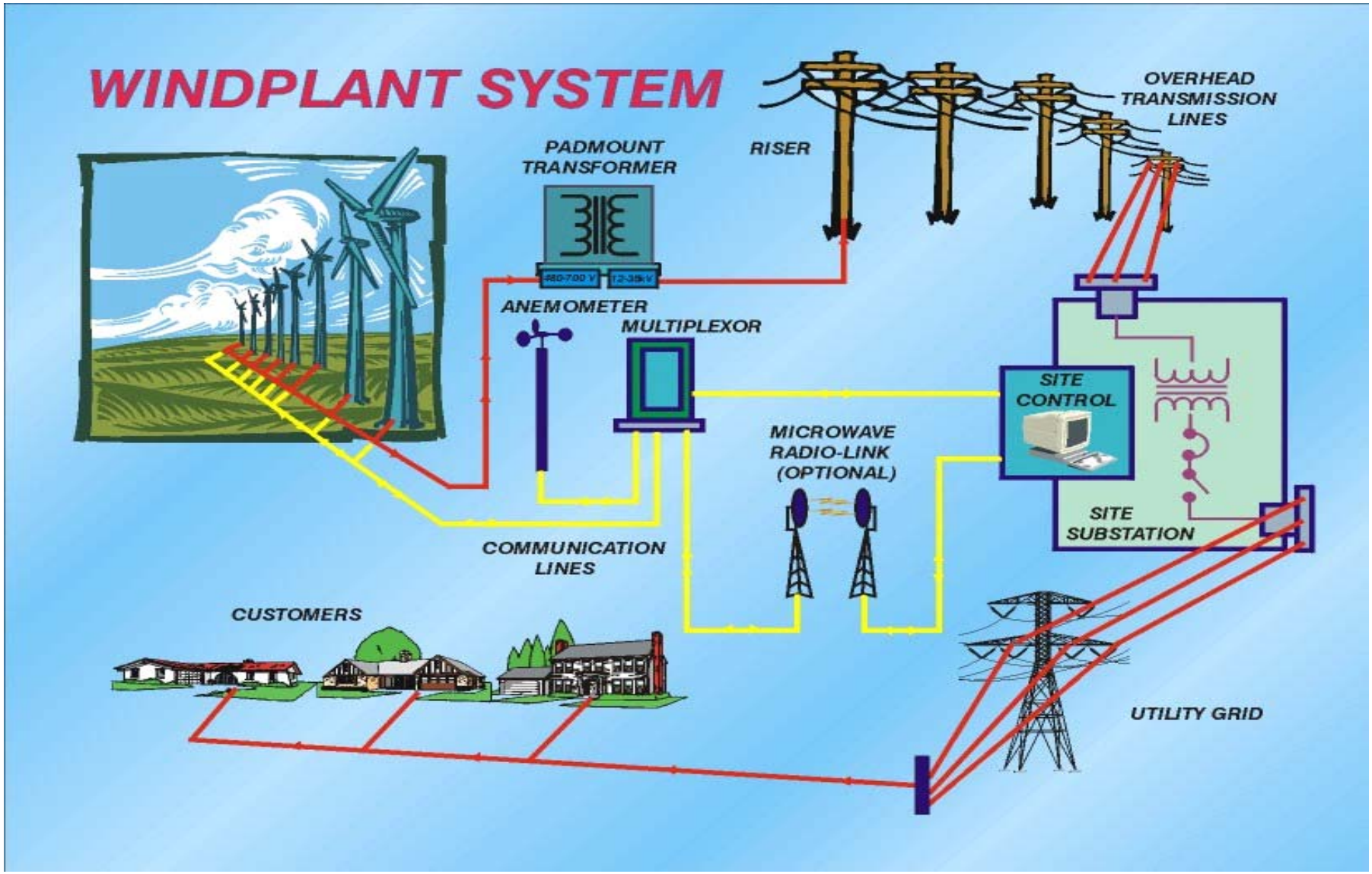


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Figure 7

**Path of Energy Diagram**

**PrairieWinds – ND 1**

**Basin Electric Power Cooperative**

**Ward County, North Dakota**

Source:
Langdon Wind Energy Center
PSC Application; Figure 7


FEB 17, 2009

Figure 8

**Typical Wind Energy Center Layout**

**PrairieWinds – ND 1**
**Basin Electric Power Cooperative**
**Ward County, North Dakota**

Source:
Langdon Wind Energy Center
PSC Application; Figure 8

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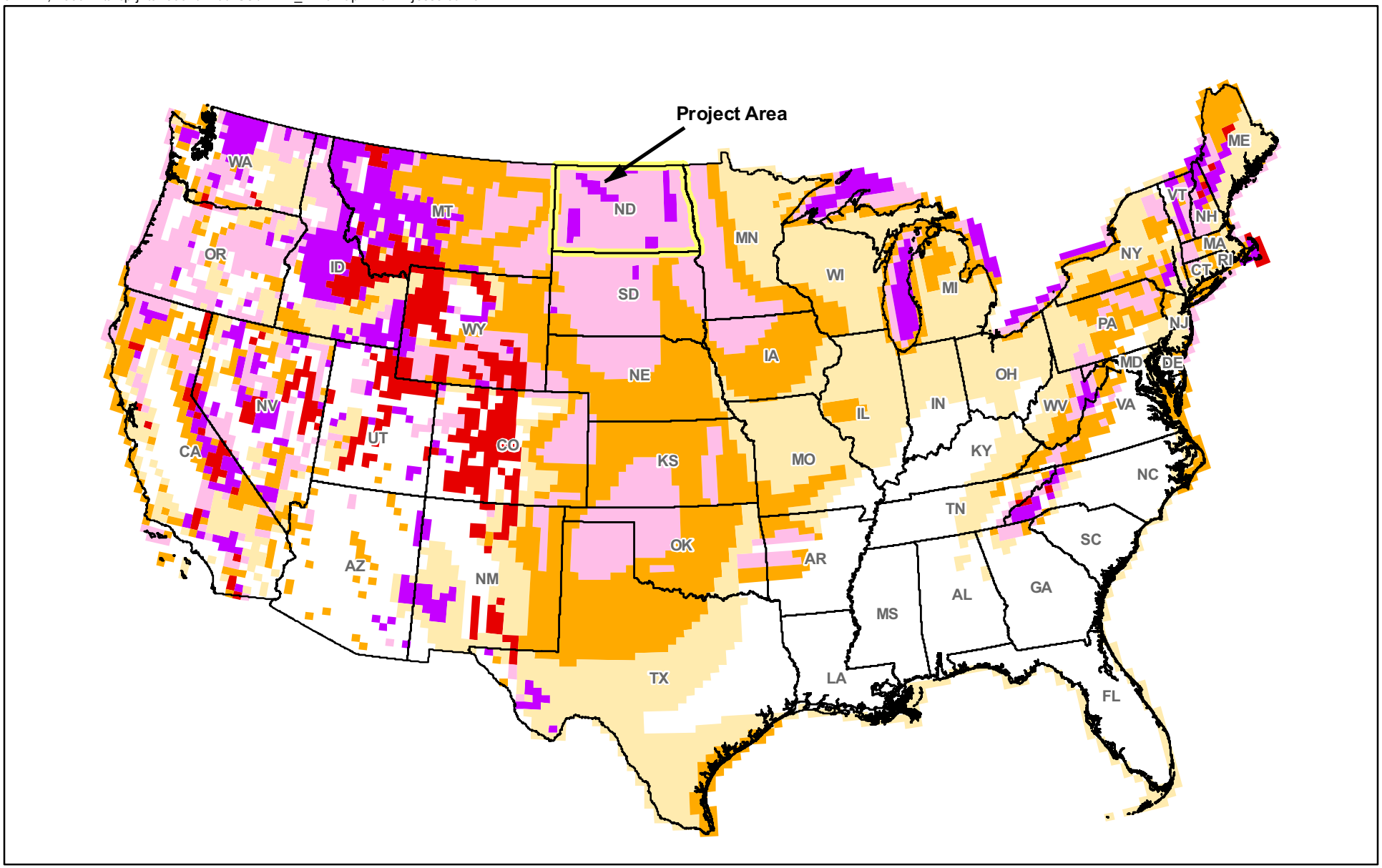


**Wind Power Classification**

- 2- Marginal
- 3- Fair
- 4- Good
- 5- Excellent
- 6- Outstanding

Source:
U.S. Department of Energy
National Renewable Energy Laboratory

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JAN 14, 2009

Figure 9

**United States Wind Resource Map**

**PrairieWinds – ND 1**
**Basin Electric Power Cooperative**
**Ward County, North Dakota**

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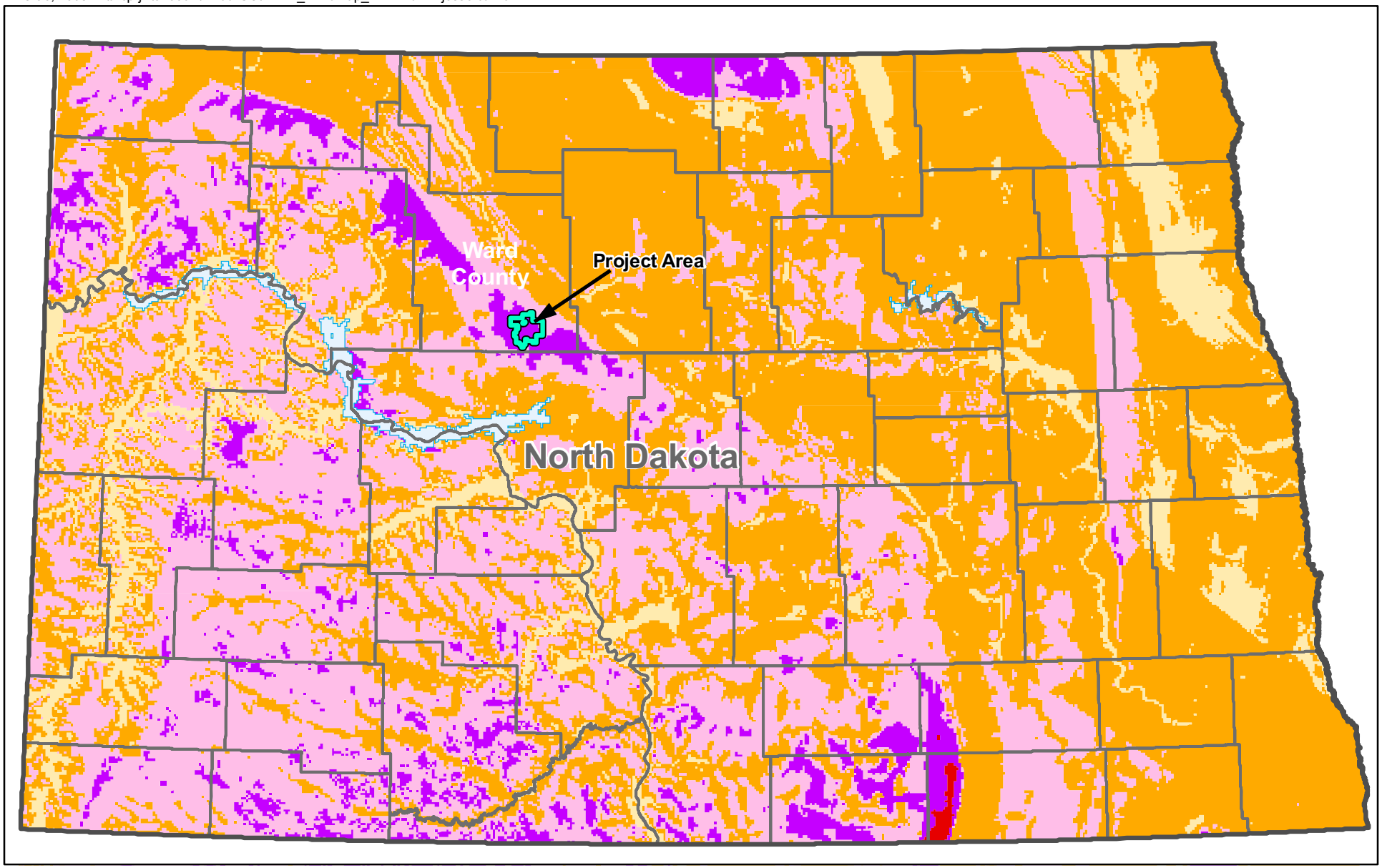



**Legend**

Project Area

**Wind Power Classification**

- 2- Marginal
- 3- Fair
- 4- Good
- 5- Excellent
- 6- Outstanding

Source:
U.S. Department of Energy
National Renewable Energy Laboratory

N

Miles

0 40

DEC 30, 2008

Figure 10

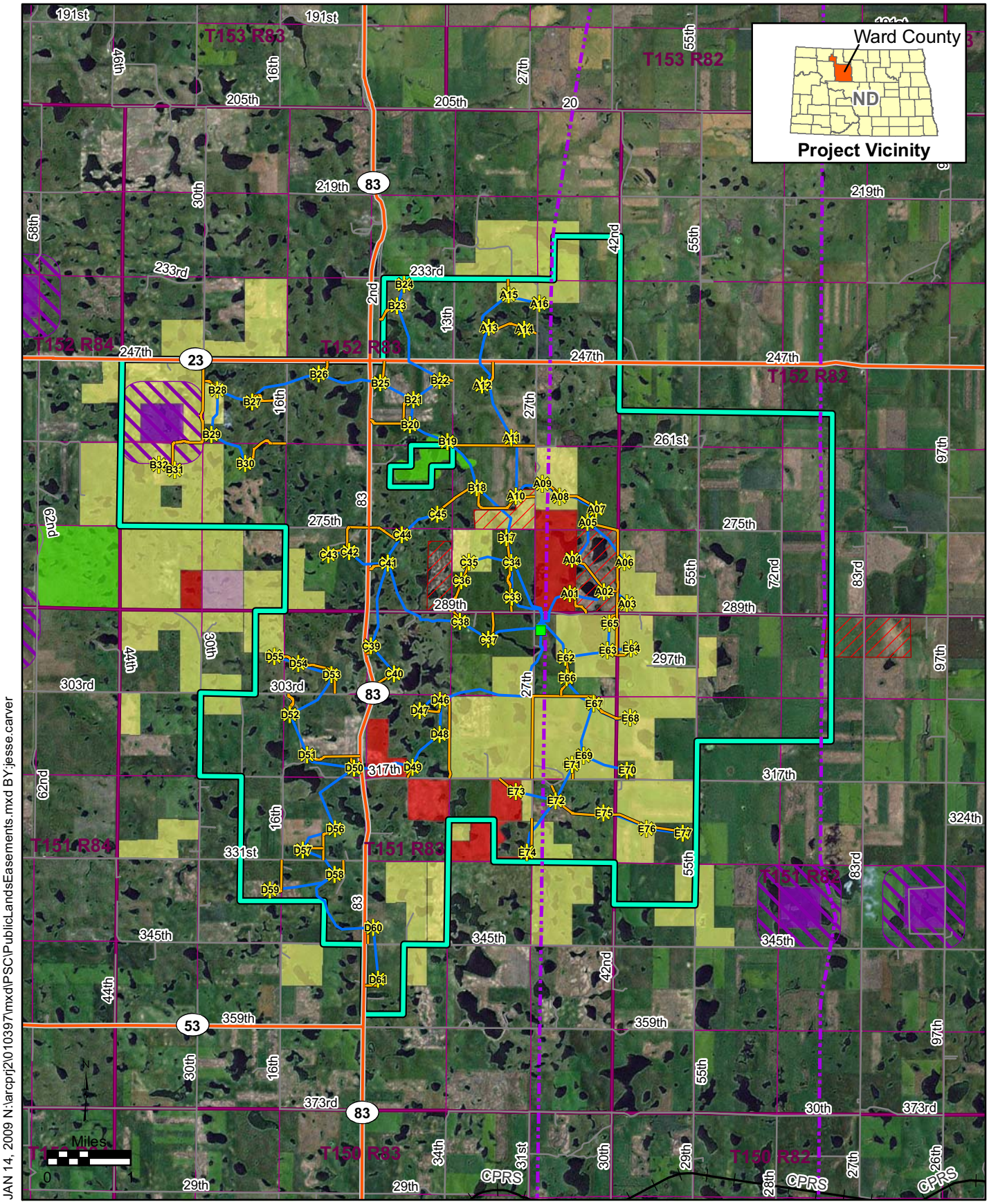
**North Dakota**

**Wind Resources**

**PrairieWinds – ND 1**

**Basin Electric Power Cooperative**

**Ward County, North Dakota**




JAN 14, 2009 N:\arcprj\2010397\mxd\PSC\PublicLandsEasements.mxd BY:jesse.carver

**Legend**

- Project Area
- **Proposed Site Layout**
- Project Roadway
- Proposed Substation Site
- Proposed Wind Turbines
- Proposed Collector Line
- Existing Transmission Line
- Railway
- Highway
- County Road
- USFWS Grassland Easement
- USFWS Waterfowl Production Area
- USFWS Wetland & Grassland Easement
- USFWS Wetland Easement
- ND State Land Department
- ND Game & Fish PLOTS Locations
- WPA .25 Mile Bufffer

JAN 14, 2009

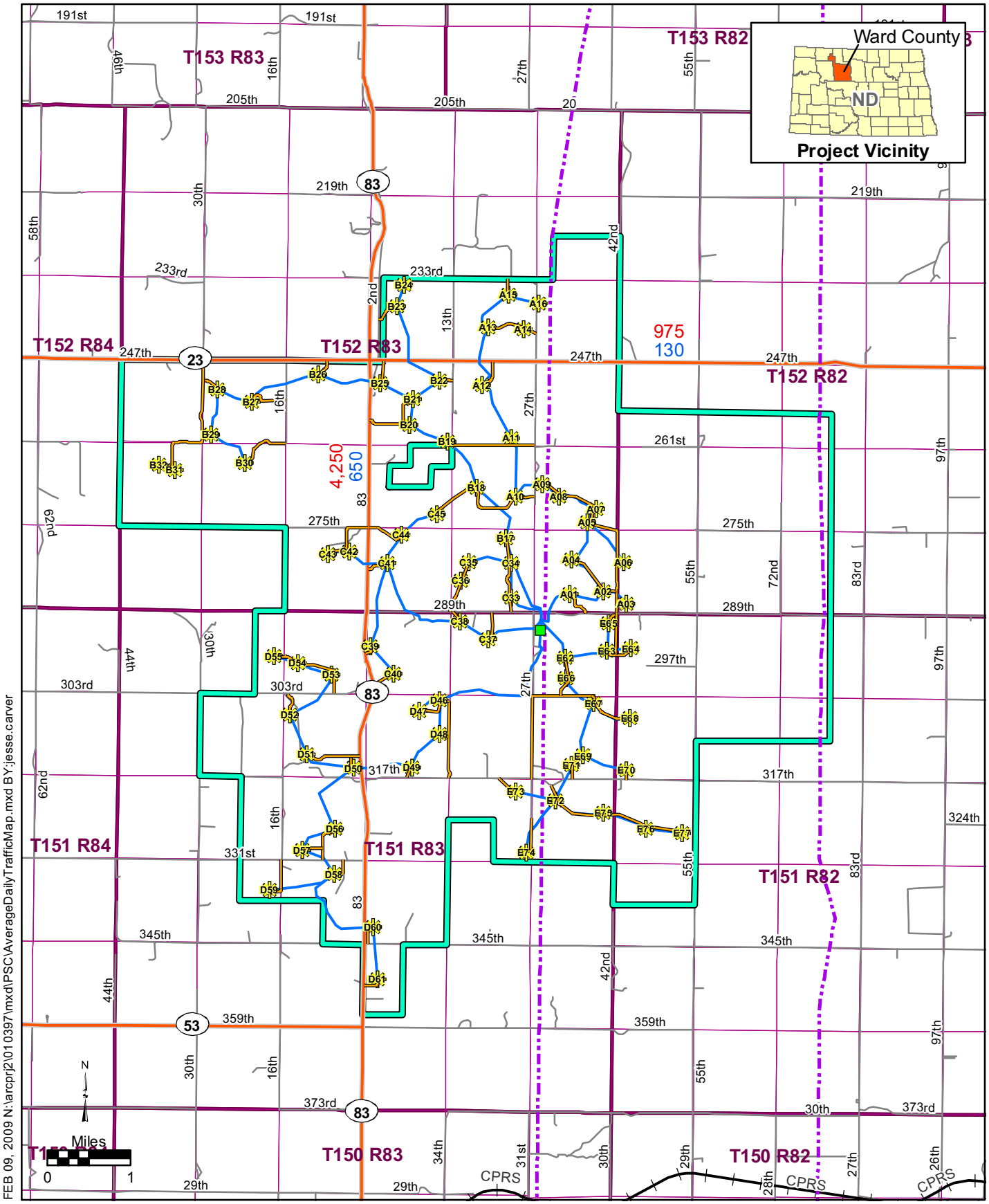
**Figure 11**

**Public Lands and Easements**

**PrairieWinds – ND 1**

**Basin Electric Power Cooperative**

**Ward County, North Dakota**




FEB 09, 2009 N:\arcprj2\1010397\mxd\PSC\AverageDailyTrafficMap.mxd BY:jesse.carver

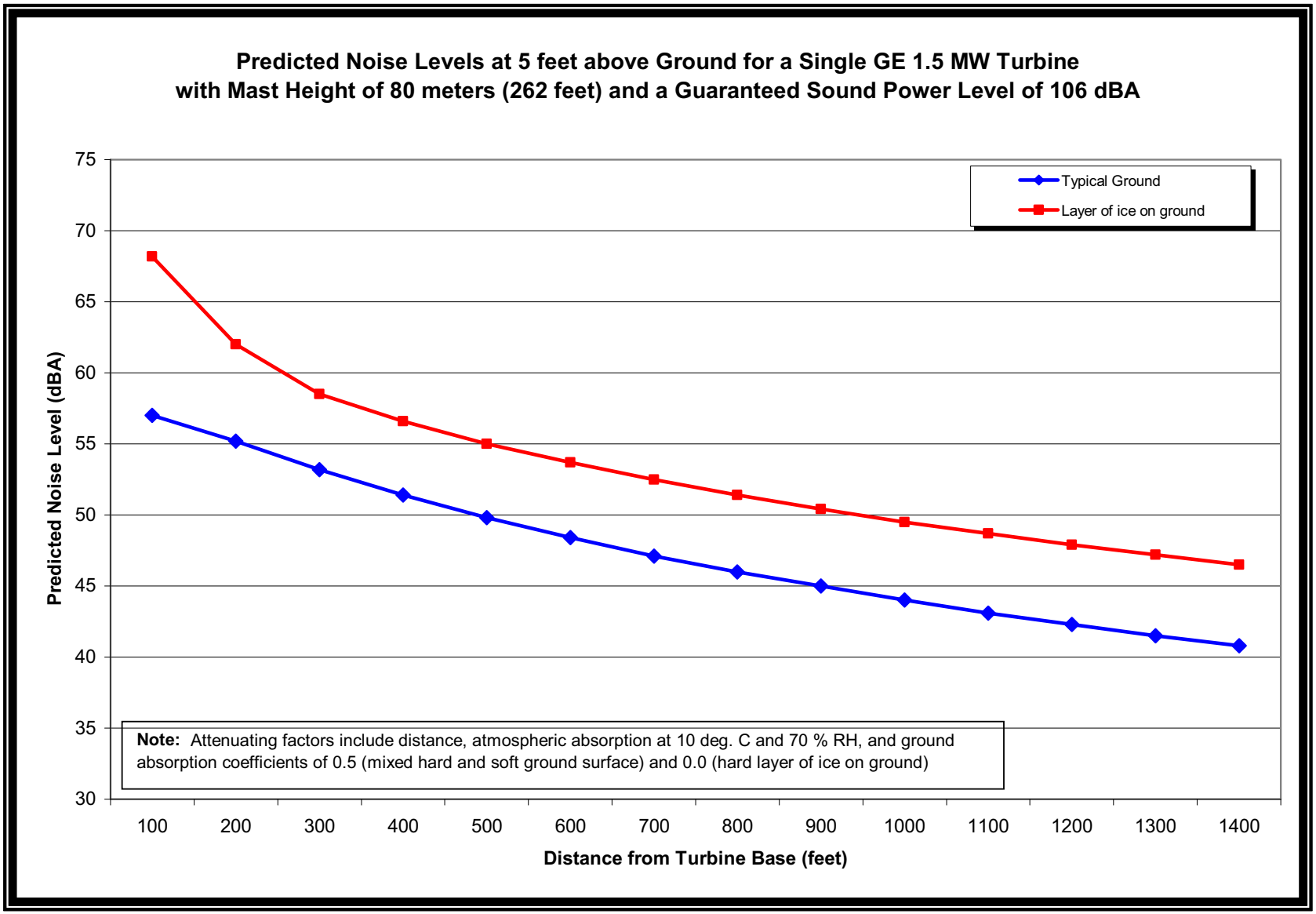
**Legend**

- Project Area
- **Proposed Site Layout**
- Project Roadway
- Proposed Substation Site
- Proposed Wind Turbine
- Proposed Collector Line
- Existing Transmission Line
- Railway
- Highway
- County Road
- 975 Average Daily Traffic (ADT)
- 130 Commercial Truck Traffic

FEB 09, 2009

**Figure 12**

**Traffic Counts**
**PrairieWinds – ND 1**
**Basin Electric Power Cooperative**
**Ward County, North Dakota**




FEB 17, 2009

Figure 13

**Predicted Noise Levels**
**For 1.5 MW Turbines**
**PrairieWinds – ND 1**
**Basin Electric Power Cooperative**
**Ward County, North Dakota**

Source:
Langdon Wind Energy Center
PSC Application; Figure 11

JAN 14, 2009

**Figure 14**

**Photo of Typical Landscape**

**PrairieWinds – ND 1**
**Basin Electric Power Cooperative**
**Ward County, North Dakota**

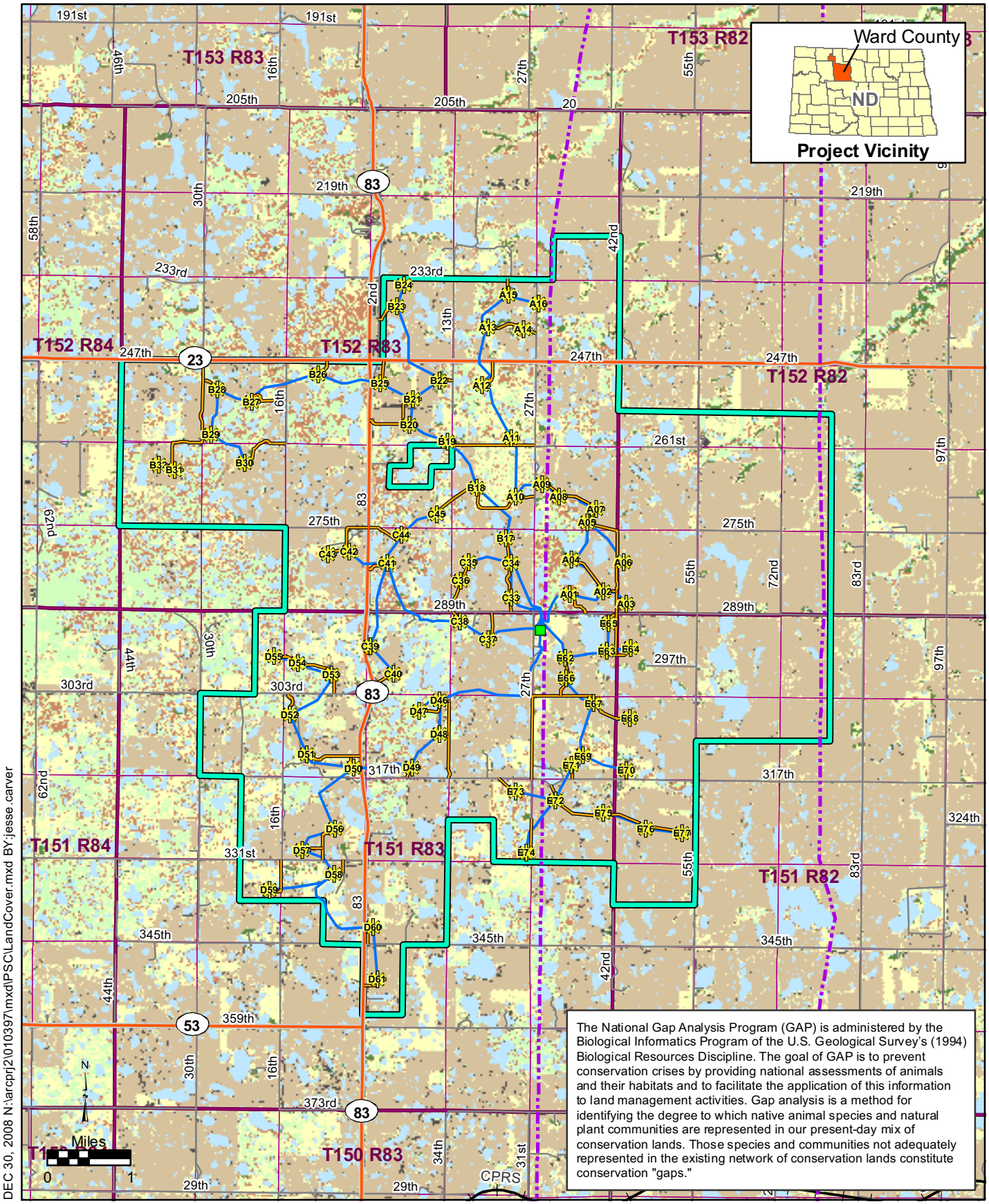
Wilton Wind Farm, ND

JAN 14, 2009

**Figure15**

**Photo Simulation**

**PrairieWinds – ND 1**
**Basin Electric Power Cooperative**
**Ward County, North Dakota**




DEC 30, 2008 N:\arcprj2\010397\mxd\PSC\LandCover.mxd BY:jesse.carver

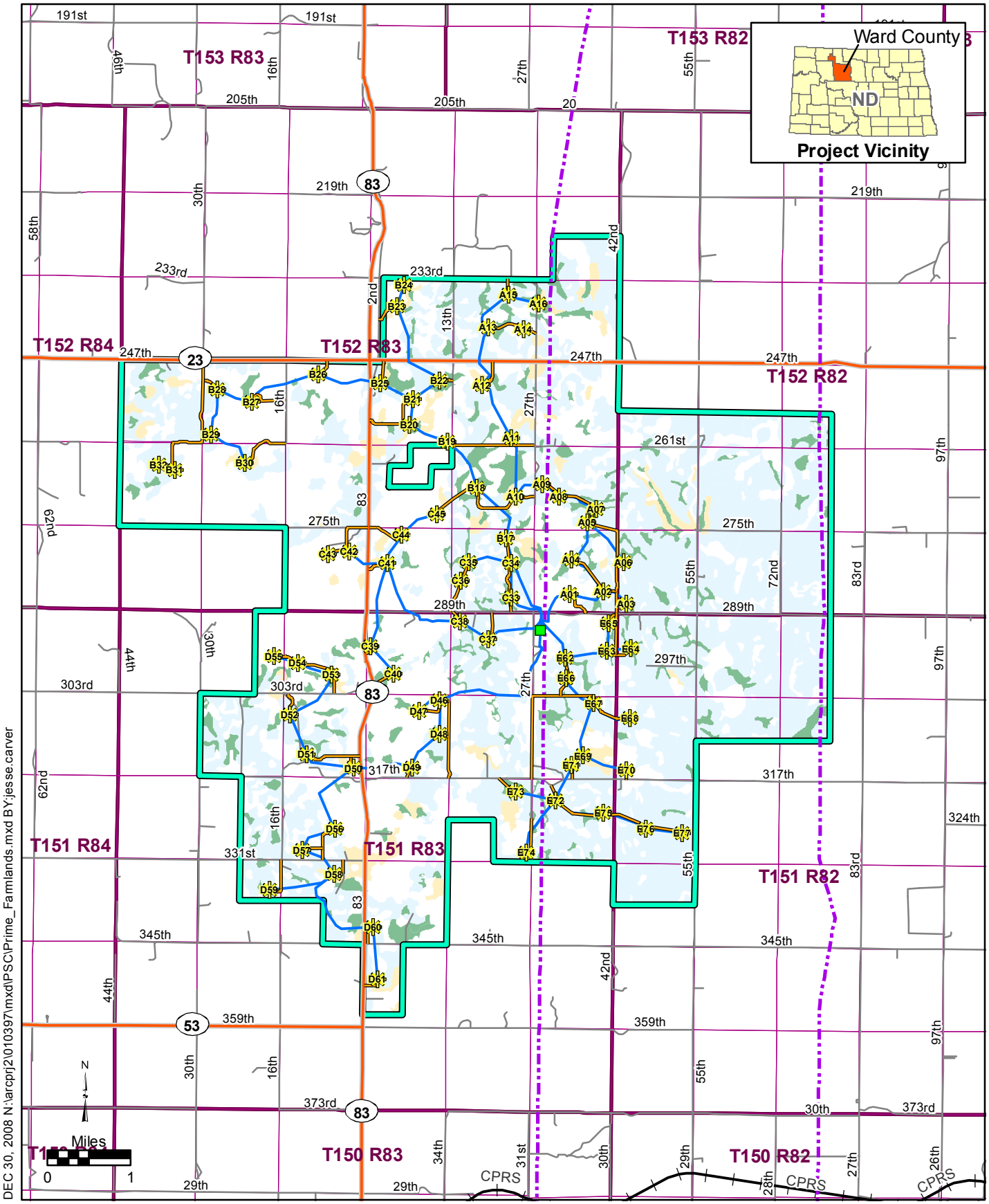
**Legend**

- Project Area
- **Proposed Site Layout**
- Project Roadway
- Proposed Substation Site
- Proposed Wind Turbines
- Proposed Collector Line
- Existing Transmission Line
- Railway
- Highway
- County Road
- **GAP Land Cover**
- Barren or Developed Land
- Agricultural
- Tame Grassland
- Native Prairie
- Native Shrubland
- Sparse Vegetation
- Wetland
- Native Woodland

DEC 30, 2008

**Figure 16**

**Land Cover**
**PrairieWinds – ND 1**
**Basin Electric Power Cooperative**
**Ward County, North Dakota**




DEC 30, 2008

**Legend**

- Project Area
- **Proposed Site Layout**
- Project Roadway
- Proposed Substation Site
- Proposed Wind Turbines
- Proposed Collector Line
- Existing Transmission Line
- Railway
- Highway
- County Road
- **Prime Farmland Types (NRCS)**
- All areas are prime farmland
- Farmland of local importance
- Farmland of statewide importance

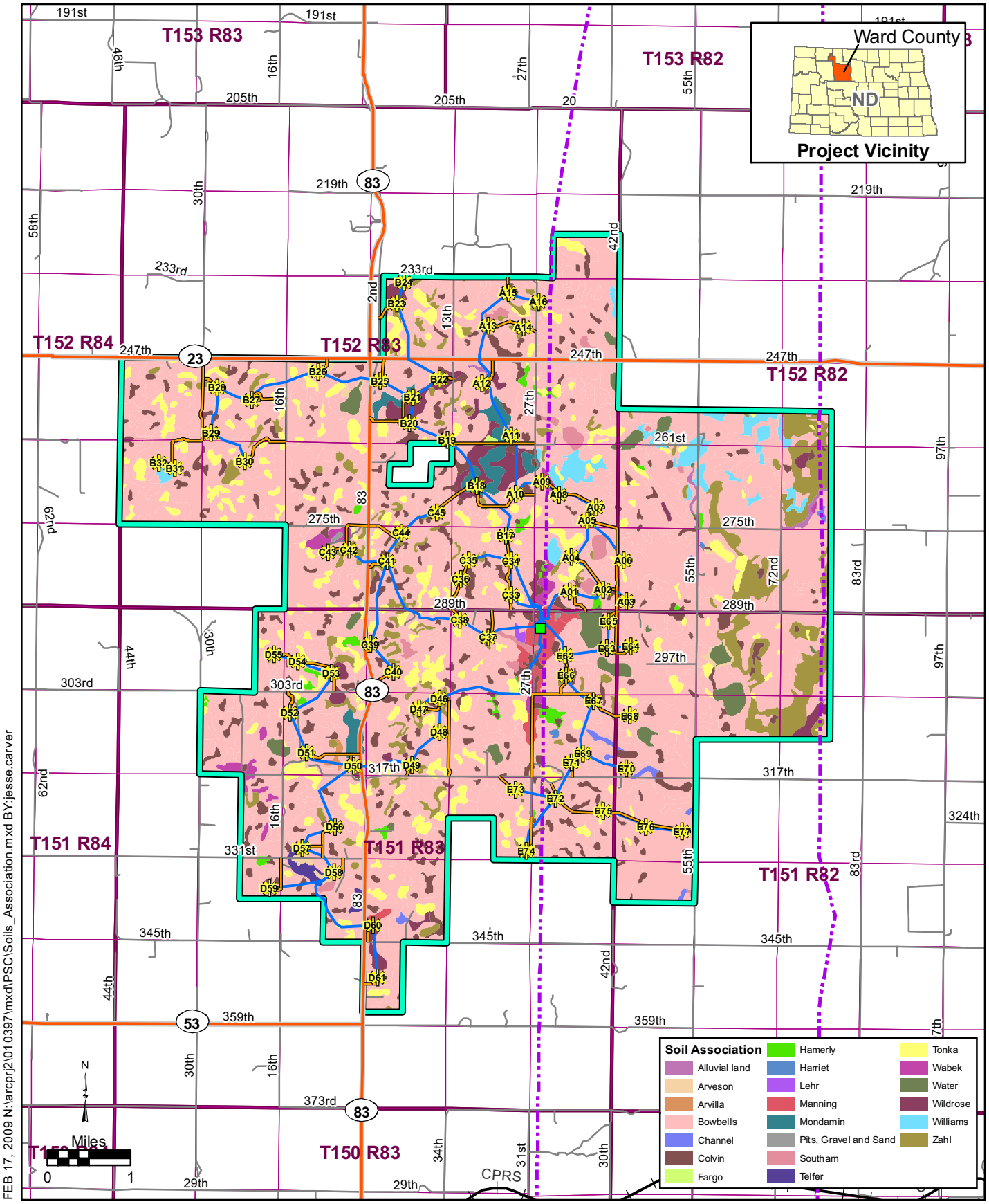
**Figure 17**

**Prime Farmland Soil Distribution**

**PrairieWinds – ND 1**

**Basin Electric Power Cooperative**

**Ward County, North Dakota**




**Legend**

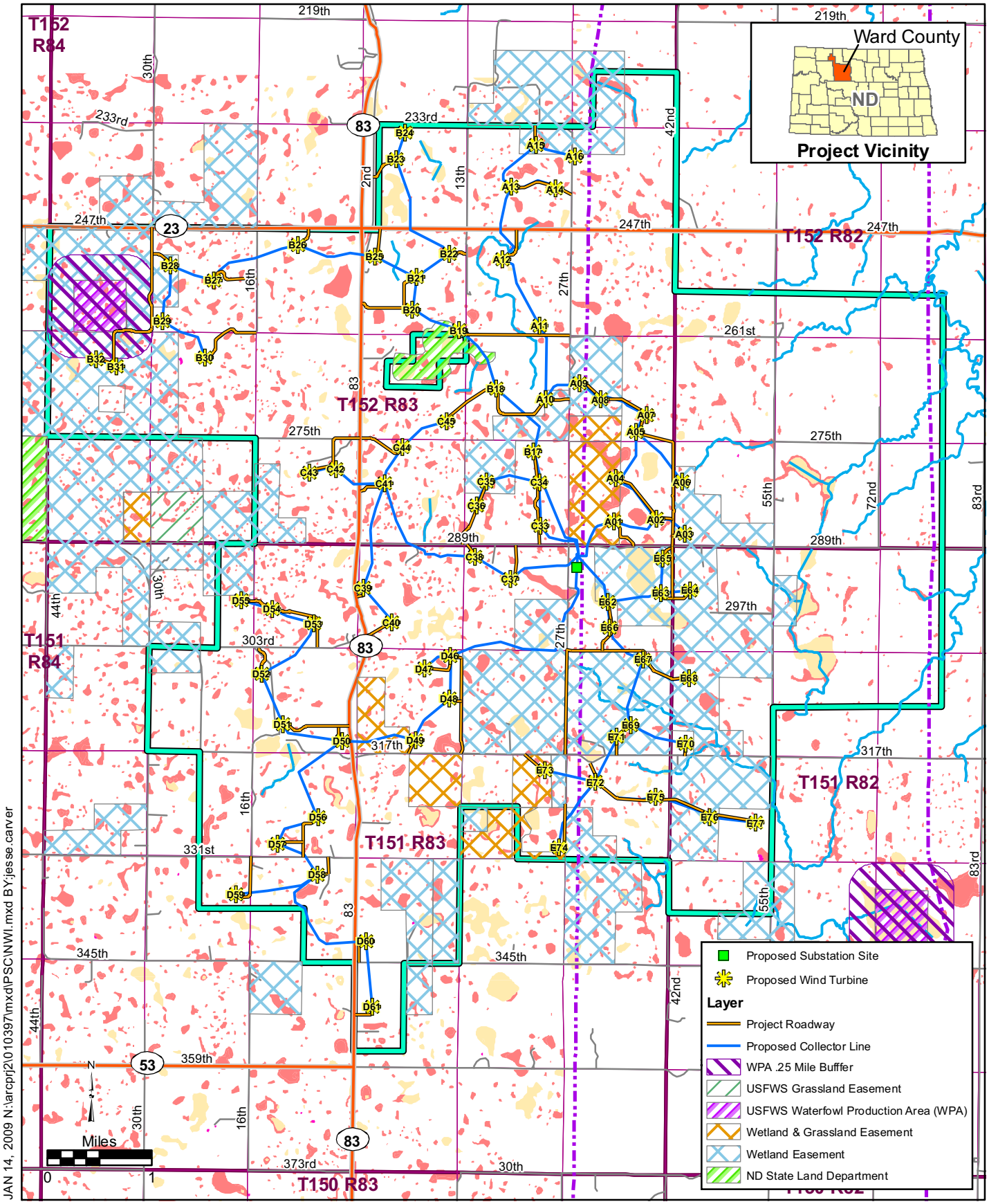
- Project Area
- **Proposed Site Layout**
- Project Roadway
- Proposed Substation Site
- Proposed Wind Turbines
- Proposed Collector Line
- Existing Transmission Line
- Railway
- Highway
- County Road

FEB 17, 2009

**Figure 18**

## Soil Association

**PrairieWinds – ND 1**
**Basin Electric Power Cooperative**
**Ward County, North Dakota**




**Legend**

- Project Area
- **Proposed Site Layout**
- Project Roadway
- Proposed Substation Site
- Proposed Wind Turbines
- Proposed Collector Line
- National Hydrography Dataset Stream or River
- Existing Transmission Line
- Railway
- Highway
- County Road
- **National Wetlands Inventory**
- Other Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland

JAN 14, 2009

**Figure 19**

**National Wetland Inventory and Surface Waters**

**PrairieWinds – ND 1**

**Basin Electric Power Cooperative**

**Ward County, North Dakota**

# APPENDIX A

# BASIN ELECTRIC'S POLICIES AND COMMITMENTS TO LIMIT ENVIRONMENTAL IMPACT

# POLICIES AND COMMITMENTS TO LIMIT ENVIRONMENTAL IMPACT

## STATEMENT OF IDEALS AND OBJECTIVES

Initially adopted by the Membership at the 1967 Annual Meeting.

Reviewed and readopted by the Membership at each subsequent Annual Meeting through 2008.

Basin Electric Power Cooperative was organized by its member systems in the Missouri Basin to provide an adequate wholesale supply of dependable, low-cost electric power under democratic member control, consistent with the public interest.

**We Believe**

1. That a healthy agricultural economy, based on the family-owned and operated concept of farming and the greater development of rural areas, is essential to the nation's general welfare.

2. That an adequate, universally available and safe supply of low cost electricity is a vital ingredient for maintaining and improving the economy and the people's standard of living.

3. That a clean and healthy environment, which we all need and enjoy, must be maintained and that the energy industry must do all that is feasible to minimize the negative impacts on the environment.

4. That the development of commercial and industrial type enterprises is very important to the Cooperative and efforts should be made to support this type of consumer-member.

5. That the Rural Utilities Service program of providing long-term, low interest loan funds and loan guarantees to the rural electric cooperatives is a vital element in providing lowest possible cost electricity for the social and economic benefit of people ever undertaken by our federal government, and that this program should be continued as an important device to foster the economic development of rural areas and to help improve the standard of living of its consumer-owners.

6. That water and power development in the Missouri Basin should go hand-in-hand and that the Missouri River as well as coal are our region's foundation resource, for both water and power development. Further power development, therefore, should be planned and carried out in unity with optimum development of the River on a Basin-wide basis, make optimum use of our water and fuel resources, protect the integrity of the regional high voltage transmission system and contribute equitably to further irrigation and other water development.

7. That the benefits of the development of our national resources should accrue to the people and the federal government has a principal responsibility for establishing and maintaining programs and policies to protect the public interest in the maximum multipurpose development conservation and utilization of our water and power resources.

8. That our Cooperative was established for all its members and the benefits of its operation should accrue to them on a consistent and uniform basis.

9. That people have the right to organize themselves to provide needed goods and services; that cooperatives and their associated entities can provide a yardstick of costs which benefits all consumers; and that they are consistent and help preserve our private enterprise system.

**To These Ends, We Pledge Ourselves To The Following Objectives:**

1. To provide for our members an adequate supply of wholesale electric power and high quality of service at the lowest possible cost to our membership as a whole by:

a) Making optimum use of the federal hydroelectric generating plants and the integrated system so that these facilities continue to serve as the backbone of a region-wide power supply system.

b) Planning jointly to meet the combined needs of all members of the integrated system in order to take full advantage of the economics of modern power technology by building feasible generating units at the most advantageous location and planning transmission lines on a coordinated, regional and national basis.

c) Fully coordinating the operations of thermal generating plants with the federal hydro system to optimize the region's water and energy resources while maintaining an economic and adequate power supply.

d) Developing mutually beneficial power pooling and interchange arrangements with other power supply systems.

e) Encouraging prudent development of clean and efficient power technologies, and legislation and research in the fuels and energy fields as it affects our lives and our environment.

f) Operating the Cooperative energy production facilities in the most efficient and productive manner possible consistent with moral and legal obligations to protect civilization and the environment.

**Resolution 6**
**Environment**

WHEREAS, Basin Electric's policy concerning conservation and protection of the environment is outlined in the statement of ideals and objectives initially adopted by the

membership at the 1967 annual meeting and renewed and readopted at each subsequent annual meeting, and

WHEREAS, on the basis of those policies Basin Electric has provided leadership, resources and effort in research, and test planting to advance the science of re-vegetating strip-mined land, and

WHEREAS, the Cooperative is constantly involved in activities with potential impact on land, air, water, flora, and fauna and continues to expend substantial amounts of time and resources to minimize potential negative aspects, and

WHEREAS, the Basin Electric membership is highly committed to maintenance of a clean and healthy environment and is also mindful that a satisfactory balance between protecting the environment and sustaining the economy must be attained;

**NOW, THEREFORE, BE IT RESOLVED, that Basin Electric supports research, legislation, and environmental mitigation efforts at the state and federal level which will minimize environmental degradation while minimizing economic and social dislocations to the population and encouraging economic development; and**

**BE IT FURTHER RESOLVED, that Basin Electric encourages the membership to take an active part in maintaining the environment at home, work, and in their community and to study the increasingly complex environmental issues in their global context in view of the social, economic, and political ramifications for all peoples.**

# APPENDIX B

# DESIGN DATA REPORT

## DESIGN DATA

### Project Overview

- 115.5 MW wind energy center
- Up to 77 turbines
- Wind turbine generator model(s) to be used pending micrositing and wind resource optimization, but project based on use of General Electric 1.5 MW series
- PSC to receive final layout after turbine micrositing, but prior to construction

Wind Turbine Generator

| **General Electric 1.5 MW Series Technical Data** | |
|---|---|
| Number of Generators | 77 |
| Model Types | 1.5sle |
| Rotor Diameter | 77 m (253 ft) |
| Swept Area | 4657 $m^2$ (50128 $ft^2$) |
| Rotorspeed | 11.0-20.4 rpm |
| Blade Material | Composite fiberglass |
| Pitch System | Active blade pitch control |
| Approximate Minimum Wind Speed Necessary for Operation | 3.5 m/s (7.8 mph) |
| Approximate Wind Speed Necessary To Achieve Rated Electrical Output | 14 m/s |
| Approximate Maximum 3-second Wind Gust Allowed During Operation | 30 m/s (67 mph) |
| Maximum Wind Speed | 25 m/s for 10-minute average (55.9 mph) |
| Modular Tower System | Multi-coated, conical tubular steel tower; 80 meters (262.5 feet) with hub heights of 61.4+, 64.7+, 80+ meters |
| Obstruction Marking and Lighting | Turbine and tower finish color of standard white/gray; aviation lighting as required by FAA determination |
| Foundations | Spread Footing or Concentric Cylinder |
| Generator Type | Doubly-fed three-phase asynchronous generator |
| Rated Power | 1,500 kW |
| Generator Rated Voltage | 575 VAC |

Balance of Plant Facilities

| **Wind Farm Power Collector System** | |
|---|---|
| Construction Type | Underground |
| Collector System Voltage | 34.5 kV |
| Step-up Transformer at Tower Base | 575 V to 34.5 kV |
| Collection System Design Standards | NEC |
| | |
| Approximate Substation Area | 2 acres |
| Main Transformer Rating | 115 kV |
| Major Equipment | Breakers, transformer, SCADA |
| Substation Design Standards | Western Area Power Administration |
| Interconnecting Utility | Western Area Power Administration |

# APPENDIX C

# STUDIES AND ASSESSMENTS

# APPENDIX C.1

## Comsearch Report

**Executive Summary – Wind Power GeoPlanner™**

**Licensed Microwave Search & Worst Case Fresnel Zone**

Comsearch performed an analysis to evaluate the potential effects of the planned PrairieWinds project in Ward County, North Dakota on existing non-Federal Government microwave telecom systems.

**Microwave Search Results:** Comsearch's Wind Power GeoPlanner™ provides a graphical representation of affected microwave paths and provides supporting technical parameters. The microwave path data is overlaid on topographic basemaps. Comsearch identified 48 microwave paths that intersect the project area (see Figures 1, 2 and Table 1 below).

Comsearch then calculated a Worst Case Fresnel Zone (WCFZ) for each microwave path in the project area. The mid-point of a full microwave path is the location where the widest (or worst case) Fresnel zone occurs. Fresnel zones are calculated for each path using the following formula.

$$Rn \cong 17.3\sqrt{\frac{n}{F_{GHz}}\left(\frac{d1d2}{d1+d2}\right)}$$

Where,
$R_n$ = First Fresnel Zone Radius, meters
n = The Number 1
$F_{GHz}$ = Frequency of Microwave Link, GHz
d1 = Distance to Wind Turbine from Microwave Station 1, km
d2 = Distance to Wind Turbine from Microwave Station 2, km

*note: For WCFZ calculation d1 = d2*

The calculated WCFZ radius, giving the linear path an area or swath, buffers each microwave path in the project area. The distance unit is in meters and can be found in the column attribute "WCFZ." In general, this is the XY area where the planned wind turbines should be avoided, if possible. These areas are shown in Figures 3 through 5.

Please note that because the turbine locations were not provided, we could not determine if any potential obstruction cases exist between the planned wind turbines and the microwave systems. If the latitude and longitude values for turbine locations are provided, Comsearch can identify specific microwave telecom paths and turbines where a potential XY conflict exists. Additionally, when wind turbines need to be located inside a WCFZ, Comsearch can provide a detailed clearance study, which considers the vertical Z-height clearance objectives.

**Map Projection**: The ESRI® Shapefiles contained in the enclosed GeoPlanner CD are in NAD 83 UTM Zone 14 projected coordinate system.

**Comsearch Contact:**
Denise Finney, Account Manager
Phone: (703) 726-5650 Fax: (703) 726-5599
Email: dfinney@comsearch.com

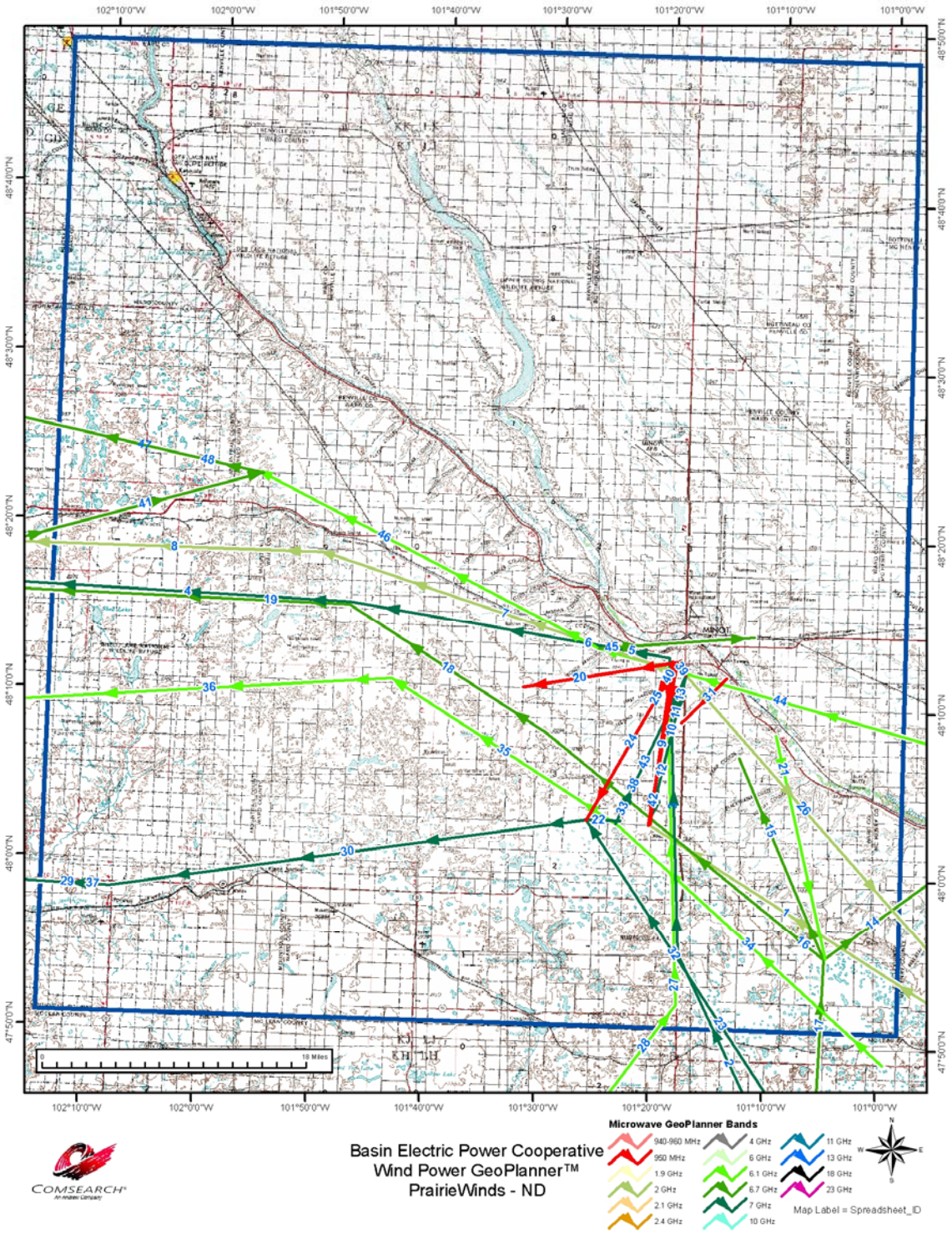



***Figure 1 – Wind Power GeoPlanner™***

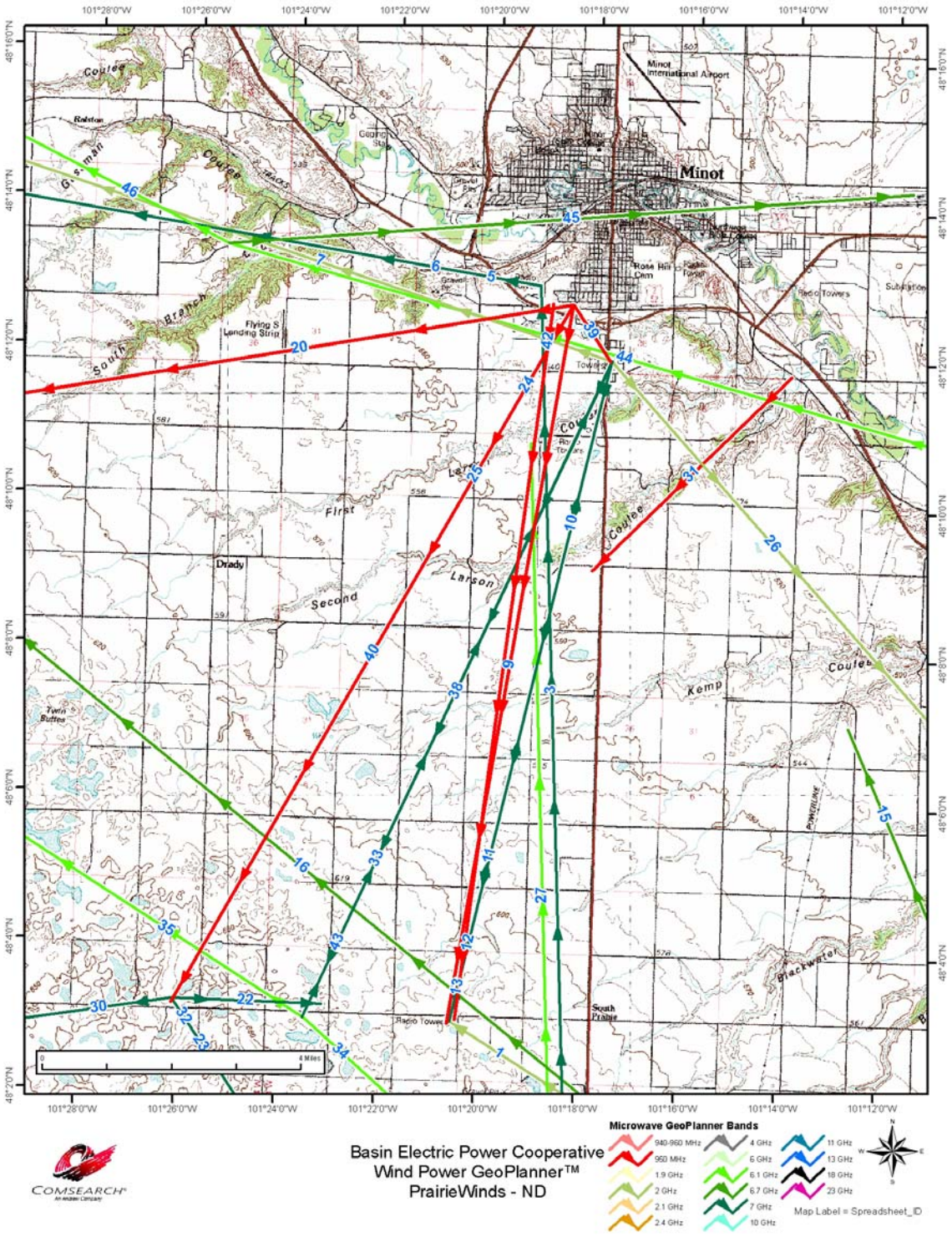



***Figure 2 – Wind Power GeoPlanner™ (Minot & Vicinity)***

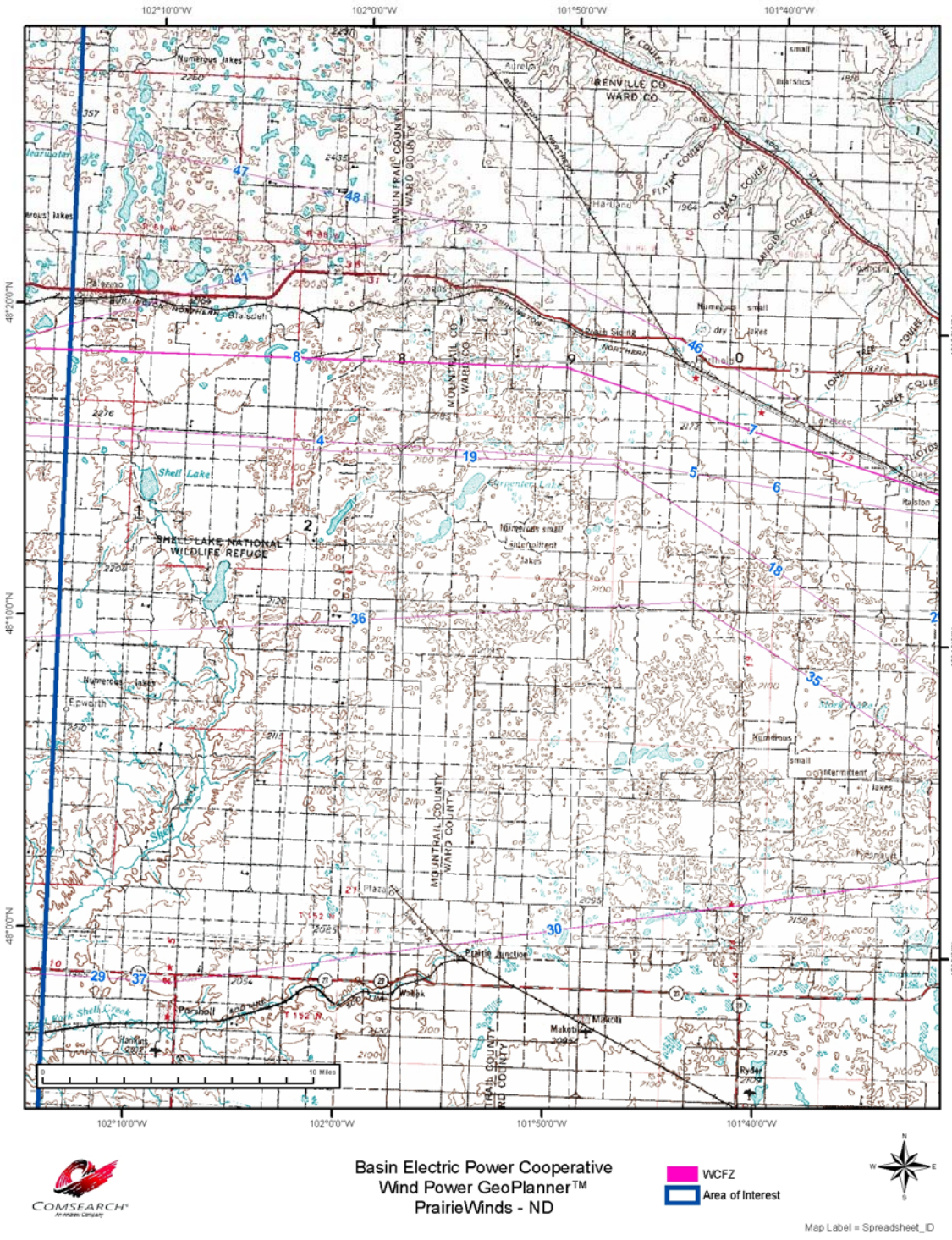



***Figure 3 – Wind Power GeoPlanner™ & WCFZ (West)***

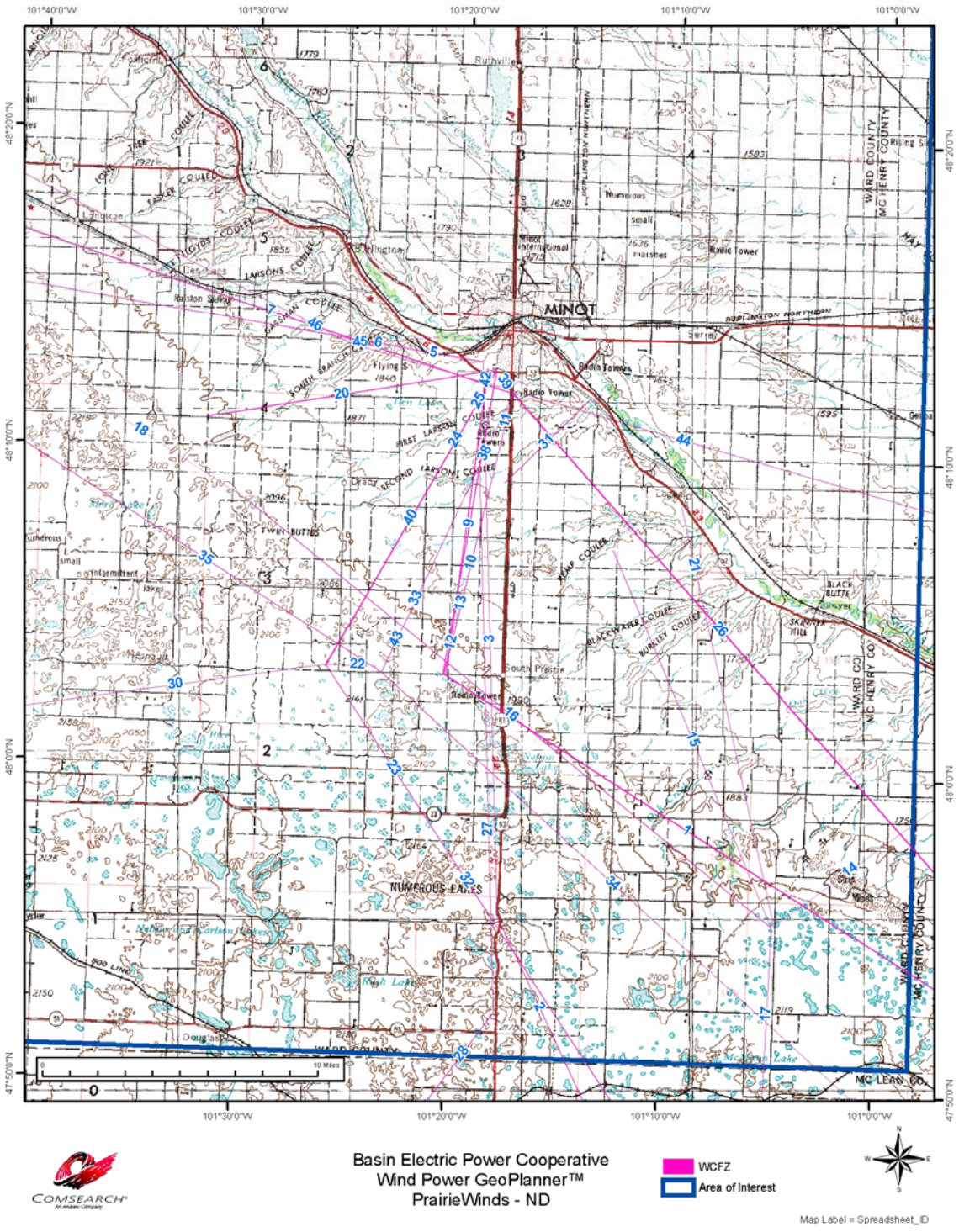



***Figure 4 – Wind Power GeoPlanner™ & WCFZ (East)***

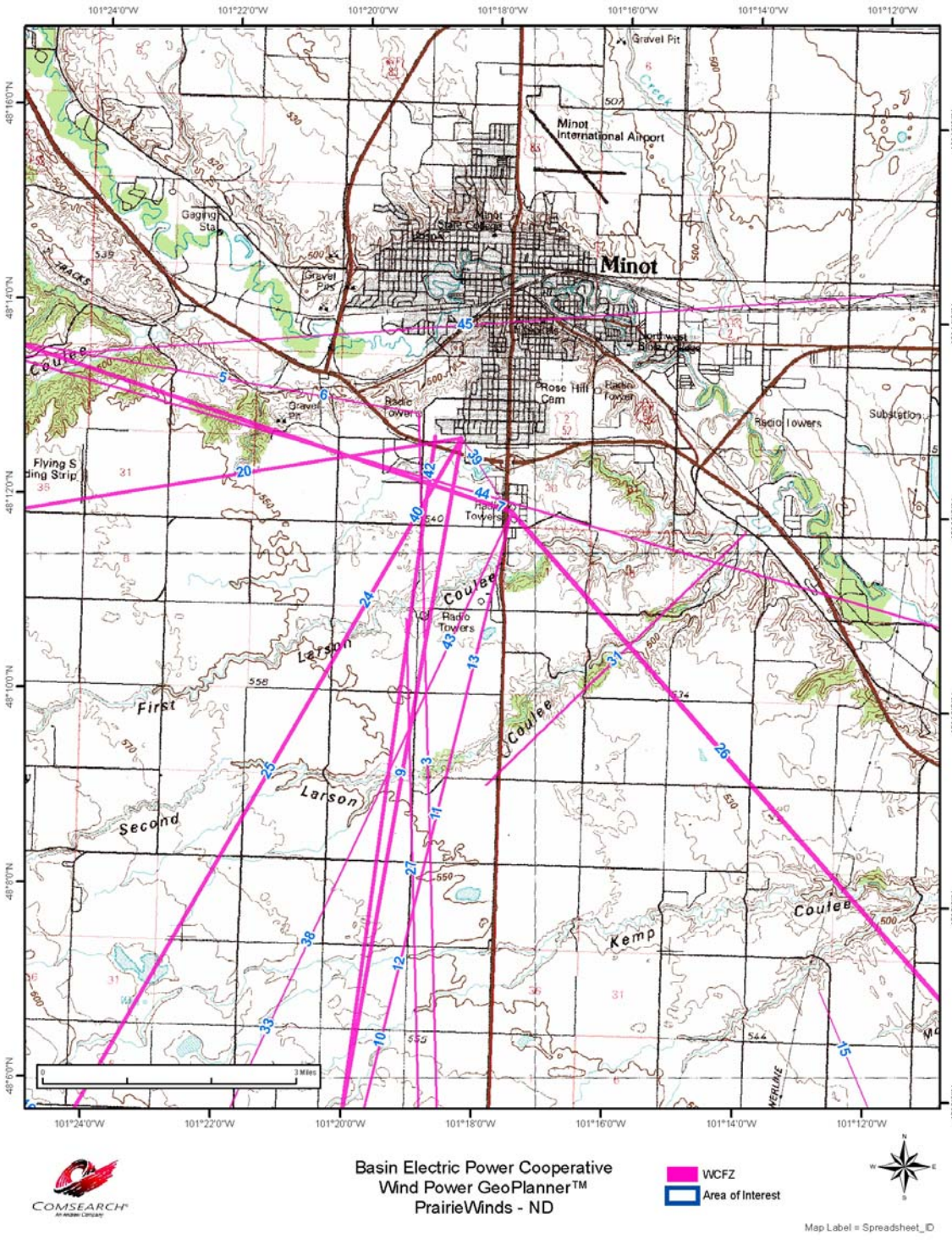



***Figure 5 – Wind Power GeoPlanner™ & WCFZ (Minot & Vicinity)***

| ID | Name Site 1 | Name Site 2 | Call Sign Site 1 | Call Sign Site 2 | BAND NAME | Licensee | WCFZ (m) |
|---|---|---|---|---|---|---|---|
| 1 | BUTTE | KXMC XMTR | KAM52 | RXONLY | 2 GHz | REITEN TELEVISION, INC (KXMC) | 42.97 |
| 2 | UNDERWOOD | DOUGLASS | KAQ29 | RXONLY | 7 GHz | HOAK MEDIA OF DAKOTA LICENSE, LLC | 24.14 |
| 3 | DOUGLASS | MINOT | KAQ30 | RXONLY | 7 GHz | HOAK MEDIA OF DAKOTA LICENSE, LLC | 18.63 |
| 4 | BERTHOLD | ROSS | KAQ31 | RXONLY | 7 GHz | HOAK MEDIA OF DAKOTA LICENSE, LLC | 24.79 |
| 5-6 | MINOT | BERTHOLD | KAU32 | RXONLY | 7 GHz | HOAK MEDIA OF DAKOTA LICENSE, LLC | 19.53 |
| 7 | S MINOT | BERTHOLD | KQV52 | RXONLY | 2 GHz | REITEN TELEVISION, INC (KXMB, KXMD) | 39.12 |
| 8 | BERTHOLD | WHEELOCK | KQW34 | RXONLY | 2 GHz | REITEN TELEVISION, INC (KXMB, KXMD) | 61.93 |
| 9 | KYYX STUDIO | KYYX XMTR | KVG24 | RXONLY | 950 MHz | CC LICENSES, LLC | 37.80 |
| 10 | MINOT | KXMC XMTR | WAP701 | RXONLY | 7 GHz | REITEN TELEVISION, INC (KXMC) | 13.44 |
| 11 | S MINOT | KXMC XMTR | WDD27 | RXONLY | 2 GHz | REITEN TELEVISION, INC (KXMC) | 24.84 |
| 12-13 | MINOT | RX ONLY | WDD28 | RXONLY | 7 GHz | REITEN TELEVISION, INC (KXMC) | 13.44 |
| 14 | BENEDICT | W J NEAL | WHC467 | WHC466 | Upper 6 GHz | BASIN ELECTRIC POWER COOPERATIVE | 14.37 |
| 15 | BENEDICT | LOGAN | WHC467 | WHC468 | Upper 6 GHz | BASIN ELECTRIC POWER COOPERATIVE | 16.35 |
| 16 | BENEDICT | MINOT | WHC467 | WHJ620 | Upper 6 GHz | BASIN ELECTRIC POWER COOPERATIVE | 20.96 |
| 17 | UNDERWOOD | BENEDICT | WHC469 | WHC467 | Upper 6 GHz | BASIN ELECTRIC POWER COOPERATIVE | 23.61 |
| 18 | MINOT | TAGUS | WHJ620 | WHJ621 | Upper 6 GHz | BASIN ELECTRIC POWER COOPERATIVE | 16.97 |
| 19 | TAGUS | ALGER | WHJ621 | WHJ622 | Upper 6 GHz | BASIN ELECTRIC POWER COOPERATIVE | 23.92 |
| 20 | KMXA STUDIO | KMXA XMTR | WHS654 | RXONLY | 950 MHz | CC LICENSES, LLC | 36.68 |
| 21 | LOGAN | BENEDICT JC | WHT204 | WHT205 | Lower 6 GHz | SOURIS RIVER TELEPHONE MUTUAL AID CORP | 17.47 |
| 22 | KXND | KMCY | WLD926 | RXONLY | 7 GHz | KBMY KMCY LLC ( KBMY) | 6.31 |
| 23 | TURTLE LAKE | KXND TXMTR | WLD993 | RXONLY | 7 GHz | KBMY KMCY LLC ( KBMY) | 27.66 |
| 24 | KZPR-FM STUD | KZPR XMTR | WLE624 | RXONLY | 950 MHz | CC LICENSES, LLC | 39.69 |
| 25 | WZPR STUDIO | WZPR XMTR | WLE636 | RXONLY | 950 MHz | CC LICENSES, LLC | 39.69 |
| 26 | S MINOT | BUTTE | WMU366 | RXONLY | 2 GHz | REITEN TELEVISION, INC (KXMC) | 46.13 |
| 27 | RYDER | MINOT | WPON240 | WPON239 | Lower 6 GHz | WWC Holding Co., Inc | 20.36 |
| 28 | GARRISON | RYDER | WPON241 | WPON240 | Lower 6 GHz | WWC Holding Co., Inc | 19.42 |
| 29 | PARSHALL | KEENE | WPON893 | RXONLY | 7 GHz | PRIME CITIES BROADCASTING, INC. | 25.38 |

| ID | Name Site 1 | Name Site 2 | Call Sign Site 1 | Call Sign Site 2 | BAND NAME | Licensee | WCFZ (m) |
|---|---|---|---|---|---|---|---|
| 30 | KXND TXMTR | PARSHALL | WPON895 | RXONLY | 7 GHz | PRIME CITIES BROADCASTING, INC. | 23.75 |
| 31 | MINOT | S MINOT | WPOQ869 | RXONLY | 950 MHz | FAITH BROADCASTING INC | 23.31 |
| 32 | TURTLE LAKE | KXND TXMTR | WPSF812 | RXONLY | 7 GHz | PRIME CITIES BROADCASTING, INC. | 27.66 |
| 33 | KSRE TX | KXMC STUDIO | WPXK483 | RXONLY | 7 GHz | PRAIRIE PUBLIC BROADCASTING INC | 13.88 |
| 34 | RUSO | MINOT | WPYP792 | WPYP793 | Lower 6 GHz | PRAIRIE PUBLIC BROADCASTING INC | 21.87 |
| 35 | MINOT | BERTHOLD | WPYP794 | WPYP795 | Lower 6 GHz | PRAIRIE PUBLIC BROADCASTING INC | 18.84 |
| 36 | BERTHOLD | BELDEN | WPYP796 | WPYP797 | Lower 6 GHz | PRAIRIE PUBLIC BROADCASTING INC | 22.03 |
| 37 | PARSHALL | KEENE | WPYQ649 | RXONLY | 7 GHz | PRIME CITIES BROADCASTING, INC. | 25.37 |
| 38 | KXMC STUDIO | KXMC XMTR | WPYQ909 | RXONLY | 7 GHz | REITEN TELEVISION, INC (KXMC) | 13.88 |
| 39 | KCJB STUDIO | KCJB XMTR | WQAQ849 | RXONLY | 950 MHz | CC LICENSES, LLC | 11.57 |
| 40 | KIZZ FM STUD | KISS FM XMTR | WQAR994 | RXONLY | 950 MHz | CC LICENSES, LLC | 39.69 |
| 41 | STANLEY | BERTHOLD | WQCL748 | WQCP357 | Upper 6 GHz | North Dakota Cellular of North Dakota | 21.92 |
| 42 | MINOT STUDIO | MINOT TX | WQCY886 | RXONLY | 950 MHz | PROGRAMMERS BROADCASTING, INC. | 37.61 |
| 43 | KSRE TX | KXMC STUDIO | WQDN923 | WQDR511 | 7 GHz | PRAIRIE PUBLIC BROADCASTING INC | 13.88 |
| 44 | SIMCOE | MINOT | WQH34 | WQH36 | Lower 6 GHz | BNSF Railway Company | 22.98 |
| 45 | MINOT | GAVIN YARD | WQH36 | WQH35 | Upper 6 GHz | BNSF Railway Company | 13.80 |
| 46 | MINOT | TAGUS | WQH36 | WQH37 | Lower 6 GHz | BNSF Railway Company | 22.46 |
| 47 | TAGUS | LOSTWOOD | WQH37 | WQH38 | Lower 6 GHz | BNSF Railway Company | 23.45 |
| 48 | TAGUS | LOSTWOOD | WQH37 | WQH38 | Upper 6 GHz | BNSF Railway Company | 22.51 |

***Table 1 – Microwave GeoPlanner Links Considered in Analysis (See enclosed mw_geopl.xls for more detailed information and GP_dict_matrix_description.xls for field description)***

19700 Janelia Farms Blvd
Ashburn, VA 20147
703-726-5500

## Communication Towers in the Vicinity of the Prairie Wind Energy Project near Minot, North Dakota

Comsearch was contracted by Basin Electric Cooperative to determine the locations of communication towers within the boundaries of the Prairie Wind Energy project near Minot, North Dakota. Comsearch determined that there were 77 communication towers registered within the Prairie Wind Energy project area. Table 1 identifies the communication towers and lists their pertinent parameters and owner/operator. The distance listed is from the center of the wind energy project. From the height information for the towers one can conclude that the towers contain various communication company tenants including microwave operators, broadcasters, land mobile radio repeaters, and mobile telephone base stations. Figure 1 is a map showing the Communication Towers in the vicinity of Minot, ND, which is located within the Prairie Wind area-of-interest. Figure 2 is a map showing all of the Communication Towers in the Prairie Wind area-of-interest.

**Table 1 List of Communication Towers in the Vicinity of the Prairie Wind Energy Project**

| Location | | Latitude | Longitude | Height-m | Owner-Operator | Distance-mi |
|---|---|---|---|---|---|---|
| BENEDICT | ND | 47.870222 | -101.015111 | 103.6 | SRT COMMUNICATIONS, INC. | 67.1 |
| Garrison | ND | 47.873056 | -101.295167 | 120.7 | WWC Holding Co., Inc. | 55.5 |
| BENEDICT | ND | 47.921944 | -101.080000 | 54.0 | BASIN ELECTRIC POWER COOP | 59.6 |
| BENEDICT | ND | 47.922222 | -101.077500 | 43.5 | Qwest Corporation | 59.7 |
| MAX | ND | 47.923889 | -101.294444 | 67.7 | HOAK MEDIA OF DAKOTA, LLC | 50.4 |
| RYDER | ND | 47.941111 | -101.570833 | 100.6 | NORTH DAKOTA, STATE OF | 43.1 |
| PARSHALL | ND | 47.972778 | -102.131389 | 97.2 | RESERVATION TELEPHONE COOP | 55.8 |
| SOUTH PRAIRIE | ND | 48.026111 | -101.316389 | 150.0 | Souris River Telecomm Coop | 39.7 |
| SOUTH PRAIRIE | ND | 48.026111 | -101.316389 | 151.0 | Souris River Telecomm Coop | 39.7 |
| Minot | ND | 48.026111 | -101.316278 | 150.9 | SRT Communications, Inc. | 39.7 |
| MINOT | ND | 48.050000 | -101.342778 | 329.5 | REITEN TELEVISION INC | 36.4 |
| MINOT | ND | 48.050556 | -101.390833 | 314.2 | Prairie Public Broadcasting Inc. | 34.6 |
| Minot | ND | 48.051028 | -101.340139 | 152.4 | Programmers Broadcasting, Inc. | 36.4 |
| MINOT | ND | 48.053056 | -101.385278 | 198.4 | Forum Commms Co.WDAY--TV | 34.6 |
| Minot | ND | 48.053083 | -101.434750 | 153.7 | Clear Channel Broadcasting, Inc. | 33.0 |
| MINOT | ND | 48.053083 | -101.434750 | 153.7 | Clear Channel Broadcasting, Inc. | 33.0 |
| MINOT | ND | 48.053889 | -101.434722 | 213.4 | Prime Cities Broadcasting, INC | 32.9 |
| DesLacs | ND | 48.115361 | -101.599639 | 103.6 | SRT Communications, Inc. | 23.6 |
| MINOT | ND | 48.138056 | -101.497500 | 69.0 | BASIN ELECTRIC POWER COOP | 22.5 |
| MINOT | ND | 48.163333 | -101.299167 | 121.3 | Faith Broadcast Inc KHRT | 29.0 |
| Minot | ND | 48.180278 | -101.320167 | 120.7 | WWC Holding Co., Inc. | 26.6 |
| MINOT | ND | 48.180833 | -101.316111 | 100.6 | NORTH DAKOTA, STATE OF | 26.8 |
| MINOT | ND | 48.182500 | -101.533056 | 150.2 | Clear Channel Broadcasting, Inc. | 17.0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| MINOT | ND | 48.196944 | -101.234167 | 63.4 | FAITH BROADCASTING INC | 31.0 |
| MINOT | ND | 48.197500 | -101.293611 | 77.1 | Clear Channel Broadcasting, Inc. | 27.1 |
| MINOT | ND | 48.198056 | -101.293056 | 77.1 | Clear Channel Broadcasting, Inc. | 27.1 |
| MINOT | ND | 48.199722 | -101.294167 | 77.1 | Clear Channel Broadcasting, Inc. | 27.0 |
| MINOT | ND | 48.202778 | -101.299861 | 55.0 | Minot Rural Fire Protection Dist. | 26.4 |
| MINOT | ND | 48.212500 | -101.268333 | 15.5 | NORTH DAKOTA, STATE OF | 27.9 |
| Minot | ND | 48.214028 | -101.323639 | 54.9 | City of Minot Police Dept | 24.3 |
| MINOT | ND | 48.215556 | -101.318611 | 210.3 | HOAK MEDIA OF DAKOTA, LLC | 24.5 |
| MINOT | ND | 48.218611 | -101.304167 | 55.4 | SRT Communications Inc | 25.3 |
| Minot | ND | 48.221667 | -101.287639 | 58.5 | | 26.2 |
| MINOT | ND | 48.223056 | -101.423333 | 48.8 | The Burlington Nthn/Santa Fe RR Co | 17.7 |
| MINOT | ND | 48.227778 | -101.272639 | 52.0 | Soo System Radio Comm Corp | 26.9 |
| Minot | ND | 48.233056 | -101.290278 | 50.7 | Milton Young Towers | 25.4 |
| Minot | ND | 48.235833 | -101.330300 | 7.6 | | 22.6 |
| MINOT | ND | 48.238333 | -101.195000 | 39.6 | The Burlington Nthn/Santa Fe RR Co | 31.8 |
| Minot | ND | 48.242000 | -101.340750 | 54.9 | SRT Communications, Inc | 21.6 |
| MINOT | ND | 48.250528 | -101.298056 | 36.6 | SRT Communications, Inc. | 24.2 |
| Minot | ND | 48.250556 | -101.298333 | 35.4 | WWC Holding Co., Inc. | 24.1 |
| MINOT | ND | 48.250861 | -101.298167 | 17.1 | Reiten Television Inc. | 24.1 |
| Minot | ND | 48.252528 | -101.297917 | 26.8 | ND Cellular of ND Limited Partners | 24.1 |
| BERTHOLD | ND | 48.258611 | -101.793889 | 69.0 | BASIN ELECTRIC POWER COOP | 16.2 |
| DES LACS | ND | 48.259861 | -101.561333 | 54.9 | SRT COMMUNICATIONS, INC. | 8.2 |
| BERTHOLD | ND | 48.262222 | -101.793889 | 76.8 | HOAK MEDIA OF DAKOTA, LLC | 16.0 |
| MINOT | ND | 48.275278 | -101.296944 | 23.5 | Souris River Telecomm Coop | 23.4 |
| MINOT | ND | 48.275278 | -101.296944 | 23.4 | Souris River Telecomm Coop | 23.4 |
| MINOT | ND | 48.275278 | -101.296944 | 23.4 | Souris River Telecomm Coop | 23.4 |
| Minot | ND | 48.277500 | -101.299778 | 21.3 | SRT Communications Inc | 23.1 |
| MINOT | ND | 48.279167 | -101.353333 | 55.0 | Motorola Inc | 19.2 |
| Burlington | ND | 48.289194 | -101.431139 | 54.9 | SRT Communications, Inc. | 13.4 |
| BERTHOLD | ND | 48.309167 | -101.835556 | 63.0 | REITEN TELEVISION INC | 17.4 |
| Berthold | ND | 48.311083 | -101.754861 | 151.8 | WWC Holding Co., Inc. | 11.5 |
| Blaisdell | ND | 48.339028 | -102.076944 | 103.6 | SRT Communications, Inc. | 35.2 |
| FOXHOLM | ND | 48.369167 | -101.573750 | 52.0 | Soo System Radio Comm Corp | 5.0 |
| Tagus | ND | 48.385167 | -101.929056 | 73.2 | Soo System Radio Comm Corp | 25.0 |
| TAGUS | ND | 48.386111 | -101.929167 | 67.6 | U S WEST COMMUICATIONS INC | 25.1 |
| BERTHOLD | ND | 48.386111 | -101.927500 | 100.6 | ND Cellular of ND Limited Partners | 25.0 |
| Deering | ND | 48.396139 | -101.038444 | 54.9 | SRT Communications Inc | 42.5 |
| TAGUS | ND | 48.408333 | -101.894167 | 67.1 | Souris River Telecomm Coop | 23.4 |
| TAGUS | ND | 48.408333 | -101.894167 | 67.1 | Souris River Telecomm Coop | 23.4 |
| BLAISDELL | ND | 48.413056 | -102.015556 | 100.6 | NORTH DAKOTA, STATE OF | 32.0 |
| Minot Air Force | ND | 48.416722 | -101.320528 | 61.6 | Souris River Telecomm Coop | 23.1 |
| Minot Air Force | ND | 48.416944 | -101.320833 | 60.9 | Souris River Telecomm Coop | 23.1 |
| Carpio | ND | 48.458750 | -101.711333 | 103.6 | SRT COMMUNICATIONS, INC. | 16.6 |
| RUTHVILLE | ND | 48.459444 | -101.330833 | 79.9 | Midcontinent Communications | 24.9 |
| Donnybrook | ND | 48.511111 | -101.900278 | 91.4 | SRT Communications, Inc. | 30.0 |
| KENMARE | ND | 48.675833 | -102.065833 | 52.0 | MONTANA DAKOTA UTILITIES CO | 51.7 |
| KENMARE | ND | 48.681111 | -102.080833 | 79.8 | Reservation Telephone Coop. | 52.8 |
| Kenmare | ND | 48.691750 | -102.132917 | 78.3 | ND Cellular of ND Limited Partners | 56.3 |
| ND | ND | 48.704194 | -101.079611 | 61.0 | Kinder Morgan Operating L.P. "A" | 56.9 |
| MAXBASS | ND | 48.720000 | -101.208889 | 97.5 | PORTAL PIPE LINE COMPANY | 52.4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Mohall | ND | 48.749972 | -101.494000 | 57.3 | WWC Holding Co., Inc. | 47.6 |
| BOWBELLS | ND | 48.764472 | -102.191278 | 52.0 | Soo System Radio Comm Corp | 65.2 |
| MOHALL | ND | 48.764528 | -101.694889 | 106.7 | SRT Communications, Inc. | 49.0 |
| MOHALL | ND | 48.765278 | -101.696389 | 106.7 | Souris River Telecomm Coop | 49.1 |

Knowledge of where communication towers are located within the boundaries of the wind facility is helpful in that areas of potential conflict with communication services can be avoided in the selection of the wind turbine locations. In the future, it further provides information of areas to avoid if additional wind turbines are to be added. .Also, with this knowledge the wind facility operator can plan to use some of these towers to support his need for the facilities Supervisory Control and Data Acquisition (SCADA) network.

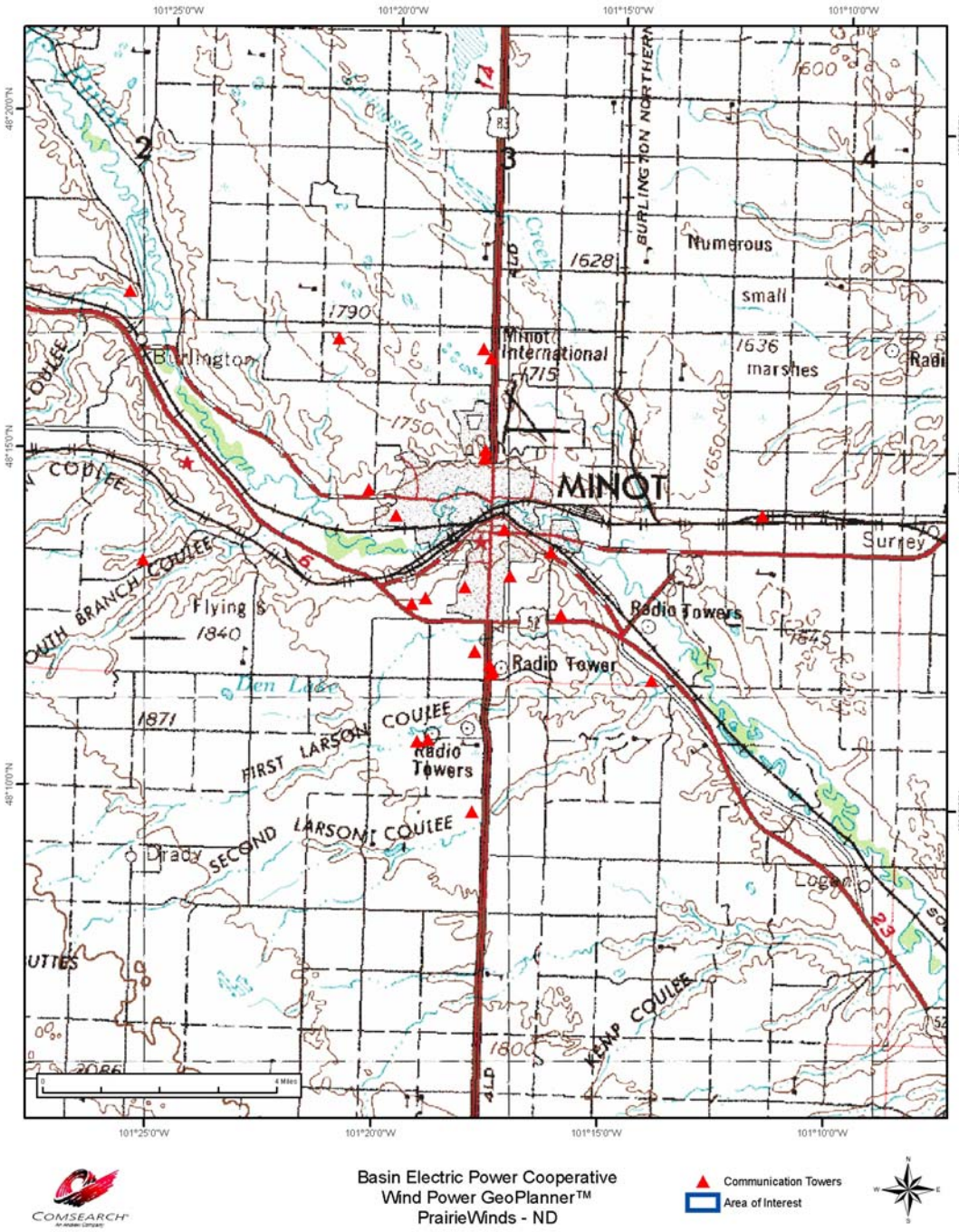



**Figure 1 Communication Towers in the Minot, ND Area**

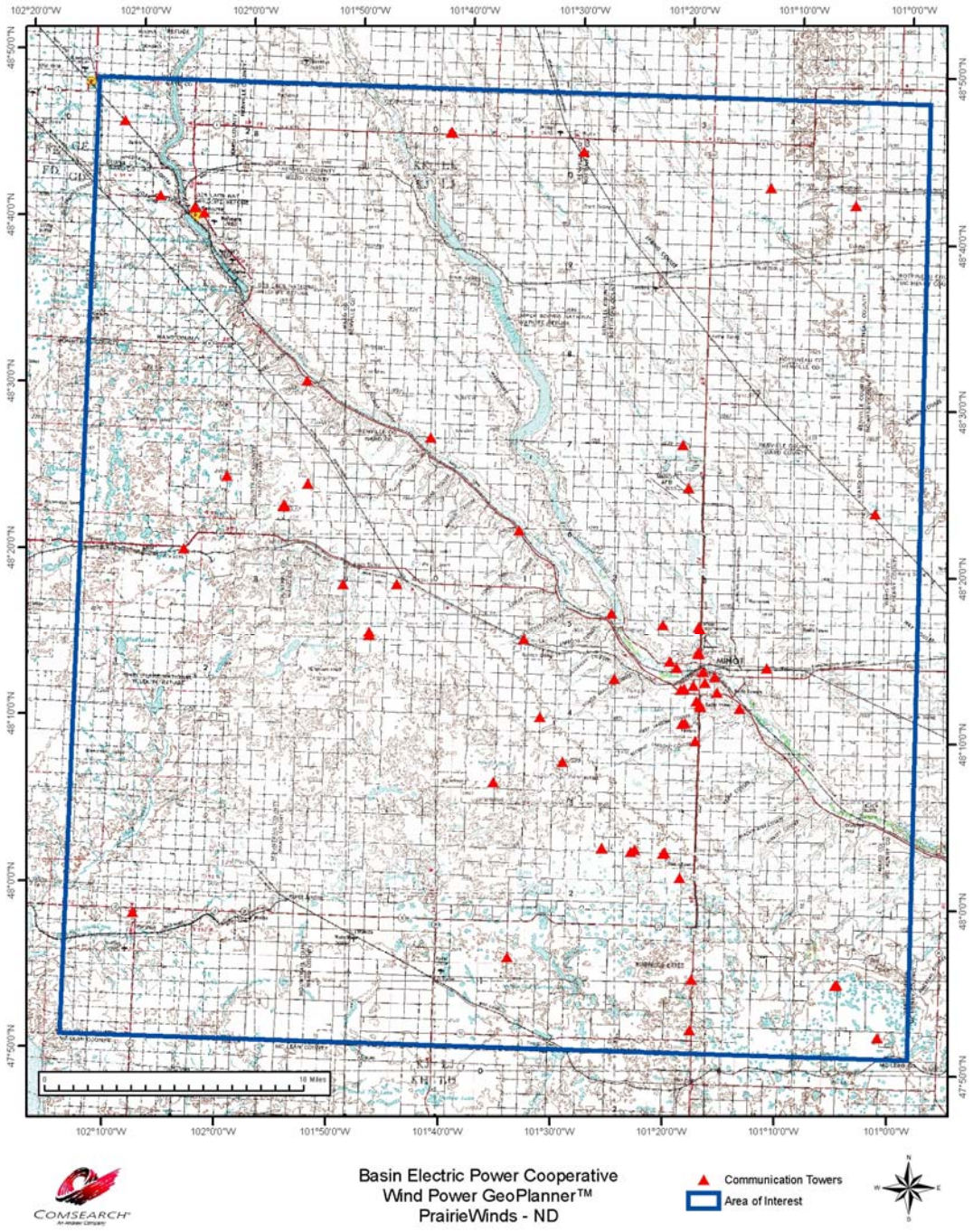



**Figure 2 Communication Tower Locations in Prairie Wind Energy Project Area**

COMSEARCH

19700 Janelia Farms Blvd
Ashburn, VA 20147
703-726-5500

# Land Mobile Radio (LMR) in the Vicinity of the Prairie Wind Energy Project in ND

Comsearch was contracted by Basin Electric Power Cooperative to identify and locate the LMR operators within their Prairie Wind Energy Project near Minot, North Dakota. Comsearch determined that there were 683 LMR systems registered in the area. This number of LMR systems is unusually high, which indicates that commercial and government agencies in the area depend on these systems to carry out their various functions. Table 1 identifies the LMR Systems and lists their pertinent parameters and owner/operator. Figure 1 shows the location of the LMR repeaters in the Minot, ND. Figure 2 shows the location of the repeaters in Kenmare, ND. Figure 3 shows all of the repeater sites in the Prairie Wind Energy area-of-interest.

**Table 1 LMR Sites in the Vicinity of the Prairie Wind Energy Project in North Dakota**

| Location | | Latitude | Longitude | Frequency-MHz | Owner-Operator |
|---|---|---|---|---|---|
| MINOT | ND | 48.21555555560 | -101.31850000000 | 174.00000000 | Hoak Media of Dakota LLC |
| MINOT | ND | 48.21555555560 | -101.31850000000 | 180.00000000 | Hoak Media of Dakota LLC |
| MAX | ND | 48.00416666670 | -101.29627777800 | 48.42000000 | Verendrye Elect Coop Inc |
| MINOT | ND | 48.22305555560 | -101.22100000000 | 48.42000000 | Verendrye Elect Coop Inc |
| KENMARE | ND | 48.67586111110 | -102.06572222200 | 456.20000000 | Montana-Dakota Co. |
| KENMARE | ND | 48.67586111110 | -102.06572222200 | 48.26000000 | Montana-Dakota Co. |
| MINOT | ND | 48.20277777780 | -101.29988888900 | 155.62500000 | WARD, COUNTY OF |
| MINOT | ND | 48.21861111110 | -101.30405555600 | 155.37000000 | WARD, COUNTY OF |
| MINOT | ND | 48.21861111110 | -101.30405555600 | 155.43000000 | WARD, COUNTY OF |
| MINOT | ND | 48.27000000000 | -101.28377777800 | 153.50000000 | Xcel Energy Services Inc. |
| MINOT | ND | 48.23833333330 | -101.19488888900 | 160.41000000 | BNSF Railway Company |
| MINOT | ND | 48.23833333330 | -101.19488888900 | 161.16000000 | BNSF Railway Company |
| MINOT | ND | 48.23833333330 | -101.19488888900 | 160.62000000 | BNSF Railway Company |
| MINOT | ND | 48.23833333330 | -101.19488888900 | 160.66500000 | BNSF Railway Company |
| MINOT | ND | 48.23833333330 | -101.19488888900 | 160.36500000 | BNSF Railway Company |
| MINOT | ND | 48.23833333330 | -101.19488888900 | 160.92000000 | BNSF Railway Company |
| MINOT | ND | 48.23833333330 | -101.19488888900 | 161.10000000 | BNSF Railway Company |
| MINOT | ND | 48.23833333330 | -101.29350000000 | 160.59000000 | BNSF Railway Company |
| MINOT | ND | 48.23833333330 | -101.29350000000 | 160.65000000 | BNSF Railway Company |
| MINOT | ND | 48.23833333330 | -101.29350000000 | 160.92000000 | BNSF Railway Company |
| MINOT | ND | 48.23833333330 | -101.29350000000 | 161.10000000 | BNSF Railway Company |
| MINOT | ND | 48.23833333330 | -101.29350000000 | 161.16000000 | BNSF Railway Company |
| MINOT | ND | 48.18361111110 | -101.30183333300 | 48.26000000 | Montana-Dakota Co. |
| MINOT | ND | 48.21138888890 | -101.31044444400 | 451.05000000 | Montana-Dakota Co. |
| MOHALL | ND | 48.76113888890 | -101.50877777800 | 155.37000000 | RENVILLE, COUNTY OF |
| MOHALL | ND | 48.76113888890 | -101.50877777800 | 155.43000000 | RENVILLE, COUNTY OF |
| MINOT | ND | 48.21333333330 | -101.26877777800 | 155.37000000 | NORTH DAKOTA, STATE OF |
| MINOT | ND | 48.21333333330 | -101.26877777800 | 155.43000000 | NORTH DAKOTA, STATE OF |
| MINOT | ND | 48.21333333330 | -101.26877777800 | 155.50500000 | NORTH DAKOTA, STATE OF |
| RYDER | ND | 47.94111111110 | -101.57100000000 | 151.10000000 | NORTH DAKOTA, STATE OF |

| | | | | | |
|---|---|---|---|---|---|
| MINOT | ND | 48.18083333330 | -101.31600000000 | 151.10000000 | NORTH DAKOTA, STATE OF |
| BLAISDELL | ND | 48.41308333330 | -102.01544444400 | 151.10000000 | NORTH DAKOTA, STATE OF |
| MINOT | ND | 48.23666666670 | -101.25044444400 | 152.93000000 | CONCRETE MOBILE LLC |
| MINOT | ND | 48.22583333330 | -101.28877777800 | 154.44500000 | CITY OF MINOT FIRE DEPART |
| MINOT | ND | 48.22583333330 | -101.28877777800 | 156.21000000 | City of Minot Fire Dept. |
| MINOT | ND | 48.26250000000 | -101.29433333300 | 156.21000000 | City of Minot Fire Dept. |
| MINOT | ND | 48.26250000000 | -101.29433333300 | 154.44500000 | City of Minot Fire Dept. |
| MINOT | ND | 48.23333333330 | -101.28794444400 | 161.64000000 | SKYNET HAWAII, LLC |
| MINOT | ND | 48.21250000000 | -101.24211111100 | 161.64000000 | SKYNET HAWAII, LLC |
| MINOT | ND | 48.22805555560 | -101.21405555600 | 151.83500000 | BECHTOLD PAVING INC |
| DESLACS | ND | 48.25500000000 | -101.56211111100 | 155.28000000 | United Public School Dist 7 |
| MINOT | ND | 48.23555555560 | -101.27433333300 | 453.77500000 | NORTH DAKOTA, STATE OF |
| FOXHOLM | ND | 48.36919444440 | -101.57377777800 | 160.47000000 | Soo Systems Radio Comm Inc. |
| FOXHOLM | ND | 48.36919444440 | -101.57377777800 | 160.47000000 | Soo Systems Radio Comm Inc. |
| FOXHOLM | ND | 48.36919444440 | -101.57377777800 | 160.77000000 | Soo Systems Radio Comm Inc. |
| FOXHOLM | ND | 48.36919444440 | -101.57377777800 | 161.08500000 | Soo Systems Radio Comm Inc. |
| FOXHOLM | ND | 48.36919444440 | -101.57377777800 | 161.37000000 | Soo Systems Radio Comm Inc. |
| FOXHOLM | ND | 48.36919444440 | -101.57377777800 | 161.52000000 | Soo Systems Radio Comm Inc. |
| BOWBELLS | ND | 48.76447222220 | -102.19127777800 | 160.21500000 | Soo Systems Radio Comm Inc. |
| BOWBELLS | ND | 48.76447222220 | -102.19127777800 | 160.77000000 | Soo Systems Radio Comm Inc. |
| BOWBELLS | ND | 48.76447222220 | -102.19127777800 | 161.08500000 | Soo Systems Radio Comm Inc. |
| BOWBELLS | ND | 48.76447222220 | -102.19127777800 | 161.37000000 | Soo Systems Radio Comm Inc. |
| BOWBELLS | ND | 48.76447222220 | -102.19127777800 | 161.52000000 | Soo Systems Radio Comm Inc. |
| MINOT | ND | 48.23305555560 | -101.25600000000 | 152.87000000 | Ernies Concrete Const Inc. |
| GLENBURN | ND | 48.45919444440 | -101.11127777800 | 152.94500000 | SIMONSON, GREG |
| BURLINGTON | ND | 48.27472222220 | -101.39572222200 | 154.37000000 | BURLINGTON, CITY OF |
| MINOT | ND | 48.22750000000 | -101.27488888900 | 453.20000000 | MINOT PARK DISTRICT |
| MINOT | ND | 48.24166666670 | -101.27961111100 | 453.20000000 | MINOT PARK DISTRICT |
| VELVA | ND | 48.20972222220 | -101.02347222200 | 153.35000000 | KAYLOR, RODNEY |
| MOHALL | ND | 48.76113888890 | -101.50877777800 | 154.08500000 | NORTH DAKOTA, STATE OF |
| MINOT | ND | 48.20138888890 | -101.24488888900 | 461.35000000 | DAKOTA WRECKER SALES |
| MINOT | ND | 48.22750000000 | -101.27600000000 | 155.02500000 | WARD, COUNTY OF |
| PARSHALL | ND | 47.98333333330 | -102.13377777800 | 151.59500000 | RUUD, RICHARD |
| PARSHALL | ND | 47.99166666670 | -102.09711111100 | 151.59500000 | RUUD, RICHARD |
| PARSHALL | ND | 47.99166666670 | -102.17544444400 | 151.59500000 | RUUD, RICHARD |
| MINOT | ND | 48.10638888890 | -101.40544444400 | 463.60000000 | MIKKELSON, LA VERNE C |
| VELVA | ND | 48.12444444440 | -101.04322222200 | 158.41500000 | BECK JR, ALBERT A |
| GLENBURN | ND | 48.44252777780 | -101.18877777800 | 158.32500000 | PECK, STEVEN |
| BLAISDELL | ND | 48.26947222220 | -102.07683333300 | 461.95000000 | JONES GRAIN CO |
| LANSFORD | ND | 48.62947222220 | -101.37822222200 | 464.52500000 | LLOYD UNDLIN FARMS |
| KENMARE | ND | 48.56002777780 | -102.05294444400 | 463.52500000 | PULLEN FARMS |
| LANSFORD | ND | 48.65836111110 | -101.36211111100 | 464.15000000 | ADAMS, MARK L |
| MOHALL | ND | 48.67613888890 | -101.68600000000 | 151.49000000 | YALE JR, HAROLD |
| BOWBELLS | ND | 48.78947222220 | -102.16377777800 | 151.92500000 | CHRISTIANSEN, LEO W |
| KENMARE | ND | 48.67475000000 | -102.07683333300 | 453.92500000 | KENMARE, CITY OF |
| PARSHALL | ND | 47.88888888890 | -102.15877777800 | 155.20500000 | Parshall ND School Dist 3 |
| PARSHALL | ND | 47.93611111110 | -102.14627777800 | 155.20500000 | Parshall ND School Dist 3 |
| PLAZA | ND | 48.02083333330 | -101.95461111100 | 151.65500000 | Farmers Union Oil Co. |

| | | | | | |
|---|---|---|---|---|---|
| COULEE | ND | 48.53447222220 | -102.08044444400 | 151.55000000 | WHILLOCK ANGUS FARMS |
| MINOT | ND | 48.36280555560 | -101.14461111100 | 463.55000000 | WOLD, LAWREN |
| BLAISDELL | ND | 48.40475000000 | -102.01405555600 | 453.32500000 | NORTH DAKOTA, STATE OF |
| GLENBURN | ND | 48.51586111110 | -101.14794444400 | 463.95000000 | CHRISTIANSON, BRIAN P |
| MINOT | ND | 48.02611111110 | -101.31627777800 | 451.50000000 | Souris River Tel Mutual Aid Inc. |
| MINOT | ND | 48.22694444440 | -101.29127777800 | 451.50000000 | Souris River Tel Mutual Aid Inc. |
| MINOT | ND | 48.27527777780 | -101.29683333300 | 451.50000000 | Souris River Tel Mutual Aid Inc. |
| MINOT | ND | 48.27527777780 | -101.29683333300 | 456.50000000 | Souris River Tel Mutual Aid Inc. |
| DONNYBROOK | ND | 48.51111111110 | -101.90027777800 | 451.50000000 | Souris River Tel Mutual Aid Inc. |
| SURREY | ND | 48.23694444440 | -101.13377777800 | 154.28000000 | Surrey Fire Prot Dist |
| SURREY | ND | 48.23694444440 | -101.13377777800 | 154.29500000 | Surrey Fire Prot Dist |
| MAKOTI | ND | 47.96305555560 | -101.65211111100 | 153.98000000 | MC LEAN, COUNTY OF |
| MAKOTI | ND | 47.96305555560 | -101.65211111100 | 155.22000000 | North Shore Public School Dist |
| MOHALL | ND | 48.66280555560 | -101.61627777800 | 462.02500000 | LEAVITT, DAVID L |
| DONNYBROOK | ND | 48.52947222220 | -102.10211111100 | 461.72500000 | GUSTAVSON, MERVIN |
| DONNYBROOK | ND | 48.57808333330 | -101.86572222200 | 463.90000000 | MILLER, DAVID |
| TAGUS | ND | 48.38336111110 | -101.92822222200 | 161.10000000 | BNSF Railway Company |
| TAGUS | ND | 48.38336111110 | -101.92822222200 | 160.92000000 | BNSF Railway Company |
| TAGUS | ND | 48.38336111110 | -101.92822222200 | 161.16000000 | BNSF Railway Company |
| TAGUS | ND | 48.38336111110 | -101.92822222200 | 160.71000000 | BNSF Railway Company |
| TAGUS | ND | 48.38336111110 | -101.92822222200 | 161.01000000 | BNSF Railway Company |
| TAGUS | ND | 48.38336111110 | -101.92822222200 | 161.49000000 | BNSF Railway Company |
| MINOT | ND | 48.23194444440 | -101.28766666700 | 463.92500000 | Trinity Health |
| RYDER | ND | 47.93888888890 | -101.56988888900 | 453.32500000 | NORTH DAKOTA, STATE OF |
| CARPIO | ND | 48.54586111110 | -101.64766666700 | 464.57500000 | ANDERSON, RICK |
| GLENBURN | ND | 48.52919444440 | -101.06100000000 | 461.70000000 | JOHNSON FARMS |
| MOHALL | ND | 48.76447222220 | -101.51100000000 | 151.58000000 | BECKER, JERRY |
| LANSFORD | ND | 48.58863888890 | -101.37350000000 | 463.57500000 | BLOMS, JERRY |
| CARPIO | ND | 48.40780555560 | -101.85822222200 | 464.67500000 | STOCKDILL, LYNN |
| MINOT | ND | 48.02611111110 | -101.31627777800 | 153.30500000 | Farmers Union Central Xchange |
| RYDER | ND | 47.85194444440 | -101.95072222200 | 463.90000000 | MYERS, EUGENE |
| MINOT | ND | 48.18611111110 | -101.30183333300 | 453.32500000 | NORTH DAKOTA, STATE OF |
| CARPIO | ND | 48.41530555560 | -101.80350000000 | 463.82500000 | HANSON, CHRIST |
| KENMARE | ND | 48.66308333330 | -101.87100000000 | 462.10000000 | BUCHHOLTZ, EDWARD |
| MOHALL | ND | 48.76363888890 | -101.53711111100 | 463.42500000 | HETT, STEVE |
| DONNYBROOK | ND | 48.44558333330 | -101.83183333300 | 461.65000000 | HANSON, RODGER I |
| MINOT | ND | 47.99888888890 | -101.46516666700 | 451.97500000 | PEDERSON, RICHARD |
| MINOT | ND | 48.22333333330 | -101.29794444400 | 151.80500000 | JOHNSON, LEROY |
| KENMARE | ND | 48.69002777780 | -102.08183333300 | 461.80000000 | IVERSON FARMS |
| BERTHOLD | ND | 48.30527777780 | -101.77544444400 | 461.57500000 | DEAVER, JUDITH |
| BERTHOLD | ND | 48.35141666670 | -101.66877777800 | 461.47500000 | Clayton, Raymond Fegley Farms |
| NORWICH | ND | 48.26972222220 | -100.99291666700 | 463.97500000 | HESKIN, KIM B |
| BERTHOLD | ND | 48.34725000000 | -101.81988888900 | 152.88500000 | Alan, Terrie R Lee Farm |
| LONETREE | ND | 48.25083333330 | -101.62377777800 | 461.15000000 | SCHAEFER, RICHARD R |
| BERTHOLD | ND | 48.31361111110 | -101.73488888900 | 461.20000000 | BIRDSALL, RALPH |
| BERTHOLD | ND | 48.33391666670 | -101.87850000000 | 461.20000000 | BIRDSALL, RALPH |
| BERTHOLD | ND | 48.33391666670 | -101.87850000000 | 463.35000000 | BIRDSALL, RALPH |
| DONNYBROOK | ND | 48.62086111110 | -101.85072222200 | 151.71500000 | ANDERSON, FRANKLIN |

| | | | | | |
|---|---|---|---|---|---|
| KENMORE | ND | 48.67475000000 | -102.06294444400 | 151.89500000 | NELSON, DELMER |
| MINOT | ND | 48.32638888890 | -101.21961111100 | 151.58000000 | WALSH, L PATRICK |
| KENMARE | ND | 48.61752777780 | -102.18405555600 | 151.68500000 | CHRISTIANSON, ELLIS |
| MOHALL | ND | 48.70752777780 | -101.51766666700 | 452.02500000 | KINZLEY, RICHARD |
| MOHALL | ND | 48.77919444440 | -101.30100000000 | 461.35000000 | RICE, ARDEL |
| SURREY | ND | 48.25555555560 | -101.24711111100 | 460.90000000 | PETRY, DAVID |
| MINOT | ND | 48.23861111110 | -101.30016666700 | 153.50000000 | Xcel Energy Services Inc. |
| MINOT | ND | 48.23861111110 | -101.30016666700 | 153.72500000 | Xcel Energy Services Inc. |
| DONNYBROOK | ND | 48.51669444440 | -101.80961111100 | 451.90000000 | MURPHY, PATRICK J |
| MOHALL | ND | 48.79252777780 | -101.74238888900 | 462.05000000 | OLSON, SIDNEY |
| DONNYBROOK | ND | 48.56252777780 | -102.16405555600 | 151.92500000 | LINDQUIST, JAMES R |
| SAWYER | ND | 48.04222222220 | -101.03433333300 | 452.12500000 | LIEBELT, N VANCE |
| MINOT | ND | 47.99833333330 | -101.29488888900 | 464.05000000 | MARTIN, WARREN |
| MINOT | ND | 48.05361111110 | -101.38516666700 | 862.58750000 | MARTIN, WARREN |
| MINOT | ND | 48.05361111110 | -101.38516666700 | 863.33750000 | MARTIN, WARREN |
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| MINOT | ND | 48.05361111110 | -101.38516666700 | 864.83750000 | MARTIN, WARREN |
| MINOT | ND | 48.05361111110 | -101.38516666700 | 865.58750000 | MARTIN, WARREN |
| MINOT | ND | 48.22166666670 | -101.28766666700 | 862.58750000 | MARTIN, WARREN |
| MINOT | ND | 48.22166666670 | -101.28766666700 | 862.71250000 | MARTIN, WARREN |
| MINOT | ND | 48.22166666670 | -101.28766666700 | 863.33750000 | MARTIN, WARREN |
| MINOT | ND | 48.22166666670 | -101.28766666700 | 863.46250000 | MARTIN, WARREN |
| MINOT | ND | 48.22166666670 | -101.28766666700 | 864.08750000 | MARTIN, WARREN |
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| MINOT | ND | 48.22166666670 | -101.28766666700 | 864.83750000 | MARTIN, WARREN |
| MINOT | ND | 48.22166666670 | -101.28766666700 | 864.96250000 | MARTIN, WARREN |
| MINOT | ND | 48.22166666670 | -101.28766666700 | 865.58750000 | MARTIN, WARREN |
| MINOT | ND | 48.22166666670 | -101.28766666700 | 865.73750000 | MARTIN, WARREN |
| KENMARE | ND | 48.67447222220 | -102.06655555600 | 152.94500000 | ST CROIX, RONALD |
| BERTHOLD | ND | 48.29944444440 | -101.64405555600 | 152.96000000 | NESHEM, Keith |
| UPHAM | ND | 48.55280555560 | -101.74766666700 | 151.89500000 | ERDMAN, BRIAN |
| GLENBURN | ND | 48.50891666670 | -101.22461111100 | 462.10000000 | WEBER, DAVID |
| DES LACS | ND | 48.18222222220 | -101.56488888900 | 169.52500000 | MINOT, CITY OF |
| BARTHOLD | ND | 48.34197222220 | -101.74350000000 | 169.52500000 | MINOT, CITY OF |
| FOXHOLM | ND | 48.37086111110 | -101.56961111100 | 169.52500000 | MINOT, CITY OF |
| FOXHOLM | ND | 48.37222222220 | -101.50516666700 | 169.52500000 | MINOT, CITY OF |
| DONNYBROOK | ND | 48.51252777780 | -101.88266666700 | 169.52500000 | MINOT, CITY OF |
| KENMARE | ND | 48.64391666670 | -102.05516666700 | 469.52500000 | MINOT, CITY OF |
| MINOT | ND | 48.13888888890 | -101.42516666700 | 169.52500000 | MINOT, CITY OF |
| MINOT | ND | 48.19611111110 | -101.23127777800 | 169.52500000 | MINOT, CITY OF |
| DOUGLAS | ND | 48.02638888890 | -101.40516666700 | 151.95500000 | NESS, JAMES A |
| MINOT | ND | 48.22833333330 | -101.38850000000 | 169.52500000 | MINOT, CITY OF |
| MINOT | ND | 48.24555555560 | -101.37183333300 | 169.52500000 | MINOT, CITY OF |
| BURLINGTON | ND | 48.29083333330 | -101.48683333300 | 169.52500000 | MINOT, CITY OF |
| DONNYBROOK | ND | 48.51002777780 | -101.85100000000 | 169.52500000 | MINOT, CITY OF |
| KENMARE | ND | 48.69113888890 | -102.12266666700 | 169.52500000 | MINOT, CITY OF |
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| MINOT | ND | 48.28000000000 | -101.35461111100 | 865.03750000 | Nextel License Holdings 4, Inc. |
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| MINOT | ND | 48.28000000000 | -101.35461111100 | 862.73750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 862.76250000 | Nextel License Holdings 4, Inc. |
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| MINOT | ND | 48.28000000000 | -101.35461111100 | 865.71250000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 865.76250000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 863.48750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 863.51250000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 863.53750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 864.41250000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 864.48750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 863.56250000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 863.58750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 863.61250000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 862.91250000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 862.93750000 | Nextel License Holdings 4, Inc. |
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| MINOT | ND | 48.28000000000 | -101.35461111100 | 865.88750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 865.91250000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 862.98750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 864.98750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 865.93750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 865.98750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 863.38750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 864.31250000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 864.33750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 864.36250000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 864.38750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 862.86250000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 862.88750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 864.88750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 865.83750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 865.86250000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 862.68750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 863.63750000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 863.66250000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 863.68750000 | Nextel License Holdings 4, Inc. |

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|---|---|---|---|---|---|
| MINOT | ND | 48.28000000000 | -101.35461111100 | 865.68750000 | Nextel License Holdings 4, Inc. |
| KENMARE | ND | 48.61919444440 | -102.11488888900 | 862.81250000 | Martin, Warren B & W Enterp |
| KENMARE | ND | 48.61919444440 | -102.11488888900 | 864.91250000 | Martin, Warren B & W Enterp |
| KENMARE | ND | 48.61919444440 | -102.11488888900 | 865.81250000 | Martin, Warren B & W Enterp |
| LANSFORD | ND | 48.60808333330 | -101.43377777800 | 151.74500000 | GUIDINGER, LOREN |
| MINOT | ND | 48.21555555560 | -101.31850000000 | 161.67000000 | Hoak Media of Dakota LLC |
| MINOT | ND | 48.23555555560 | -101.29155555600 | 161.64000000 | CC LICENSES, LLC |
| MINOT | ND | 48.19916666670 | -101.29405555600 | 161.64000000 | CC LICENSES, LLC |
| BERTHOLD | ND | 48.30947222220 | -101.83405555600 | 450.98000000 | Prairie Public Broadcasting, Inc. |
| MINOT | ND | 48.05361111110 | -101.43461111100 | 450.01000000 | CC LICENSES, LLC |
| DEERING | ND | 48.39225000000 | -101.04738888900 | 152.99000000 | MILLER, RAYMOND A |
| MINOT | ND | 48.24166666670 | -101.27961111100 | 151.92500000 | Main Electric Construction Inc. |
| DONNYBROOK | ND | 48.56280555560 | -101.97961111100 | 161.37000000 | Soo Systems Radio Comm Inc. |
| MINOT | ND | 48.23138888890 | -101.30516666700 | 155.29500000 | Trinity Health |
| MINOT | ND | 48.23138888890 | -101.30516666700 | 155.40000000 | Trinity Health |
| MINOT | ND | 48.23138888890 | -101.30516666700 | 155.34000000 | Trinity Health |
| MINOT | ND | 48.25000000000 | -101.37544444400 | 152.00750000 | Trinity Health |
| RYDER | ND | 47.93888888890 | -101.56988888900 | 154.90500000 | NORTH DAKOTA, STATE OF |
| RYDER | ND | 47.93888888890 | -101.56988888900 | 154.93500000 | NORTH DAKOTA, STATE OF |
| RYDER | ND | 47.93888888890 | -101.56988888900 | 155.47500000 | NORTH DAKOTA, STATE OF |
| MINOT | ND | 48.18611111110 | -101.30183333300 | 154.90500000 | NORTH DAKOTA, STATE OF |
| MINOT | ND | 48.18611111110 | -101.30183333300 | 154.93500000 | NORTH DAKOTA, STATE OF |
| MINOT | ND | 48.18611111110 | -101.30183333300 | 155.47500000 | NORTH DAKOTA, STATE OF |
| BLAISDELL | ND | 48.41308333330 | -102.01405555600 | 154.90500000 | NORTH DAKOTA, STATE OF |
| BLAISDELL | ND | 48.41308333330 | -102.01405555600 | 154.93500000 | NORTH DAKOTA, STATE OF |
| BLAISDELL | ND | 48.41308333330 | -102.01405555600 | 155.47500000 | NORTH DAKOTA, STATE OF |
| MINOT | ND | 48.21166666670 | -101.27988888900 | 152.30000000 | MIDCONTINENT COMM |
| DES LACS | ND | 48.21666666670 | -101.57683333300 | 151.74500000 | KOPP, RAYMOND |
| PARSHALL | ND | 47.97277777780 | -102.13183333300 | 155.74500000 | MOUNTRAIL, COUNTY OF |
| MINOT | ND | 48.22166666670 | -101.28738888900 | 461.87500000 | TEAM ELECTRONICS |
| MINOT | ND | 48.23388888890 | -101.28961111100 | 155.02500000 | WARD, COUNTY OF |
| LANSFORD | ND | 48.51780555560 | -101.43794444400 | 151.56500000 | NELSON, HARRY G |
| LANSFORD | ND | 48.52836111110 | -101.45211111100 | 151.56500000 | NELSON, HARRY G |
| MINOT | ND | 48.21805555560 | -101.23238888900 | 151.49000000 | GRAVEL PRODUCTS INC |
| BERTHOLD | ND | 48.22722222220 | -101.87322222200 | 151.49000000 | GRAVEL PRODUCTS INC |
| MOHALL | ND | 48.76113888890 | -101.50877777800 | 155.50500000 | RENVILLE, COUNTY OF |
| MINOT | ND | 48.21861111110 | -101.30405555600 | 155.50500000 | WARD, COUNTY OF |
| MINOT | ND | 48.21402777780 | -101.32363888900 | 155.47500000 | MINOT, CITY OF |
| MINOT | ND | 48.21402777780 | -101.32363888900 | 155.79000000 | MINOT, CITY OF |
| MINOT | ND | 48.22500000000 | -101.27961111100 | 155.47500000 | MINOT, CITY OF |
| MINOT | ND | 48.22500000000 | -101.27961111100 | 155.79000000 | MINOT, CITY OF |
| MINOT | ND | 48.23611111110 | -101.30322222200 | 155.79000000 | MINOT, CITY OF |
| NORWICH | ND | 48.21250000000 | -100.97263888900 | 451.72500000 | GOTVASLEE, ALLEN |
| DES LACS | ND | 48.24305555560 | -101.57544444400 | 151.86500000 | STEVICK, VERN |
| MINOT | ND | 48.08000000000 | -101.38350000000 | 153.33500000 | SMITH, MICHAEL H |
| PARSHALL | ND | 47.96944444440 | -102.13377777800 | 151.68500000 | NELSON, WALLACE |
| MINOT | ND | 48.02611111110 | -101.31627777800 | 461.97500000 | CHS Inc |
| GLENBURN | ND | 48.51586111110 | -101.21961111100 | 154.29500000 | Glenburn Rural Fire Prot Dist |

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|---|---|---|---|---|---|
| DES LACS | ND | 48.18027777780 | -101.64988888900 | 151.52000000 | HAUGEN, TERRENCE |
| MINOT | ND | 48.22583333330 | -101.32266666700 | 160.92000000 | BNSF Railway Company |
| MINOT | ND | 48.22583333330 | -101.32266666700 | 161.10000000 | BNSF Railway Company |
| MINOT | ND | 48.22583333330 | -101.32266666700 | 161.16000000 | BNSF Railway Company |
| LONETREE | ND | 48.29916666670 | -101.69211111100 | 160.92000000 | BNSF Railway Company |
| LONETREE | ND | 48.29916666670 | -101.69211111100 | 161.10000000 | BNSF Railway Company |
| LONETREE | ND | 48.29916666670 | -101.69211111100 | 161.16000000 | BNSF Railway Company |
| PALERMO | ND | 48.33725000000 | -102.22905555600 | 160.92000000 | BNSF Railway Company |
| PALERMO | ND | 48.33725000000 | -102.22905555600 | 161.10000000 | BNSF Railway Company |
| PALERMO | ND | 48.33725000000 | -102.22905555600 | 161.16000000 | BNSF Railway Company |
| DEERING | ND | 48.50225000000 | -100.99319444400 | 460.95000000 | NIEWOEHNER, KENNETH A |
| MOHALL | ND | 48.76280555560 | -101.51044444400 | 464.05000000 | GLESSING, EUGENE L |
| TOLLEY | ND | 48.76308333330 | -101.89794444400 | 461.97500000 | BREKHUS, PALMER |
| BENEDICT | ND | 47.92250000000 | -101.07988888900 | 153.42500000 | Basin Electric Power Coop |
| DOUGLAS | ND | 47.86138888890 | -101.52544444400 | 151.86500000 | WOHLK, GORLYN |
| PARSHALL | ND | 47.86611111110 | -102.12461111100 | 464.00000000 | WILLIAMSON, WADE F |
| KENMARE | ND | 48.58447222220 | -102.00766666700 | 464.17500000 | HARRIS CONSTRUCTION INC |
| BERTHOLD | ND | 48.25861111110 | -101.79377777800 | 153.42500000 | Basin Electric Power Coop |
| GLENBURN | ND | 48.52669444440 | -101.37127777800 | 157.56000000 | SAUER, HAROLD |
| DESLACS | ND | 48.25527777780 | -101.56655555600 | 463.70000000 | BROWN, ALLEN |
| MINOT | ND | 48.23805555560 | -101.35488888900 | 461.12500000 | JESSEN ROOFING INC |
| KENMARE | ND | 48.67530555560 | -102.06905555600 | 157.68000000 | BAUER, GEORGE |
| MOHALL | ND | 48.68197222220 | -101.53044444400 | 464.37500000 | OBERHOLTZER, JERRY L |
| MOHALL | ND | 48.68197222220 | -101.53044444400 | 469.37500000 | OBERHOLTZER, JERRY L |
| MINOT | ND | 48.27916666670 | -101.35322222200 | 862.61250000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.27916666670 | -101.35322222200 | 863.36250000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.27916666670 | -101.35322222200 | 864.11250000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.27916666670 | -101.35322222200 | 864.86250000 | Nextel License Holdings 4, Inc. |
| MINOT | ND | 48.27916666670 | -101.35322222200 | 865.61250000 | Nextel License Holdings 4, Inc. |
| BERTHOLD | ND | 48.31058333330 | -101.87322222200 | 460.72500000 | OLSON, GERALD R |
| DONNYBROOK | ND | 48.51808333330 | -101.96322222200 | 464.87500000 | JOHNSON, WILLIAM D |
| MINOT | ND | 48.24222222220 | -101.33516666700 | 464.15000000 | MINOT PAVING COMPANY |
| MINOT | ND | 48.27916666670 | -101.35322222200 | 863.76250000 | Nextel License Holdings 4, Inc. |
| MOHALL | ND | 48.77641666670 | -101.70544444400 | 464.42500000 | JOHNSON, BRUCE P |
| MAX | ND | 47.85444444440 | -101.32211111100 | 151.56500000 | SCHMIDT, WARREN A |
| LANSFORD | ND | 48.63030555560 | -101.37683333300 | 464.92500000 | ROUTLEDGE, CLYDE |
| MINOT | ND | 48.22666666670 | -101.29350000000 | 151.86500000 | Souris Basin Transport Board |
| PARSHALL | ND | 47.95833333330 | -102.13016666700 | 155.23500000 | PARSHALL AMBULANCE INC |
| PLAZA | ND | 48.06583333330 | -102.07211111100 | 452.07500000 | BERGSTROM, DENNIS |
| MINOT | ND | 48.24611111110 | -101.30294444400 | 453.35000000 | NORTH DAKOTA, STATE OF |
| PLAZA | ND | 48.03805555560 | -102.04211111100 | 152.91500000 | WESTGARD, BRENT |
| CARPIO | ND | 48.41530555560 | -101.80350000000 | 452.17500000 | HANSON, CHRIST |
| LANSFORD | ND | 48.67558333330 | -101.28794444400 | 153.00500000 | TYLER, FREDRICK W |
| TOLLEY | ND | 48.77419444440 | -101.88905555600 | 461.87500000 | LAUMB, ROBERT |
| MINOT | ND | 48.27916666670 | -101.35488888900 | 461.90000000 | Aggregate Constrution Inc |
| KENMARE | ND | 48.67419444440 | -102.07377777800 | 451.85000000 | HENNIX, LAURY |
| MAKOTI | ND | 47.91944444440 | -101.88794444400 | 152.88500000 | RAU, PAUL |
| KENMARE | ND | 48.70641666670 | -101.89266666700 | 464.40000000 | PETERSON, DAVID C |

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|---|---|---|---|---|---|
| MINOT | ND | 48.27916666670 | -101.35488888900 | 461.90000000 | VANGSNESS, STANLEY K |
| CARPIO | ND | 48.39891666670 | -101.75961111100 | 461.37500000 | VANGSNESS, STANLEY K |
| CARPIO | ND | 48.39891666670 | -101.75961111100 | 461.37500000 | VANGSNESS, STANLEY K |
| GLENBURN | ND | 48.51530555560 | -101.22322222200 | 155.17500000 | Glenburn Pub SCl Dist # 26 |
| KENMARE | ND | 48.67725000000 | -102.07044444400 | 153.51500000 | Burke Divide Electric Coop Inc |
| KENMARE | ND | 48.67725000000 | -102.07044444400 | 158.13000000 | Burke Divide Electric Coop Inc |
| MINOT | ND | 48.26277777780 | -101.29405555600 | 155.08500000 | MINOT, CITY OF |
| MINOT | ND | 48.26277777780 | -101.29405555600 | 158.94000000 | MINOT, CITY OF |
| MINOT | ND | 48.19805555560 | -101.29294444400 | 457.22500000 | MINOT, CITY OF |
| MINOT | ND | 48.20527777780 | -101.32711111100 | 457.22500000 | MINOT, CITY OF |
| MINOT | ND | 48.20833333330 | -101.25877777800 | 457.22500000 | MINOT, CITY OF |
| MINOT | ND | 48.22583333330 | -101.23294444400 | 457.22500000 | MINOT, CITY OF |
| MINOT | ND | 48.23083333330 | -101.32683333300 | 457.22500000 | MINOT, CITY OF |
| MINOT | ND | 48.23611111110 | -101.30322222200 | 457.22500000 | MINOT, CITY OF |
| PLAZA | ND | 48.02444444440 | -102.06461111100 | 464.87500000 | Harstad Trucking & Contracting |
| MINOT | ND | 48.21861111110 | -101.30405555600 | 457.22500000 | MINOT, CITY OF |
| MINOT | ND | 48.22194444440 | -101.29488888900 | 457.22500000 | MINOT, CITY OF |
| MINOT | ND | 48.23250000000 | -101.26572222200 | 457.22500000 | MINOT, CITY OF |
| MINOT | ND | 48.24083333330 | -101.29544444400 | 457.22500000 | MINOT, CITY OF |
| MINOT | ND | 48.25472222220 | -101.32350000000 | 457.22500000 | MINOT, CITY OF |
| MINOT | ND | 48.26527777780 | -101.29711111100 | 457.22500000 | MINOT, CITY OF |
| SAWYER | ND | 47.96694444440 | -101.04627777800 | 464.87500000 | KNORR, MARK G |
| RUTHVILLE | ND | 48.45947222220 | -101.33072222200 | 463.92500000 | Midcontinent Communications |
| MINOT | ND | 48.22861111110 | -101.21072222200 | 461.42500000 | SECURITY FENCE INC |
| LANSFORD | ND | 48.69002777780 | -101.30100000000 | 461.27500000 | Lyle, Harold:Gravseth, Farms |
| SAWYER | ND | 48.09444444440 | -101.09822222200 | 463.42500000 | KRUEGER, JAMES |
| MINOT | ND | 48.20277777780 | -101.29988888900 | 154.74000000 | MINOT, CITY OF |
| MINOT | ND | 48.23611111110 | -101.30322222200 | 154.74000000 | MINOT, CITY OF |
| RYDER | ND | 48.06416666670 | -101.63933333300 | 158.38500000 | LEIFSON, DONALD |
| KENMARE | ND | 48.61030555560 | -102.16016666700 | 461.10000000 | CHRISTIANSON, DEAN |
| MINOT | ND | 47.99805555560 | -101.29516666700 | 460.82500000 | MARTIN, WARREN |
| MINOT | ND | 48.26750000000 | -101.39933333300 | 151.80500000 | Ray, Ruby, Randy Circle Sanit |
| VELVA | ND | 48.12444444440 | -101.01236111100 | 460.87500000 | EFFERTZ, GERALD |
| DEERING | ND | 48.37252777780 | -101.19127777800 | 460.87500000 | EFFERTZ, GERALD |
| MINOT | ND | 48.20777777780 | -101.31905555600 | 466.30000000 | WURGLER FARMS |
| LANSFORD | ND | 48.62975000000 | -101.37516666700 | 461.30000000 | WURGLER FARMS |
| PARSHALL | ND | 47.97500000000 | -102.13377777800 | 173.39000000 | OTTER TAIL POWER CO |
| DONNYBROOK | ND | 48.58280555560 | -101.88266666700 | 153.12500000 | JOHNSON, BRUCE |
| KENMARE | ND | 48.56169444440 | -102.04877777800 | 463.67500000 | LEHMAN, LEONARD |
| MINOT | ND | 48.23583333330 | -101.29127777800 | 452.05000000 | MINOT CAB INC |
| MOHALL | ND | 48.68975000000 | -101.65738888900 | 862.56250000 | Warren, Martin |
| MOHALL | ND | 48.68975000000 | -101.65738888900 | 863.31250000 | Warren, Martin |
| MOHALL | ND | 48.68975000000 | -101.65738888900 | 864.06250000 | Warren, Martin |
| MOHALL | ND | 48.68975000000 | -101.65738888900 | 864.81250000 | Warren, Martin |
| MOHALL | ND | 48.68975000000 | -101.65738888900 | 865.56250000 | Warren, Martin |
| MINOT | ND | 48.24611111110 | -101.25183333300 | 157.68000000 | INTERNATIONAL INN |
| LANSFORD | ND | 48.60391666670 | -101.51988888900 | 152.42000000 | BROSSART, DAVID J |
| LANSFORD | ND | 48.56002777780 | -101.44238888900 | 153.33500000 | SAVELKOUL, DALE |

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|---|---|---|---|---|---|
| PARSHALL | ND | 47.95000000000 | -102.10461111100 | 151.83500000 | ESTVOLD, MIKE |
| PARSHALL | ND | 47.93944444440 | -102.13461111100 | 463.85000000 | KUEHN, JON |
| MINOT | ND | 48.23083333330 | -101.27933333300 | 464.60000000 | BERNING, TODD |
| MINOT | ND | 48.21138888890 | -101.24600000000 | 151.95500000 | Continental Metal Products Inc |
| NORWICH | ND | 48.25194444440 | -100.99902777800 | 151.89500000 | FINNESETH, K B |
| BERTHOLD | ND | 48.31613888890 | -101.78933333300 | 154.54000000 | HELLER, MARVIN L |
| MINOT | ND | 48.26583333330 | -101.40100000000 | 154.54000000 | DECHANDT, ROBERT J |
| DONNYBROOK | ND | 48.53252777780 | -101.87627777800 | 460.70000000 | MURPHY, JAMES |
| MINOT | ND | 48.22527777780 | -101.29683333300 | 461.87500000 | HABERLOCK, DUANE |
| MINOT | ND | 48.19916666670 | -101.29405555600 | 460.75000000 | REITEN TELEVISION |
| MINOT | ND | 48.25083333330 | -101.29877777800 | 460.75000000 | REITEN TELEVISION |
| TOLLEY | ND | 48.71530555560 | -101.84433333300 | 463.85000000 | BAUER, JEFFREY |
| GLENBURN | ND | 48.41586111110 | -101.22711111100 | 152.40500000 | Rod, Ken Anderson |
| SURREY | ND | 48.23861111110 | -101.14988888900 | 160.71000000 | BNSF Railway Company |
| SURREY | ND | 48.23861111110 | -101.14988888900 | 161.01000000 | BNSF Railway Company |
| KENMARE | ND | 48.66558333330 | -101.91405555600 | 464.47500000 | JD ZELTINGER FARMS INC |
| PARSHALL | ND | 47.92166666670 | -102.09683333300 | 158.32500000 | ANDES, IRVIN:ANDES, JON |
| MINOT | ND | 48.21027777780 | -101.28850000000 | 462.02500000 | HAWTHORNE, EDWARD K |
| DES LACS | ND | 48.11111111110 | -101.59711111100 | 462.07500000 | OPLAND, DOUGLAS |
| BURLINGTON | ND | 48.31027777780 | -101.51127777800 | 160.77000000 | Soo Systems Radio Comm Inc. |
| BURLINGTON | ND | 48.31027777780 | -101.51127777800 | 161.08500000 | Soo Systems Radio Comm Inc. |
| BURLINGTON | ND | 48.31027777780 | -101.51127777800 | 161.37000000 | Soo Systems Radio Comm Inc. |
| BURLINGTON | ND | 48.31027777780 | -101.51127777800 | 161.52000000 | Soo Systems Radio Comm Inc. |
| DES LACS | ND | 48.18500000000 | -101.57572222200 | 153.03500000 | TRANBY, JAMES |
| MINOT | ND | 48.23638888890 | -101.26350000000 | 461.55000000 | BERNING, TODD |
| STANLEY | ND | 48.32808333330 | -102.21766666700 | 851.73750000 | Warren, Martin |
| STANLEY | ND | 48.32808333330 | -102.21766666700 | 852.48750000 | Warren, Martin |
| STANLEY | ND | 48.32808333330 | -102.21766666700 | 853.23750000 | Warren, Martin |
| STANLEY | ND | 48.32808333330 | -102.21766666700 | 853.98750000 | Warren, Martin |
| STANLEY | ND | 48.32808333330 | -102.21766666700 | 854.73750000 | Warren, Martin |
| STANLEY | ND | 48.32808333330 | -102.21766666700 | 862.63750000 | Warren, Martin |
| STANLEY | ND | 48.32808333330 | -102.21766666700 | 863.38500000 | Warren, Martin |
| STANLEY | ND | 48.32808333330 | -102.21766666700 | 864.13750000 | Warren, Martin |
| STANLEY | ND | 48.32808333330 | -102.21766666700 | 864.88750000 | Warren, Martin |
| STANLEY | ND | 48.32808333330 | -102.21766666700 | 865.63750000 | Warren, Martin |
| MAKOTI | ND | 47.88944444440 | -101.85100000000 | 861.01250000 | DOBRINSKI, EVERETT |
| DONNYBROOK | ND | 48.54419444440 | -102.01211111100 | 464.25000000 | KING, DAVID |
| MINOT | ND | 48.03138888890 | -101.36266666700 | 451.92500000 | HENNE FARMS |
| MINOT | ND | 48.04444444440 | -101.32877777800 | 451.92500000 | HENNE FARMS |
| MINOT | ND | 48.02611111110 | -101.31627777800 | 461.97500000 | BROWN, DONN |
| DESLACS | ND | 48.25388888890 | -101.57072222200 | 461.97500000 | BROWN, DONN |
| KENMARE | ND | 48.70780555560 | -102.05822222200 | 464.82500000 | JOHNSON, LARRY |
| MINOT | ND | 48.22305555560 | -101.42322222200 | 160.71000000 | BNSF Railway Company |
| MINOT | ND | 48.22305555560 | -101.42322222200 | 160.92000000 | BNSF Railway Company |
| MINOT | ND | 48.22305555560 | -101.42322222200 | 161.10000000 | BNSF Railway Company |
| MINOT | ND | 48.22305555560 | -101.42322222200 | 161.01000000 | BNSF Railway Company |
| MOHALL | ND | 48.76613888890 | -101.61655555600 | 151.68500000 | MOBERG, EMMET |
| CAPRIO | ND | 48.54002777780 | -101.71683333300 | 152.90000000 | JOHNSON, FRED |

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|---|---|---|---|---|---|
| LOGAN | ND | 48.15222222220 | -101.15350000000 | 161.37000000 | Soo Systems Radio Comm Inc. |
| KENMORE | ND | 48.67586111110 | -102.06572222200 | 451.35000000 | Reservation Telephone Coop |
| PARSHALL | ND | 47.97500000000 | -102.13377777800 | 153.59000000 | OTTER TAIL POWER CO |
| CARPIO | ND | 48.47641666670 | -101.63100000000 | 463.80000000 | PETERSON, DALE J |
| SAWYER | ND | 48.02333333330 | -101.13544444400 | 451.87500000 | SYS, KEVIN M |
| SAWYER | ND | 48.05416666670 | -101.12294444400 | 461.17500000 | VIX, KENTON |
| BERTHOLD | ND | 48.31058333330 | -101.87322222200 | 862.96250000 | MARTIN, WARREN |
| BERTHOLD | ND | 48.31058333330 | -101.87322222200 | 863.71250000 | MARTIN, WARREN |
| BERTHOLD | ND | 48.31058333330 | -101.87322222200 | 864.46250000 | MARTIN, WARREN |
| BERTHOLD | ND | 48.31058333330 | -101.87322222200 | 865.21250000 | MARTIN, WARREN |
| BERTHOLD | ND | 48.31058333330 | -101.87322222200 | 865.96250000 | MARTIN, WARREN |
| DEERING | ND | 48.37697222220 | -101.05600000000 | 862.96250000 | MARTIN, WARREN |
| DEERING | ND | 48.37697222220 | -101.05600000000 | 863.71250000 | MARTIN, WARREN |
| DEERING | ND | 48.37697222220 | -101.05600000000 | 864.46250000 | MARTIN, WARREN |
| DEERING | ND | 48.37697222220 | -101.05600000000 | 865.21250000 | MARTIN, WARREN |
| DEERING | ND | 48.37697222220 | -101.05600000000 | 865.96250000 | MARTIN, WARREN |
| MOHALL | ND | 48.76391666670 | -101.51600000000 | 48.26000000 | Montana-Dakota Co. |
| MINOT | ND | 48.27916666670 | -101.35322222200 | 173.25000000 | Xcel Energy Services Inc. |
| MINOT | ND | 48.28000000000 | -101.35461111100 | 152.48000000 | SRT COMMUNICATIONS INC |
| SAWYER | ND | 47.96888888890 | -101.09266666700 | 463.50000000 | Laidlaw Environmental Services |
| NORMA | ND | 48.75863888890 | -101.99988888900 | 157.56000000 | JENSEN, KIRT D |
| PARSHALL | ND | 47.85833333330 | -102.13100000000 | 153.03500000 | MYERS, RANDY |
| PARSHALL | ND | 47.86250000000 | -102.13100000000 | 153.03500000 | MYERS, RANDY |
| MAKOTI | ND | 47.96305555560 | -101.80377777800 | 151.56500000 | SCHENFISCH, BRYON |
| MINOT | ND | 48.23111111110 | -101.38905555600 | 911.50000000 | BNSF Railway Company |
| MINOT | ND | 48.23111111110 | -101.38905555600 | 915.00000000 | BNSF Railway Company |
| MINOT | ND | 48.23111111110 | -101.38905555600 | 917.00000000 | BNSF Railway Company |
| MINOT | ND | 48.23111111110 | -101.38905555600 | 918.50000000 | BNSF Railway Company |
| MINOT | ND | 48.23444444440 | -101.13350000000 | 911.50000000 | BNSF Railway Company |
| MINOT | ND | 48.23444444440 | -101.13350000000 | 918.50000000 | BNSF Railway Company |
| MINOT | ND | 48.23444444440 | -101.30100000000 | 911.50000000 | BNSF Railway Company |
| MINOT | ND | 48.23444444440 | -101.30100000000 | 918.50000000 | BNSF Railway Company |
| SURREY | ND | 48.23916666670 | -101.12766666700 | 911.50000000 | BNSF Railway Company |
| SURREY | ND | 48.23916666670 | -101.12766666700 | 918.50000000 | BNSF Railway Company |
| PARSHALL | ND | 47.92166666670 | -102.09683333300 | 157.62000000 | ANDES, IRVIN:ANDES, JON |
| PLAZA | ND | 47.94861111110 | -101.93572222200 | 157.62000000 | ANDES, IRVIN:ANDES, JON |
| CARPIO | ND | 48.46808333330 | -101.68794444400 | 464.45000000 | LAWRENCE, MARY:HANSEN |
| PARSHALL | ND | 47.87583333330 | -102.13016666700 | 151.49000000 | WALDOCK, DAN |
| DONNYBROOK | ND | 48.46530555560 | -101.90905555600 | 452.12500000 | CRIDER, JOSEPH S |
| DONNYBROOK | ND | 48.46530555560 | -101.90905555600 | 452.12500000 | CRIDER, JOSEPH S |
| DONNYBROOK | ND | 48.46586111110 | -101.90850000000 | 457.12500000 | CRIDER, JOSEPH S |
| KENMARE | ND | 48.65419444440 | -101.91988888900 | 461.02500000 | ZELTINGER, F EVAN |
| MOHALL | ND | 48.76530555560 | -101.69627777800 | 158.80500000 | BOTTINEAU, COUNTY OF |
| VELVA | ND | 48.11944444440 | -101.99294444400 | 151.52000000 | ODLAND, JOHN H |
| VELVA | ND | 48.12083333330 | -101.99544444400 | 151.52000000 | ODLAND, JOHN H |
| GLENBURN | ND | 48.51725000000 | -101.17127777800 | 464.77500000 | ELDEVIK, STEVEN |
| PLAZA | ND | 48.05416666670 | -102.05461111100 | 464.57500000 | SCOTT LESTER FARM |
| MINOT | ND | 48.42086111110 | -101.20877777800 | 464.67500000 | ERBER FARMS |

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|---|---|---|---|---|---|
| BOWBELLS | ND | 48.76641666670 | -102.12988888900 | 154.54000000 | WITTMAN FARM |
| LANSFORD | ND | 48.65502777780 | -101.25183333300 | 451.85000000 | CUNNINGHAM, LEE |
| KENMARE | ND | 48.67086111110 | -102.13266666700 | 154.54000000 | NELSON, MARK |
| LANSFORD | ND | 48.63225000000 | -101.33544444400 | 464.97500000 | ERICKSON TALLEY FARMS |
| LANSFORD | ND | 48.63225000000 | -101.33544444400 | 469.97500000 | ERICKSON TALLEY FARMS |
| PLAZA | ND | 48.02111111110 | -101.89350000000 | 152.97500000 | BANGEN, QUENTIN |
| MOHALL | ND | 48.79308333330 | -101.25766666700 | 463.87500000 | G PETERSON FARM INC |
| MINOT | ND | 48.05055555560 | -101.18850000000 | 153.36500000 | NEWMAN, JAY |
| SURREY | ND | 48.32836111110 | -101.04877777800 | 461.05000000 | NICKLE, RODNEY |
| MAX | ND | 47.88027777780 | -101.23044444400 | 464.37500000 | KRUEGER, JEFF |
| DONNYBROOK | ND | 48.53086111110 | -101.85211111100 | 451.72500000 | GRAFF, KEITH |
| MOHALL | ND | 48.76086111110 | -101.50794444400 | 151.65500000 | OVERBY, LEON |
| MINOT | ND | 48.17055555560 | -101.59488888900 | 461.40000000 | MARTIN, WARREN |
| TOLLEY | ND | 48.74947222220 | -101.80655555600 | 463.20000000 | RENVILLE ELEVATOR CO |
| MOHALL | ND | 48.77086111110 | -101.58655555600 | 461.85000000 | SCHOENBERG, VERNON |
| MAXBASS | ND | 48.72002777780 | -101.20877777800 | 461.47500000 | WARD WILLISTON |
| MAKOTI | ND | 47.92250000000 | -101.81155555600 | 151.74500000 | QUANDT, DARWIN |
| RYDER | ND | 47.91611111110 | -101.67516666700 | 464.27500000 | FARMERS UNION OIL CO |
| PALERMO | ND | 48.19613888890 | -102.22572222200 | 461.77500000 | JOHNSON, WAYNE |
| BURLINGTON | ND | 48.35833333330 | -101.47183333300 | 460.77500000 | JOST CEMENT COMPANY |
| MAXBASS | ND | 48.70697222220 | -101.22738888900 | 460.85000000 | ANDERSEN, DUANE |
| PLAZA | ND | 48.09697222220 | -102.10405555600 | 157.68000000 | LEE, HARLAN P |
| MINOT | ND | 48.20194444440 | -101.28516666700 | 452.02500000 | Couglin Construction Co Inc |
| KENMARE | ND | 48.67391666670 | -102.08183333300 | 154.02500000 | KENMARE, CITY OF |
| PLAZA | ND | 47.86666666670 | -101.95877777800 | 153.00500000 | CHRISTENSON, ROGER |
| MINOT | ND | 48.16555555560 | -101.29850000000 | 463.45000000 | BELL COMMUNICATIONS INC |
| MINOT | ND | 48.16555555560 | -101.29850000000 | 468.45000000 | BELL COMMUNICATIONS INC |
| MINOT | ND | 48.22666666670 | -101.37933333300 | 160.71000000 | BNSF Railway Company |
| MINOT | ND | 48.22666666670 | -101.37933333300 | 161.01000000 | BNSF Railway Company |
| MINOT | ND | 48.23250000000 | -101.40127777800 | 160.71000000 | BNSF Railway Company |
| MINOT | ND | 48.23250000000 | -101.40127777800 | 161.01000000 | BNSF Railway Company |
| MINOT | ND | 48.23555555560 | -101.21933333300 | 160.71000000 | BNSF Railway Company |
| MINOT | ND | 48.23555555560 | -101.21933333300 | 161.01000000 | BNSF Railway Company |
| MINOT | ND | 48.23555555560 | -101.30127777800 | 160.71000000 | BNSF Railway Company |
| MINOT | ND | 48.23555555560 | -101.30127777800 | 161.01000000 | BNSF Railway Company |
| SURREY | ND | 48.23944444440 | -101.14683333300 | 160.71000000 | BNSF Railway Company |
| SURREY | ND | 48.23944444440 | -101.14683333300 | 161.01000000 | BNSF Railway Company |
| DES LACS | ND | 48.25972222220 | -101.56711111100 | 160.71000000 | BNSF Railway Company |
| DES LACS | ND | 48.25972222220 | -101.56711111100 | 161.01000000 | BNSF Railway Company |
| BERTHOLD | ND | 48.30583333330 | -101.71461111100 | 160.71000000 | BNSF Railway Company |
| BERTHOLD | ND | 48.30583333330 | -101.71461111100 | 161.01000000 | BNSF Railway Company |
| BERTHOLD | ND | 48.31527777780 | -101.74266666700 | 160.71000000 | BNSF Railway Company |
| BERTHOLD | ND | 48.31527777780 | -101.74266666700 | 161.01000000 | BNSF Railway Company |
| BERTHOLD | ND | 48.31916666670 | -101.75600000000 | 160.71000000 | BNSF Railway Company |
| BERTHOLD | ND | 48.31916666670 | -101.75600000000 | 161.01000000 | BNSF Railway Company |
| BLAISDELL | ND | 48.33697222220 | -102.08988888900 | 160.71000000 | BNSF Railway Company |
| BLAISDELL | ND | 48.33697222220 | -102.08988888900 | 161.01000000 | BNSF Railway Company |
| BLAISDELL | ND | 48.33725000000 | -102.04850000000 | 160.71000000 | BNSF Railway Company |

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|---|---|---|---|---|---|
| BLAISDELL | ND | 48.33725000000 | -102.04850000000 | 161.01000000 | BNSF Railway Company |
| MINOT | ND | 48.24000000000 | -101.28322222200 | 158.32500000 | Kemper Construction Co |
| MINOT | ND | 48.22166666670 | -101.28766666700 | 161.87500000 | Souris Basin transportation |
| MINOT | ND | 48.22166666670 | -101.28766666700 | 462.10000000 | MARTIN, WARREN |
| DES LACS | ND | 48.16833333330 | -101.55655555600 | 460.90000000 | SUNDSBAK, MIKE |
| MINOT | ND | 48.19666666670 | -101.22405555600 | 911.50000000 | Soo Systems Radio Comm Inc. |
| MINOT | ND | 48.19666666670 | -101.22405555600 | 913.00000000 | Soo Systems Radio Comm Inc. |
| MINOT | ND | 48.23638888890 | -101.29683333300 | 911.50000000 | Soo Systems Radio Comm Inc. |
| MINOT | ND | 48.23638888890 | -101.29683333300 | 913.00000000 | Soo Systems Radio Comm Inc. |
| MINOT | ND | 48.26666666670 | -101.31711111100 | 453.85000000 | NORTH DAKOTA, STATE OF |
| KENMARE | ND | 48.55752777780 | -101.96433333300 | 911.50000000 | Soo Systems Radio Comm Inc. |
| KENMARE | ND | 48.55752777780 | -101.96433333300 | 913.00000000 | Soo Systems Radio Comm Inc. |
| KENMARE | ND | 48.67002777780 | -102.08572222200 | 911.50000000 | Soo Systems Radio Comm Inc. |
| KENMARE | ND | 48.67002777780 | -102.08572222200 | 913.00000000 | Soo Systems Radio Comm Inc. |
| KENMARE | ND | 48.67002777780 | -102.08572222200 | 918.50000000 | Soo Systems Radio Comm Inc. |
| MINOT | ND | 48.18694444440 | -101.20211111100 | 151.95500000 | SUNDRE SAND & GRAVEL INC |
| MINOT | ND | 48.18861111110 | -101.20322222200 | 151.95500000 | SUNDRE SAND & GRAVEL INC |
| TOLLEY | ND | 48.67697222220 | -101.86377777800 | 464.12500000 | ENGEBERG, LORY |
| MINOT | ND | 48.21611111110 | -101.28377777800 | 154.54000000 | Trinity Health |
| MINOT | ND | 48.22444444440 | -101.28794444400 | 158.85000000 | WARD, COUNTY OF |
| BERTHOLD | ND | 48.31058333330 | -101.87322222200 | 151.01000000 | WARD, COUNTY OF |
| DONNYBROOK | ND | 48.54752777780 | -101.90155555600 | 461.07500000 | GRAFF, CURTIS |
| MINOT | ND | 48.22805555560 | -101.20627777800 | 464.72500000 | STEIN CONSTRUCTION INC |
| SAWYER | ND | 47.92583333330 | -101.14100000000 | 461.77500000 | HENKE, RANDY |
| TOLLEY | ND | 48.64697222220 | -101.70988888900 | 151.77500000 | METZEN, LARRY A |
| MINOT | ND | 48.24166666670 | -101.27961111100 | 154.10000000 | MINOT, CITY OF |
| MINOT | ND | 48.24861111110 | -101.28405555600 | 151.71500000 | ROUTLEDGE, JAMES |
| GLENBURN | ND | 48.51641666670 | -101.37711111100 | 151.71500000 | ROUTLEDGE, JAMES |
| GLENBURN | ND | 48.50086111110 | -101.20016666700 | 461.82500000 | PRESKEY, MITCH |
| DONNYBROOK | ND | 48.53558333330 | -101.88711111100 | 151.68500000 | PEARSON, JAMES |
| GLENBURN | ND | 48.51280555560 | -101.22238888900 | 461.32500000 | SLAVINSKY, ANDREW J |
| MINOT | ND | 48.18250000000 | -101.53294444400 | 853.78750000 | Federal Express Corp |
| MINOT | ND | 48.18083333330 | -101.31600000000 | 460.27500000 | NORTH DAKOTA, STATE OF |
| MINOT | ND | 48.18083333330 | -101.31600000000 | 460.30000000 | NORTH DAKOTA, STATE OF |
| MINOT | ND | 48.18083333330 | -101.31600000000 | 460.37500000 | NORTH DAKOTA, STATE OF |
| MINOT | ND | 48.18083333330 | -101.31600000000 | 460.55000000 | NORTH DAKOTA, STATE OF |
| MINOT | ND | 48.27694444440 | -101.34461111100 | 461.90000000 | A-1 Evans Septic Tank Service |
| MINOT | ND | 48.22222222220 | -101.25377777800 | 452.40000000 | PEPSI COLA BOTTLING CO |
| MINOT | ND | 48.22972222220 | -101.20488888900 | 151.89500000 | PORTER BROS CORP |
| KENMARE | ND | 48.72169444440 | -102.19711111100 | 464.85000000 | OLSON, RUBEN F |
| NORMA | ND | 48.72780555560 | -101.97183333300 | 160.86000000 | NORTHERN PLAINS RR INC |
| NORMA | ND | 48.72780555560 | -101.97183333300 | 161.43000000 | NORTHERN PLAINS RR INC |
| MINOT | ND | 48.24583333330 | -101.28155555600 | 159.57000000 | UNDLIN, RON |
| MAX | ND | 47.94111111110 | -101.30544444400 | 463.45000000 | HAUGEBERG, RICHARD |
| RYDER | ND | 47.86111111110 | -101.72294444400 | 464.12500000 | SHERVEN, WESLEY |
| BERTHOLD | ND | 48.28805555560 | -101.68627777800 | 462.17500000 | NESHEM, GARY |
| VELVA | ND | 48.04305555560 | -101.05711111100 | 159.72000000 | VIX, ROBERT A |
| MINOT | ND | 48.22722222220 | -101.27155555600 | 160.77000000 | Soo Systems Radio Comm Inc. |

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|---|---|---|---|---|---|
| MINOT | ND | 48.22722222220 | -101.27155555600 | 161.08500000 | Soo Systems Radio Comm Inc. |
| MINOT | ND | 48.22722222220 | -101.27155555600 | 161.37000000 | Soo Systems Radio Comm Inc. |
| MINOT | ND | 48.22722222220 | -101.27155555600 | 161.52000000 | Soo Systems Radio Comm Inc. |
| MINOT | ND | 48.22777777780 | -101.27266666700 | 161.52000000 | Soo Systems Radio Comm Inc. |
| MINOT | ND | 48.22777777780 | -101.27266666700 | 160.21500000 | Soo Systems Radio Comm Inc. |
| MINOT | ND | 48.22777777780 | -101.27266666700 | 160.77000000 | Soo Systems Radio Comm Inc. |
| MINOT | ND | 48.22777777780 | -101.27266666700 | 161.08500000 | Soo Systems Radio Comm Inc. |
| MINOT | ND | 48.22777777780 | -101.27266666700 | 161.37000000 | Soo Systems Radio Comm Inc. |
| MINOT | ND | 48.22777777780 | -101.27266666700 | 161.52000000 | Soo Systems Radio Comm Inc. |
| RYDER | ND | 47.94111111110 | -101.57072222200 | 460.27500000 | NORTH DAKOTA, STATE OF |
| RYDER | ND | 47.94111111110 | -101.57072222200 | 460.30000000 | NORTH DAKOTA, STATE OF |
| RYDER | ND | 47.94111111110 | -101.57072222200 | 460.37500000 | NORTH DAKOTA, STATE OF |
| RYDER | ND | 47.94111111110 | -101.57072222200 | 460.55000000 | NORTH DAKOTA, STATE OF |
| BLAISDELL | ND | 48.41308333330 | -102.01544444400 | 460.27500000 | NORTH DAKOTA, STATE OF |
| BLAISDELL | ND | 48.41308333330 | -102.01544444400 | 460.30000000 | NORTH DAKOTA, STATE OF |
| BLAISDELL | ND | 48.41308333330 | -102.01544444400 | 460.37500000 | NORTH DAKOTA, STATE OF |
| BLAISDELL | ND | 48.41308333330 | -102.01544444400 | 460.55000000 | NORTH DAKOTA, STATE OF |
| NIOBE | ND | 48.68919444440 | -102.21600000000 | 160.92000000 | BNSF Railway Co |
| NIOBE | ND | 48.68919444440 | -102.21600000000 | 161.25000000 | BNSF Railway Co |
| NIOBE | ND | 48.68919444440 | -102.21600000000 | 160.29000000 | BNSF Railway Co |
| NIOBE | ND | 48.68919444440 | -102.21600000000 | 160.92000000 | BNSF Railway Co |
| NIOBE | ND | 48.68919444440 | -102.21600000000 | 161.31000000 | BNSF Railway Co |
| MINOT | ND | 48.26111111110 | -101.29322222200 | 153.08000000 | NORTHWEST AIRLINES, INC. |
| DONNYBROOK | ND | 48.45863888890 | -101.92155555600 | 151.95500000 | HUFF, ROBERT C. |
| MINOT | ND | 48.23250000000 | -101.29222222200 | 452.25000000 | OPTICAL TECHNOLOGIES INC |
| Lansford | ND | 48.61947222220 | -101.47516666700 | 464.75000000 | Carlson, Blake G |
| Minot | ND | 48.23027777780 | -101.21263888900 | 451.35000000 | Land O Lakes |
| Minot | ND | 48.21402777780 | -101.32363888900 | 453.30000000 | MINOT, CITY OF |
| Minot | ND | 48.21402777780 | -101.32363888900 | 453.90000000 | MINOT, CITY OF |
| MOHALL | ND | 48.78444444440 | -101.51777777800 | 451.40000000 | SOUTHAM, SCOTT |
| GlenBurn | ND | 48.51444444440 | -101.22277777800 | 151.98500000 | Hoiland, John |
| DONNYBROOK | ND | 48.39947222220 | -101.86655555600 | 463.37500000 | ENGELHARD, CURT A |
| MINOT | ND | 48.22611111110 | -101.28750000000 | 461.25000000 | DAKOTA WRECKER SALES |
| Minot | ND | 48.20416666670 | -101.30555555600 | 152.45000000 | CUSA ES, LLC |
| Minot | ND | 48.24666666670 | -101.29000000000 | 152.45000000 | CUSA ES, LLC |
| Kenmore | ND | 48.67833333330 | -102.07472222200 | 462.20000000 | Brekhus, Monte C |
| NORWICH | ND | 48.27777777780 | -101.00888888900 | 464.70000000 | HESKIN, NORRIS H |
| Minot | ND | 48.23833333330 | -101.19500000000 | 160.41000000 | BNSF Railway Company |
| Minot | ND | 48.23833333330 | -101.19500000000 | 160.50000000 | BNSF Railway Company |
| DONNYBROOK | ND | 48.56169444440 | -101.88127777800 | 464.97500000 | MURPHY, TOM |
| Minot | ND | 48.22166666670 | -101.28763888900 | 462.22500000 | Earth Movers Inc |
| Lansford | ND | 48.62638888890 | -101.37777777800 | 452.27500000 | Savelkoul, Bart |
| LANSFORD | ND | 48.63916666670 | -101.62500000000 | 462.32500000 | MILLER, JOHN G |
| MINOT | ND | 48.20444444440 | -101.27277777800 | 152.36000000 | HUWE, KENNY |
| TOLLEY | ND | 48.72277777780 | -101.87083333300 | 151.65500000 | WALLSTRUM, TIMOTHY M |
| TOLLEY | ND | 48.72277777780 | -101.87083333300 | 151.80500000 | WALLSTRUM, TIMOTHY M |
| KENMARE | ND | 48.67583333330 | -102.06583333300 | 155.34000000 | Kenmare Community Hospital |
| KENMARE | ND | 48.67583333330 | -102.06583333300 | 155.35500000 | Kenmare Community Hospital |

| | | | | | |
|---|---|---|---|---|---|
| KENMARE | ND | 48.67583333330 | -102.06583333300 | 163.25000000 | Kenmare Community Hospital |
| Minot | ND | 48.22305555560 | -101.42277777800 | 44.58000000 | MCC Holdings |
| Tagus | ND | 48.38516666670 | -101.92905555600 | 44.58000000 | MCC Holdings |
| BERTHOLD | ND | 48.31416666670 | -101.73583333300 | 155.88000000 | Berthold Emergency Services |
| RYDER | ND | 47.91775000000 | -101.67500000000 | 154.51500000 | REINISCH, JODY |
| MINOT | ND | 48.22913888890 | -101.25277777800 | 464.10000000 | MUUS LUMBER COMPANY |
| Ryder | ND | 47.89500000000 | -101.79016666700 | 452.00000000 | Warner, John M |
| MINOT | ND | 48.27452777780 | -101.27966666700 | 463.75000000 | Novak's landscape/snow removal |
| DOUGLAS | ND | 47.86527777780 | -101.51611111100 | 154.17500000 | DOUGLAS FIRE DEPART |
| Ryder | ND | 47.86055555560 | -101.63277777800 | 152.99000000 | Brandt, Dwayne |
| MINOT | ND | 48.27527777780 | -101.29694444400 | 862.26250000 | AERONAUTICAL RADIO INC |
| MINOT | ND | 48.27527777780 | -101.29694444400 | 863.26250000 | AERONAUTICAL RADIO INC |
| MINOT | ND | 48.27527777780 | -101.29694444400 | 864.01250000 | AERONAUTICAL RADIO INC |
| MINOT | ND | 48.27527777780 | -101.29694444400 | 864.76250000 | AERONAUTICAL RADIO INC |
| MINOT | ND | 48.27527777780 | -101.29694444400 | 865.26250000 | AERONAUTICAL RADIO INC |
| VELVA | ND | 48.16600000000 | -100.99183333300 | 452.67500000 | KAYLOR, SHAWN |
| MINOT | ND | 48.23944444440 | -101.20850000000 | 453.00000000 | Minot Milling Div-Philladephia |
| PALERMO | ND | 48.20888888890 | -102.22527777800 | 462.25000000 | Feldman, David |
| DONNYBROOK | ND | 48.57586111110 | -101.93211111100 | 461.75000000 | Mike: Debbie Miller |
| RYDER | ND | 47.91633333330 | -101.67408333300 | 153.77000000 | Ryder-Makoti Fire Department |
| RYDER | ND | 47.91633333330 | -101.67408333300 | 154.32500000 | Ryder-Makoti Fire Department |
| MINOT | ND | 48.25194444440 | -101.28711111100 | 464.32500000 | MINOT DAKOTA MALL LLC |
| RYDER | ND | 47.94111111110 | -101.57083333300 | 154.69500000 | NORTH DAKOTA, STATE OF |
| RYDER | ND | 47.94111111110 | -101.57083333300 | 154.90500000 | NORTH DAKOTA, STATE OF |
| RYDER | ND | 47.94111111110 | -101.57083333300 | 154.93500000 | NORTH DAKOTA, STATE OF |
| RYDER | ND | 47.94111111110 | -101.57083333300 | 155.47500000 | NORTH DAKOTA, STATE OF |
| BLAISDALE | ND | 48.41305555560 | -102.01555555600 | 154.69500000 | NORTH DAKOTA, STATE OF |
| BLAISDALE | ND | 48.41305555560 | -102.01555555600 | 154.90500000 | NORTH DAKOTA, STATE OF |
| BLAISDALE | ND | 48.41305555560 | -102.01555555600 | 154.93500000 | NORTH DAKOTA, STATE OF |
| BLAISDALE | ND | 48.41305555560 | -102.01555555600 | 155.47500000 | NORTH DAKOTA, STATE OF |
| Minot | ND | 48.18083333330 | -101.31611111100 | 154.69500000 | NORTH DAKOTA, STATE OF |
| Minot | ND | 48.18083333330 | -101.31611111100 | 154.90500000 | NORTH DAKOTA, STATE OF |
| Minot | ND | 48.18083333330 | -101.31611111100 | 154.93500000 | NORTH DAKOTA, STATE OF |
| Minot | ND | 48.18083333330 | -101.31611111100 | 155.47500000 | NORTH DAKOTA, STATE OF |
| BENEDICT | ND | 47.92194444440 | -101.08000000000 | 462.45000000 | Basin Electric Power Coop |
| BENEDICT | ND | 47.92194444440 | -101.08000000000 | 463.47500000 | Basin Electric Power Coop |
| BERTHOLD | ND | 48.25861111110 | -101.79388888900 | 451.02500000 | Basin Electric Power Coop |
| BERTHOLD | ND | 48.25861111110 | -101.79388888900 | 452.97500000 | Basin Electric Power Coop |
| MINOT | ND | 48.22166666670 | -101.28763888900 | 461.85000000 | EARTH MOVERS INC |
| MINOT | ND | 48.22166666670 | -101.28763888900 | 451.30000000 | MARTIN, WARREN |
| MINOT | ND | 48.22166666670 | -101.28763888900 | 451.76250000 | MARTIN, WARREN |
| MINOT | ND | 48.20694444440 | -101.30708333300 | 462.75000000 | MAP DAKOTA LLC |
| RYDER | ND | 47.94111111110 | -101.57083333300 | 155.62500000 | WARD, COUNTY OF |
| SAWYER | ND | 48.08769444440 | -101.06169444400 | 155.62500000 | WARD, COUNTY OF |
| MINOT | ND | 48.20277777780 | -101.29986111100 | 155.62500000 | WARD, COUNTY OF |
| BERTHOLD | ND | 48.25861111110 | -101.79388888900 | 155.62500000 | WARD, COUNTY OF |
| DONNYBROOK | ND | 48.51111111110 | -101.90027777800 | 155.62500000 | WARD, COUNTY OF |
| KENMARE | ND | 48.68111111110 | -102.08083333300 | 155.62500000 | WARD, COUNTY OF |

| | | | | | |
|---|---|---|---|---|---|
| MINOT | ND | 48.21752777780 | -101.25416666700 | 461.17500000 | Dakota Agonomy Partners, LLC |
| MOHALL | ND | 48.68975000000 | -101.65738888900 | 461.50000000 | Team Electronics |
| MOHALL | ND | 48.68975000000 | -101.65738888900 | 462.30000000 | Team Electronics |
| TOLLEY | ND | 48.72919444440 | -101.82738888900 | 154.98000000 | RENVILLE, COUNTY OF |
| MOHALL | ND | 48.76669444440 | -101.51627777800 | 154.98000000 | RENVILLE, COUNTY OF |
| Upham | ND | 48.60358333330 | -100.99788888900 | 461.22500000 | Hall, Keith |
| Sawyer | ND | 48.04194444440 | -101.03388888900 | 159.93000000 | Grosse, Randy |
| MINOT | ND | 48.27000000000 | -101.28377777800 | 154.08500000 | NORTH DAKOTA, STATE OF |
| GLENBURN | ND | 48.43169444440 | -101.23766666700 | 464.37500000 | MATSON, CARTER |
| DESLACS | ND | 48.25833333330 | -101.56572222200 | 151.65500000 | GATHMAN GOEBEL FARMS |
| SAWYER | ND | 47.99472222220 | -101.09988888900 | 460.65000000 | Waste Management Holdings |
| BERTHOLD | ND | 48.37225000000 | -101.73294444400 | 462.00000000 | HAALAND, JAMES |
| GLENBURN | ND | 48.51586111110 | -101.14655555600 | 157.72500000 | CHRISTIANSON FARMS |
| MAXBASS | ND | 48.70391666670 | -101.08044444400 | 451.65000000 | Kinder Morgan Operating LP. "A" |
| BERTHOLD | ND | 48.30558333330 | -101.92405555600 | 461.05000000 | ECKMANN, WALLACE H |
| MAXBASS | ND | 48.72475000000 | -101.14822222200 | 463.50000000 | FARDEN, KENNETH |
| MAXBASS | ND | 48.73002777780 | -101.14600000000 | 463.50000000 | FARDEN, KENNETH |
| MINOT | ND | 48.21861111110 | -101.29572222200 | 151.68500000 | Manns Automotive Supply |
| SAWYER | ND | 47.98222222220 | -101.16322222200 | 151.59500000 | BUECHLER, CARL R |
| KENMARE | ND | 48.71891666670 | -102.08322222200 | 151.77500000 | SCHOEMER, JAMES M |
| MINOT | ND | 48.27388888890 | -101.29544444400 | 461.92500000 | LUNDEEN, JEROME |
| MOHALL | ND | 48.76363888890 | -101.38877777800 | 461.17500000 | WITTEMAN BROTHERS |
| MOHALL | ND | 48.76363888890 | -101.38877777800 | 466.17500000 | WITTEMAN BROTHERS |
| MOHALL | ND | 48.76502777780 | -101.39016666700 | 461.17500000 | WITTEMAN BROTHERS |
| MINOT | ND | 48.20277777780 | -101.29988888900 | 154.23500000 | MINOT RURAL FIRE DIST |
| MOHALL | ND | 48.76113888890 | -101.47072222200 | 461.77500000 | M, C: BRACKELSBERG |
| MOHALL | ND | 48.76113888890 | -101.47072222200 | 466.77500000 | M, C: BRACKELSBERG |
| MOHALL | ND | 48.76280555560 | -101.47211111100 | 461.77500000 | M, C: BRACKELSBERG |
| DES LACS | ND | 48.19500000000 | -101.58238888900 | 153.00500000 | SCHERESKY, LAURENCE |

Because of the high-number of LMR systems in the area it must be concluded that this is a very important communication infra-structure for business and government agencies in the area. The wind turbines that will be installed in the Prairie Wind Energy facility should not have a degrading affect on these systems. This is true because the frequencies of operation of the LMR repeaters are generally unaffected by the presence of wind turbines because of there large wave length (> 0.3 meters) and broad beam antenna coverage. Very little, if any, change in the coverage of the repeaters will occur when the wind turbines are installed. However, if there is a reported change in coverage it can be easily corrected by repositioning or adding repeaters that operate with the LMR system mobile systems. This can be accomplished by adding or positioning the repeaters at locations within the wind facility. Repeater antennas can be installed on utility, meteorological and/or turbine towers in the wind facility if needed. The plans for the installation of these repeater antennas for this purpose should be given to the local government oversight authority for review and approval before actual installation is undertaken.

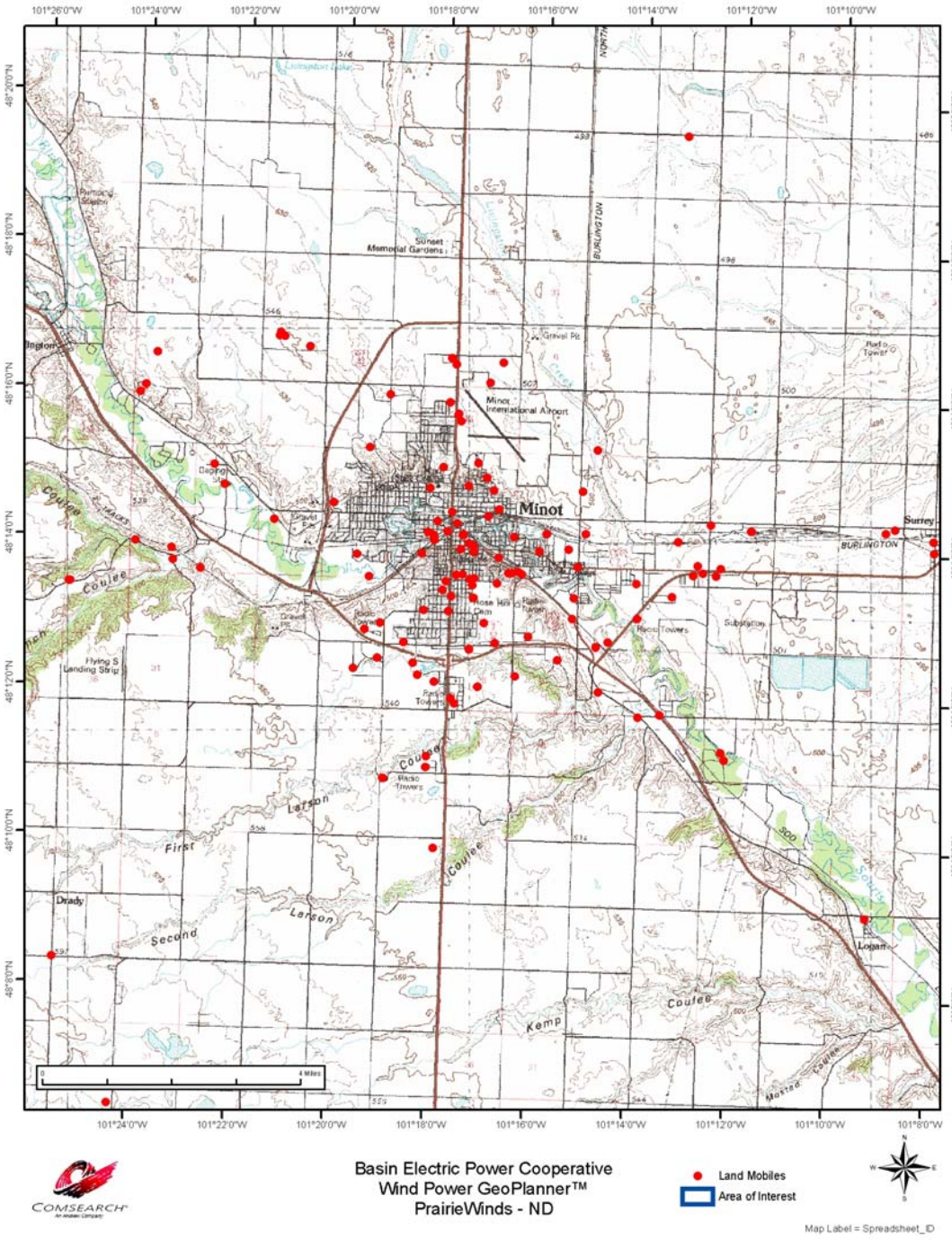



**Figure 1 Minot, ND LMR Repeater Sites**

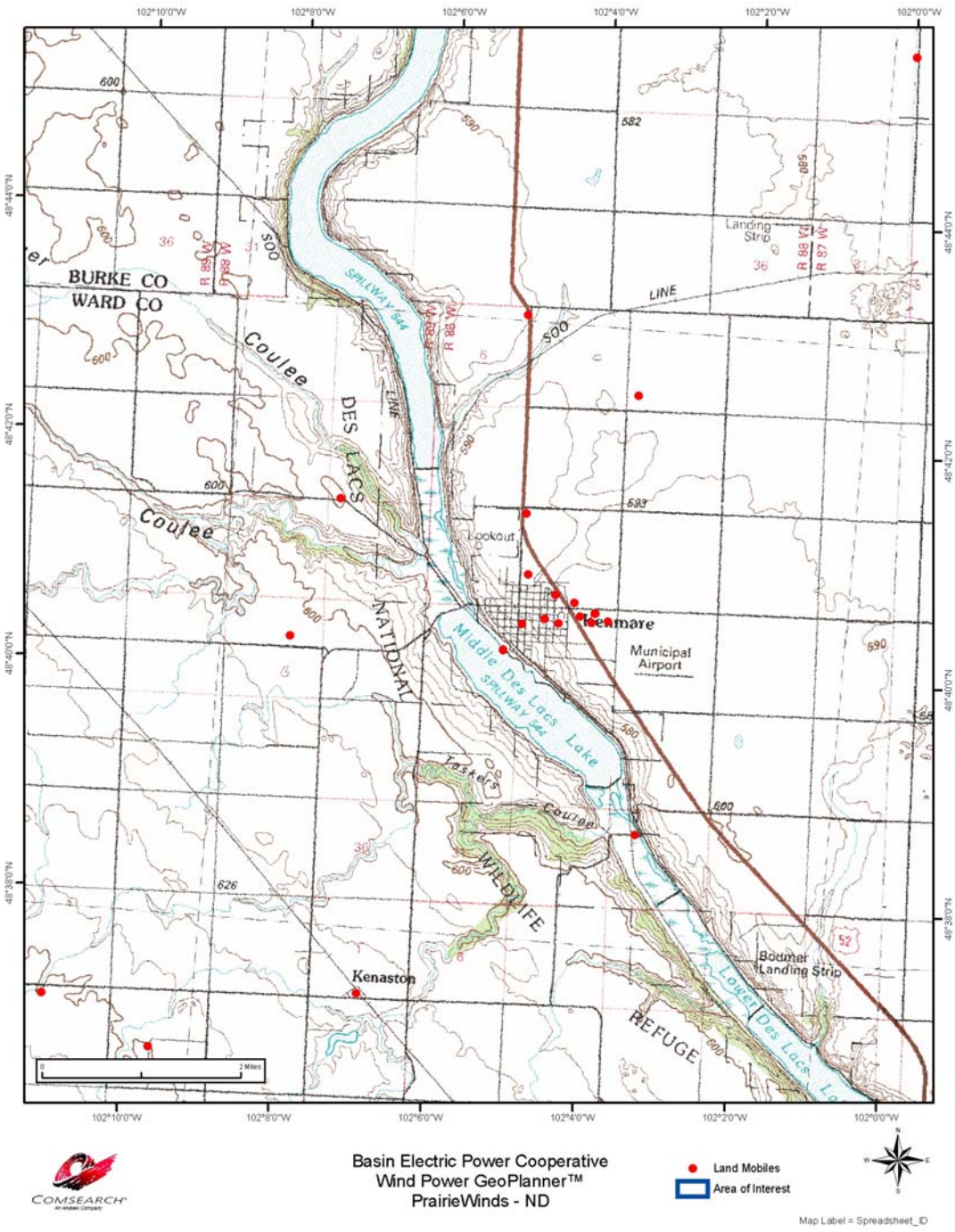



**Figure 2 Kenmare, ND LMR Repeater Sites**

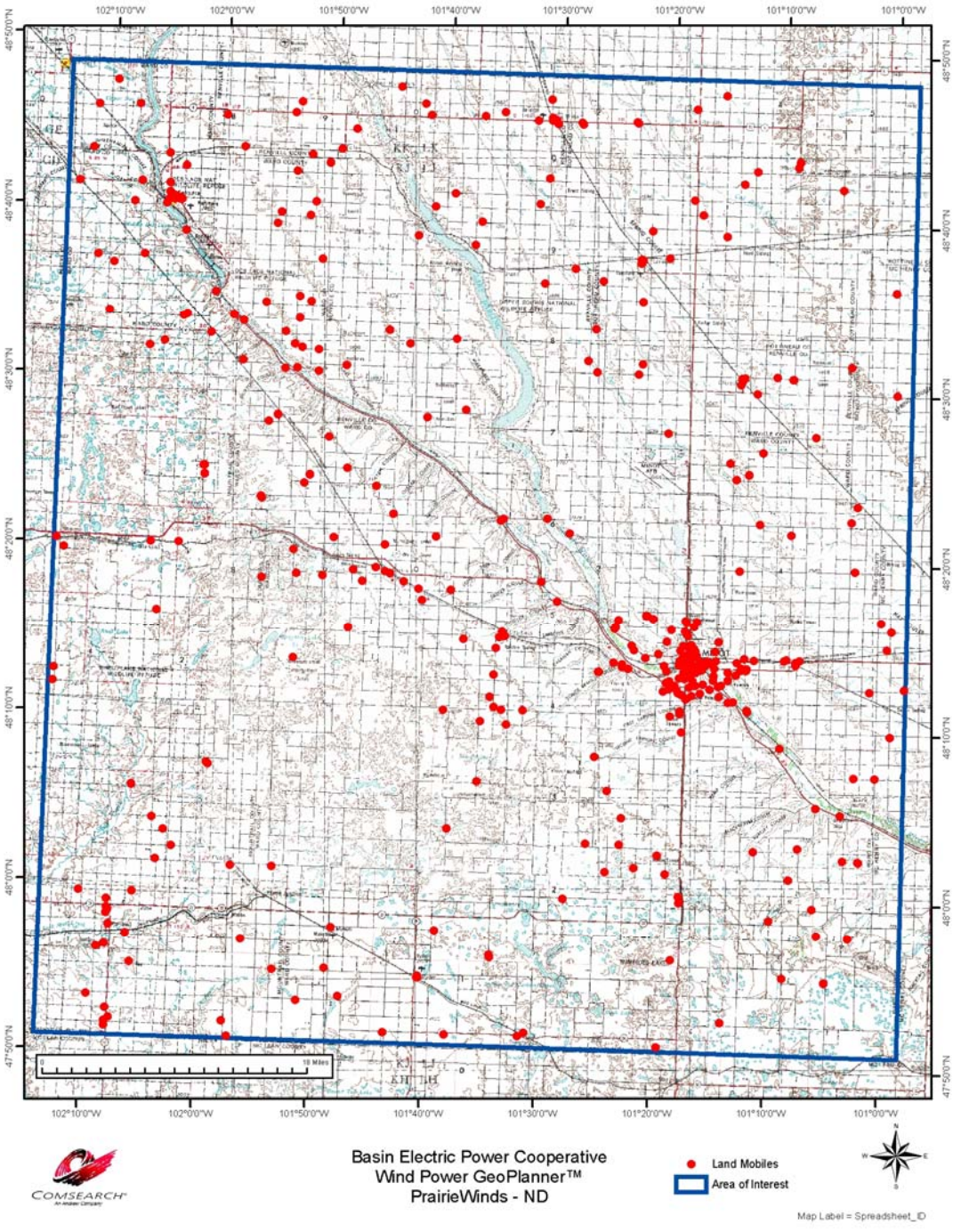



**Figure 3 Prairie Wind Energy Project LMR Sites within Area-of-Interest**

COMSEARCH

19700 Janelia Farms Blvd
Ashburn, VA 20147
703-726-5500

**Off-Air TV Reception Analysis at the Prairie Wind Energy Project Area near Minot, North Dakota**

Comsearch was contracted by Basin Electric Cooperative to identify all of the off-air television stations within 100-mile radius of the proposed Prairie Wind Energy Project near Minot, North Dakota. Off-air television stations are broadcasters that transmit signals that can be received directly on a television receiver from terrestrially located broadcast facilities. Comsearch examined the coverage of the off-air TV stations and the communities in the area that could potentially have degraded television reception because of the location of the Prairie Wind Energy Project's wind turbines. The proposed wind energy facility boundaries and local communities are plotted in the map shown in Figure 1 of this memorandum. Table 1 lists the U. S. off-air television stations within 100 mile radius of the Prairie Wind Energy Project. Table 2 lists the Canadian off-air television stations within 100 miles of the wind project. Figure 2 shows the location of the off-air TV channel broadcast antennas with respect to the Prairie Wind Energy Facility.

**Table 1 U. S. Off-Air TV Stations within 100 Miles of the Prairie Wind Energy Project**

| Location | | Call Sign | Channel | Service | Status | Distance |
|---|---|---|---|---|---|---|
| MINOT | ND | KSRE | 6 | TV | LIC | 21.51 mi |
| HAZEN | ND | W09AZ | 7 | TX | CP | 69.32 mi |
| BEULAH | ND | K07EZ | 7 | TX | LIC | 75.88 mi |
| BEULAH | ND | K09EZ | 9 | TX | LIC | 75.88 mi |
| HAZEN | ND | K09JR | 9 | TX | LIC | 69.32 mi |
| MINOT | ND | KMOT | 10 | TV | LIC | 15.23 mi |
| HAZEN | ND | K11QD | 11 | TX | LIC | 69.32 mi |
| MINOT | ND | KXMC-TV | 13 | TV | LIC | 22.64 mi |
| MINOT | ND | KMCY | 14 | TV | LIC | 21.46 mi |
| WILLISTON | ND | - | 15 | TA | - | 93.83 mi |
| MINOT | ND | KMCY | 15 | DT | CP | 21.49 mi |
| ROLETTE, ETC. | ND | K20AM | 20 | TX | LIC | 85.14 mi |
| MINOT | ND | K21GQ | 21 | TX | LIC | 18.05 mi |
| MINOT | ND | KXND | 24 | TV | LIC | 20.47 mi |
| MINOT | ND | NEW | 27 | TX | APP | 15.05 mi |
| MINOT | ND | K30IY | 30 | TX | CP | 15.02 mi |
| WILLISTON | ND | NEW | 31 | LD | APP | 88.61 mi |
| MINOT | ND | NEW | 35 | LD | APP | 15.02 mi |
| WILLISTON | ND | K38HS | 38 | TX | LIC | 88.43 mi |
| WILLISTON | ND | K40DE | 40 | TX | LIC | 94.06 mi |
| MINOT | ND | KSRE-TV | 40 | DR | GRANT | 21.53 mi |
| MINOT | ND | KSRE | 40 | DT | LIC | 21.53 mi |
| WILLISTON | ND | NEW | 42 | TX | APP | 87.00 mi |
| MINOT | ND | NEW | 42 | LD | APP | 15.23 mi |
| WILLISTON | ND | K44HR | 44 | TX | STA | 88.43 mi |

| | | | | | | |
|---|---|---|---|---|---|---|
| WILLISTON | ND | K44HR | 44 | TX | LIC | 88.43 mi |
| MINOT | ND | KXMC-TV | 45 | DT | LIC | 21.53 mi |
| MINOT | ND | K47KA | 47 | TX | CP | 15.23 mi |
| TURTLE MOUNTAIN INDI | ND | K51EX | 51 | TX | LIC | 87.13 mi |
| COLUMBUS | ND | K52JP | 52 | TX | CP | 61.43 mi |
| BELCOURT | ND | K53DH | 53 | TX | LIC | 87.13 mi |
| BELCOURT | ND | K55FH | 55 | TX | LIC | 87.13 mi |
| BENEDICT | ND | K56IV | 56 | TX | CP | 37.02 mi |
| KEENE | ND | NEW | 56 | TX | APP | 66.22 mi |
| BELCOURT | ND | K57EY | 57 | TX | LIC | 87.13 mi |
| MINOT | ND | KMOT | 58 | DT | CP | 15.23 mi |
| KEENE | ND | K58IJ | 58 | TX | CP | 66.22 mi |
| BENEDICT | ND | K58IK | 58 | TX | CP | 37.02 mi |
| MOHALL | ND | K58IN | 58 | TX | CP | 30.51 mi |
| BELCOURT | ND | K59DM | 59 | TX | LIC | 87.13 mi |
| BELCOURT | ND | K61EF | 61 | TX | LIC | 87.13 mi |
| TURTLE MOUNTAIN INDI | ND | K63ER | 63 | TX | LIC | 87.13 mi |
| TURTLE MOUNTAIN INDI | ND | K65FE | 65 | TX | LIC | 87.13 mi |

TV –Normal Broadcast Station
DS-Digital Service Television, Temporary Operation, STA Operation
DT-Digital Television Broadcast Station
DR- Indicates Station has Applied for FCC Rule Making
GRA-Indicates Rule Making was granted by FCC
LP-Low Power Television Broadcast Station
TX-Translator Television Broadcast Station
LIC – Licensed and operational station
CP – License approved construction permit granted
APP – License application, not yet operational
STA – Special transmit authorization, usually granted by FCC for temporary operation
CA – Class A Television, Low-power
LD - Digital Low power
TA – Vacant channel

**Table 2 Canadian Off-Air TV Stations within 100 Miles of the Prairie Wind Energy Project**

| Location | | Call Sign | Channel | Distance-miles |
|---|---|---|---|---|
| Boissevain | MB | MB-DT-111 | 41 | 94.52 |
| Boissevain | MB | MB-TV-411 | 29 | 94.52 |
| Melita | MB | CKX-TV-2 | 9 | 71.56 |
| Melita | MB | CKX-DT-2 | 47 | 71.56 |
| Melita | MB | MB-DT-163 | 43 | 70.44 |
| Melita | MB | MB-TV-463 | 48 | 70.44 |
| Bellegarde | SK | SA-DT-104 | 24 | 83.33 |
| Bellegarde | SK | SA-TV-404 | 54 | 83.33 |
| Bellegarde | SK | CBKFT-9 | 26 | 82.05 |
| Bellegarde | SK | CBKFT-DT-9 | 38 | 82.05 |
| Oxbow | SK | SA-DT-147 | 17 | 67.96 |

| | | | | |
|---|---|---|---|---|
| Oxbow | SK | SA-TV-447 | 34 | 67.96 |
| Estevan | SK | SA-DT-118 | 28 | 84.18 |
| Estevan | SK | SA-TV-418 | 33 | 84.18 |

The most likely TV stations that will produce off-air coverage to the area near the Prairie Wind Energy Facility will be those stations at a distance of 40 miles or less. Of the stations listed in Table 1 and 2 there are a total of 19 stations registered within this range and they are listed in Table 3 below. None of the Canadian TV Stations are within the 40 mile range. Of the 19 stations, eight are presently licensed and operational. Five of the stations are full service analog stations, two are full service digital stations, and one is a low-power translator station. Translators are stations that are re-broadcasting TV signals from distant stations at low-power to a very limited local area. The other eleven stations listed in Table 3 are either in their license application, or construction phase, but not yet operational.

**Table 3 Off-air TV Channels within 40 Miles of the Prairie Wind Energy Project**

| Location | | Call Sign | Channel | Service | Status | Distance |
|---|---|---|---|---|---|---|
| MINOT | ND | K30IY | 30 | TX | CP | 15.02 mi |
| MINOT | ND | NEW | 35 | LD | APP | 15.02 mi |
| MINOT | ND | NEW | 27 | TX | APP | 15.05 mi |
| MINOT | ND | KMOT | 10 | TV | LIC | 15.23 mi |
| MINOT | ND | NEW | 42 | LD | APP | 15.23 mi |
| MINOT | ND | K47KA | 47 | TX | CP | 15.23 mi |
| MINOT | ND | KMOT | 58 | DT | CP | 15.23 mi |
| MINOT | ND | K21GQ | 21 | TX | LIC | 18.05 mi |
| MINOT | ND | KXND | 24 | TV | LIC | 20.47 mi |
| MINOT | ND | KMCY | 14 | TV | LIC | 21.46 mi |
| MINOT | ND | KMCY | 15 | DT | CP | 21.49 mi |
| MINOT | ND | KSRE | 6 | TV | LIC | 21.51 mi |
| MINOT | ND | KSRE-TV | 40 | DR | GRANT | 21.53 mi |
| MINOT | ND | KSRE | 40 | DT | LIC | 21.53 mi |
| MINOT | ND | KXMC-TV | 45 | DT | LIC | 21.53 mi |
| MINOT | ND | KXMC-TV | 13 | TV | LIC | 22.64 mi |
| MOHALL | ND | K58IN | 58 | TX | CP | 30.51 mi |
| BENEDICT | ND | K56IV | 56 | TX | CP | 37.02 mi |
| BENEDICT | ND | K58IK | 58 | TX | CP | 37.02 mi |

The off-air television available to the local communities is extremely limited since there are only 5 full-power analog and 2 full-power digital stations available. There is also one low-power translator available and its range and programming is extremely limited. Based on the low number of TV Channels available in the area it is not expected that the off-air television broadcasts is the primary mode of television service for the local communities. Because of this, TV Cable service, where available, and/or direct satellite broadcast (DBS) are probably the dominant delivery mode of TV service to the Prairie Wind Energy facility's surrounding communities. These services will be unaffected by the presence of the wind turbine facility. These modes of TV service can be offered by the wind energy facility developer to those area

residents who can show that there off-air TV reception is disrupted by the presence of the wind turbines after they are installed.

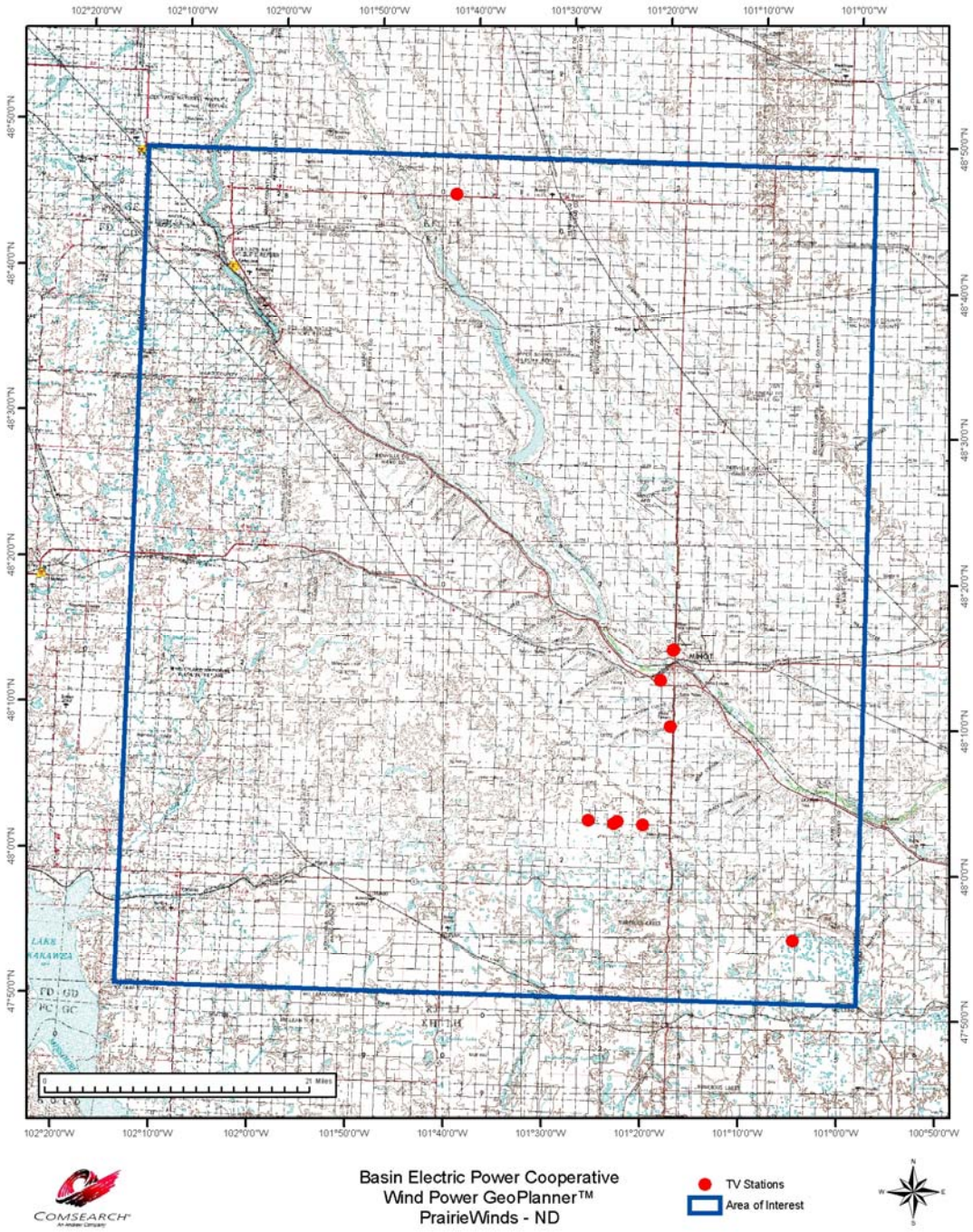



**Figure 1 Map of Off-Air TV Stations within the Prairie Wind Energy Facility Boundaries and Local Communities**

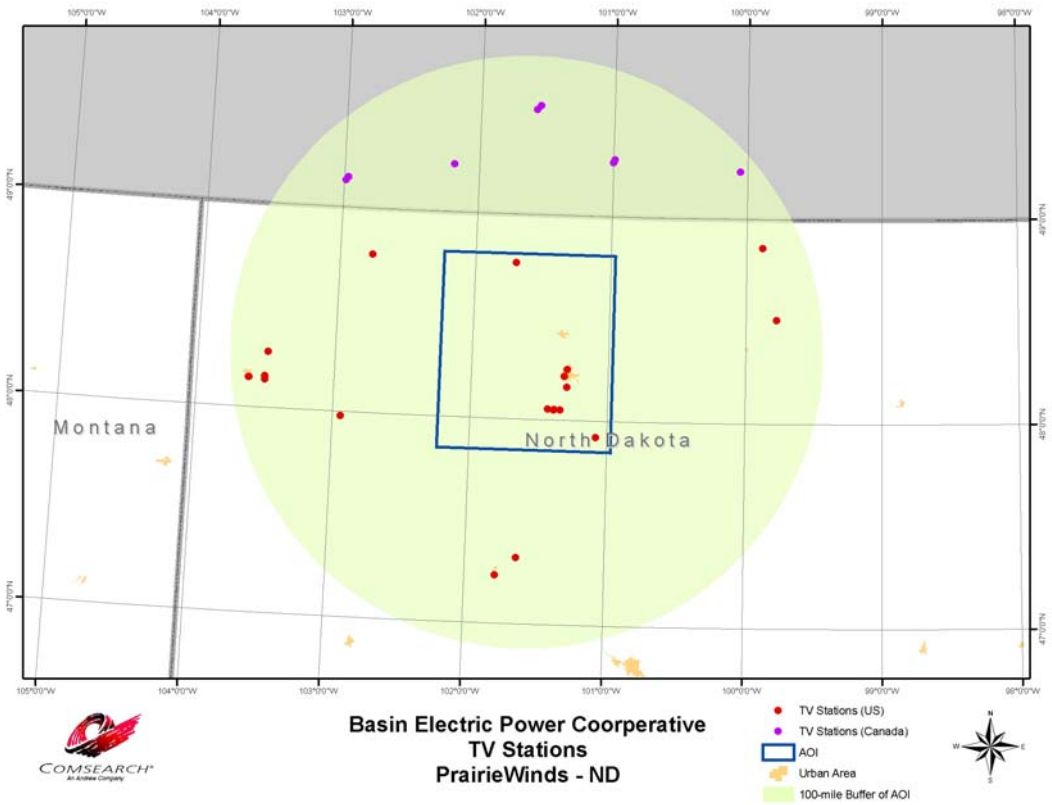



**Figure 2 TV Stations within 100 Miles of Prairie Wind Energy Project Area**

COMSEARCH

19700 Janelia Farms Blvd
Ashburn, VA 20147
703-726-5500

# Analysis of AM and FM Broadcast Station Operations in the Vicinity of the Prairie Wind Energy Project in North Dakota

Comsearch was contracted by Basin Electric Power Cooperative to determine if there would be any degradation to the operational coverage of AM and FM Radio Broadcast Stations located in the vicinity of their proposed Prairie Wind Energy Project (the Project) in North Dakota

Comsearch determined that there were three licensed AM station within a search radius of the Project site. The separation distance of the nearest AM station antenna from the planned center of the Project site is approximately 16.75 miles. No degradation of AM broadcast coverage will occur due to the presence of the wind turbines as long as the separation distance to the nearest wind turbine is greater than 2 miles. Potential problems with broadcast coverage are only anticipated when AM broadcast stations with directive antennas are within 2 miles of turbine towers and AM broadcast stations with non-directive antennas are within 0.5 miles. Figure 1 is a map that shows the location of the AM transmit antennas with respect to the Project site.

**Table 1 Location of AM Radio Stations in Vicinity of Prairie Wind Energy Project**

| Location | | Call Sign | Class | Frequency | Distance |
|---|---|---|---|---|---|
| MINOT | ND | KCJB | B | 910 kHz | 16.75 mi |
| MINOT | ND | KHRT | B | 1320 kHz | 19.23 mi |
| MINOT | ND | KRRZ | B | 1390 kHz | 18.39 mi |

Comsearch determined that there were thirteen FM stations within an area that included within the Project site boundaries. The stations are listed in Tables 2 of this report. Eight of the FM stations are full-power stations. Two of the other stations are low-power FM stations. And two of the remaining stations are very low-power stations. The thirteenth station listed in the database does not have a Call Sign nor is it's transmit power defined. This station is located in Berthold, ND. Figure 2 of this report is a map showing the location of the FM transmit antennas with respect to the Project site.

**Table 2 Location of FM Radio Stations in Vicinity of Prairie Wind Energy Project**

| Location | | Call Sign | Frequency | Tx-ERP | Distance |
|---|---|---|---|---|---|
| MINOT | ND | KMPR | 88.9 MHz | 50. kW | 21.52 mi |
| MINOT | ND | K216EE | 91.1 MHz | 0.01 kW | 21.53 mi |
| MINOT | ND | K220GC | 91.9 MHz | 0.25 kW | 11.97 mi |
| MINOT | ND | KIZZ | 93.7 MHz | 100. kW | 20.52 mi |
| VELVA | ND | KTZU | 94.9 MHz | 100. kW | 22.65 mi |
| MINOT | ND | KYYX | 97.1 MHz | 100. kW | 22.64 mi |
| BURLINGTON | ND | KOWW-LP | 98.1 MHz | 0.1 kW | 9.80 mi |

| | | | | | |
|---|---|---|---|---|---|
| MINOT | ND | KMXA-FM | 99.9 MHz | 100. kW | 10.56 mi |
| BERTHOLD | ND | - | 100.7 MHz | - | 6.27 mi |
| BURLINGTON | ND | KWGO | 102.9 MHz | 100. kW | 22.65 mi |
| MINOT | ND | KSAF-LP | 104.1 MHz | 0.085 kW | 16.16 mi |
| MINOT | ND | KZPR | 105.3 MHz | 100. kW | 20.52 mi |
| MINOT | ND | KHRT-FM | 106.9 MHz | 26. kW | 18.05 mi |

The full-power and medium-power FM stations are owned and operated by commercial broadcasters. The low-power and very-low-power FM stations are owned and operated by either business, religious or educational organizations. All of the FM station antennas are located at distances greater than 6.27 miles of the center of the Prairie Wind Energy Project.

The very low-power FM stations are designed for very limited coverage. There coverage is normally no greater than 0.5 mile. Normally this is a church parking lot or a very small community. The low-power FM station will cover a college campus or a small-town church community with special broadcasting for a limited audience. Normal coverage for these stations is usually less than 1.5 mile. Therefore, as long as the wind turbines are installed at distances greater than the coverage of these systems should be unaffected.

For the full power FM stations a separation distance of 2.5 miles should be maintained so that the stations can maintain normal operation and coverage. The problem that may occur if wind turbines are too close to FM broadcast antennas is that the coverage pattern of the FM Station will be decreased in the direction of the wind turbine because of the physical obstruction of the tower and wind turbine blades. Attenuation of the signal can be as great as 2 dB in the azimuth that the wind turbine obstructs. This will affect reception at the perimeter of the FM station's range but not at ranges closer in to the station. The wavelength of the FM broadcast signal is long enough to wrap around the blades of a wind turbine minimizing the attenuation affect to the signal. The FM broadcast audio signal is not that noticeably affected by wind turbines for two additional reasons; mainly, the signal modulation is frequency modulated (FM) and the wind turbines have the affect of varying the amplitude of the signal which will produce distortion to an amplitude modulated signal but not to a FM signal. Also, changes to audio coverage or distortion are not that noticeable to a listener when factored together with other causes of degradation; such as being out of range of the station or signal fades. In other words, the effects to FM audio coverage from wind turbines will not be as noticeable as the distortion that will occur to a video signal.

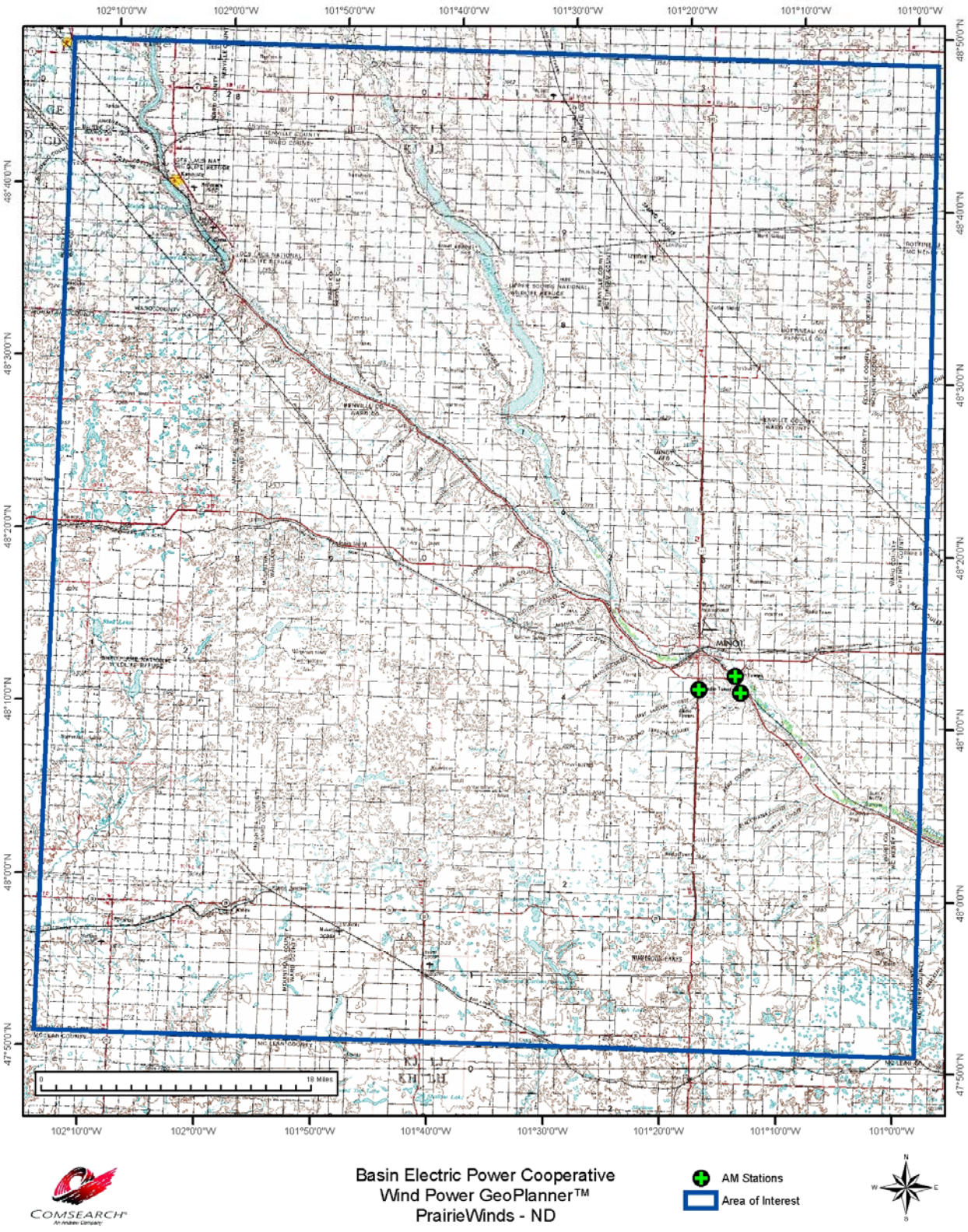



**Figure 1 AM Stations in the Prairie Wind Energy Project Area**

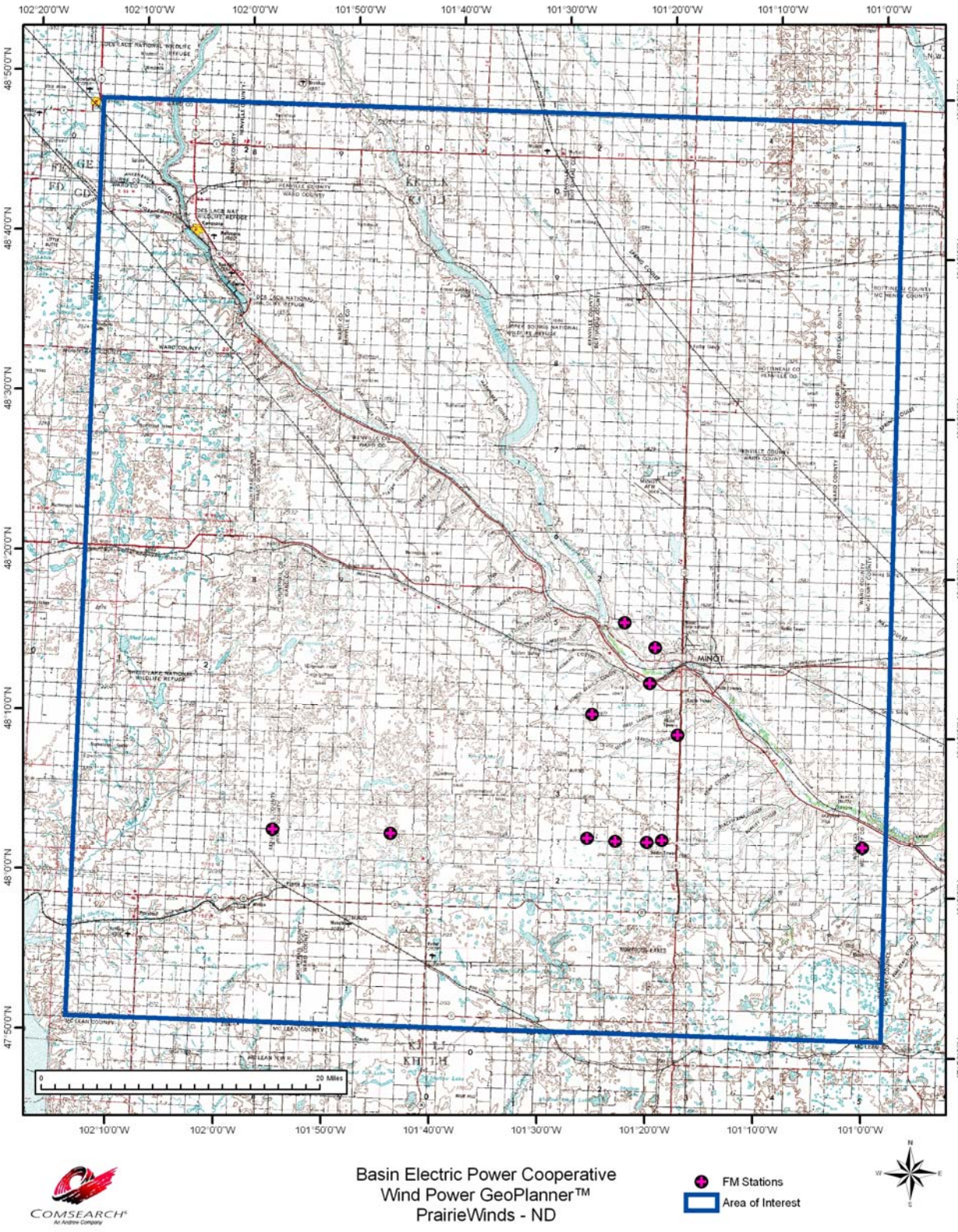



**Figure 2 FM Stations in the Prairie Wind Energy Project Area**

# APPENDIX C.2

## Environmental Assessment

**An Environmental Assessment for this project is being prepared but the documentation had not been finalized as of the date of this document.**

**The Environmental Assessment will be available upon finalizing the documentation.**

# APPENDIX C.3

## Class III Cultural Report

# APPENDIX D

# AGENCY LETTERS

# APPENDIX D.1

## Notification List

# PrairieWinds-ND1 Project
# Notification List
# February 22, 2008

## Federal Agencies

**U.S. Fish and Wildlife Services**
Mr. Jeff Towner, Field Supervisor
U.S. Fish and Wildlife Service
North Dakota Field Office
3425 Miriam Avenue
Bismarck, North Dakota 58501-7926

**U.S. Army Corps of Engineers**
Dan Cimarosti, State Program Manager
US Army Corps of Engineers
1513 S. 12th Street
Bismarck, North Dakota 58504

**Federal Emergency Management Agency**
Mr. Bob Cox
Regional Environmental Officer
Federal Emergency Management Agency
Department of Homeland Secutiry
P.O. Box 25267
Denver, CO 80225-0267

**Federal Aviation Administration**
Christopher R. Blum
Regional Administrator
Federal Aviation Administration
Great Lakes Region
O'Hare Lake Office Center
2300 East Devon Avenue
Des Plaines, IL 60018

**Federal Highway Administration**
Mr. Ronny Hartel
Federal Highway Administration
1471 Interstate Loop
Bismarck, North Dakota 58503-0567

**Environmental Protection Agency, Region 8**
Mr. Larry Svoboda
Director, NEPA Program – 8EPR-N Mail Code
Office of Ecosystem Protection and Remediation
U.S. Environmental Protection Agency
999 18th Street, Suite 300
Denver, CO 80202-2466

**Natural Resource Conservation Service**

J. L. Flores
State Conservationist
North Dakota NRCS State Office
Natural Resources Conservation Service
220 East Rosser Avenue
Federal Building, Room 270
Bismarck, ND 58501

**Farm Service Agency**

Gary Nelson
State Executive Director
North Dakota State Farm Service Agency
1025 28th St. S
Fargo, ND 58103-2372

**North Dakota Congressional Delegation**

The Honorable Earl Pomeroy
Room 328, Federal Building
220 East Rosser Avenue
Bismarck, ND 58501

The Honorable Byron Dorgan
312 Federal Building
P.O. Box 2579
Bismarck, ND 58502

The Honorable Kent Conrad
U.S. Federal Building, Room 228
220 East Rosser Avenue
Bismarck, ND 58501

**State Agencies**

**North Dakota Department of Agriculture**

Mr. Roger Johnson, Commissioner
North Dakota Department of Agriculture
600 E. Boulevard Ave., Dept 602
Bismarck, North Dakota 58505-0020

**North Dakota Forest Service**

Commissioner
North Dakota Forest Service
Molberg Center
307 First Street East
Bottineau, North Dakota 58318

**North Dakota Game and Fish Department**
Mr. Terry Steinwand, Director
North Dakota Game and Fish Department
100 N. Bismarck Expressway
Bismarck, North Dakota 58501-5095

**North Dakota State Historical Society**
Mr. Merl Paaverud, ND SHPO
North Dakota State Historical Society
612 East Boulevard Avenue
Bismarck, North Dakota 58505-0830

**North Dakota Parks and Recreation (Natural Heritage info)**
Jesse Hanson, Division Director
North Dakota Parks and Recreation Department
1600 E. Century Avenue, Suite 3
Bismarck, ND 58503

**North Dakota Indian Affairs Commission**
Ms. Cheryl Kulas, Executive Director
North Dakota Indian Affairs Commission
600 East Boulevard Avenue
1st Floor Judicial Wing, Room #117
Bismarck, North Dakota 58505

**North Dakota State Land Department**
Director
North Dakota State Land Department
1707 North 9th Street
P.O. Box 5523
Bismarck, North Dakota 58506-5523

**North Dakota Department of Transportation**
Mr. Francis G. Ziegler, Director
North Dakota Department of Transportation
608 East Boulevard Avenue
Bismarck, North Dakota 58505

**North Dakota Department of Commerce**
Mr. Paul Govig, Director
North Dakota Department of Commerce
Division of Community Services
Century Center
1600 East Century Avenue, Suite 2
Bismarck, North Dakota 58503

**North Dakota Public Service Commission**
Ms. Susan E. Wefald, President
Public Service Commission
600 E. Boulevard, Dept. 408
Bismarck, North Dakota 58505-0480

**North Dakota Transmission Authority**

Sandi Tabor, Acting Director
North Dakota Transmission Authority
State Capitol, 14th Floor
600 E. Boulevard Ave., Dept. 405
Bismarck, ND 58505-0840

**North Dakota Department of Health**

L. David Glatt, PE, Chief
Environmental Health Section
North Dakota Department of Health
918 East Divide Avenue
Bismarck, ND 58501-1947

**North Dakota State Legislature**

Senator John M. Warner, District 4
33200 331st Ave SW
Ryder, ND 58779-9105

Senator David O'Connell, District 6
2624 CR 30
Lansford, ND 58750-9737

Representative Dawn Marie Charging, District 4
7276 14th Street NW #16
Garrison, ND 58540-9610

Representative Kenton Onstad, District 4
3515 66th Avenue NW
Parshall, ND 58770-9468

Representative Glen Froseth, District 6
Box 894
Kenmare, ND 58746-0894

Representative Bob Hunskor, District 6
Box 1
Newburg, ND 58762-0001

**County**

**(Zoning)**

Don Siebert, Director of Tax Equalization
Tax Equalization Office
P.O. Box 5005
Minot, North Dakota 58702

**(Commissioners)**

Ward County, North Dakota
County Commissioners
Darlene Watne, Chair
Carrol W. Erickson, John Fjeldahl, Jim Lee, Jerome Gruenberg

County Courthouse
315 3rd Street SE
Minot, ND 58701

**Organizations**

Executive Director
Ducks Unlimited
3502 Franklin Avenue
Bismarck, North Dakota 58501

Executive Director
Nature Preserves Program
North Dakota Parks and Recreation Department
1835 Bismarck Expressway
Bismarck, North Dakota 58504

Executive Director
The Nature Conservancy
P.O. Box 1156
Bismarck, North Dakota 58502-1156

Sierra Club, Dacotah Chapter
Executive Director
311 E. Thayer Ave., Suite 113
Bismarck, ND 58501

**Tribes**

**Eastern Shoshone Tribe:**

Mr. Ivan Posey, Chairman
Shoshone Business Council
P.O. Box 538
Fort Washakie, WY 82514
(307) 332-3532 or 4932

cc:

Arlen Shoyo
Shoshone Business Council
P.O. Box 538
Fort Washakie, WY 82514
(307) 332-3532 or 4932

Ms. Reba Tehran
Shoshone Cultural Office
P.O. Box 1008
Fort Washakie, WY 82514

**Northern Arapaho Tribe:**

Mr. Richard Brannan, Chairman

Arapaho Business Council
P.O. Box 396
Fort Washakie, WY 82514
(307) 332-6120 or (307) 856-3461
FAX (307) 332-7543
E-mail: arapahotribe@hotmail.com

cc: Ms. JoAnn White
Tribal Historic Preservation Officer
Northern Arapaho Tribe
P.O. Box 1056
Fort Washakie, WY 82514
cell: (307) 851-9617

**Northern Cheyenne Tribe:**

Mr. Eugene Littlecoyote, President
Northern Cheyenne Tribal Council
P.O. Box 128
Lame Deer, MT 59043
(406) 477-6284

cc:

Mr. Conrad Fisher
Tribal Historic Preservation Officer
P.O. Box 128
Lame Dear, MT 59043
(406) 477-6035

Mr. Steven Brady
Traditional Spokesperson
P.O. Box 542
Lame Deer, MT 59043
(406) 477-8344

**Oglala Lakota Nation:**

Ms. Cecelia Firethunder, President
Oglala Sioux Tribal Council
P.O. Box H
Pine Ridge, SD 57770
(605) 867-5821
Fax (605) 867-5659

**Rosebud Sioux Tribe:**

Mr. Rodney Bordeaux President
Rosebud Sioux Tribal Council
P.O. Box 430
Rosebud, SD 57570
(605) 747-2381
Fax (605) 747-2243

cc:

Mr. Russell Eagle Bear, THPO
Rosebud Sioux Tribe of Indians

P.O. Box 809
Rosebud, SD 57570
605-747-4225

**Cheyenne River Sioux Tribe:**

Mr. Herold Frazier, Chairman
Cheyenne River Sioux Tribal Council
P.O. Box 590
Eagle Butte, SD 57625
(605) 964-4155
Fax (605) 964-4155

cc:

Albert Lebeau
Tribal Historic Preservation Officer
Cheyenne River Sioux Tribe
P.O. Box 590
Eagle Butte, SD 57625
(605) 964-7554

**Standing Rock Sioux:**

Mr. Ron His-Horse-is-Thunder, Chairman
Standing Rock Sioux Tribal Council
P.O. Box D
Fort Yates, ND 58538
(701)-854-7448

cc:

Mr. Tim Mentz
Tribal Historic Preservation Officer
P.O. Box D
Fort Yates, ND 58538
(701) 854-2120

**Crow Tribe:**

Mr. Carl Venne, Chairman
Crow Tribal Council
P.O. Box 159
Crow Agency, MT 59022
(406) 638-3708
Fax (406) 638-7283

cc:

Mr. Darrin Old Coyote
Cultural Director
Crow Tribal Administration
P.O. Box 159
Crow Agency, MT 59022
(406) 638-3793

**Fort Peck Tribes:**

Mr. John Morales, Chairman
Ft. Peck Tribes
P.O. Box 836
Poplar, MT 59255

cc:

Mr. Curley Youpee, THPO
Ft. Peck Tribes
P.O. Box 836
Poplar, MT 59255

**Three Affiliated Tribes:**

Marcus D. Wells, Chairman
Three Affiliated Tribes Business Council
404 Frontage Road
New Town, ND 58763
701-627-4781

# APPENDIX D.2

## Example Letters Sent to Agencies

United States Department of Agriculture
Rural Development

MAR 1 1 2008

Mr. Jeff Towner, Field Supervisor
U.S. Fish and Wildlife Service
North Dakota Field Office
3425 Miriam Avenue
Bismarck, North Dakota 58501-7926

RE: Proposed PrairieWinds-ND1 115 MW Wind Turbine Generation Facility near Minot, North Dakota

Dear Mr. Towner:

The U.S. Department of Agriculture (USDA) Rural Utilities Service (RUS) is serving as the lead Federal agency responsible for compliance with the National Environmental Policy Act (NEPA) for the proposed wind turbine generation facility referred to as the Prairie Winds - ND1 Project, to be located near Minot, North Dakota. Basin Electric Power Cooperative (BEPCO), headquartered in Bismarck, North Dakota, proposes to construct a 77-turbine, 115 megawatt (MW) facility which will tie to an existing Western Area Power Administration (WAPA) line and new substation. The Project would include seventy-seven (77) 1.5 MW wind turbine generators. Power from the facility would be supplied to Basin Electric's customers through an interconnection with the Integrated System (IS) of which WAPA is the control area operator.

A RUS funding decision must consider potential environmental impacts of the proposed project under the National Environmental Policy Act and other laws and regulations. Per RUS's NEPA implementing regulations at 7 CFR 1794.24, the BEPCO proposal requires preparation of an Environmental Assessment (EA) with scoping. RUS has agreed to be the lead agency for preparation of the EA. The Western Area Power Administration is a cooperating agency with RUS in preparation of the EA.

Enclosed for your review and comment is a copy of the Alternative Evaluation and Site Selection Study prepared for the Prairie Winds ND-1 Wind Project. We would appreciate receiving your comments within 30 days of receipt of this document.

A public scoping meeting will be held on April 3, 2008, from 4:00 PM to 7:00 PM Central Standard Time, at the North Central Research Extension Center, 5400 Highway 83 South, Minot North Dakota 58701. Representatives from RUS, WAPA, and Basin Electric will be available to discuss the planning process for the project, answer questions and take comments.

Questions should be directed to Ms. Barbara Britton, Environmental Protection Specialist, RUS, Engineering and Environmental Staff, 1400 Independence Avenue, SW, Stop 1571, Washington, D.C. 20250-1571, telephone (202) 720-1414, fax (202)720-0820, e-mail: barbara.britton@wdc.usda.gov, or Mr. Kevin Solie, Basin Electric Power Cooperative, 1717 E. Interstate Avenue, Bismarck, ND, 58503-0564, telephone 701-355-5495, fax 701-255-5144, e-mail: ksolie@bepc.com.

Sincerely,

Mark S. Plank

MARK S. PLANK
Director
Engineering and Environmental Staff
USDA, Rural Development, Utilities Programs

Enclosure

**United States Department of Agriculture**
**Rural Development**

MAR 1 1 2008

Mr. Nicolas Stas
Western Area Power Administration
P.O. Box 35800
Billings, Montana 59107

Dear Mr. Stas,

The Rural Utilities Service (RUS), an agency that administers the U.S. Department of Agriculture's Rural Development Utilities Programs, has received an application for funding from the Basin Electric Power Cooperative (BEPCO) for its proposed PrairieWinds-ND1 115 Megawatt (MW) wind project to be located in north central North Dakota, near the city of Minot. The Project would include seventy-seven 1.5 MW wind turbine generators. Power from the facility would be supplied to Basin Electric's customers through an interconnection with the Integrated System (IS) of which Western Area Power Administration (WAPA) is the control area operator.

An RUS funding decision must consider potential environmental impacts under the National Environmental Policy Act (NEPA) and other laws and regulations. Per RUS's NEPA implementing regulations at 7 CFR 1794.24, the BEPCO proposal requires preparation of an Environmental Assessment (EA) with scoping. RUS has agreed to be the lead agency for preparation of the EA.

Given WAPA's involvement in providing interconnection capability to the proposed project, we wish to formally request that your agency be a cooperating agency in the preparation of the EA. Based on your response, we can discuss the need for executing a memorandum of understanding between our agencies regarding respective roles and responsibilities.

Should you have questions or require further information, please contact Barbara Britton at (202) 720-1414 or e-mail barbara.britton@wdc.usda.gov.

Sincerely,

Mark S. Plank

MARK S. PLANK
Director
Engineering and Environmental Staff
USDA, Rural Development, Utilities Programs

United States Department of Agriculture
Rural Development

MAR 1 1 2008

Minot Public Library
516 2nd Ave. SW,
Minot, North Dakota 58701

RE: Prairie Winds ND-1 Wind Turbine Generation Facility – Proposal Development Document for Environmental Assessment

Dear Sir or Madam:

The U.S. Department of Agriculture (USDA), Rural Utilities Service (RUS) is serving as the lead Federal agency responsible for compliance with the National Environmental Policy Act (NEPA) for the proposed Prairie Winds ND-1 115 megawatt (MW) Wind Turbine Generation Facility near Minot, North Dakota. Basin Electric Power Cooperative (Basin Electric), headquartered in Bismarck, North Dakota, proposes to construct a 77-turbine, 115 MW facility, which will tie to an existing Western Area Power Administration (WAPA) line. The Project would include seventy-seven 1.5 MW wind turbine generators. Power from the facility would be supplied to Basin Electric's customers through and interconnection with the Integrated System (IS) of which WAPA is the control area operator.

Enclosed are copies of the Alternative Evaluation and Site Selection Study prepared for the proposed facility. We would appreciate it if you would allow us to make these documents available for public review until May 3, 2008. Please keep the documents as reference copies in your library.

A public scoping meeting will be held on April 3, 2008, from 4:00 PM to 7:00 PM Central Standard Time (CST) at the North Central Research Extension Center, 5400 Highway 83 South, Minot, North Dakota 58701. Representatives from RUS, WAPA and Basin Electric will be available to discuss the planning process for the project, answer questions and take comments.

Questions should be directed to Barbara Britton, Environmental Protection Specialist, RUS, Engineering and Environmental Staff, 1400 Independence Avenue, SW, Stop 1571, Washington, D.C. 20250-1571, telephone (202) 720-1414, fax (202)720-0820, e- mail: barbara.britton@wdc.usda.gov or Mr. Kevin Solie, Basin Electric Power Cooperative, 1717 E. Interstate Avenue, Bismarck, ND, 58503-0564, telephone 701-355-5495, fax 701-255-5144, e-mail: ksolie@bepc.com.

Sincerely,

MARK S. PLANK
Director
Engineering and Environmental Staff
USDA, Rural Development, Utilities Programs

Enclosures

# APPENDIX D.3

## Agency Response Letters

NORTH DAKOTA
DEPARTMENT *of* HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

March 24, 2008

Mr. Mark S. Plank, Director
Engineering & Environmental Staff
USDA, Rural Development Utilities Programs
1400 Independence Ave. SW
Washington, DC 20250-0700

Re: Proposed Prairie Winds-ND1 115 MW Wind Turbine Generation Facility
Near Minot, Ward County, North Dakota

Dear Mr. Plank:

This department has reviewed the information concerning the above-referenced project submitted under date of March 11, 2008, with respect to possible environmental impacts.

This department believes that environmental impacts from the proposed construction will be minor and can be controlled by proper construction methods. With respect to construction, we have the following comments:

1. All necessary measures must be taken to minimize fugitive dust emissions created during construction activities. Any complaints that may arise are to be dealt with in an efficient and effective manner.

2. Noise from construction activities may have adverse effects on persons who live near the construction area. Noise levels can be minimized by ensuring that construction equipment is equipped with a recommended muffler in good working order. Noise effects can also be minimized by ensuring that construction activities are not conducted during early morning or late evening hours.

The department owns no land in or adjacent to the proposed improvements, nor does it have any projects scheduled in the area. In addition, we believe the proposed activities are consistent with the State Implementation Plan for the Control of Air Pollution for the State of North Dakota.

If you have any questions regarding our comments, please feel free to contact this office.

Sincerely,

L. David Glatt, P.E., Chief
Environmental Health Section

LDG:cc

# North Dakota Department of Transportation

Francis G. Ziegler, P.E.
*Director*

John Hoeven
*Governor*


April 2, 2008

Mark S. Plank, Director
USDA, Rural Development, Utilities Program
1400 Independence Ave. SW
Washington, DC 200250-0700

WIND TURBINE GENERATION FACILITY, WARD COUNTY, NEAR MINOT, NORTH DAKOTA

We have reviewed your March 11, 2008, letter.

The project referenced above will have no adverse effect on the North Dakota Department of Transportation highways.

However, if because of this project any work needs to be done on highway right-of-way, appropriate permits and risk management documents will need to be obtained from the Department of Transportation District Engineer, Jim Redding at 701-837-7625.

Ronald J. Henke

RONALD J. HENKE, P.E., DIRECTOR – OFFICE OF PROJECT DEVELOPMENT

57:rjh:js

c: Jim Redding, Minot District Engineer

"VARIETY IN HUNTING AND FISHING"

NORTH DAKOTA GAME AND FISH DEPARTMENT

100 NORTH BISMARCK EXPRESSWAY BISMARCK, NORTH DAKOTA 58501-5095 PHONE 701-328-6300 FAX 701-328-6352

April 7, 2008

Mark S. Plank, Director
Engineering & Environmental Staff
USDA Rural Development Utilities Programs
1400 Independence Avenue SW
Washington, DC 20250-0700

Dear Mr. Plank:

RE: Proposed Prairie Winds-ND1 115 MW Wind Turbine Generation Facility near Minot, North Dakota

The North Dakota Game and Fish Department has reviewed this project for wildlife concerns.

Our primary concern with wind power development is the disturbance of native prairie associated with construction of turbines, access roads, transmission lines, etc. We ask that work within native prairie be avoided to the extent possible, and that US Fish and Wildlife Service wind turbine siting guidelines be implemented as appropriate in an effort to reduce these impacts.

National Wetland Inventory maps indicate numerous wetlands within the project area. We recommend that steps be taken to protect any wetlands that cannot be avoided, above-ground appurtenances not be placed in wetland areas, and no alterations be made to existing drainage patterns.

We would appreciate being kept informed as this project progresses, and as other wind power projects are developed in North Dakota. If possible, we would also like the GPS coordinates for each turbine after the site has been established.

Sincerely,

Michael G. McKenna
Chief
Conservation & Communication Division

js

John Hoeven, Governor
Douglass A. Prchal, Director

1600 East Century Avenue, Suite 3
Bismarck, ND 58503-0649
Phone 701-328-5357
Fax 701-328-5363
E-mail parkrec@nd.gov
www.parkrec.nd.gov

March 26, 2008

Mark S. Plank
USDA – Rural Development
1400 Independence Ave. SW.
Washington, DC 20250-0700

Re: Prairie Winds-ND1 115 MW Wind Turbine Generation Facility near Minot, North Dakota

Dear Mr. Plank:

The North Dakota Parks and Recreation Department (the Department) has reviewed the above referenced project proposal to construct a wind turbine generation facility located near the City of Minot in Ward County.

Our agency scope of authority and expertise covers recreation and biological resources (in particular rare plants and ecological communities). The project as defined does not affect state park lands that we manage or Land and Water Conservation Fund recreation projects that we coordinate.

The North Dakota Natural Heritage biological conservation database has been reviewed to determine if any plant or animal species of concern or other significant ecological communities are known to occur within an approximate one-mile radius of the project area. Based on this review, several occurrences have been identified within or adjacent to the project area including: *Stipa comata – Bouteloua gracilis/Carex filifolia prairie* (needle-and-thread mixed grass prairie), *Stipa curtiseta – elmus lanceolatus prairie* (Western porcupine grass hillside), *Scirpus acutus – scirpus fluviatilis freshwater wetland* (bullrush freshwater marsh), *Wolffia columbiana* (Southern watermeal), *Potamogeton pectinatus – ruppia maritime saline wetland* (saline wetland), and *Charadrius melodus* (piping plover). Please see attached spreadsheet and map for more specific information on these species. We defer further comments regarding animal species to the North Dakota Game and Fish Department and the United States Fish and Wildlife Service.

Because this information is not based on a comprehensive inventory, there may be species of concern or otherwise significant ecological communities in the area that are not represented in the database. The lack of data for any project area cannot be construed to mean that no significant features are present. The absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks natural heritage resources.

Given the potential for not only habitat disturbance and disruption but threat to nesting, feeding and migratory bird and bats in the area we suggest that all efforts be made to avoid impacts to wildlife species and their habitats. In an effort to avoid or minimize impacts to wildlife and their habitats we encourage proper evaluation of all potential wind energy sites. To identify and assess adverse impacts to wildlife we suggest pre and post construction avian and bat monitoring studies be conducted.

The Department recommends that the project be accomplished with minimal impacts and that all efforts be made to ensure that critical habitats not be disturbed in the project area to help secure rare species conservation in North Dakota. Regarding any reclamation efforts, we recommend that any impacted areas be revegetated with species native to the project area.

Thank you for the opportunity to comment on this project. Please contact Kathy Duttenhefner (701-328-5370 or kgduttenhefner@nd.gov) of our staff if additional information is needed.

Sincerely,

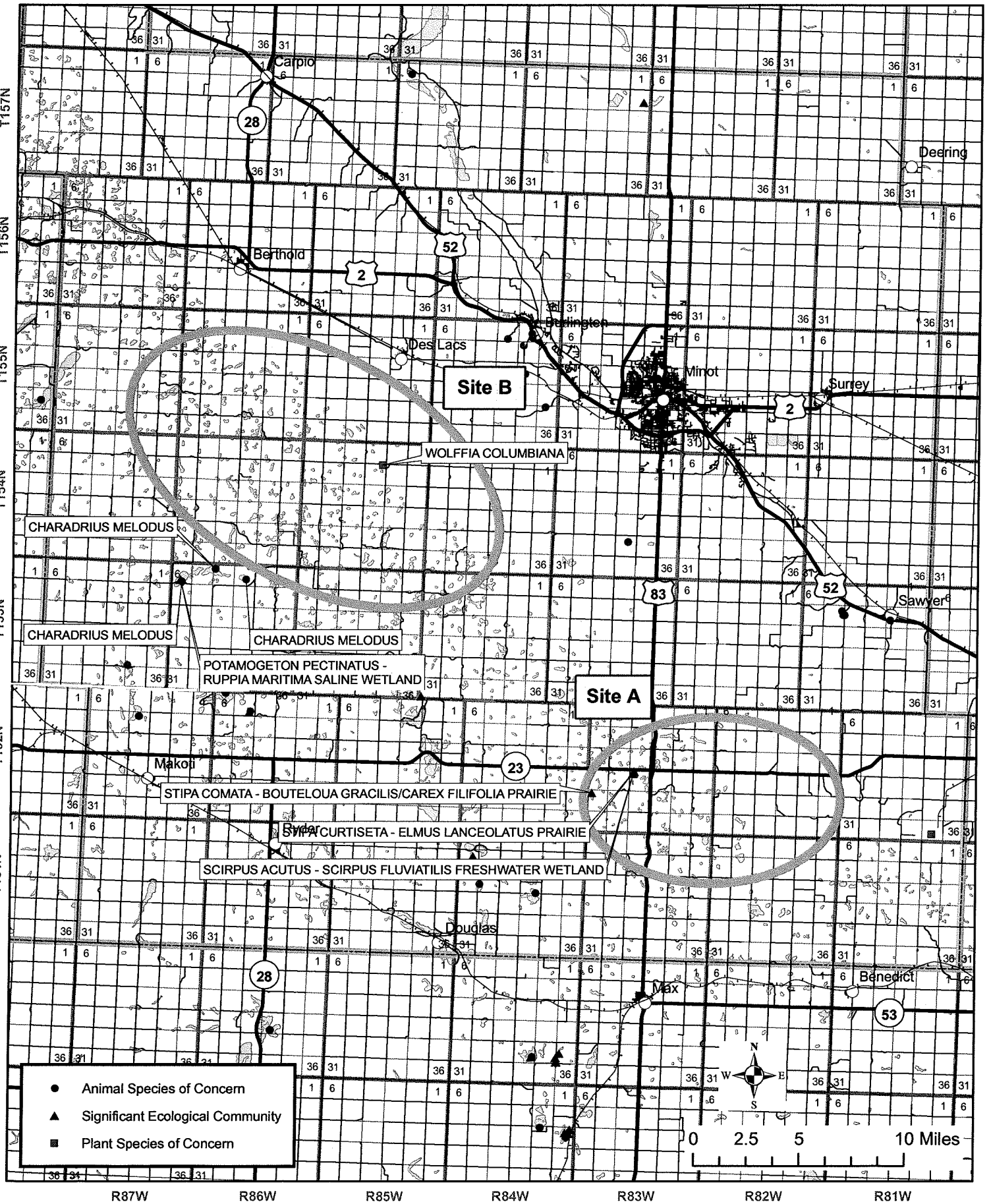
Jesse Hanson

Jesse Hanson, Coordinator
Planning and Natural Resources Division

R.USNDNHI*1950

*Play in our backyard!*

# North Dakota Natural Heritage Inventory
## Species of Concern and Significant Ecological Communities




North Dakota Parks & Recreation Department
North Dakota Natural Heritage Inventory
March 2008

# North Dakota Natural Heritage Inventory
## Species of Concern and Significant Ecological Communities

| State Scientific Name | State Common Name | Township & Range | Section | TRS Notes | State Rank | Global Rank | Federal Status | Last Observation |
|---|---|---|---|---|---|---|---|---|
| SCIRPUS ACUTUS - SCIRPUS FLUVIATILIS FRESHWATER WETLAND | BULLRUSH FRESHWATER MARSH | 141N083W | 21 | NW4NW4 | S3 | | | 1985-06-04 |
| STIPA CURTISETA - ELMUS LANCEOLATUS PRAIRIE | WESTERN PORCUPINE GRASS HILLSIDE | 152N083W | 21 | NW4NW4 | S2 | | | 1985-06-04 |
| STIPA COMATA - BOUTELOUA GRACILIS/ CAREX FILIFOLIA PRAIRIE | NEEDLE-AND-THREAD MIXED GRASS PRAIRIE | 152N083W | 30 | W2NW4 | S2 | | | 1985-06-04 |
| CHARADRIUS MELODUS | PIPING PLOVER | 153N086W | 3 | | S1S2 | G3 | (LE,LT) | 1991 |
| CHARADRIUS MELODUS | PIPING PLOVER | 153N086W | 6 | S2 | S1S2 | G3 | (LE,LT) | 1994-06-14 |
| POTAMOGETON PECTINATUS - RUPPIA MARITIMA SALINE WETLAND | SALINE WETLAND | 153N086W | 6 | | S3 | | | 1983-06-22 |
| CHARADRIUS MELODUS | PIPING PLOVER | 153N086W<br>154N086W | 04<br>33 | N2, ALSO SEC 5<br>SW4 | S1S2 | G3 | (LE,LT) | 1994-06-18 |
| WOLFFIA COLUMBIANA | SOUTHERN WATERMEAL | 154N085W | 10 | NE4 | S2 | G5 | | 1975-11-07 |

**North Dakota Natural Heritage Inventory Biological and Conservation Data Disclaimer**

The quantity and quality of data collected by the North Dakota Natural Heritage Inventory are dependent on the research and observations of many individuals and organizations. In most cases, this information is not the result of comprehensive or site-specific field surveys; many natural areas in North Dakota have never been thoroughly surveyed, and new species are still being discovered. For these reasons, the Natural Heritage Inventory cannot provide a definite statement on the presence, absence, or condition of biological elements in any part of North Dakota. Natural Heritage data summarize the existing information known at the time of the request. Our data are continually upgraded and information is continually being added to the database. This data should never be regarded as final statements on the elements or areas that are being considered, nor should they be substituted for on-site surveys.

3/26/2008

**NORTHERN CHEYENNE TRIBE**
**TRIBAL HISTORIC PRESERVATION OFFICE**
**P.O. Box 128**
**Lame Deer, Montana 59043**
**Tel:(406) 477-6035 Fax: (406) 477-6491**

## Native American Consultation Response Form

| | |
|---|---|
| **Site Name:** | Prairie Wind-NDI 115MW Wind Turbine |
| **TCNS Notification ID Number:** | |
| **Site Address:** | U.S.D.A - Rural Development |
| **Fax:** 1-701-255-5144 | **Attn:** Ms. Barbara Britton |

Response:

- **REQUEST ADDITIONAL INFORMATION**_____(Initials of duly authorized Tribal Officials) I require the following additional information in order to provide a finding of effect for this purpose undertaking:_____.
- **NO ADVERSE EFFECT** _____(Initials of duly authorized Tribal Official)
  I believe the proposed project would have no adverse effect on these properties.
- **ADVERSE EFFECT**_____(Initials of duly authorized Tribal Official)
  Based on the information given, I believe the proposed project would cause an adverse effect on these properties.
- **NO INTEREST**_____(Initials of duly authorized Tribal Official)
  I have identified that there are no properties of religious and cultural significance to the Northern Cheyenne in the proposed construction area.
- **NO EFFECT**_____(Initials of duly authorized Tribal Official)
  I have determined that there are no properties of religious and cultural significance to the Northern Cheyenne Tribe that are listed on the National Register within the area of potential effect or that the proposed project will have no effect on any such properties that may be present.
- **NO COMMENT**_____(Initials of duly authorized Tribal Official)
- **Other (Specify)** May effect areas that have TCPs

**Exception:** If archaeological materials or human remains are encountered during construction, the State Historic Preservation Office and applicable Native American Tribes will be notified.

C. Fisher
Signature

4/28/08
Date

*Mr. Conrad Fisher, Director N.C.T./THPO*
Printed Name

1(406) 477-6035
Telephone No.

**STATE HISTORICAL SOCIETY OF NORTH DAKOTA**



March 20, 2008

Ms. Barbara Britton
Environmental Protection Specialist
RUS
Engineering and Environmental Staff
1400 Independence Avenue SW
Stop 1571
Washington DC 20250-1571

Mr. Kevin Solie
Basin Electric Power Cooperative
1717 E Interstate Ave
Bismarck ND 58503-0564

**ND SHPO Ref.:08-0516 RUS/WAPA Proposed Prairie Winds-ND-1 115 MW Wind Turbine Generation Facility Near Minot, North Dakota**

Dear Ms. Britton and Mr. Solie,

We received the preliminary information from RUS regarding ND SHPO Ref.:08-0516 RUS/WAPA Proposed Prairie Winds-ND-1 115 MW Wind Turbine Generation Facility Near Minot, North Dakota. There is potential for unrecorded and recorded properties in a variety of physiographic settings in the overall study area near Minot. At this point, we encourage that a Class I Cultural Resource Inventory (file and records search) be prepared and submitted for review by federal agencies and this office.

Thank you for the opportunity to review this project. Please include the ND SHPO Reference number listed above in further correspondence for this specific project. If you have questions, please contact either Paul Picha, Chief Archaeologist at (701)328-3574 or Susan Quinnell, Review ad Compliance Coordinator, at (701)328-3576 or squinnell@nd.gov.

Sincerely,

Merlan E. Paaverud, Jr.
State Historic Preservation Officer
(North Dakota)
and
Director, State Historical Society of North Dakota

c: Ms. Susan Wefald, Commissioner ND PSC

**DEPARTMENT OF THE ARMY**
CORPS OF ENGINEERS, OMAHA DISTRICT
NORTH DAKOTA REGULATORY OFFICE
1513 SOUTH 12TH STREET
BISMARCK ND 58504-6640

REPLY TO
ATTENTION OF

March 18, 2008

North Dakota Regulatory Office [NWO-2008-00733-BIS]

USDA, Rural Development, Utilities Program
Attn: Mark S. Plank, Director
1400 Independence Ave. SW
Washington, DC 20250-0700

Dear Mr. Plank:

This is in response to your request for Department of the Army (DA), US Army Corps of Engineers (Corps) comments on a proposal for a wind turbine generation facility referred to as the Prairie Winds – ND 1 Project. The project is located near Minot, North Dakota.

Corps regulatory offices administer Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Section 10 of the Rivers and Harbors Act regulates work affecting navigable waters; work could be over, through, or under navigable waters. Section 404 of the Clean Water Act regulates the discharge of dredge or fill material (temporarily or permanently) in waters of the United States. Waters of the United States may include, but are not limited to, rivers, streams, ditches, coulees, lakes, ponds, and their adjacent wetlands. Fill material includes, but is not limited to, rock, sand, soil, clay, plastics, construction debris, wood chips, overburden from mines or other excavation activities and materials used to create any structure or infrastructure in the waters of the United States.

If your proposal would require a Section 10 and/or Section 404 permit, please complete and submit the enclosed Corps of Engineers permit application to the U. S. Army Corps of Engineers, North Dakota Regulatory Office, 1513 South 12th Street, Bismarck, North Dakota 58504. If you are unsure if a permit is required, you may submit an application, or, a letter requesting a jurisdictional determination. Include a project location map, description of work, and construction methodology when submitting either.

If we can be of further assistance or should you have any questions regarding our program, please do not hesitate to contact this office by letter or phone at (701) 255-0015 and reference project number **NWO-2008-00733-BIS.**

Sincerely,

Daniel E. Cimarosti
Regulatory Program Manager
North Dakota

Enclosure
-application

**Instructions for Preparing a**
**Department of the Army Permit Application**

**Blocks 1 through 4.** To be completed by Corps of Engineers.

**Block 5. Applicant's Name.** Enter the name of the responsible party or parties. If the responsible party is an agency, company, corporation or other organization, indicate the responsible officer and title. If more than one party is associated with the application, please attach a sheet with the necessary information marked **Block 5.**

**Block 6. Address of Applicant.** Please provide the full address of the party or parties responsible for the application. If more space is needed, attach an extra sheet of paper marked Block 6.

**Block 7. Applicant Telephone Number(s).** Please provide the number where you can usually be reached during normal business hours.

**Blocks 8 through 11.** To be completed if you choose to have an agent.

**Block 8. Authorized Agent's Name and Title.** Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer or any other person or organization. Note: An agent is not required.

**Blocks 9 and 10. Agent's Address and Telephone Number.** Please provide the complete mailing address of the agent, along with the telephone number where he/she can be reached during normal business hours.

**Block 11. Statement of Authorization.** To be completed by applicant if an agent is to be employed.

**Block 12. Proposed Project Name or Title.** Please provide name identifying the proposed project (i.e., Landmark Plaza, Burned Hills Subdivision or Edsall Commercial Center).

**Block 13. Name of Waterbody.** Please provide the name of any stream, lake, marsh or other waterway to be directly impacted by the activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

**Block 14. Proposed Project Street Address.** If the proposed project is located at a site having a street address (not a box number), please enter here.

**Block 15. Location of Proposed Project.** Enter the county and state where the proposed project is located. If more space is required, please attach a sheet with the necessary information marked Block 15.

**Block 16. Other Location Descriptions.** If available, provide the Section, Township and Range of the site and/or the latitude and longitude. You may also provide description of the proposed project location, such as lot numbers, tract numbers or you may choose to locate the proposed project site from a known point (such as the right descending bank of Smith Creek, one mile down from the Highway 14 bridge). If a large river or stream, include the river mile of the proposed project site if known.

**Block 17. Directions to the Site.** Provide directions to the site from a known location or landmark. Include highway and street numbers as well as names. Also provide distances from known locations and any other information that would assist in locating the site.

**Block 18. Nature of Activity.** Describe the overall activity or project. Give appropriate dimensions of structures such as wingwalls, dikes (identify the materials to be used in construction, as well as the methods by which the work is to be done), or excavations (length, width, and height). Indicate whether discharge of dredged or fill material is involved. Also, identify any structure to be constructed on a fill, piles or float supported platforms.

The written descriptions and illustrations are an important part of the application. Please describe, in detail, what you wish to do. If more space is needed, attach an extra sheet of paper marked Block 18.

**Block 19. Proposed Project Purpose.** Describe the purpose and need for the proposed project. What will it be used for and why? Also include a brief description of any related activities to be developed as the result of the proposed project. Give the approximate dates you plan to both begin and complete all work.

**Block 20. Reason(s) for Discharge.** If the activity involves the discharge of dredged and/or fill material into a wetland or other waterbody, including the temporary placement of material, explain the specific purpose of the placement of the material (such as erosion control).

**Block 21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards.** Describe the material to be discharged and amount of each material to be discharged within Corps jurisdiction. Please be sure this description will agree with your illustrations. Discharge material includes: rock, sand, clay, concrete, etc.

**Block 22. Surface Areas of Wetlands or Other Waters Filled.** Describe the area to be filled at each location. Specifically identify the surface areas, or part thereof, to be filled. Also include the means by which the discharge is to be done (backhoe, dragline, etc.). If dredged material is to be discharged on an upland site, identify the site and the steps to be taken (if necessary) to prevent runoff from the dredged material back into a waterbody. If more space is needed, attach an extra sheet of paper marked **Block 22**.

**Block 23. Is Any Portion of the Work Already Complete?** Provide any background on any part of the proposed project already completed. Describe the area already developed, structures completed, any dredged or fill material already discharged, the type of material, volume in cubic yards, acres filled, if a wetland or other waterbody (in acres or square wet). if tile work was done under an existing Corps permit, identify the authorization if possible.

**Block 24. Names and Addresses of Adjoining Property Owners, Lessees, etc., Whose Property Adjoins the Project Site.** List complete names and full mailing addresses of the adjacent property owners (public and private) lessees, etc., whose property adjoins the waterbody or aquatic site where the work is being proposed so that they may be notified of the proposed activity (usually by public notice). If more space is needed, attach an extra sheet of paper marked Block 24.

***Information regarding adjacent landowners is usually available through the office of the tax assessor in the county of counties where the project is to be developed.***

**Block 25. Information about Approvals or Denials by Other Agencies.** You may need the approval of other Federal, state or local agencies for your project. identify any applications you have submitted and the status, if any (approved or denied) of each application. You need not have obtained all other permits before applying for a Corps permit.

**Block 26. Signature of Applicant or Agent.** The application must be signed by the owner or other authorized party (agent) . This signature shall be an affirmation that the party applying for the permit possesses the requisite property rights to undertake the activity applied for (including compliance with special conditions, mitigation, etc.).

## DRAWINGS AND ILLUSTRATIONS

General Information.

Three types of illustrations are needed to properly depict the work to be undertaken. These illustrations or drawings are identified as a **Vicinity Map, a Plan View <u>or</u> a Typical Cross-Section Map**. Identify each illustration with a figure or attachment number.

Please submit one original, or good quality copy, of all drawings on 8 I/2x1 1 inch plain white paper (tracing paper or film may be substituted). Use the fewest number of sheets necessary for your drawings or illustrations.

Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view or cross-section). **While illustrations need not be professional (many small, private project illustrations are prepared by hand), they should be clear, accurate and contain all necessary information.**

| APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT (33 CFR 325) | OMB APPROVAL NO. 0710-0003 Expires December 31, 2004 |
|---|---|

The Public burden for this collection of information is estimated to average 10 hours per response, although the majority of applications should require 5 hours or less. This includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Service Directorate of Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302; and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003), Washington, DC 20503. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research and Sanctuaries Act, 33 USC 1413, Section 103. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies. Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued.

One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

*(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)*

| 1. APPLICATION NO. | 2. FIELD OFFICE CODE | 3. DATE RECEIVED | 4. DATE APPLICATION COMPLETED |
|---|---|---|---|
| NWO-2008-00733-BIS | | | |

*(ITEMS BELOW TO BE FILLED BY APPLICANT)*

| 5. APPLICANT'S NAME | 8. AUTHORIZED AGENT'S NAME AND TITLE *(an agent is not required)* |
|---|---|
| 6. APPLICANT'S ADDRESS | 7. AGENT'S ADDRESS |
| 7. APPLICANT'S PHONE NOS. W/AREA CODE | 10. AGENT'S PHONE NOS. W/AREA CODE |
| a. Residence | a. Residence |
| b. Business | b. Business |

11. STATEMENT OF AUTHORIZATION

I hereby authorize _____ to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

_____

APPLICANT'S SIGNATURE DATE

NAME, LOCATION AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE *(see instructions)*

| 13. NAME OF WATERBODY, IF KNOWN *(if applicable)* | 14. PROJECT STREET ADDRESS *(if applicable)* |
|---|---|
| 15. LOCATION OF PROJECT<br>COUNTY STATE | |

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions)

17. DIRECTIONS TO THE SITE

18. Nature of Activity *(Description of project, include all features)*

19. Project Purpose *(Describe the reason or purpose of the project, see instructions)*

USE BLOCKS 20-22 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards

22. Surface Area in Acres of Wetlands or Other Waters Filled *(see instructions)*

23. Is Any Portion of the Work Already Complete? Yes _____ No _____ IF YES, DESCRIBE THE COMPLETED WORK

24. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list).

25. List of Other Certifications or Approvals/Denials Received from other Federal, State, or Local Agencies for Work Described in This Application

| AGENCY | TYPE APPROVAL* | IDENTIFICATION NUMBER | DATE APPLIED | DATE APPROVED | DATE DENIED |
|---|---|---|---|---|---|
| | | | | | |

*Would include but is not restricted to zoning, building and flood plain permits

26. Application is hereby made for a permit or permits to authorize the work described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

| SIGNATURE OF APPLICANT | DATE | SIGNATURE OF AGENT | DATE |
|---|---|---|---|

The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

# FAX TRANSMISSION

U.S. FISH AND WILDLIFE SERVICE
3425 MIRIAM AVENUE
BISMARCK, NORTH DAKOTA 58501-7926
701-250-4481
Fax: 701-355-8513

| | | | |
|---|---|---|---|
| **To:** | Mark Plank | **Date:** | April 16, 2008 |
| **Fax #:** | 202-720-0820 | **Pages:** | |
| **From:** | Jeffrey Towner | | |
| **Subject:** | Proposed Prairie Winds-ND1 115 MW Wind Turbine Generation Facility near Minot, ND | | |

COMMENTS:

**PLEASE CALL TO CONFIRM RECEIPT.**

# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

Ecological Services
3425 Miriam Avenue
Bismarck, North Dakota 58501

APR 16 2008

Mr. Mark S. Plank
Director, Engineering and Environmental Staff
USDA, Rural Development, Utilities Programs
1400 Independence Avenue SW
Washington, DC 20250-0700

Dear Mr. Plank:

This is in response to your March 11, 2008, request for environmental information in relation to a proposed Basin Electric Power Cooperative (Basin) 77-turbine, 115 megawatt (MW) wind power project in Ward County, North Dakota. Two alternative locations that are being considered for the wind power project are approximately 15 miles south of Minot, North Dakota, along Highway 83 (Site A) and approximately 5 miles southwest of Des Lacs (Site B), North Dakota. The Rural Utilities Service (RUS) is the lead Federal agency with Western Area Power Administration (Western) as a cooperating Federal agency in preparation of an Environmental Assessment (ES) for the proposed project. We offer the following comments under the authority of and in accordance with the Migratory Bird Treaty Act (16 U.S.C. 703 et seq.), Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668d, 54 Stat. 250), Executive Order 13186 "Responsibilities of Federal Agencies to Protect Migratory Birds", the Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.), the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57), and the National Environmental Policy Act (NEPA) ( Pub. L. 91-190, 42 U.S.C. 4321-4347, January 1, 1970, as amended by Pub. L. 94-52, July 3, 1975, Pub. L. 94-83, August 9, 1975, and Pub. L. 97-258, § 4(b), Sept. 13, 1982). If requested, the U.S. Fish and Wildlife Service (Service) would also be willing to serve as a cooperating agency for the NEPA review.

The Service has reviewed the Basin Prairie Winds-ND1 Alternative Evaluation Analysis and Site Selection Study document enclosed with your letter. The Alterative Evaluation Analysis is focused on evaluating various energy generation alternatives to meet Basin's energy needs and the Site Selection Study evaluates factors such as wind energy potential, proximity to transmission lines with available capacity, and the availability of suitable land for purchase or lease. In addition to wind resource potential and transmission consideration, wind energy companies, and Federal funding and regulatory agencies should also be aware of, and give significant consideration to, utilizing the Service voluntary guidelines on siting and design, as well as pre- and post-construction research and monitoring to evaluate the proposed project's potential impact to wildlife resources, and potential impacts to other trust resources.

The Service holds certain resources in trust and manages them for the benefit of the American people. These resources include migratory birds, inter-jurisdictional fish, federally-listed threatened and endangered species of plants and animals and their habitats, and units of the National Wildlife Refuges system. When planning an activity, project proponents and Federal action agencies should give careful consideration to potential impacts to these trust resources and compliance with the laws mentioned above. Additional information is provided below.

**Migratory Birds**

Adequate consideration for avian resources early in the site evaluation process can help to minimize impacts and facilitate project review. Although current wind turbine technology and proper siting can help to minimize the incidence of avian deaths due to blade, aerial line, and tower strikes, the potential for direct mortality of some migratory birds will remain. Wind power developers and Federal Action agencies, in concert with the Service, can help to ensure that projects proceed with as little impact to migratory birds as possible. This can be accomplished by gathering information on avian resources as they relate to project siting and by implementing measures to minimize impacts to migratory birds from the construction and operation of the wind facility. The Service's Interim Wind Turbine Siting Guidelines are enclosed to assist in project planning (enclosure 1). We encourage the project proponent or RUS to conduct a Potential Impact Index (PII) analysis to assist in the selection of a wind power site that minimizes the potential to impact migratory birds. Please inform this office whether or not you plan to use the Service's interim guidelines in selecting a site and if not, why not, and whether you intend to use a different method to assess avian resources and impacts to migratory birds.

To minimize the electrocution hazard to birds, the Service, with support from the Rural Utilities Service, recommends that new or updated overhead power lines be constructed in accordance with the current guidelines for preventing raptor electrocutions. The recommended guidelines can be found in "Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996". To increase power line visibility and reduce bird fatalities resulting from collisions with power lines, the Service recommends new power lines that cross or run adjacent to rivers or large wetlands be modified according to "Mitigating Bird Collisions with Power Lines: The State of the Art in 1994". Both publications can be obtained by writing or calling the Edison Electric Institute, P.O. Box 266, Waldorf Maryland 20604-0266, (1-800-334-5453) or visiting their website at www.eei.org.

**Threatened and Endangered Species**

A list of federally threatened and endangered species that may occur within the proposed project's area of influence is enclosed (enclosure 2). If a Federal agency authorizes, funds, or carries out a proposed action, the responsible Federal agency, or its delegated agent, is required to evaluate whether the action "may affect" listed species or critical habitat. If the Federal agency or its designated agent determines the action "is likely to adversely affect" listed species, or destroy or modify critical habitat, the responsible Federal agency shall request formal section 7

consultation with this office. If the evaluation shows a "no effect" determination on listed species or critical habitat, further consultation is not necessary. If a private entity receives Federal funding for a construction project, or if any Federal permit or license is required, the Federal agency may designate the fund recipient or permittee as its agent for purposes of informal section 7 consultation. RUS is providing funding for this project; therefore, the RUS is the Federal action agency responsible for consulting with the Service pursuant to Section 7 of ESA.

The Aransas Wood Buffalo Population (AWBP) of whooping cranes is the only self-sustaining migratory population of whooping cranes remaining in the wild. These birds breed in the wetlands of Wood Buffalo National Park in Alberta and the Northwest Territories of northern Canada, and spend winters on the Texas coast. Whooping cranes in the AWBP annually migrate through North Dakota during their spring and fall migrations.

Endangered whooping cranes have been documented in the vicinity of the proposed project areas. Sites A and B are located within a 90-mile wide migration corridor that includes 75% of all confirmed whooping crane sightings in North Dakota (enclosure 3). The presence of suitable roosting and feeding habitat for whooping cranes in this wind resource area and confirmed whooping crane sightings, document the potential for whooping crane presence at the proposed project sites. Basin's proposed wind energy project has the potential to impact whooping cranes during their annual spring and fall migration through North Dakota. Impacts may be direct (e.g. collision mortality) or indirect (e.g. avoidance of the site resulting in cranes seeking alternate stopover habitat). The interactions of whooping cranes with wind turbines and wind farms are currently uncertain, although there is some evidence to suggest that these large birds with relatively low maneuverability may be susceptible to mortality via collisions with turbines. Currently, collisions with power lines are the greatest known source of mortality for fledged whooping cranes, and have accounted for the death or serious injury of at least 46 whooping cranes since 1956.

Piping plovers, a federally threatened species, are known to use beaches of several alkali lakes adjacent to the proposed project area during the breeding season. Additionally, the Service has designated these lakes as critical habitat for piping plovers (enclosure 4). Critical habitat on alkali lakes and wetlands includes: 1) sandy to gravelly, sparsely vegetated beaches, salt-encrusted mud flats and/or gravelly salt flats; springs and fens along edges of alkali lakes and wetlands; and adjacent uplands 200 feet (61 meters) above the high water mark of the alkali lake or wetland. The Service recommends that all construction activities avoid these critical habitats.

The Service does not believe that a determination of "no effect" is appropriate for this wind resource area because of, but not limited to, the presence of migrating whooping cranes and nesting piping plovers in this area.

**Fish and Wildlife Service Property Interests**

The Service administers Waterfowl Production Areas owned in fee title as well as wetland and grassland easements throughout North Dakota. A review of Service realty records indicate Service property interests are located in the planning area (enclosure 5). The Service has an ongoing easement acquisition program and we recommend that you contact Mr. Lloyd Jones, Project Leader, Audubon Wetland Management District (WMD), 3275 11th Street NW, Coleharbor, North Dakota 58531-9419 (701-442-5474), for more specific information relative to Service easements and up-to-date realty records.

The Service has adopted a goal for working with wind development companies of reasonable accommodation on wetland and grassland easements. The Service will not consider wind projects located on fee title tracts such as Waterfowl Production Areas.

Following are some suggestions and explanations of the various land interests the Service is responsible for in the proposed project area. Wetland easements are legal agreements with private landowners that permanently protect wetland basins from being drained, burned, leveled, or filled. Grassland easements are legal agreements with landowners that permanently protect grassland vegetation, primarily native prairie, from being destroyed or developed. The primary responsibility in protecting these easements is to review all proposed uses to ensure that the requests are compatible with Service easement regulations and various laws and policies. Therefore, these comments and suggestions are made in an attempt to accomplish three goals: 1) avoid impacts to Service grassland and wetland easements in the project area as much as possible; 2) if unavoidable, ensure that any proposed turbine and associated infrastructure impacts (roads, buried collection lines, transmission lines, sub-stations, etc.) on any Service easement areas are kept to an minimum; and 3) investigate potential alternatives to eliminate or reduce impacts to easement areas to protect the integrity of the easement.

With these goals in mind, the Service offers the following comments: There are grassland and wetland easement tracts in the proposed project area. You will need to contact the WMD office for specific information.

- Grassland Easements: Building turbines on grassland easements will require a discussion about a variety of administrative procedures that will need to be completed to comply with various laws, policies and regulations (NEPA documentation, compatibility determinations, restoration plans, decommissioning plans, replacement of impacted areas, a possible reimbursable agreement in support of Service expenditures for review, etc.). As with all other resource considerations, we urge you to discuss your plans with us prior to final site selection. If an interconnection point (sub-station) is proposed for construction on a grassland easement, the substation construction will need to be discussed further, since this type of infrastructure may impact a substantial amount of the Service grassland easement versus the disturbance resulting from placing a turbine on the easement.

- Wetland Easements: The Service manages a number of wetland easements in the proposed project area. The National Wetlands Inventory (NWI) identifies many of the area's wetlands; however, many of the small, shallow temporary wetland basins may not be recognized on NWI photography. You should make all reasonable efforts to avoid facility placement and disturbance to wetlands protected by easement. If your plans indicate a proposal to locate project facilities on Service wetland easements, the Service will review aerial photography along with field inspections to review construction stakes to make sure all wetland basins are avoided. In addition, it is important to make sure that access roads do not alter individual wetland basins and their individual watersheds.

- NEPA Review: As mentioned, if Service lands are proposed to be impacted, the Service will be required to conduct an analysis of impacts and examine alternatives, pursuant to NEPA. If the Service becomes a cooperating agency, NEPA review of impacts to Service easements would be addressed in RUS's EA.

**High Value Habitat Avoidance**

The proposed project area is located in the Missouri Coteau region of North Dakota and includes areas of native mixed-grass prairie. Since the 1800s, North Dakota has lost approximately 75-90 percent of its native grasslands, primarily due to crop production. The Service recommends avoiding construction or disturbance on native prairie areas.

Native prairie has significant natural resource values including:

- Provides habitat for a number of migratory and resident grassland birds whose populations are declining.
- Provides nesting habitat for millions of waterfowl.
- Contains 200-300 plant species, which provide genetic diversity important to agriculture and medicine.
- Provides habitat for thousands of insects including the Dakota skipper, a candidate species for listing under the ESA, and other butterflies (Ex: Regal fritillary, Tawny crescent).
- Crucial for soil and water conservation.
- Provides recreational opportunities (hunting, bird watching/wildlife observation, hiking).
- Living laboratories for scientific research.

Our review of NWI maps indicate that wetland areas are located within the project area. NWI data can be accessed directly by visiting their website at (wetlands.fws.gov). Section 404 of the Clean Water Act regulates placement of fill materials in certain wetlands. A Corps of Engineers' 404 permit may be required if fill material will be placed in aquatic sites including wetlands. Contact Mr. Dan Cimarosti, Regulatory Office, Corps of Engineers, 1513 South 12th Street,

Bismarck, North Dakota 58504 (701-255-0015), to determine their permit requirements. If a 404 permit is required, the Service will provide recommendations on this project to the Corps.

Other high-value wildlife habitat types in North Dakota include wooded draws and riparian forests. We recommend that you avoid construction of wind towers and appurtenant facilities in the above habitat types whenever possible.

Construction activities should be conducted in a manner that will minimize impacts to the wildlife and the existing habitat in the project area. Where impacts are unavoidable, we recommend that you:

- Schedule construction for late summer or fall/early winter so as not to disrupt waterfowl or other wildlife during the breeding season (February 1 to July 15). If work is proposed to take place during the breeding season or at any other time which may result in the take of migratory birds or active nests, the Service recommends that the project proponent or Federal action agency arrange to have a qualified biologist conduct a field survey of the affected habitats to determine the absence or presence of nesting migratory birds. If nesting migratory birds are found, we request you contact this office, suspend construction, or take other measures, such as maintaining adequate buffers, to protect the birds until the young have fledged. The Service further recommends that field surveys for nesting birds, along with information regarding the qualification of the biologist(s) performing the surveys, and any avoidance measures implemented at the project site, be throughly documented and that such documentation be shared with the Service and maintained on file by the project proponent at least until such time as construction on the proposed project has been completed.
- Avoid construction in native prairie, if possible, and reseed disturbed native prairie with a comparable native grass/forb seed mixture. Obtain seed stock from nurseries within 250 miles of the project area to insure the particular cultivars are well adapted to the local climate.
- Minimize grassland disturbance by using fewer, larger turbines and limiting new road construction.
- Use underground transmission lines between turbines, as well as to the primary substation.
- Locate appurtenant facilities to avoid placement of fill in wetlands along the route.
- Install and maintain appropriate erosion control measures to reduce sedimentation and water quality degradation of wetlands and streams near the project area.
- Replace unavoidable wetland losses with functionally equivalent wetlands.

**Research, Monitoring, and Assessment**

We encourage project proponents and Federal action agencies to conduct collision monitoring studies designed to determine the effect of several factors, such as site selection, turbine designs, the layout of wind plants, wind plant operations, habitat alteration, and changes in available

perching and nesting sites, on bird deaths. The Avian Subcommittee of the National Wind Coordinating Committee (NWCC) has developed a guidance document to assist wind energy developers in designing studies that will produce credible and comparable results of avian interaction with wind power plants. The NWCC document, "Studying Wind Energy/Bird Interactions: A Guidance Document. Metrics and methods for determining or monitoring potential impacts on birds at existing and proposed wind energy sites," can be obtained by contacting the National Wind Coordination Committee, c/o RESOLVE, 1255 23rd Street, Suite 275, Washington, D.C. 20037, or by visiting their website at (www.nationalwind.org).

Given the Service requirements and recommendations above, as well as possible unforeseen issues that may arise, we encourage you to build sufficient planning time for coordination with the Service into your project review and coordination time line. Thank you for the opportunity to comment. If you require further information as project planning proceeds, please contact Terry Ellsworth of my staff, or contact me directly, at (701) 250-4481, or at the letterhead address.

Sincerely,

Jeffrey K. Towner

Jeffrey K. Towner
Field Supervisor
North Dakota Field Office

Enclosures (5)

cc: Project Leader, Audubon WMD
(Attn: M. Goos)
Regulatory Office, Army Corps of Engineers, Bismarck
(Attn: D. Cimarosti)
ND Public Service Commission, Bismarck
Director, ND Game & Fish Department, Bismarck
(Attn: M. McKenna)

Enclosure 1

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
Washington, D.C. 20240

IN REPLY REFER TO:

MAY 13 2003

FWS/DFPA/BFA

Memorandum

To: Regional Directors, Regions 1-7

From: Deputy Director

Subject: Service Interim Guidance on Avoiding and Minimizing Wildlife Impacts from Wind Turbines

Wind-generated electrical energy is renewable, produces no emissions, and is considered to be generally environmentally friendly technology. Development of wind energy is strongly endorsed by the Secretary of the Interior, as expressed in the Secretary's Renewable Energy on Public Lands Initiative (May 2002). However, wind energy facilities can adversely impact wildlife, especially birds and bats, and their habitats. As more facilities with larger turbines are built, the cumulative effects of this rapidly growing industry may initiate or contribute to the decline of some wildlife populations. The potential harm to these populations from an additional source of mortality makes careful evaluation of proposed facilities essential. Due to local differences in wildlife concentration and movement patterns, habitats, area topography, facility design, and weather, each proposed development site is unique and requires detailed, individual evaluation.

Service personnel may become involved in the review of potential wind energy developments on public lands through National Environmental Policy Act review (sections 1501.6, *opportunity as a cooperating agency*, and section 1503.4, *duty to comment on federally-licensed activities for agencies with jurisdiction by law*, i.e., the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act); or because of special expertise. The National Wildlife Refuge System Improvement Act requires that any activity on Refuge lands be determined to be compatible with the Refuge system mission and Refuge purpose(s). In addition, the Service is required by the Endangered Species Act to assist other Federal agencies in ensuring that any action they authorize, implement, or fund will not jeopardize the continued existence of any federally endangered or threatened species. Service biologists have also received requests from industry for consultation on wildlife impacts of proposed wind energy developments on private lands.

The following guidance was prepared by the Service's Wind Turbine Siting Working Group. It is intended to assist Service staff in providing technical assistance to the wind energy industry to avoid or minimize impacts to wildlife and their habitats through: (1) proper evaluation of potential wind energy development sites; (2) proper location and design of turbines and

associated structures within sites selected for development; and (3) pre- and post-construction research and monitoring to identify and/or assess impacts to wildlife. This guidance is intended for terrestrial applications only; guidelines for wind energy developments in marine environments and the Great Lakes will be provided at a future date. The interim guidelines are based on current science and will be updated as new information becomes available. They will be evaluated over a two-year period, and then modified as necessary based on their performance in the field and on the latest scientific and technical discoveries developed in coordination with industry, states, academic researchers, and other Federal agencies. A Notice of Availability and request for comments will be published in the Federal Register simultaneously with the release of this guidance to Service personnel. We encourage industry use of this guidance and solicit their feedback on its efficacy.

These guidelines are not intended nor shall they be construed to limit or preclude the Service from exercising its authority under any law, statute, or regulation, and to take enforcement action against any individual, company, industry or agency or to relieve any individual, company, industry, or agency of its obligations to comply with any applicable Federal, State, or local laws, statutes, or regulations.

Implementation of Service recommendations provided in accordance with these guidelines by the wind energy industry is voluntary. Field offices have discretion in the use of these guidelines on a case-by-case basis, and may also have additional recommendations to add which are specific to their geographic area.

The Migratory Bird Treaty Act (16 U.S.C. 703-712) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior. While the Act has no provision for allowing an unauthorized take, it must be recognized that some birds may be killed at structures such as wind turbines even if all reasonable measures to avoid it are implemented. The Service's Office of Law Enforcement carries out its mission to protect migratory birds not only through investigations and enforcement, but also through fostering relationships with individuals and industries that proactively seek to eliminate their impacts on migratory birds. While it is not possible under the Act to absolve individuals, companies, or agencies from liability if they follow these recommended guidelines, the Office of Law Enforcement and Department of Justice have used enforcement and prosecutorial discretion in the past regarding individuals, companies, or agencies who have made good faith efforts to avoid the take of migratory birds.

Please ensure that all field personnel involved in review of wind energy development proposals receive copies of this memorandum. Questions regarding this issue should be directed to Dr. Benjamin N. Tuggle, Chief, Division of Federal Program Activities, at (703) 358-2161, or Brian Millsap, Chief, Division of Migratory Bird Management, at (703) 358-1714.

Attachment

# INTERIM GUIDELINES TO AVOID AND MINIMIZE WILDLIFE IMPACTS FROM WIND TURBINES

## Introduction

Wind-generated electrical energy is renewable, produces no emissions, and is generally considered to be an environmentally friendly technology. Development of wind energy is strongly endorsed by the Secretary of the Interior, as expressed in the Secretary's Renewable Energy on Public Lands Initiative (May 2002). However, wind energy facilities can adversely impact wildlife, especially birds (e.g., Orloff and Flannery 1992, Leddy et al. 1999, Woodward et al. 2001, Braun et al. 2002, Hunt 2002) and bats (Keeley et al. 2001, Johnson et al. 2002, Johnson et al. 2003). As more facilities with larger turbines are built, the cumulative effects of this rapidly growing industry may initiate or contribute to the decline of some wildlife populations (Manes et al. 2002, Johnson et al. 2002, Manville 2003). The potential harm to these populations from an additional source of mortality or adverse habitat impacts makes careful evaluation of proposed facilities essential. Due to local differences in wildlife concentration and movement patterns, habitats, area topography, facility design, and weather, each proposed development site is unique and requires detailed, individual evaluation.

The following guidance was prepared by the U.S. Fish and Wildlife Service (Service). Like the Service's voluntary guidance addressing the siting, construction, operation, and decommissioning of communication towers (http://migratorybirds.fws.gov/issues/towers/comtow.html) and the voluntary guidance developed in cooperation with the electric utility industry to minimize bird strikes and electrocutions (APLIC 1994, APLIC 1996), this guidance is intended to assist the wind energy industry in avoiding or minimizing impacts to wildlife and their habitats. This is accomplished through: (1) proper evaluation of potential Wind Resource Areas (WRAs), (2) proper location and design of turbines and associated structures within WRAs selected for development, and (3) pre- and post-construction research and monitoring to identify and/or assess impacts to wildlife. These guidelines are based on current science and will be updated as new information becomes available. They are voluntary, and interim in nature. They will be evaluated over a two-year period, and then modified as necessary based on their performance in the field, on comments from the public, and on the latest scientific and technical discoveries developed in coordination with industry, states, academic researchers, and other Federal agencies. After this period, the Service plans to develop a complete operations manual for evaluation, site selection, design, construction, operation, and monitoring of wind energy facilities in both terrestrial and aquatic environments.

Data on wildlife use and mortality collected at one wind energy facility are not necessarily applicable to others; each site poses its own set of possibilities for negative effects on wildlife. In addition, the wind industry is rapidly expanding into habitats and regions that have not been well studied. The Service therefore suggests a precautionary approach to site selection and development, and will employ this approach in making recommendations and assessing impacts of wind energy developments. We encourage the wind energy industry to follow these guidelines and, in cooperation with the Service, to conduct scientific research to provide additional information on the impacts of wind energy development on wildlife. We further encourage the industry to look for opportunities to promote bird and other wildlife conservation when planning wind energy facilities (e.g., voluntary habitat acquisition or conservation easements).

The Service is guided by the Fish and Wildlife Service Mitigation Policy (Federal Register 46 (15), January 1981) in evaluating modifications to or loss of habitat caused by development. This policy follows the sequence of steps recommended in the Council on Environmental Quality's Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA) in seeking to avoid, minimize, or compensate for negative impacts. Mitigation can involve (1) avoiding the impact of an activity by taking no action; (2) minimizing impacts by limiting the degree of activity; (3) rectifying an impact by repairing, rehabilitating, or restoring an affected environment; (4) reducing or eliminating an impact by conducting activities that preserve and maintain the resources; or (5) compensating for an impact by replacing or providing substitute resources or environments. Any mitigation recommended by the Service

for wind energy development would be voluntary on the part of the developer unless made a condition of a Federal license or permit. Mitigation does not apply to "take" of species under the Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, or Endangered Species Act. The goal of the Service under these laws is the elimination of loss of migratory birds and endangered and threatened species due to wind energy development. The Service will actively expand partnerships with regional, national, and international organizations, States, tribes, industry, and environmental groups to meet this goal.

Projects with Federal involvement may require additional analysis under the National Environmental Policy Act (http://www.fws.gov/r9esnepa), Endangered Species Act (http://endangered.fws.gov), or National Wildlife Refuge System Administration Act (http://www.fws.gov/policyMakers/mandates/index.html#adminact). This includes projects on federally-owned lands (e.g., National Wildlife Refuges, National Forests), lands where a Federal permit is required for development (e.g., BLM-administered lands), or lands where Federal funds were used for purchase or improvement (some State Wildlife Management Areas).

These guidelines are not intended nor shall they be construed to limit or preclude the Service from exercising its authority under any law, statute, or regulation, and to take enforcement action against any individual, company, or agency, or to relieve any individual, company, or agency of its obligations to comply with any applicable Federal, State, or local laws, statutes, or regulations.

The guidelines contain a site evaluation process with checklists for pre-development evaluations of potential terrestrial wind energy development sites (Appendix 1). Use of this process allows comparison of one site with another with respect to the impacts that would occur to wildlife if the area were developed. The evaluation area for a potential development site should include the "footprint" encompassing all of the turbines and associated structures planned for that proposed facility, and the adjacent wildlife habitats which may be affected by the proximity of the structures, but excluding transmission lines extending outside the footprint. All potential development sites within a geographic area should be evaluated before a site is selected for development.

Pre-development evaluations should be conducted by a team that includes Federal and/or State agency wildlife professionals with no vested interest (e.g., monetary or personal business gain) in the sites selected. Teams may also include academic and industry wildlife professionals as available. Any site evaluations conducted by teams that do not include Federal and/or State agency wildlife professionals will not be considered valid evaluations by the Service.

The pre-development evaluation may also identify additional studies needed prior to and after development. Post-construction monitoring to identify any wildlife impacts is recommended at all developed sites. Pre- and post-development studies and monitoring may be conducted by any qualified wildlife biologist without regard to his/her affiliation or interest in the site.

Additional information relevant to these guidelines is appended as follows:

Appendix 2 – Definitions Related to Wind Energy Development and Evaluation
Appendix 3 – Wildlife Laws Relevant to Wind Power Development Projects
Appendix 4 - Research Needs on the Impacts of Wind Power Development on Wildlife
Appendix 5 – Procedures for Endangered Species Evaluations and Consultations
Appendix 6 – Guidelines for Considering Wind Turbine Siting on Easement Lands Administered as Part of the National Wildlife Refuge System in Region 6 (CO, KS, MT, NE, ND, SD, UT, WY)
Appendix 7 – Known and Suspected Impacts of Wind Turbines on Wildlife
Appendix 8 – Literature Cited

**Site Evaluation**

The site evaluation protocol presented in Appendix 1 was developed by a team of Federal, State, university, and wind energy industry biologists to rank potential terrestrial wind energy development sites by their potential impacts on wildlife. There are two steps to follow:

1. Identify and evaluate reference sites, preferably within the general geographic area of the proposed facility. Reference sites are high-quality wildlife areas where wind development would result in the maximum negative impact on wildlife (i.e., sites selected to have the highest possible rank using the protocol). Reference sites are used to determine the comparative risks of developing other potential sites.

2. Evaluate potential development sites to determine risk to wildlife and rank sites against each other using the highest-ranking reference site as a standard. Although high-ranking sites are generally less desirable for wind energy development, a high rank does not necessarily preclude development of a site, nor does a low rank automatically eliminate the need to conduct pre-development assessments of wildlife resources or post-development assessments of impacts.

**Studies to Assess and Monitor Wildlife Impacts**

While ranking potential development sites, the site evaluation team referenced above may identify pre-development studies that are needed to better assess potential negative impacts to wildlife. Ranking may also suggest the extent and duration of study required. Developers are encouraged to conduct any studies suggested by the team in coordination with Service and other agency wildlife biologists.

Post-development mortality studies should be a part of any site development plan in order to determine if or to what extent mortality occurs. As with pre-development studies, ranking may suggest the extent and duration of study needed. Studies should be designed in coordination with Federal and other agency biologists.

**Site Development Recommendations**

The following recommendations apply to locating turbines and associated structures within WRAs selected for development of wind energy facilities:

1. Avoid placing turbines in documented locations of any species of wildlife, fish, or plant protected under the Federal Endangered Species Act.

2. Avoid locating turbines in known local bird migration pathways or in areas where birds are highly concentrated, unless mortality risk is low (e.g., birds present rarely enter the rotor-swept area). Examples of high concentration areas for birds are wetlands, State or Federal refuges, private duck clubs, staging areas, rookeries, leks, roosts, riparian areas along streams, and landfills. Avoid known daily movement flyways (e.g., between roosting and feeding areas) and areas with a high incidence of fog, mist, low cloud ceilings, and low visibility.

3. Avoid placing turbines near known bat hibernation, breeding, and maternity/nursery colonies, in migration corridors, or in flight paths between colonies and feeding areas.

4. Configure turbine locations to avoid areas or features of the landscape known to attract raptors (hawks, falcons, eagles, owls). For example, Golden Eagles, hawks, and falcons use cliff/rim edges extensively; setbacks from these edges may reduce mortality. Other examples include not locating turbines in a dip or pass in a ridge, or in or near prairie dog colonies.

5. Configure turbine arrays to avoid potential avian mortality where feasible. For example, group turbines rather than spreading them widely, and orient rows of turbines parallel to known bird movements, thereby decreasing the potential for bird strikes. Implement appropriate storm water management practices that do not create attractions for birds, and maintain contiguous habitat for area-sensitive species (e.g., Sage Grouse).

6. Avoid fragmenting large, contiguous tracts of wildlife habitat. Where practical, place turbines on lands already altered or cultivated, and away from areas of intact and healthy native habitats. If not practical, select fragmented or degraded habitats over relatively intact areas.

7. Avoid placing turbines in habitat known to be occupied by prairie grouse or other species that exhibit extreme avoidance of vertical features and/or structural habitat fragmentation. In known prairie grouse habitat, avoid placing turbines within 5 miles of known leks (communal pair formation grounds).

8. Minimize roads, fences, and other infrastructure. All infrastructure should be capable of withstanding periodic burning of vegetation, as natural fires or controlled burns are necessary for maintaining most prairie habitats.

9. Develop a habitat restoration plan for the proposed site that avoids or minimizes negative impacts on vulnerable wildlife while maintaining or enhancing habitat values for other species. For example, avoid attracting high densities of prey animals (rodents, rabbits, etc.) used by raptors.

10. Reduce availability of carrion by practicing responsible animal husbandry (removing carcasses, fencing out cattle, etc.) to avoid attracting Golden Eagles and other raptors.

**Turbine Design and Operation Recommendations**

1. Use tubular supports with pointed tops rather than lattice supports to minimize bird perching and nesting opportunities. Avoid placing external ladders and platforms on tubular towers to minimize perching and nesting. Avoid use of guy wires for turbine or meteorological tower supports. All existing guy wires should be marked with recommended bird deterrent devices (Avian Power Line Interaction Committee 1994).

2. If taller turbines (top of the rotor-swept area is >199 feet above ground level) require lights for aviation safety, the minimum amount of pilot warning and obstruction avoidance lighting specified by the Federal Aviation Administration (FAA) should be used (FAA 2000). Unless otherwise requested by the FAA, only white strobe lights should be used at night, and these should be the minimum number, minimum intensity, and minimum number of flashes per minute (longest duration between flashes) allowable by the FAA. Solid red or pulsating red incandescent lights should not be used, as they appear to attract night-migrating birds at a much higher rate than white strobe lights.

3. Where the height of the rotor-swept area produces a high risk for wildlife, adjust tower height where feasible to reduce the risk of strikes.

4. Where feasible, place electric power lines underground or on the surface as insulated, shielded wire to avoid electrocution of birds. Use recommendations of the Avian Power Line Interaction Committee (1994, 1996) for any required above-ground lines, transformers, or conductors.

5. High seasonal concentrations of birds may cause problems in some areas. If, however, power generation is critical in these areas, an average of three years monitoring data (e.g., acoustic, radar, infrared, or observational) should be collected and used to determine peak use dates for specific sites. Where feasible, turbines should be shut down during periods when birds are highly concentrated at those sites.

6. When upgrading or retrofitting turbines, follow the above guidelines as closely as possible. If studies indicate high mortality at specific older turbines, retrofitting or relocating is highly recommended.

## Appendix 1

## PROTOCOL TO RANK POTENTIAL TERRESTRIAL WIND ENERGY DEVELOPMENT SITES BY IMPACTS ON WILDLIFE

This protocol was developed by a team of Federal, State, university, and industry biologists to rank potential wind development sites in Montana by their potential for impacts on wildlife (USFWS 2002). It has been modified to apply nationwide. The protocol allows the user to evaluate potential development sites and rank them against a reference site. Objectives are to: (1) assist developers in deciding whether to proceed with development; (2) provide a procedure to determine pre-construction study needs to verify use of potential sites by wildlife; and (3) provide recommendations for monitoring potential sites post-construction to identify, quantify, or verify actual impacts (or lack thereof).

Although this protocol focuses on impacts to wildlife, potential impacts to fish, other aquatic life, and plants should be considered as well. Surveys for rare, threatened, or endangered plants known or suspected to occur in the geographic area should be conducted at all proposed terrestrial development sites having suitable habitat.

This protocol is intended to provide a conceptual framework for initial steps in investigating a site. It is not intended to be all-inclusive relative to objectives, methods, and analysis nor to serve as the definitive reference or directive for any step in wind power related investigations. The Physical Attributes, Species Occurrence and Status, and Ecological Attractiveness groupings in this protocol should serve as a model framework; the terrain features, species, and conditions used in these groupings will be dictated by local conditions and should be developed by wildlife biologists familiar with the region in which this protocol is being used.

### Potential Impact Index (PII)

The Potential Impact Index represents a "first cut" analysis of the suitability of a site proposed for development. It does so by estimating use of the site by selected wildlife species as an indicator of potential impact. Emphasis of the PII is on initial site evaluation and is intended to provide more objectivity than simple reconnaissance surveys.

There are two steps to follow in ranking sites by their potential impact on wildlife:

1. Identify and evaluate reference sites within the general geographic area of Wind Resource Areas (WRA's) being considered for development of a facility. Reference sites are areas where wind development would result in the maximum negative impact on wildlife, resulting in a high PII score. Reference sites are used to determine the comparative risks of developing other potential sites.

2. Evaluate potential development sites to determine risk to wildlife, and rank sites against each other using the highest-ranking reference site as a standard. While high-ranking sites are generally less desirable for wind development, a high rank does not necessarily preclude development of a site, not does a low rank automatically eliminate the need to conduct pre-development assessments of wildlife use and impact potential.

The following assumptions are implicit in the PII process:

1. All WRA sites, regardless of turbine design, configuration, placement, or operation present some hazard and risk to wildlife from both an individual and population perspective.

2. Certain sites present less hazard and risk to wildlife than others.

3. No adequate and defensible information exists regarding the appropriateness of the proposed WRA site being evaluated relative to impacts to wildlife.

4. Evaluations will be conducted by qualified biologists without competitive interest in site selection, including those from State and Federal agencies who are familiar with local and regional wildlife.

The PII is designed primarily to evaluate potential impacts on aerial wildlife from collision with turbines and infrastructure. The PII is derived from the results of three checklists (forms are attached). These checklists should be developed and applied as follows:

A. The PHYSICAL ATTRIBUTE checklist considers topographic, meteorological, and site characteristics that may influence bird and bat occurrence and movements.

B. The SPECIES OCCURRENCE AND STATUS checklist includes: Birds of Conservation Concern at the Bird Conservation Region level (http://migratorybirds.fws.gov/reports/reports.html); all federally-listed Endangered, Threatened, and Candidate Species (http://endangered.fws.gov); bird species of high recreational or other value (e.g., waterfowl, prairie grouse); State Endangered, Threatened, and Species of Management Concern; and any additional species of concern listed by State Natural Heritage Programs.

C. The ECOLOGICAL ATTRACTIVENESS checklist evaluates the presence and influence of ecological magnets and other conditions that would draw birds or bats to the site or vicinity.

Each checklist has boxes to be checked for a particular attribute or species found at an evaluation site. The number of boxes in each checklist will vary from region to region due to variations in the number of physical attributes and species of concern in that region. Keep in mind that all boxes in a checklist are very unlikely to be checked at a single evaluation site, because all species and ecological physical conditions potentially occurring in the region would not exist at one site.

Each checklist should be assigned a divisor, which is developed by dividing the number of boxes in a checklist by the total number of boxes in all three checklists. This expands the spread of index values and more dramatically displays the magnitude of differences among sites. For example, if the PHYSICAL ATTRIBUTE checklist has 36 boxes and the total number of boxes in all three checklists is 144, divide 36 by 144 = 0.25, the divisor.

You can change the number of boxes in any of the checklists to fit your geographic area, habitat type, or other selected region (e.g., a state or portion of a state). Remember to recalculate the divisor if you change the number of boxes.

Boxes in a checklist are checked if the condition or species is known or strongly suspected to occur. Criteria for checklist conditions marked with an asterisk (*) are explained on the following page. Conditions that are self-explanatory are not included. Conditions are not weighted. Boxes are checked in the SPECIES OCCURRENCE AND STATUS checklist if presence of the species is unconfirmed but strongly suspected (i.e., WRA is within the range and habitat of the species). This permits more liberal assignment of potential impact, reduces the probability of missing impacts on specific species due to lack of empirical data, and focuses future study and monitoring effort. Totals for each checklist are simple column sums. The PII is calculated from the checklist totals. A completed example from Montana is provided at the end of this Appendix.

**Determining Checklist Scores**

Checklist scores are determined as follows:

1. Place a check in each box for which an attribute, species, or condition is present or strongly suspected.

2. After completing the three checklists for each site, add the total number of checks in a checklist for an ending sum (each box checked equals one).

**Determining PII Score**

The Potential Impact Index score is determined as follows:

1. Place the sums from each of the three checklists in the POTENTIAL IMPACT INDEX table sum boxes (Σ column) in the appropriate category.

2. Divide each checklist sum by the previously calculated divisor to adjust the sum for disproportionate numbers of conditions in each checklist, and place this adjusted sum in the Σ/p boxes for each checklist.

3. Add the adjusted checklist sums (Σ/p column) to produce the PII score.

Include any questions, statements, comments, or concerns regarding any checklist cell or category on the SITE SPECIFIC COMMENTS sheet. These comments are critical to determining pre-construction study needs. They will also help identify and refine questions and objectives to be addressed by follow-up study and monitoring. The nature of suspected Significant Ecological Events should be noted on the SITE SPECIFIC COMMENTS sheet.

**Ranking PII Scores**

PII of each site evaluated is assigned a ranking based on its proportional relationship to the reference site that has the maximum PII score, as shown in Figure 2 in the Montana example. Ranking categories (High, Low, etc.) in the example are arbitrarily set at intervals of 20 percent of maximum.

Rankings are intended as a guide to developers. They are designed to serve as indicators of relative risk to wildlife and thus provide an estimator of the level of impact that may be expected should a site be developed. A high rank does not preclude development, nor does a low rank automatically eliminate the need to conduct pre-development assessments of impacts on wildlife. More intensive pre-construction studies may be needed for both scenarios if development of the site is pursued. Rankings may also suggest the extent of additional study needed.

In the case of federally listed threatened, endangered, or candidate species of wildlife, fish, or plants, consultation with the Fish and Wildlife Service under the Endangered Species Act is required, and may preclude development of a site regardless of its PII score. See Appendix 5 for procedures for obtaining lists of these species that may be present, and for consulting with the Fish and Wildlife Service if species or their habitats are found.

**Determining Pre-construction Study Needs**

The goals of pre-construction studies are to estimate impacts of proposed wind power development on wildlife by addressing areas of concern identified during the PII process. Objectives, intensity, duration, and methods of pre-construction studies are likely to be site specific, but may be independent of ranking. Regardless of ranking, studies should be designed to address (1) verification of use of WRAs by all species recorded in the "SPECIES OCCURRENCE AND STATUS" checklist, (2) verification of natural conditions (e.g., under "Significant Ecological Events", the magnitude, timing, and location of suspected bird/bat migration), or (3) questions noted in the SITE SPECIFIC COMMENTS sheet for that site. The SITE SPECIFIC COMMENTS sheet may also indicate conditions that need not be investigated. As a result, a site with a low rank may require radar surveillance (e.g., important songbird migration site) while a site with a high rank may require only a single season visual survey (e.g., site potentially contains autumn Whooping Crane habitat). The process should involve a feedback mechanism within an adaptive management strategy (Figure 1). Timely review of study results will determine if data are

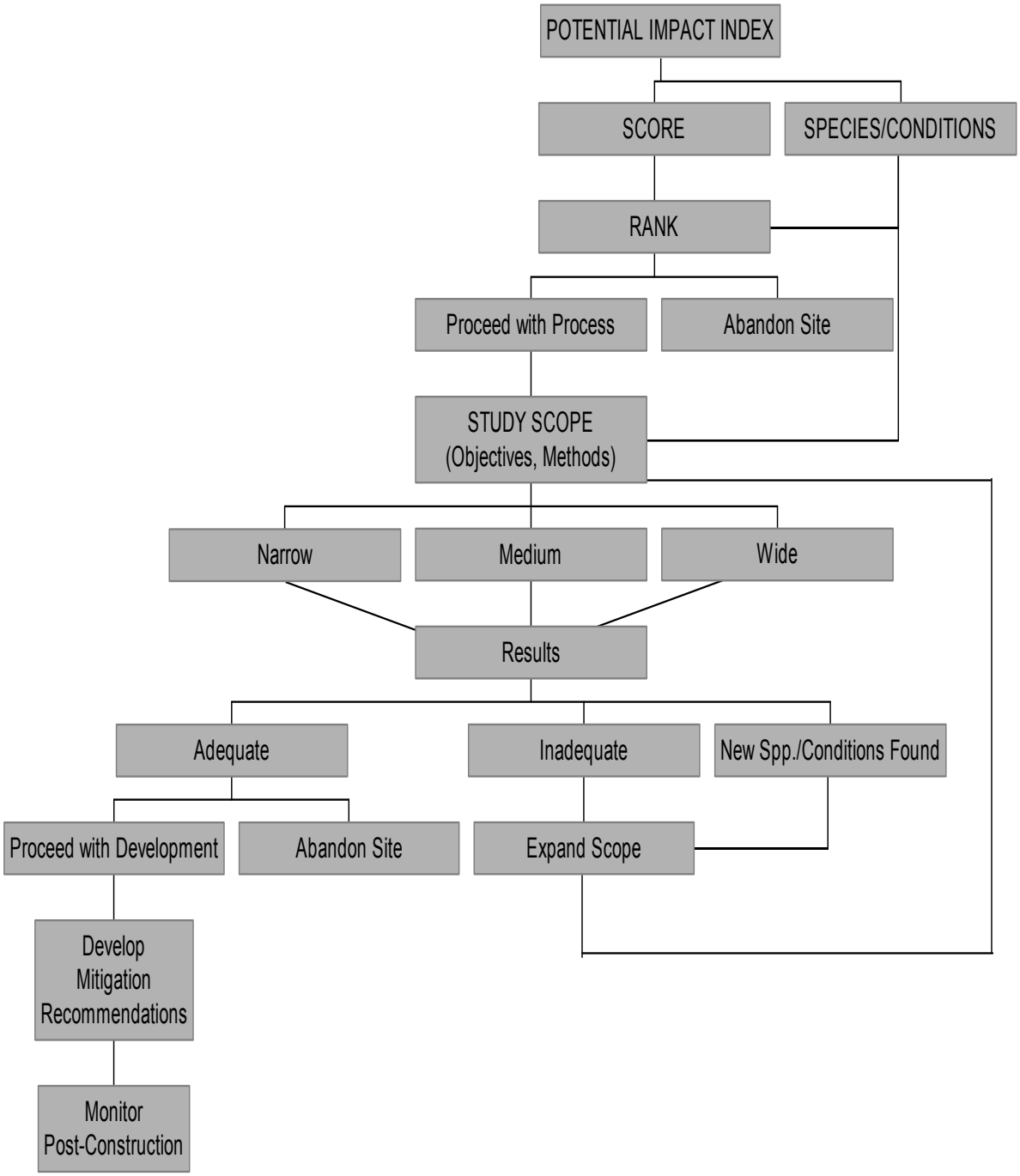



Figure 1. A suggested decision tree for assessing potential development sites. Begin by developing a PII score.

adequate, if conclusions are defensible (Anderson et al. 1999), and if additional investigational effort is required (e.g., if Black-footed Ferrets are found on Mountain Plover searches). Projects with Federal involvement may require additional analysis under the National Environmental Policy Act (http://www.fws.gov/r9esnepa), Endangered Species Act (http://endangered.fws.gov), or National Wildlife Refuge System Administration Act (http://www.fws.gov/policyMakers/mandates/index.html#adminact). Also, the mere existence of a pre-construction study, whether in progress or completed, does not imply Federal sanction for development of a site.

**Post-construction Studies**

The Service recommends that all sites be monitored for impacts on wildlife after construction is completed. Some sites may be so obviously benign that little more than simple reconnaissance study may be needed and any impact will be revealed during post-construction monitoring. Otherwise, pre-construction studies should be designed to explicitly consider post-construction monitoring that permits statistically valid evaluation of actual impacts. Accordingly, studies should be conducted as much as possible within a Before-After-Control-Impact (BACI) study design (Green 1979). Such design requires investigation of at least two sites (Impact [proposed site] and Control) simultaneously, both pre-construction (Before) and post-construction (After). Because true "Control" sites are seldom available, other sites may be substituted, including reference sites used in developing the PII ranking. In the case of radar surveillance studies, sites within the proposed WRA boundaries may be acceptable (e.g., Harmata et al. 1998). Structuring pre-construction studies within a hypotheses-testing framework will help identify appropriate metrics, focus effort, and permit comparisons with post-construction conditions or other WRAs.

Where feasible, post-construction studies should also be utilized to test measures that may eliminate or reduce impacts on wildlife. See Appendix 4, Research Needs on the Impacts of Wind Power Development on Wildlife.

**Metrics and Methods**

Metrics and methods are specific tools used to assess wildlife populations and their status (e.g., point counts, line transects, nest success studies, radar surveys, mortality rates, and risk). They can provide important information about birds, bats, and other wildlife at proposed development sites. Metrics and methods may be selected to collect seasonal, group, guild, or habitat specific information, based on data and comments in the SPECIES OCCURRENCE AND STATUS checklist and SITE SPECIFIC COMMENTS sheet. For example, a proposed WRA may be in a narrow north-south oriented valley of relatively monotypic habitat. These conditions suggest a heavy seasonal avian migration corridor but little avian breeding habitat. Accordingly, study emphasis should be on defining use and mortality of migratory birds during autumn or spring or both, with little effort directed at defining use and mortality of breeding birds. Conversely, a potential WRA on a flat plain in diverse habitat would indicate the exact opposite in study emphasis.

While metrics represent specific measurements, concepts, and relationships, methods refer to observational or manipulative study techniques that may be used to verify the location of birds and other wildlife, estimate their numbers, and document their use and behavior (Anderson et al. 1999). Table 1 depicts some commonly used metrics and methods for wildlife studies.

Table 1. Examples of metrics and methods associated with evaluating use and mortality of wildlife at proposed Wind Resource Areas in Montana.

| Data Need | Metric | Methods |
|---|---|---|
| Use Profile | Individuals/Count | Point Counts (birds)<br>Winter Raptor Surveys<br>Lek Counts (grouse)<br>Migration Counts<br>Ungulate Surveys<br>Spotlight Surveys |

| | | |
|---|---|---|
| | Species/Count | Species/guild/group List<br>Point Counts (birds)<br>Raptor Nesting Surveys<br>Raptor Migration Counts<br>Winter Raptor Surveys<br>Acoustic Surveillance (bats)<br>Pellet Counts<br>Bait Stations<br>Track Boards |
| | Use per unit of time (e.g., hour, season) | Radar<br>Migration Counts<br>Raptors/watch<br>Area Searches |
| | Individuals/capture effort | Various techniques for capture |
| | Productivity | Nests/area<br>Raptor Nesting Surveys<br>Nest Success<br>Ungulate Surveys |
| | Events/height category (Altitude Profile) | Radar |
| | Events/distance category (Spatial Profile) | Radar |
| Mortality | Dead/injured individuals/unit | Transects<br>Spot Searches<br>Carcass Removal Study<br>Observer Detection Efficiency Study |

Studies should also strive to generate information to mitigate impacts by properly locating, configuring, or operating turbines (Johnson et al. 2000). Every effort should be made to choose metrics and methods that allow comparisons of pre-construction studies with post-construction studies, other WRAs, and other regions.

**Interpreting Metrics**

It may be difficult to establish empirically exactly what constitutes high use (i.e., potentially high impact). When looking at the distribution and movements, and local, regional, or range-wide population estimates for particular species, the relative proportions of species, groups, or guilds of wildlife using proposed WRAs may indicate degrees of risk. If baseline population data are unknown, consult with a qualified biologist who can recommend a specific metric.

It is likely that little or no evidence of mortality will be found during pre-construction study. If, however, post-construction mortality is found, and statistical evaluation is not possible, that mortality should be assessed in regard to the species status (e.g., ESA-listed species or Birds of Conservation Concern) or the effect of the loss of individuals of that species on a local, regional, or continental population.

**Determining Post-construction Monitoring Needs**

Post-construction monitoring is important to the Service, industry, and public because of the limited information available on impacts of wind turbines and WRAs on wildlife. Therefore, post-construction monitoring should be designed to detect major impacts. The intended time frame for post-construction monitoring is not expected to exceed three years, however. Major impacts may be considered as statistically significant decreases in use by species of concern, or limited to statistically significant increases in mortality rates of any wildlife. Monitoring effort may be intensive or cursory, depending on results of pre-construction use and mortality studies. Simple, infrequent mortality surveys on impact and

control plots may be all that is needed at WRAs where recorded pre-construction use by wildlife is low. Documented high use of a proposed WRA may require monitoring methods identical to those employed in pre-construction studies. Anderson et al. (1999) provide specific, detailed direction in post-construction study design and monitoring. Manville (2002) developed a monitoring protocol for use by the U.S. Forest Service at three National Forests in Arizona to monitor the impact of cellular telecommunications towers on migratory birds that could be modified for use at land-based wind turbines.

**POTENTIAL IMPACT INDEX CHECKLIST FORMS AND INSTRUCTIONS**

PHYSICAL ATTRIBUTE CHECKLIST

| Physical Attribute | | | | Site | | | |
|---|---|---|---|---|---|---|---|
| Topography | Mountain Aspect, if mountainous* | Side | W | | | | |
| | | | E | | | | |
| | | | N | | | | |
| | | | S | | | | |
| | | Top | | | | | |
| | | Foothill | W | | | | |
| | | | E | | | | |
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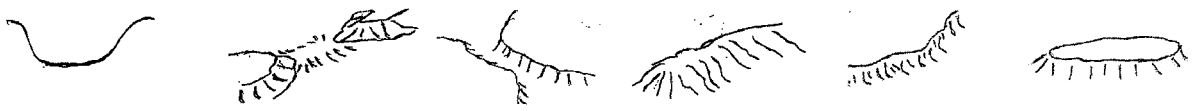
| Wind* Direction | S | | | | | | |
| | N | | | | | | |
| | E | | | | | | |
| | W | | | | | | |
| | Updrafts* | | | | | | |
| Migratory* Corridor Potential | Latitudinal (N ↔ S) | | | | | | |
| | Longitudinal (E ↔ W) | | | | | | |
| | Wide Approaches (>30 km)* | | | | | | |
| | Funnel Effect | Horizontal | | | | | |
| | | Vertical | | | | | |
| Site Size (acres) & Configuration* | <640 | | | | | | |
| | >640 <1000 | | | | | | |
| | >1000 <1500 | | | | | | |
| | Turbine Rows not Parallel to | | | | | | |
| Infrastructure To Build | Transmission | | | | | | |
| | Roads | | | | | | |
| | Buildings* | | | | | | |
| | Maintenance | | | | | | |
| | Daily Activity | | | | | | |
| | Substation | | | | | | |
| Increased Activity* | | | | | | | |
| Totals | | | | | | | |

* Criteria on following page

PHYSICAL ATTRIBUTE CRITERIA - categories, max Σ = , (p = ).

Topography - Terrain characteristic within the ecological influence of the proposed wind development site, generally, but not restricted to ± 5 mi. Some examples are:

Valley Pass Gap Ridgetop Bluff Butte



Mountain Aspect - Aspect of topography for site of proposed development. Multiple categories may be checked.

Wind Direction - Compass direction *from* which prevailing winds approach. Multiple categories may be checked.

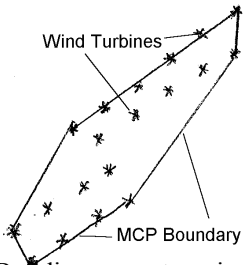
Updrafts - Do updrafts/upslope winds prevail?

Migratory Corridor Potential - Subjective estimate of area to be a potential avian/bat migratory corridor based strictly on topographical characteristics. Multiple categories may be checked.

Wide (>20 mi) - Terrain characteristics of approaches to site from each migratory direction, i.e., a large plain, river corridor, long valley. The larger the area that migrant birds/bats are drawn from, the more may be at risk

Funnel Effect - Is the site in or near an area where migrant birds/bats may be funneled (concentrated) into a smaller area, either altitudinally, laterally, or both?

Site Size & Configuration – Size is estimated as if a minimum convex polygon (MCP) were drawn around peripheral turbines.




Successive boxes are checked to convey relationship of larger size = increased impact to birds/bats, *e.g.*, a 700 acre site will have 2 categories checked while a 1,200 acre site will have all 3 categories checked.

Configuration of turbine rows is usually perpendicular to prevailing wind direction. Rows aligned perpendicular or oblique to route of migration intuitively presents more risk to birds than rows aligned parallel to movement.

Buildings – Building are categorized by relative size and visitation frequency, *i.e.,* structures that are visited daily are usually larger and present more impact than those that are not. If a "Daily Activity" building is required, all Building categories are checked. If a maintenance structure is required, Substation is also checked.

Increased Activity - Will any type of human activity increase? Sites in urban-suburban or otherwise developed areas (oil, gas, mines) will have less impact on wildlife than those in remote or undeveloped areas.

Avian Species of Concern Checklist
(Complete prior to SPECIES OCCURRENCE & STATUS Checklist)

| | Site | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Birds (n = ) | | | | | | | | | | | | |
| Occurrence | B | M/W | Σ | B | M/W | Σ | B | M/W | Σ | B | M/W | Σ |
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| Subtotals | | | | | | | | | | | | |
| Total | | | | | | | | | | | | |

Avian Species of Concern Checklist ( species, max Σ = )

Column totals of this list are added to appropriate cells in the SPECIES OCCURRENCE & STATUS checklist. Consult Birds of Conservation Concern (http://migratorybirds.fws.gov/reports/reports.html) and Threatened/Endangered Species list (http://endangered.fws.gov), and list other species of high value or management concern such as migratory waterfowl and prairie grouse. Appropriate avian field guides and species accounts should be consulted for confirmation of species distribution and habitat associations. State Natural Heritage Programs may also provide species accounts that include additional information useful in completing checklists.

In addition to species lists (rows), season of occurrence is also indicated (columns). "B" indicates breeding or summer occurrence and "M/W" indicates presence during migration or as wintering species. If occurrence within or in the vicinity of a proposed site is confirmed or suspected, an "X" is entered.

Bat Species Of Concern Checklist
(Complete prior to SPECIES OCCURRENCE & STATUS Checklist)

| | Site | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bats (n = ) | | | | | | | | | | | | |
| Occurrence | B | M/W | Σ | B | M/W | Σ | B | M/W | Σ | B | M/W | Σ |
| | | | | | | | | | | | | |
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| Subtotals | | | | | | | | | | | | |
| Total | | | | | | | | | | | | |

Bat Species Of Concern Checklist (  species, max Σ =  ).

Column totals of this list are added to appropriate cells in the SPECIES OCCURRENCE & STATUS checklist. Appropriate bat field guides and references (Barbour and Davis 1969) should be consulted for confirmation of species distribution and habitat associations. State Natural Heritage Programs may also provide species accounts that include additional information useful in completing checklists.

In addition to species lists (rows), season of occurrence is also indicated (columns). "B" indicates breeding or summer occurrence and "M/W" indicates presence during migration or as wintering species. If occurrence within or in the vicinity of a proposed site is confirmed or suspected, an "X" is entered.

SPECIES OCCURRENCE & STATUS CHECKLIST

| Species | | Site | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Occurrence | B | M/W | Σ | B | M/W | Σ | B | M/W | Σ | B | M/W | Σ |
| Threatened & Endangered (includes wildlife, fish, and plants) | | | | | | | | | | | | | |
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| Candidate* | | | | | | | | | | | | | |
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| Special Concern* | Birds (max Σ=) | | | | | | | | | | | | |
| | Bats (max Σ=) | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | Subtotals | | | | | | | | | | | | |
| | Total | | | | | | | | | | | | |

* Criteria on following page

SPECIES OCCURRENCE & STATUS Checklist (  categories, max Σ =  , (p =  ).

Checklist totals for each column in "Avian Species of Concern List" and "Bat Species of Concern List" are inserted in this checklist.

Threatened & Endangered Species - Species on the Federal List of Endangered and Threatened Species (http://endangered.fws.gov).

Candidate Species - Species being investigated for inclusion in the Federal List of Endangered and Threatened Species (http://endangered.fws.gov).

Species of Special Concern - Species listed in Birds of Conservation Concern; by Natural Heritage Programs that are known or suspected to be rare, endemic, disjunct, threatened or endangered; and species of high value such as migratory or other game birds.

Golden Eagles may be included in this checklist because of special protective status afforded under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d). Other species (e.g., Sage Grouse) may be included because of recent concern over population declines range wide. Bats (other than bat Species of Special Concern) should be included due to generally unknown impacts of wind farms on individuals and populations.

ECOLOGICAL ATTRACTIVENESS CHECKLIST

| Ecological Attractor | | | Site | | | |
|---|---|---|---|---|---|---|
| Migration Route* | | Local | | | | |
| | Continental* | N | | | | |
| | | S | | | | |
| | | E | | | | |
| | | W | | | | |
| Ecological Magnets* | | Lotic System | | | | |
| | | Lentic System | | | | |
| | | Wetlands | | | | |
| | | Native Grassland | | | | |
| | | Forest | | | | |
| | | Food Concentrated | | | | |
| | | Energetic Foraging | | | | |
| | Vegetation/ Habitat | Unique | | | | |
| | | Diverse | | | | |
| Significant Ecological Event* | | | | | | |
| Site of Special Conservation Status* | | | | | | |
| Total | | | | | | |

* Criteria on following page

ECOLOGICAL ATTRACTIVENESS CRITERIA - categories, max Σ = , (p = ).

Migration Route - Indicates predominate direction of movement of seasonal migrations. Multiple categories may be checked.

Local - Some avian populations move only altitudinally & direction may be East-West (Sage Grouse, owls, Bald Eagles).

Continental - Some migratory corridors experience mass movements in only one season/direction annually (e.g., Bridger Mountains autumn eagle migration).

Ecological Magnets - Special, unique, unusual, or super ordinary habitats or conditions within the vicinity of the site that may attract wildlife. Lotic systems include small perennial or seasonal creeks to major rivers. Lentic systems include stock ponds to lakes to marine environments. Multiple categories may be checked.

Vegetation/Habitat - Unique or exceptionally diverse vegetation or habitat in the vicinity may indicate exceptional diversity and abundance of avian species or bats.

Significant Ecological Event - Special, unique, unusual, or super ordinary events that occur or are suspected to occur in the vicinity of the site, e.g., up to one third of the Continental population of Trumpeter Swans visit Ennis Lake, < 2.5 miles from a proposed Wind Resource Area; the Continental migration of shorebirds passes over (many stop) at Benton Lake National Wildlife Refuge) and up to 2,000 Golden Eagles pass over the Bridger Mountains in autumn. If unknown but suspected a "?" is entered. Specifics regarding the cell are then addressed in the appropriate box of the SITE SPECIFIC COMMENTS sheet to focus follow-up investigation and assist in definition of study objectives.

Site of Special Conservation Status - Any existing or proposed covenants, conservation easements, or other land development limitations intended to conserve, protect, or enhance wildlife or habitat. This criterion is weighted (2 entered if true) because of previous financial or other investment in ecological values. Specifics regarding the easement are then addressed in the appropriate box of the SITE SPECIFIC COMMENTS sheet to focus follow-up attention.

**POTENTIAL IMPACT INDEX**

| | Site | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| Checklist (p)[1] | Σ | Σ/p | Σ | Σ/p | Σ | Σ/p | Σ | Σ/p |
| Physical ( ) | | | | | | | | |
| Species Occurrence & Status ( ) | | | | | | | | |
| Ecological ( ) | | | | | | | | |
| Totals | | | | | | | | |

[1]Proportion of total checklist categories.

**Determining PII Score**

A. Place the sums from each of the three checklists in the POTENTIAL IMPACT INDEX table sum boxes (Σ column) in the appropriate category.

B. Divide each checklist sum by the previously calculated divisor to adjust the sum for disproportionate numbers of conditions in each checklist, and place this adjusted sum in the Σ/p boxes for each checklist.

C. Add the Σ/p boxes for the three checklists to obtain a total score.

SITE SPECIFIC COMMENTS

| Checklist | Site | | | |
|---|---|---|---|---|
| Physical | | | | |
| | | | | |
| | | | | |
| Species Occurrence | | | | |
| | | | | |
| | | | | |
| Ecological | | | | |
| | | | | |
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**EXAMPLE SITE ASSESSMENT AND**
**CALCULATION OF POTENTIAL IMPACT INDEX (PII)**
**FROM MONTANA**

**POTENTIAL IMPACT INDEX CHECKLISTS**

**Calculating Divisors**

A. Each checklist should be assigned a divisor, which is developed by dividing the number of boxes in a checklist by the total number of boxes in all three checklists. In this example, the total number of boxes in all three checklists is 143.

B. Physical Attribute checklist: 36 boxes ÷ 143 = 0.25; Species Occurrence and Status checklist: 91 boxes ÷ 143 = 0.63; Ecological Attractiveness checklist: 16 boxes ÷ 143 = 0.11.

**Determining Checklist Scores**

A. Place a check in each box for which an attribute, species, or condition is present or strongly suspected.

B. After completing the three checklists for each site, add the total number of checks in a checklist for an ending sum (each box checked equals 1).

PHYSICAL ATTRIBUTE CHECKLIST

| Physical Attribute | | | | Site: Snowy Mtn.Range | | | |
|---|---|---|---|---|---|---|---|
| Topography | Mountain Aspect | Side | W | X | | | |
| | | | E | | | | |
| | | | N | | | | |
| | | | S | | | | |
| | | Top | | | | | |
| | | Foothill | W | X | | | |
| | | | E | | | | |
| | | | N | | | | |
| | | | S | | | | |
| | Valley | | | X | | | |
| | Pass | | | | | | |
| | Gap | | | | | | |
| | Ridge | | | X | | | |
| | Bluff | | | | | | |
| | Butte | | | | | | |
| Wind Direction | S | | | | | | |
| | N | | | X | | | |
| | E | | | | | | |
| | W | | | | | | |
| | Updrafts | | | X | | | |
| Migratory Corridor Potential | Latitudinal (N ↔ S) | | | | | | |
| | Longitudinal (E ↔ W) | | | X | | | |
| | Wide Approaches (>30 km) | | | | | | |
| | Funnel Effect | Horizontal | | X | | | |
| | | Vertical | | | | | |
| Site Size (acres) & Configuration | <640 | | | X | | | |
| | >640 <1000 | | | X | | | |
| | >1000 <1500 | | | X | | | |
| | Turbine Rows not Parallel to | | | | | | |
| Infrastructure To Build | Transmission | | | X | | | |
| | Roads | | | X | | | |
| | Buildings | | | X | | | |
| | Maintenance | | | X | | | |
| | Daily Activity | | | X | | | |
| | Substation | | | X | | | |
| Increased Activity | | | | X | | | |
| Totals | | | | 18 | | | |

Avian Species of Concern Checklist
(Complete prior to SPECIES OCCURRENCE & STATUS Checklist)

| Birds (n = 12) | Site: Snowy Mtn. R. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Occurrence | B | M/W | Σ | B | M/W | Σ | B | M/W | Σ | B | M/W | Σ |
| Nelson's Sharptailed Sparrow | X | X | 2 | | | | | | | | | |
| LeConte's Sparrow | X | X | 2 | | | | | | | | | |
| Baird's Sparrow | X | X | 2 | | | | | | | | | |
| Dickcissel | X | | 1 | | | | | | | | | |
| Cassion's Kingbird | X | | 1 | | | | | | | | | |
| Blackbacked Woodpecker | X | | 1 | | | | | | | | | |
| Yellow-billed Cuckoo | X | | 1 | | | | | | | | | |
| Peregrine Falcon | X | | 1 | | | | | | | | | |
| Northern Goshawk | | X | 1 | | | | | | | | | |
| Ferruginous Hawk | | X | 1 | | | | | | | | | |
| Clark's Grebe | X | | 1 | | | | | | | | | |
| Common Loon | X | | 1 | | | | | | | | | |
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| | | | | | | | | | | | | |
| Subtotals | 10 | 5 | 15 | | | | | | | | | |
| Total | | | 15 | | | | | | | | | |

Bat Species Of Concern Checklist
(Complete prior to SPECIES OCCURRENCE & STATUS Checklist)

| Bats (n = 2) | Site: Snowy Mtn. Range | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Occurrence | B | M/W | ∑ | B | M/W | Σ | B | M/W | Σ | B | M/W | Σ |
| Fringed Myotis | X | | 1 | | | | | | | | | |
| Spotted Bat | X | | 1 | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Subtotals | 2 | | 2 | | | | | | | | | |
| Total | | | 2 | | | | | | | | | |

SPECIES OCCURRENCE & STATUS CHECKLIST

| | | Site | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | | Snow Mtn. R. | | | | | | | | | | | |
| | Occurrence | B | M/W | ∑ | B | M/W | Σ | B | M/W | Σ | B | M/W | Σ |
| Threatened & Endangered | Bald Eagle | | X | 1 | | | | | | | | | |
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| | | | | | | | | | | | | | |
| Candidate | Columbian Sharp-tailed Grouse | X | X | 2 | | | | | | | | | |
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| | | | | | | | | | | | | | |
| Special Concern | Birds (max ∑=) | | | 15 | | | | | | | | | |
| | Bats (max ∑=) | | | 2 | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | Subtotals | | | 20 | | | | | | | | | |
| | Total | | | 20 | | | | | | | | | |

ECOLOGICAL ATTRACTIVENESS CHECKLIST

Site

| Ecological Attractor | | | Snowy Mtn. Range | | | |
|---|---|---|---|---|---|---|
| Migration Route | Local | | | | | |
| | Continental | N | X | | | |
| | | S | X | | | |
| | | E | | | | |
| | | W | | | | |
| Ecological Magnets | Lotic System | | | | | |
| | Lentic System | | | | | |
| | Wetlands | | X | | | |
| | Native Grassland | | X | | | |
| | Forest | | X | | | |
| | Food Concentrated | | | | | |
| | Energetic Foraging | | X | | | |
| | Vegetation/ Habitat | Unique | | | | |
| | | Diverse | X | | | |
| Significant Ecological Event | | | | | | |
| Site of Special Conservation Status | | | | | | |
| Total | | | 7 | | | |

POTENTIAL IMPACT INDEX

| | Site | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| Checklist (p)[1] | Σ | Σ/p | Σ | Σ/p | Σ | Σ/p | Σ | Σ/p |
| Physical (0.25) 15÷.25=60 | 15 | 60 | | | | | | |
| Species Occurrence & Status (0.63) 20÷.63=32 | 20 | 32 | | | | | | |
| Ecological (0.11) 7÷.11=64 | 7 | 64 | | | | | | |
| Totals | 42 | **156** | | | | | | |

[1]Proportion of total checklist categories.

**Score is 156, compared to the highest reference site score of 244 (Figure 2).**

**Determining PII Score**

A. Place the sums from each of the three checklists in the POTENTIAL IMPACT INDEX table sum boxes (Σ column) in the appropriate category.

B. Divide each checklist sum by the previously calculated divisor to adjust the sum for disproportionate numbers of conditions in each checklist, and place this adjusted sum in the Σ/p boxes for each checklist.

C. Add the Σ/p boxes for the three checklists to obtain a total score.

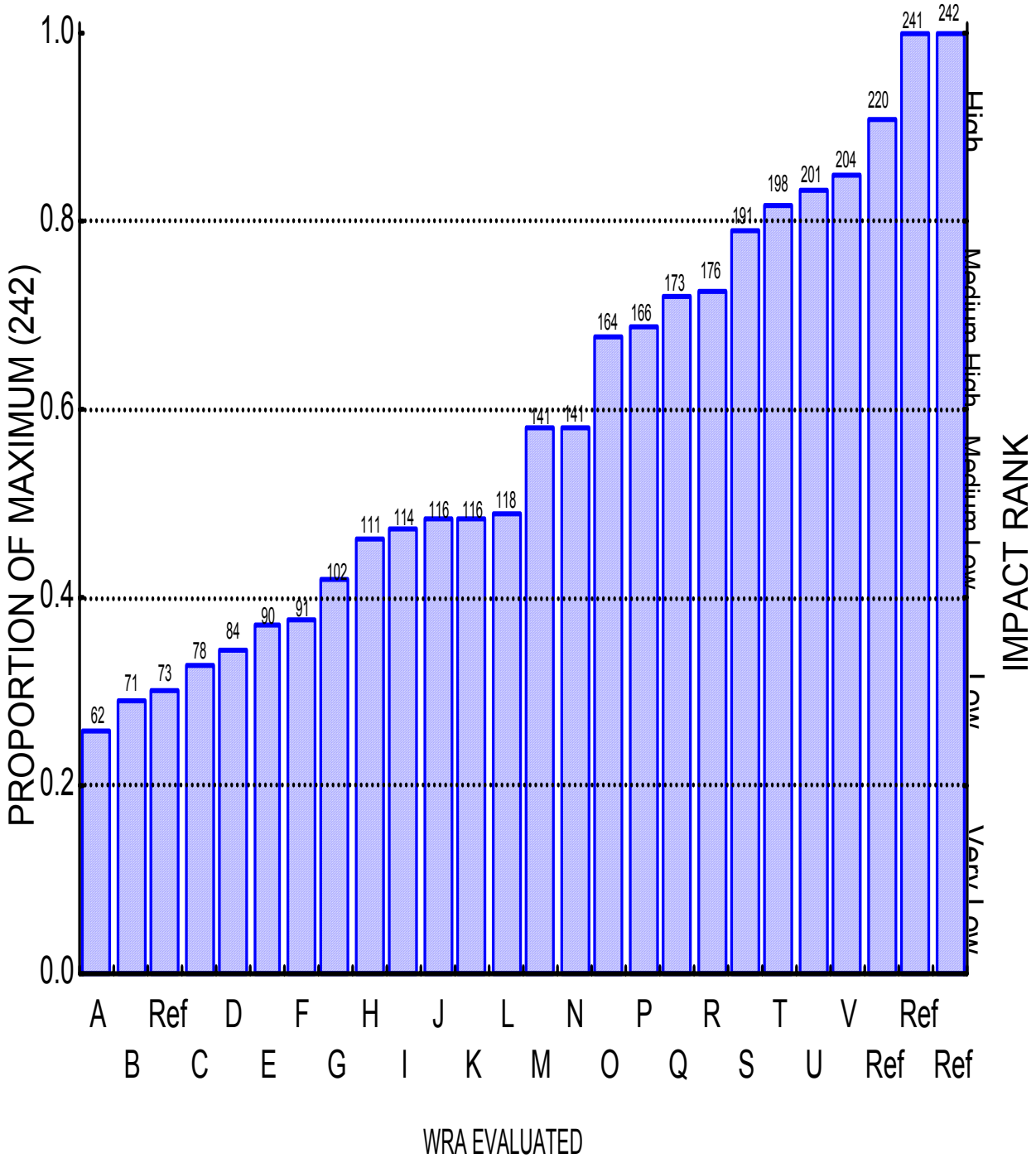


Figure 2. Impact ranks of proposed Wind Resource Areas in Montana. The number above each bar is the PII score. Rank is a function of the proportional relationship of proposed development sites to the maximum score of 4 Reference Sites evaluated.

## Appendix 2

## DEFINITIONS RELATED TO WIND ENERGY DEVELOPMENT AND EVALUATION

**AGL**: height above ground level in feet.

**Breco Bird Scaring Buoy**: a device developed to disperse seabirds at oil spills, which emits some 30 different sounds (including alert calls) up to 130 dB, generally effective in scaring birds at distances up to 200 yards, but may deter birds to 0.5 mile radius. The floating device can be used daytime or night, in fog, wind or storms.

**Deterrent Devices**: specific equipment, devices, or techniques which are intended to be seen or heard to alert and deter birds from contacting turbine towers, rotors, guy wires, or related equipment. These include diverters installed on turbine or meteorological tower guy wires, dark (e.g., black) paint on single turbine blades or portions of a blade, or noise-making devices that alert (e.g., infrasound) or frighten (e.g., Breco Buoys) birds.

**Fish and Wildlife**: any member of the animal kingdom, including any bird (including any migratory, non-migratory, or endangered bird for which protection is afforded), mammal, fish, amphibian, reptile, mollusk, crustacean, arthropod, or other invertebrate. Unless otherwise indicated, the Fish and Wildlife Service is particularly concerned about the impacts of wind turbines on birds and bats.

**Flyway**: a concentrated, predictable flight path of migratory bird species (e.g., particularly water birds such as ducks, geese, large waders, and shorebirds, but also raptors, and sometimes songbirds) from their breeding ground to wintering area. Except along coast lines, the flyway concept may not generally apply to songbirds because they tend to migrate in broad fronts rather than down specific flyways. The term "corridors" has sometimes been used. These frontal movements of songbirds can change within and between seasons and years – as can, for example, movements of waterfowl – making specific designations more difficult. The concept applies both biologically and administratively. For administrative purposes, for example, there are four waterfowl flyways (Atlantic, Pacific, Central, and Pacific and three shorebird flyways (East, Central, and Pacific). "Daily flyways" may also exist between roosting, breeding, and feeding areas.

**Lek**: A traditional site used year after year by males of certain species of birds (in North America, Greater and Lesser Prairie-chickens, Sage and Sharp-tailed grouse, and Buff-breasted Sandpiper), within which the males display communally to compete for female mates. Dominant males secure the majority of all the matings. Pair bonds are not formed; females leave to nest and raise the young, and males do not take part in parental care.

**Passerines**: a scientific term for the order of songbirds, many of which winter in tropical areas.

**Precautionary Approach**: a conservative, scientific approach to conserving and managing habitats and species. Absent definitive data, the approach suggests taking the best steps available to initiate appropriate conservation actions. Those actions should then be refined through the use of principles of adaptive management and sound science. The absence of complete or definitive scientific information should not be used as a reason for postponing or failing to take measures to conserve target species, associated or dependent species, or non-target species and their environments. Specifically, developers should apply a precautionary approach widely to conservation and management of birds, bats, other fauna, flora, and affected habitats. This will protect the resources and preserve Wind Resource Areas by taking account of the best scientific evidence available.

**Reference Site**: an area of high wildlife value which is used to evaluate the suitability of other areas for wind energy development. Reference sites are selected by biologists familiar with the wildlife in the geographic area and habitat types where wind energy development is contemplated, and evaluated using the Ranking Protocol in Appendix 1. The reference site having the highest score, i.e., the area where wind energy development would have the greatest negative impact on wildlife, is used as the standard against which potential wind energy development sites are ranked.

**Riparian Area**: The vegetation, habitats, or ecosystems that are associated with streams, rivers, or lakes, or are dependent upon the existence of perennial, intermittent, or ephemeral surface or subsurface water drainage. Relative to other habitats, riparian habitats have a disproportionately high wildlife value in the drier western states due to the

presence of surface water and/or lush vegetation that is typically surrounded by harsher, arid or semi-arid environments.

**Rookery**: the breeding place of a colony of gregarious birds (e.g., herons) or mammals (e.g., bats).

**Rotor-swept Area**: generally the vertical airspace within which the turbine blades (usually 3) rotate on a pivot point or drive train rotor. The Area will vary in location depending on the direction of the prevailing wind. While "slower" turbines may operate at speeds less than 30 revolutions per minute (RPMs), turbine speeds at the blade tips can still exceed 220 miles per hour in stiff winds. Recent studies indicate that birds appear unable to recognize blade presence at rotor tips during high blade speed, referred to as the "smear effect."

**Staging Area**: a traditional site where migratory birds of one or more species congregate in spring and fall for varying periods of time to forage and build up fat reserves prior to launching migratory flights. The term may be used on both the breeding and wintering grounds, as well as at intermediate stopover sites used at any point along the migration route.

**Turbine Position within a Row/String**: the specific position of a turbine within a string or row of turbines. It may be designated as an end-row, mid-row, or lone row turbine (one not located within a row).

**Wind Resource Area**: the geographic area or footprint within which wind turbines are located and operated, such as the Altamont Pass, California, WRA, or where location and operation of turbines are anticipated. The term may be used to describe an existing facility, or a general area in which development of a facility is proposed. Existing facilities are known variously as "wind farms," "wind parks," or "energy parks." WRAs are selected based primarily on the reliability and availability of sufficient wind. These areas are designated by the *United States Wind Resource Map*, published by the National Renewable Energy Laboratory, Department of Energy (http://rredc.nrel.gov). The *Map* delineates wind power classifications from "marginal" to "superb" based on a Weibull wind speed index.

## Appendix 3

## WILDLIFE LAWS RELEVANT TO WIND POWER DEVELOPMENT PROJECTS

**The Migratory Bird Treaty Act** (16 U.S.C. 703-712; MBTA), which is administered by the Fish and Wildlife Service (FWS), is the cornerstone of migratory bird conservation and protection in the United States. The MBTA implements four treaties that provide for international protection of migratory birds. It is a strict liability statute wherein proof of intent is not an element of a taking violation. Wording is clear in that most actions that result in a "taking" or possession (permanent or temporary) of a protected species can be a violation. Specifically, the MBTA states:

"Unless and except as permitted by regulations … it shall be unlawful at any time, by any means, or in any manner to pursue, hunt, take, capture, kill … possess, offer for sale, sell … purchase … ship, export, import … transport or cause to be transported … any migratory bird, any part, nest, or eggs of any such bird … (The Act) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior." The word "take" is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect."

A 1972 amendment to the MBTA resulted in inclusion of Bald Eagles and other birds of prey in the definition of a migratory bird. The MBTA provides criminal penalties for persons who, by any means or in any manner, pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export, any migratory bird (including Bald Eagles) as well as possessing Bald Eagles, their parts, nests, or eggs without a permit. A violation of the MBTA by an individual can result in a fine of up to $15,000, and/or imprisonment for up to 6 months, for a misdemeanor, and up to $250,000 and/or imprisonment for up to 2 years for a felony. Fines are doubled for organizations. Penalties increase greatly for offenses involving commercialization and/or the sale of migratory birds and/or their parts. Under authority of the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d; BGEPA), Bald and Golden Eagles are afforded additional legal protection. Penalties for violations of the BGEPA are up to $250,000 and/or 2 years imprisonment for a felony, with fines doubled for an organization.

While these Acts have no provision for allowing unauthorized take, the FWS realizes that some birds may be killed even if all reasonable measures to avoid the take are implemented. The FWS Office of Law Enforcement carries out its mission to protect migratory birds not only through investigations and enforcement, but also through fostering relationships with individuals, companies, and industries who seek to eliminate their impacts on migratory birds. Unless the activity is authorized, it is not possible to absolve individuals, companies, or agencies from liability even if they implement avian mortality avoidance or similar conservation measures. However, the Office of Law Enforcement focuses on those individuals, companies, or agencies that take migratory birds with disregard for their actions and the law, especially when conservation measures have been developed but are not properly implemented.

**The Endangered Species Act** (16 U.S.C. 1531-1544; ESA) was passed by Congress in 1973 in recognition that many of our Nation's native plants and animals were in danger of becoming extinct. The purposes of the Act are to protect these endangered and threatened species and to provide a means to conserve their ecosystems. To this end, Federal agencies are directed to utilize their authorities to conserve listed species, as well as "Candidate" species which may be listed in the near future, and make sure that their actions do not jeopardize the continued existence of these species. The law is administered by the Interior Department's FWS and the Commerce Department's National Marine Fisheries Service (NMFS). The FWS has primary responsibility for terrestrial and freshwater organisms, while the NMFS has responsibility for marine species such as whales and salmon. These two agencies work with other agencies to plan or modify Federal projects so that they will have minimal impact on listed species and their habitats. Protection of species is also achieved through partnerships with the States, with Federal financial assistance and a system of incentives available to encourage State participation. The FWS also works with private landowners, providing financial and technical assistance for management actions on their lands to benefit both listed and non-listed species.

Section 9 of the ESA makes it unlawful for a person to "take" a listed species. Take means ". . . to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." The Secretary

of the Interior, through regulations, defined the term "harm" as "an act which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering." However, permits for "incidental take" can be obtained from the FWS for take which would occur as a result of an otherwise legal activity, such as construction of wind turbines, and which would not jeopardize the species.

Section 10 of the ESA allows for the development of "Habitat Conservation Plans" for endangered species on private lands. This provision is designed to assist private landowners in incorporating conservation measures for listed species with their land and/or water development plans. Private landowners who develop and implement an approved habitat conservation plan can receive an incidental take permit that allows their development to go forward.

**The National Environmental Policy Act** of 1969 (42 U.S.C. 4371 et seq.; NEPA) requires that Federal agencies prepare an environmental impact statement (EIS) for Federal actions significantly affecting the quality of the human environment. "Federal Actions" are those actions in which a Federal agency is conducting the activity, providing funding for the activity, or licensing or permitting the activity. An EIS must describe the proposed action, present detailed analyses of the impacts of the proposed action and alternatives to that action, and include public involvement in the decision making process on how to proceed to accomplish the purpose of the action. The purpose of NEPA is to allow better environmental decisions to be made. The Council on Environmental Quality, established by NEPA, has promulgated regulations in 40 CFR 1500-1508 that include provisions for 1) preparing EISs and Environmental Assessments, 2) considering categorical exclusions from NEPA documentation requirements for certain agency actions, and 3) developing cooperating agency agreements between Federal agencies.

Other Federal agencies may be required by NEPA to review and comment on proposed activities as a cooperating agency with the action agency under Section 1501.6, or because of a duty to comment on federally-licensed activities for which the agency has jurisdiction by law (Section 1503.4). For the FWS, this would be the MBTA and BGEPA. Other agencies may also be called on for review and comment because of special expertise.

**The National Wildlife Refuge System Administration Act** (16 U.S.C. 668dd), as amended, serves as the "organic act" for the National Wildlife Refuge System. It consolidates the various categories of lands administered by the Secretary of the Interior (Secretary) through the FWS into a single National Wildlife Refuge System. The Act establishes a unifying mission for the Refuge System, a process for determining compatible uses of refuges, and a requirement for preparing comprehensive conservation plans. The Act states first and foremost that the mission of the National Wildlife Refuge System will be focused singularly on wildlife conservation.

The Act identifies six priority wildlife-dependent recreation uses; clarifies the Secretary's authority to accept donations of money for land acquisition; and places restrictions on the transfer, exchange, or other disposal of lands within the Refuge System. Most importantly, the Act reinforces and expands the "compatibility standard" of the Refuge Recreation Act, authorizing the Secretary, under such regulations as he may prescribe, to "permit the use of any area within the System for any purpose, including but not limited to hunting, fishing, public recreation and accommodations, and access whenever he determines that such uses are compatible with the major purposes for which such areas were established." This section applies to any proposed development of wind energy on Refuge System lands; such development must be compatible with the major purpose for which that Refuge was established.

**The National Historic Preservation Act** of 1966 (16 U.S.C. 470-470b, 470c-470n) approved October 15, 1966 and repeatedly amended, provides for preservation of significant historical features (buildings, objects, and sites) through a grant-in-aid program to the States. It established a National Register of Historic Places and a program of matching grants under the existing National Trust for Historic Preservation (16 U.S.C. 468-468d). The Act also requires Federal agencies to take into account the effects of their actions on items or sites listed or eligible for listing in the National Register. Thus, the Act functions similarly to NEPA, requiring a determination of the presence of any such items or sites, and an evaluation of the effects of proposed developments (such as wind energy facilities) on them, if the facility would be built, funded, licensed or permitted by a Federal agency. This includes State lands purchased or improved with Federal Aid in Wildlife Restoration funds.

## Appendix 4

## RESEARCH NEEDS ON THE IMPACTS OF WIND POWER DEVELOPMENT ON WILDLIFE

Representatives of the Fish and Wildlife Service's Wind Turbine Siting Working Group have suggested the following research needs:

- Effects of inclement weather in attracting birds and bats to lighted turbines, e.g., drawing birds and bats to within rotor-swept area of turbines, particularly for passerines during spring and fall migrations.

- Localized effects of turbines on wildlife: habitat fragmentation and loss; effects of noise on both aquatic and terrestrial wildlife; habituation.

- Effects of wind turbine string configuration on mortality, e.g., end of row turbine effect, turbines in dips or passes or draws, setbacks from rim/cliff edges.

- Effectiveness of deterrents: alternating colors on blades (particularly, effect of black/white and UV gel coats on the smear effect); lights (e.g., color, duration, and intensity of pilot warning lights; lasers); infrasound (Breco Buoys, other noisemakers such as predator and distress calls if not irritating to humans, other wildlife, or domestic animals); visual markers on guy wires.

- Utility of acoustic, infrared, and radar technologies to detect bird species presence, abundance, location height, and movement.

- Accuracy of mortality counts: estimate of the number of carcasses (especially of passerines) lost because they have been fragmented and lost to collision momentum and the wind; size and shape of dead bird search areas; possibility of recording collisions acoustically or with radar or infrared monitoring.

- Annual variability (temporal and spatial) in migratory pathways; what is the utility of Geographic Information System to assess migratory pathways and stopovers, particularly for passerines and bats.

- Effectiveness of seasonal wind turbine shutdowns at preventing mortalities, including the feasibility of using "self-erecting" turbines that are easily erected and dismantled without cranes, and taking them down during critical periods such as migrations.

- Impacts of larger turbines versus smaller models.

- Changes in predator-prey relationships due to placing potential perching sites in prairie habitats.

## Appendix 5

## PROCEDURES FOR ENDANGERED SPECIES EVALUATIONS AND CONSULTATIONS

The Endangered Species Act (ESA) directs all Federal agencies to participate in endangered species conservation. Specifically, section 7(a)(1) of the ESA charges Federal agencies to aid in the conservation of listed species. Section 7 (a)(2) requires Federal agencies to consult with the Fish and Wildlife Service (FWS) to ensure that actions that they fund, authorize, permit, or otherwise carry out will not jeopardize the continued existence of any listed species or adversely modify designated critical habitats. The FWS has developed a handbook describing the consultation process in detail. It is available on the FWS web site at http://endangered.fws.gov/consultations. Consultation may be informal or formal, depending upon the presence of listed species and the potential for the proposed project to affect them.

Before initiating an action, the Federal action agency (the agency authorizing a specific action) or its non-Federal permit applicant, must ask the FWS to provide a list of threatened, endangered, proposed, and candidate species and designated critical habitats that may be present in the project area. This initiates the informal consultation process. If the FWS answers that no species or critical habitats are present, then the Federal action agency or permit applicant has no further ESA obligation under section 7(a)(2), and consultation is concluded. If listed species or critical habitats are present, then the action agency or applicant must determine whether the project may affect those species (known as a *may affect* determination), and informal consultation continues. If the action agency or applicant determines, and the FWS agrees, that the project does not adversely affect any listed species, then the consultation is concluded and the decision is put in writing.

If the action agency or applicant determines that a project *may adversely affect* a listed species or designated critical habitat, the action agency/applicant prepares a *Biological Assessment* and requests formal consultation. There is a designated period of time in which to consult (90 days), and beyond that, another set period of time for the FWS to prepare a *biological opinion* (45 days). An analysis of whether or not the proposed action would be likely to jeopardize the species or adversely modify its critical habitat is determined in the biological opinion. If a *jeopardy* or *adverse modification* determination is made, the biological opinion must identify any reasonable and prudent alternatives that could allow the project to move forward.

The biological opinion will contain an "incidental take statement." "Take" is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting or attempting to engage in any such conduct. "Harm" is further defined to include significant habitat modification or degradation that results in death or injury to a listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. "Incidental take" is defined as take that is incidental to, and not the purpose of, an otherwise lawful activity. If the FWS issues a *jeopardy* opinion, the incidental take statement will simply state that no take is authorized. If the FWS issues a nonjeopardy opinion, the FWS will anticipate the take that may result from the proposed project and describe that take in the incidental take statement. The statement will contain clear terms and conditions designed to reduce the impact of the anticipated take to the species; these terms are non-discretionary on the action agency or applicant.

When non-Federal activities will result in take of threatened or endangered species, an *incidental take permit* is required under section 10 of the ESA. A habitat conservation plan or "HCP" must accompany an application for an incidental take permit. The habitat conservation plan associated with the permit is to ensure that there are adequate conservation measures to avoid jeopardy to the species.

Examples:

1. **No Effect** – The appropriate conclusion when the action agency or applicant determines that its proposed action will not affect a listed species or designated critical habitat.

   Example: A permit applicant contacts the FWS to request information on listed species. The FWS provides a species list containing 3 plants, 1 fish, and 1 butterfly. The proposed project would be constructed at an upland site on clay soils. The 3 plants are found only on sandy soils. The butterfly's habitat is one of the plants on sandy soil. The nearest sandy soils are 10 miles from the proposed project. The fish is in a stream 5 miles from the proposed project. Conclusion: No effects from the project, either

direct or indirect. Justification: No construction is proposed in listed species habitat or in an area that may affect listed species. In addition, the project proponent has charted a route for heavy equipment moving onto the construction site that avoids listed species habitat.

2. **May Affect, but Not Likely to Adversely Affect** – The appropriate conclusion when effects on listed species are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not (a) be able to meaningfully measure, detect, or evaluate insignificant effects, or (b) expect discountable effects to occur.

   Example: The applicant contacts the FWS to request information on listed species. The FWS provides a species list containing 2 birds and 1 fish. The proposed project would be constructed at an upland site, 200 yards from the stream (fish habitat) and adjoining riparian vegetation (bird habitat). The migratory birds use the riparian vegetation to nest between April 15 and August 15. The uplands are highly erodible soils. The project proponent agrees not to construct during the nesting season. He flags the riparian vegetation to indicate an avoidance zone and installs silt fencing between the riparian vegetation and the construction site. He states that he will plant the disturbed soils surrounding the project with native vegetation after construction. He also agrees to monitor the vegetation planted for 3 years to assure that it establishes sufficiently to prevent any additional erosion in the project area caused by construction. Conclusion: Although the project proponent is working in very close proximity to listed species habitat, the action is not likely to adversely affect listed species. Justification: The proponent has incorporated sufficient avoidance and other mitigation measures into the project that any effects to listed species would be discountable. The project proponent prepares a Biological Assessment that includes a complete description of the project, all proposed avoidance and other mitigation measures, and the resulting effects of the project on the listed species. The Biological Assessment is sent to the FWS to request concurrence that the project is not likely to adversely affect listed species.

3. **May Affect, and Likely to Adversely Affect** – The appropriate finding in a Biological Assessment (or conclusion during informal consultation) if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. In the event the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects, then the proposed action "is likely to adversely affect" the listed species. If incidental take is anticipated to occur as a result of the proposed action, an "is likely to adversely affect" determination should be made. This determination requires the initiation of formal section 7 consultation.

   Example: The applicant contacts the FWS to request information on listed species. The FWS provides a species list containing 10 birds. The proposed project would be constructed at an upland site within a significant migratory bird corridor that is utilized by the 10 listed birds. Construction will permanently alter the character of the corridor and will likely cause take of listed birds every year during the migration periods. Conclusion: Formal consultation will be required. The project proponent prepares a Biological Assessment to submit to the action agency to accompany their request to initiate formal consultation. Justification: The project is likely to cause take of listed birds every year during their migration periods.

**Appendix 6**

**GUIDELINES FOR CONSIDERING WIND TURBINE SITING ON EASEMENT LANDS ADMINISTERED AS PART OF THE NATIONAL WILDLIFE REFUGE SYSTEM IN REGION 6**

Grassland easements are acquired to protect native and planted grasslands essential for grassland dependent migratory birds and other wildlife. Healthy grasslands provide both nesting and migration habitat necessary to maintain these important populations. Wind energy could severely impact this important program if not developed carefully with as little impact to migratory birds and their habitat as possible.

The following guidelines are to be used when making compatibility determinations for the siting of wind turbines and associated facilities on lands encumbered by U.S. Fish and Wildlife Service (Service) grassland easements and USDA conservation easements administered by the Service in Region 6, particularly in North Dakota, South Dakota, and Montana. These guidelines are intended to provide guidance for considering compatibility determinations during the period while the Service and the wind power industry monitor potential impacts to migratory birds as a result of turbine construction, maintenance, and operation. The following guidelines will be incorporated into rights-of-way permits issued for the construction of turbines, access roads, and other associated activities necessary to make the turbines operational. The intention of these guidelines is to minimize impacts to migratory birds and protect the habitat covered by the easement. The guidelines pertain only to permits issued for the alteration or destruction of grassland habitat as a result of turbine and other associated construction on lands encumbered by Service easements.

Refuge Managers and Wetland District Managers shall use these guidelines for site-by-site consideration of compatibility determinations for individual right-of-way requests for wind turbines on easement lands. These guidelines may be incorporated as needed as right-of-way or permit stipulations.

These guidelines may be revised and modified as a result of the findings of research and monitoring conducted in the future. Wind turbine rights-of-way applications will be reviewed according to these guidelines in conjunction with the Service's compatibility policy and in accordance with 50 CFR 29.21 and the Service Realty Manual. Future right-of-way applications will be reviewed using the guidelines in effect at the time of application. The Service will not make changes to previously issued rights-of-way or easement permits issued under these guidelines.

1) The Service may permit up to one turbine per 160 acres on an individual easement tract. No more than one turbine may be allowed on an individual easement tract of less than 160 acres. Current biological information (Attachment 2) indicates that this density of turbines would not have any significant impact to grassland habitat and its value to migratory birds or other wildlife. This is the upper limit for the density of turbines on easements. However, consideration may be given to clump or consolidate towers within an easement tract(s) to minimize the disturbance to the remaining habitat, i.e., two turbines may be clumped on a tract of 320 acres. Information available at this time indicates that turbine densities at this level will not materially interfere with or detract from the purposes of the easement (Attachment 2). Wind power industry turbine spacing recommendations are 2,000 feet between wind turbines and 2,000 feet from an occupied building. This constraint may limit the ability to clump turbines.

2) Turbines shall not be constructed in wetlands, including lakes, ponds, marshes, sloughs, swales, swamps, or potholes. Similarly, turbine locations should avoid obvious "duck passes" between large (20 acres or greater), semi-permanent (type 4, or cattail/bulrush) wetlands or sloughs. In addition, known migratory bird corridors or flight paths and environmentally sensitive areas such as colonial bird nesting areas or upland game bird leks, should be avoided.

3) Siting recommendations made by the Service for turbines and access roads and turbine lighting recommendations shall be consistent with all general siting and mitigating measures for tower and transmission line construction (Director's September 14, 2000 memorandum, attachment 3, APLIC 1996, and APLIC 1994).

4) Priority should be given to siting turbines on tame, planted, or seeded grasslands in preference to unbroken native prairie when such options are available on a given easement tract.

5) Spoil material from the excavated turbine pad shall not be deposited in wetlands and must be stored or deposited off easement lands using established roads to transport the material off site.

6) Turbines shall be sited as close to existing roads or the edge of the grassland tract as practical. Disturbance of grassland to construct and maintain a wind turbine shall be done in such a manner as to minimize the destruction or alteration of the habitat. Use of existing roads as a means of accessing a turbine within protected habitats is strongly encouraged. Conservation measures shall be used to avoid the impacts of erosion and sedimentation in order to protect grasslands and wetlands during the construction of the access road. Buried transmission lines, electric lines, and other cables shall be co-located on the access road when practical. Turbine construction should be encouraged to occur outside the breeding season for migratory birds when practical.

7) Regardless of a Service permit the developer is responsible for adhering to all local, state, and federal regulations in siting turbine location and construction. In the event that location and construction criteria conflict between the various levels of government, the criteria providing the maximum protection to the habitat shall be the criteria used during turbine location and construction.

8) In the event that a turbine is no longer utilized for power generation and has been abandoned for that purpose, the turbine owner shall remove the turbine at his/her own expense from the easement tract. The turbine site and associated facilities shall be reclaimed by the turbine owner by planting these areas to a grass mixture consistent with the surrounding grassland or such mixture as is mutually agreed upon by the Service and the turbine owner.

9) The turbine owner must update bird strike avoidance equipment on turbines and implement techniques that reduce the disturbance to nesting birds at turbine sites as future research and evaluation by the Service and the industry indicate.

These guidelines provide flexibility for the Service Refuge Manager in evaluating compatibility determinations and to negotiate with the energy company and the easement landowner to allow wind turbine development consistent with the purposes of the conservation easements. Where development is found to be compatible with easement purposes the guidelines will be used to negotiate siting, lighting, and other restrictions to grant rights-of-way and easement permits for wind turbines.

References:

Avian Power Line Interaction Committee (APLIC). 1994. Mitigating bird collisions with power lines: The state of the art in 1994.

Avian Power Line Interaction Committee (APLIC). 1996. Suggested practices for raptor protection on power lines: the state of the art in 1996.

Attachment 2

**Potential Effect of Wind Turbine Presence on Numbers of Breeding Grassland Birds and Nesting Ducks on Grassland Easement Properties in North and South Dakota.**

Ron Reynolds, Project Leader, Habitat And Population Evaluation Team, Bismarck, North Dakota.
Neal Niemuth, Biologist, Habitat And Population Evaluation Team, Bismarck, North Dakota

Recently, companies that develop wind-powered electricity generation have begun operations in areas of South Dakota and North Dakota where the U.S. Fish and Wildlife Service has purchased or intends to purchase conservation easements on grasslands. Questions have been raised within the FWS as to whether the placement of wind towers on easement tracts would violate terms of the easement contract, and whether the Service would consider purchasing easements on lands after towers are in place. Before allowing turbines on easement lands, the Service must address the issue of whether placement of wind turbines on grassland easements is compatible with the

goals and purpose of refuge lands as defined by the Refuge Improvement Act, which states that, "A Compatible use means . . . any other use of a National Wildlife Refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes(s) of the National Wildlife Refuge." If birds avoid the area surrounding wind turbines because of noise, disruption of habitat, or disturbance, the biological value of an easement may be compromised. At this time, we do not know if wind turbines are compatible with the purpose of grassland easements, because we do not know if turbines reduce the attractiveness of a site to birds or if turbines affect avian reproductive success. The issue is complicated partly because, if, the FWS restricts certain alternative uses on easements, this may reduce the willingness of landowners to offer to sell easements to the FWS in the future. For example, some landowners believe the potential income derived from wind generators will exceed the income from selling grass easements to the FWS or other conservation organizations. In this respect, the future success of the easement program could be compromised if these restrictions are unnecessary.

Little is known about bird avoidance of grasslands near wind turbines, as previous avian research at wind towers has focused primarily on bird strikes. In one study that did consider avoidance, density of grassland birds was reduced in the immediate vicinity of wind turbines at Buffalo Ridge, Minnesota, (Leddy et al. 1999), although at larger scales no differences were detected (Johnson et al. 2000). However, in the Buffalo Ridge study, wind turbines were placed primarily in Conservation Reserve Program fields with few wetlands and much higher densities of breeding birds than are typically found in native prairie where grassland easements are targeted in the Dakotas, and therefore results from Leddy et al. (1999) may not be applicable here. In the absence of specific data on the effect of wind turbines on birds in North and South Dakota, we used two approaches to assess the potential impact; 1) existing data (Igl and Johnson 1997, D. H. Johnson, unpublished data) was used to estimate the potential impact of wind turbine placement on grassland bird use in quarter-section (160 acre) parcels, and 2) a Mallard productivity model (Cowardin et al. 1988) was used to predict changes in nesting and recruitment rate of ducks on grassland areas with wind turbines in place.

**Grassland birds.** For the first assessment, abundance of grassland birds, standardized to 160 acres of grassland habitat, was estimated from data gathered on 128 quarter sections in North Dakota during summers of 1992 and 1993 (Igl and Johnson 1997, D. H. Johnson, unpublished data). We estimated the potential impact of wind turbines at two scales representing a five-acre and two-acre loss of habitat for each wind tower, with one wind tower per quarter section. We estimated the two-acre potential area of impact as approximately 4 times the area of road and tower pad (Appendix 1); the five-acre area of impact was estimated using the 80-m reported zone of reduced bird density surrounding towers at Buffalo Ridge (Leddy et al. 1999, Appendix 1). For purposes of our analysis, we assumed that no grassland birds would be present in the area immediately surrounding the tower, which is a worst-case scenario, because (Leddy et al. 1999) showed that birds are present immediately adjacent to turbines, but at reduced densities. Thus, our methods guaranteed we would predict a reduction in birds using easements, however, our intent was to put this change into perspective relative to bird use on the entire easement. Given the high variance associated with the grassland bird data we used, it would be impossible to detect a statistically significant decrease in grassland bird numbers, because the lower 95% confidence limit for population estimates was less than zero for each species (D. H. Johnson, unpublished data). Therefore, we estimated the impact of tower presence by calculating the density of each grassland bird species per 160-acre tract, and then calculating the mean reduction in the number of pairs if 2 acre and 5 acre areas of habitat were considered as unused (Table 1).

Expected reductions were estimated at approximately 1% and 3% of the number of individuals present for each species. As expected, greatest reductions in number of pairs occurred with common species such as the chestnut-collared longspur and horned lark; where, at the 5 acres level, a reduction of less than 1 pair per 160-acre tract would be expected. For all species combined, we estimated the expected maximum reduction would be about 2 pairs per 160 acre area, or about 3 percent of the total population. As mentioned previously, based on variation observed in the existing data set, these levels of change would not be statistically significant. Additionally, because we would expect some bird use of the area near the tower, the actual change would likely be less than the numbers presented in table 1.

Table 1. Mean number of breeding pairs of grassland birds found per 160 acres of grassland and expected reduction in pairs with loss of 5 acres and 2 acres of habitat. Data based on surveys of 128 160-acre parcels in North Dakota during summers of 1992 and 1993 (Igl and Johnson 1997, D. H. Johnson, unpublished data).

| | Mean Number (pairs) | | Mean Reduction (pairs) | |
|---|---|---|---|---|
| Species | 1992 | 1993 | 5 acre | 2 acre |
| Baird's Sparrow | 1.424 | 2.464 | 0.06075 | 0.0243 |
| Bobolink | 0.336 | 0.784 | 0.0175 | 0.007 |

| | | | | |
|---|---|---|---|---|
| Brewer's Sparrow | 0 | 0 | 0 | 0 |
| Brown-headed Cowbird | 2.88 | 3.632 | 0.10175 | 0.0407 |
| Chestnut-collared Longspur | 15.584 | 19.696 | 0.55125 | 0.2205 |
| Clay-colored Sparrow | 2.08 | 1.92 | 0.0625 | 0.025 |
| Common Yellowthroat | 0.144 | 0.112 | 0.004 | 0.0016 |
| Dickcissel | 0.304 | 0.32 | 0.00975 | 0.0039 |
| Ferruginous Hawk | 0.032 | 0.24 | 0.00425 | 0.0017 |
| Field Sparrow | 0.24 | 0 | 0.00375 | 0.0015 |
| Grasshopper Sparrow | 6.368 | 8.928 | 0.239 | 0.0956 |
| Gray Catbird | 0 | 0 | 0 | 0 |
| Gray Partridge | 0.16 | 0.128 | 0.0045 | 0.0018 |
| Horned Lark | 6.88 | 12.544 | 0.3035 | 0.1214 |
| Killdeer | 0.544 | 0.848 | 0.02175 | 0.0087 |
| Lark Bunting | 8.416 | 4.16 | 0.1965 | 0.0786 |
| Lark Sparrow | 0.448 | 0.128 | 0.009 | 0.0036 |
| Le Conte's Sparrow | 0 | 0.192 | 0.003 | 0.0012 |
| Northern Harrier | 0.304 | 0.512 | 0.01275 | 0.0051 |
| Red-winged Blackbird | 1.616 | 1.248 | 0.04475 | 0.0179 |
| Ring-necked Pheasant | 0.16 | 0.368 | 0.00825 | 0.0033 |
| Savannah Sparrow | 1.184 | 2.144 | 0.052 | 0.0208 |
| Sedge Wren | 0.16 | 0 | 0.0025 | 0.001 |
| Sharp-tailed Grouse | 0.432 | 0.464 | 0.014 | 0.0056 |
| Sharp-tailed Sparrow | 0.032 | 0 | 0.0005 | 0.0002 |
| Short-eared Owl | 0.032 | 0.032 | 0.001 | 0.0004 |
| Sprague's Pipit | 0.256 | 0.576 | 0.013 | 0.0052 |
| Swainson's Hawk | 0.032 | 0.16 | 0.003 | 0.0012 |
| Upland Sandpiper | 1.52 | 1.552 | 0.048 | 0.0192 |
| Vesper Sparrow | 1.312 | 0.976 | 0.03575 | 0.0143 |
| Western Meadowlark | 7.088 | 11.184 | 0.2855 | 0.1142 |
| **SUM** | **59.97** | **75.31** | **2.11** | **0.85** |

**Ducks.** To assess the impact of wind turbines on ducks, we used the Mallard Productivity Model (Cowardin et al. 1988). The Mallard Model is particularly useful for this exercise because it allowed us to predict any "net" change in nest site selection and recruitment that might occur as a result of simulating the reduction of grasslands available to nesting hens due to the placement of wind turbines. For example, if grassland availability is reduced as a result of disturbance, displaced hens may select other habitat types (e.g., cropland, hayland etc.) in the area for nesting, or they may elect to nest elsewhere in the grasslands protected by easement. If other habitats are selected, this could result in reduced recruitment because, most other habitats are characterized by lower nest success compared to grass habitats. However, if these hens select nest sites in the remaining grasslands outside the influence of the wind turbines, nest success will not change materially and recruitment rate will be the same with-or-without turbines. For this exercise, we selected six study areas from Four Square Mile plots used for breeding population and production surveys (Cowardin et al. 1995) in the Kulm Wetland Management District in North Dakota. Plots were selected that had ≥160 acres of grassland in one unit, and were accessible to ≥60 breeding duck pairs (≥12 mallard pairs) based on the "thunderstorm map" (HAPET 2000) for North Dakota. These criteria are consistent with those used by FWS Realty Office, Bismarck, ND for focusing grassland easements, and the Kulm WMD is representative of areas where the grassland easement program is being targeted. For the purpose of our assessment, all grasslands on study plots selected were treated as protected by easement. This was done to obtain sample acreage similar to easement acreage being purchased. We ran the model on plots with-and-without wind turbines in place and compared the response by mallard hens. The area of influence for turbines was set at 5 acres and was converted to barren habitat which simulated eliminating all nesting activity in that area. To reduce variability, and thus increase the precision of our estimates we conducted eight model runs (1000 hens each) and then scaled the average results to the estimated mallard population on each study plot.

Neither nests initiated or recruitment rates differed significantly between treatment and control model runs (Table 2). The variation shown in nests initiated and recruitment rate between treatment and control runs is due to variation inherent in the biological system being examined. The model predicts that hens displaced by the presence of wind turbines will select nesting sites in the remaining available grass habitat and that recruitment rates will not be influenced.

**Summary.** Using data collected in North Dakota and South Dakota for grassland birds and ducks, we were able to estimate the magnitude of change that would likely be observed if similar data were collected on grassland easement properties. For some species of grassland birds that have restricted distributions the changes predicted could be underestimated on some sites, but it is unlikely these would be of a different order of magnitude. For ducks, the changes predicted account for differences in geographic distribution. Based on our assessment, the expected impact of wind turbines on grassland nesting species would be negligible with the density of one turbine per 160 acre area.

Table 2. Mallard nests initiated and recruitment rate estimates on six study plots with-and-without wind turbines, based on Mallard Model predictions. ( ) standard errors.

| | | | Without Wind Turbines | | | With Wind Turbines | | | |
|---|---|---|---|---|---|---|---|---|---|
| Study plot | Pop. Estimate | Grass Acres | Init. Nests | Recr. Rate | SE | No. Turbines | Init.Nests | Recr. Rate | SE |
| 153 | 55 | 761 | 21 | 0.67 | (.0115) | 2 | 21 | 0.64 | (.0090) |
| 178 | 60 | 205 | 14 | 0.53 | (.0094) | 1 | 13 | 0.52 | (.0064) |
| 329 | 45 | 1496 | 59 | 0.57 | (.0055) | 3 | 59 | 0.59 | (.0124) |
| 330 | 35 | 1810 | 51 | 0.55 | (.0163) | 8 | 52 | 0.55 | (.0118) |
| 331 | 26 | 1310 | 18 | 0.62 | (.0104) | 2 | 18 | 0.59 | (.0120) |
| 332 | 70 | 1312 | 58 | 0.58 | (.0166 | 2 | 60 | 0.58 | (.0072) |

LITERATURE CITED

Cowardin, L. M., D. H. Johnson, T. L. Shaffer, and D. L. Sparling. 1988. Applications of a simulation model to decisions in mallard management. U. S. Fish and Wildlife Service Technical Report 17.

Cowardin, L. M., T. L. Shaffer, and P.M. Arnold. 1995. Evaluation of Duck habitat and estimation of duck population sizes with a remote-sensing-based system. Biological Science Report 2.

Igl, L. D., and D. H. Johnson. 1997. Changes in breeding bird populations in North Dakota: 1967 to 1992-1993. Auk 114:74-92.

Johnson, G. D., W. P. Erickson, M. D. Strickland, M. F. Shepherd, and D. A. Shepherd. 2000. Avian monitoring studies at the Buffalo Ridge, Minnesota Wind Resource Area: results of a 4-year study. Western Ecosystems Technology, Inc. Cheyenne, Wyoming. 262pp.

Leddy, K. L., K. F. Higgins, and D. E. Naugle. 1999. Effects of wind turbines on upland nesting birds in Conservation Reserve Program grasslands. Wilson Bulletin 111:100-104.

APPENDIX 1. Calculations of potential area of impact for wind towers on grassland easements in North Dakota and South Dakota.

**Two-acre impact**:

| | | |
|---|---|---|
| 40 foot by 40 foot pad for tower | | 1,600 $ft^2$ |
| 16.5 foot by 1320 foot access road | | 21,780 $ft^2$ |
| | total | 23,380 |

Physical disruption of site is approximately 0.54 acre; we multiplied this by four to estimate a zone of potential impact.

**Five-acre impact**:
80-m zone of reduced density surrounding tower
80 m * 80 m * 3.14 2.0 ha
˜ 2.5 acres per ha 5.0 acres

Attachment 3

Memorandum

To: Regional Directors, Regions 1-7

From: Director

Subject: Service Guidance on the Siting, Construction, Operation and Decommissioning of Communications Towers

Construction of communications towers (including radio, television, cellular, and microwave) in the United States has been growing at an exponential rate, increasing at an estimated 6 percent to 8 percent annually. According to the Federal Communication Commission=s *2000 Antenna Structure Registry*, the number of lighted towers greater than 199 feet above ground level currently number over 45,000 and the total number of towers over 74,000. By 2003, all television stations must be digital, adding potentially 1,000 new towers exceeding 1,000 feet AGL.

The construction of new towers creates a potentially significant impact on migratory birds, especially some 350 species of night-migrating birds. Communications towers are estimated to kill 4-5 million birds per year, which violates the spirit and the intent of the Migratory Bird Treaty Act and the Code of Federal Regulations at Part 50 designed to implement the MBTA. Some of the species affected are also protected under the Endangered Species Act and Bald and Golden Eagle Act.

Service personnel may become involved in the review of proposed tower sitings and/or in the evaluation of tower impacts on migratory birds through National Environmental Policy Act review; specifically, sections 1501.6, opportunity to be a cooperating agency, and 1503.4, duty to comment on federally-licensed activities for agencies with jurisdiction by law, in this case the MBTA, or because of special expertise. Also, the National Wildlife Refuge System Improvement Act requires that any activity on Refuge lands be determined as compatible with the Refuge system mission and the Refuge purpose(s). In addition, the Service is required by the ESA to assist other Federal agencies in ensuring that any action they authorize, implement, or fund will not jeopardize the continued existence of any federally endangered or threatened species.

A Communication Tower Working Group composed of government agencies, industry, academic researchers and NGO=s has been formed to develop and implement a research protocol to determine the best ways to construct and operate towers to prevent bird strikes. Until the research study is completed, or until research efforts uncover significant new mitigation measures, all Service personnel involved in the review of proposed tower sitings and/or the evaluation of the impacts of towers on migratory birds should use the attached interim guidelines when making recommendations to all companies, license applicants, or licensees proposing new tower sitings. These guidelines were developed by Service personnel from research conducted in several eastern, midwestern, and southern States, and have been refined through Regional review. They are based on the best information available at this time, and are the most prudent and effective measures for avoiding bird strikes at towers. We believe that they will provide significant protection for migratory birds pending completion of the Working Group=s recommendations. As new information becomes available, the guidelines will be updated accordingly.

Implementation of these guidelines by the communications industry is voluntary, and our recommendations must be balanced with Federal Aviation Administration requirements and local community concerns where necessary. Field

offices have discretion in the use of these guidelines on a case by case basis, and may also have additional recommendations to add which are specific to their geographic area.

Also attached is a Tower Site Evaluation Form which may prove useful in evaluating proposed towers and in streamlining the evaluation process. Copies may be provided to consultants or tower companies who regularly submit requests for consultation, as well as to those who submit individual requests that do not contain sufficient information to allow adequate evaluation. This form is for discretionary use, and may be modified as necessary.

The Migratory Bird Treaty Act (16 U.S.C. 703-712) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior. While the Act has no provision for allowing an unauthorized take, it must be recognized that some birds may be killed at structures such as communications towers even if all reasonable measures to avoid it are implemented. The Service=s Division of Law Enforcement carries out its mission to protect migratory birds not only through investigations and enforcement, but also through fostering relationships with individuals and industries that proactively seek to eliminate their impacts on migratory birds. While it is not possible under the Act to absolve individuals or companies from liability if they follow these recommended guidelines, the Division of Law Enforcement and Department of Justice have used enforcement and prosecutorial discretion in the past regarding individuals or companies who have made good faith efforts to avoid the take of migratory birds.

Please ensure that all field personnel involved in review of FCC licensed communications tower proposals receive copies of this memorandum. Questions regarding this issue should be directed to Dr. Benjamin N. Tuggle, Chief, Division of Habitat Conservation, at (703)358-2161, or

Jon Andrew, Chief, Division of Migratory Bird Management, at (703)358-1714. These guidelines will be incorporated in a Director=s Order and placed in the Fish and Wildlife Service Manual at a future date.

Attachment

cc: 3012-MIB-FWS/Directorate Reading File
3012-MIB-FWS/CCU Files
3245-MIB-FWS/AFHC Reading Files
840-ARLSQ-FWS/AF Files
400-ARLSQ-FWS/DHC Files
400-ARLSQ-FWS/DHC/BFA Files
400-ARLSQ-FWS/DHC/BFA Staff
520-ARLSQ-FWS/LE Files
634-ARLSQ-FWS/MBMO Files (Jon Andrew)

FWS/DHC/BFA/RWillis:bg:08/09/00:(703)358-2183
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**Service Interim Guidelines For Recommendations On**
**Communications Tower Siting, Construction, Operation, and Decommissioning**

1. Any company/applicant/licensee proposing to construct a new communications tower should be strongly encouraged to collocate the communications equipment on an existing communication tower or other structure (e.g., billboard, water tower, or building mount). Depending on tower load factors, from 6 to 10 providers may collocate on an existing tower.

2. If collocation is not feasible and a new tower or towers are to be constructed, communications service providers should be strongly encouraged to construct towers no more than 199 feet above ground level, using construction techniques which do not require guy wires (e.g., use a lattice structure, monopole, etc.). Such towers should be unlighted if Federal Aviation Administration regulations permit.

3. If constructing multiple towers, providers should consider the cumulative impacts of all of those towers to migratory birds and threatened and endangered species as well as the impacts of each individual tower.

4. If at all possible, new towers should be sited within existing "antenna farms" (clusters of towers). Towers should not be sited in or near wetlands, other known bird concentration areas (e.g., State or Federal refuges, staging areas, rookeries), in known migratory or daily movement flyways, or in habitat of threatened or endangered species. Towers should not be sited in areas with a high incidence of fog, mist, and low ceilings.

5. If taller (>199 feet AGL) towers requiring lights for aviation safety must be constructed, the minimum amount of pilot warning and obstruction avoidance lighting required by the FAA should be used. Unless otherwise required by the FAA, only white (preferable) or red strobe lights should be used at night, and these should be the minimum number, minimum intensity, and minimum number of flashes per minute (longest duration between flashes) allowable by the FAA. The use of solid red or pulsating red warning lights at night should be avoided. Current research indicates that solid or pulsating (beacon) red lights attract night-migrating birds at a much higher rate than white strobe lights. Red strobe lights have not yet been studied.

6. Tower designs using guy wires for support which are proposed to be located in known raptor or waterbird concentration areas or daily movement routes, or in major diurnal migratory bird movement routes or stopover sites, should have daytime visual markers on the wires to prevent collisions by these diurnally moving species. (For guidance on markers, see *Avian Power Line Interaction Committee (APLIC). 1994. Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute, Washington, D.C., 78 pp*, and *Avian Power Line Interaction Committee (APLIC). 1996. Suggested Practices for Raptor Protection on Power Lines. Edison Electric Institute/Raptor Research Foundation, Washington, D.C., 128 pp.* Copies can be obtained via the Internet at http://www.eei.org/resources/pubcat/enviro/, or by calling 1-800/334-5453).

7. Towers and appendant facilities should be sited, designed and constructed so as to avoid or minimize habitat loss within and adjacent to the tower "footprint"@ However, a larger tower footprint is preferable to the use of guy wires in construction. Road access and fencing should be minimized to reduce or prevent habitat fragmentation and disturbance, and to reduce above ground obstacles to birds in flight.

8. If significant numbers of breeding, feeding, or roosting birds are known to habitually use the proposed tower construction area, relocation to an alternate site should be recommended. If this is not an option, seasonal restrictions on construction may be advisable in order to avoid disturbance during periods of high bird activity.

9. In order to reduce the number of towers needed in the future, providers should be encouraged to design new towers structurally and electrically to accommodate the applicant/licensee's antennas and comparable antennas for at least two additional users (minimum of three users for each tower structure), unless this design would require the addition of lights or guy wires to an otherwise unlighted and/or unguyed tower.

10. Security lighting for on-ground facilities and equipment should be down-shielded to keep light within the boundaries of the site.

11. If a tower is constructed or proposed for construction, Service personnel or researchers from the Communication Tower Working Group should be allowed access to the site to evaluate bird use, conduct dead-bird searches, to place net catchments below the towers but above the ground, and to place radar, Global Positioning

System, infrared, thermal imagery, and acoustical monitoring equipment as necessary to assess and verify bird movements and to gain information on the impacts of various tower sizes, configurations, and lighting systems.

12. Towers no longer in use or determined to be obsolete should be removed within 12 months of cessation of use.

In order to obtain information on the extent to which these guidelines are being implemented, and to identify any recurring problems with their implementation which may necessitate modifications, letters provided in response to requests for evaluation of proposed towers should contain the following request:

> "In order to obtain information on the usefulness of these guidelines in preventing bird strikes, and to identify any recurring problems with their implementation which may necessitate modifications, please advise us of the final location and specifications of the proposed tower, and which of the measures recommended for the protection of migratory birds were implemented. If any of the recommended measures can not be implemented, please explain why they were not feasible."

**Appendix 7**

**KNOWN AND SUSPECTED IMPACTS OF WIND TURBINES ON WILDLIFE**

While wind-generated electrical energy is renewable, emission-free, and generally environmentally clean (American Wind Energy Association [AWEA] unpubl. data, <http://www.awea.org>), it does have one significant downside -- rotor blades kill birds, especially raptors (Hunt 2002) and bats. Birds can strike the towers; electrocutions can occur if designs are poor; and wind farms may impact bird movements, breeding, and habitat use.

Wind turbine technology is not new to the United States. In the 1800s, Cape Cod supported over 1,000 working wind turbines (Ferdinand 2002). In the late 1930s, Vermont boasted the world's then-largest turbine, which was likely disabled by high winds due to design flaws. But wind turbine 'farms' and their impacts to birds are a recent phenomenon compared to power lines and communication towers, where mortality has been documented for decades or longer (Boeker and Nickerson 1975, Olendorff et al. 1981, APLIC 1994, APLIC 1996, Harness 1997, Ainley et al. 2001, Manville 2001). The problem in the U.S. surfaced in the late 1980s and early 1990s at the Altamont Pass Wind Resource Area, a facility then containing some 6,500 turbines on 73 $mi^2$ of gently rolling hills just east of San Francisco Bay, California (Davis 1995). Orloff and Flannery (1992) estimated that several hundred raptors were killed each year due to turbine collisions, guy wire strikes, and electrocutions. The most common fatalities were those of Red-tailed Hawks (*Buteo jamaicensis*), American Kestrels (*Falco sparvarius*) and Golden Eagles (*Aquila chrysaetos*), with fewer mortalities of Turkey Vultures (*Cathartes aura*), Common Ravens (*Corvus corax*), and Barn Owls (*Tyto alba*). The impacts of this wind farm were of most concern to the population of Golden Eagles, which was showing a "disturbing source of mortality" to a disproportionately large segment of the population (Southern Niagara Escarpment [WI] Wind Resource Area unpubl. report). More recent studies indicate that a model previously used to assess Golden Eagle mortality was defective, and that nonbreeding Golden Eagles representing a "floater" population were likely suffering less mortality based on a new model (Hunt 2002). Research continues at this time to further assess the impacts of Altamont turbines on raptors. The Altamont turbines are still estimated to kill 40-60 subadult and adult Golden Eagles each year, as well as several hundred Red-tailed Hawks and American Kestrels – a continuing concern for the FWS. Of the variety of wind turbines at the site, the smaller, faster moving, Kenetech-built, lattice-supported turbines caused most of the mortality. As part of a re-powering effort, these turbines are now being replaced with slower moving, tubular-supported turbines. While Europeans have used tubular towers almost exclusively, the U.S. has almost solely used lattice support, at least until recently (Berg 1996).

Colson (1995) indicated that some 16,000 wind turbines operated in California, making the State the largest concentration of wind energy development in the world. Since 1995, that statistic has changed. While California still boasts the greatest number of turbines in the U.S., many smaller turbines are being replaced by fewer but larger models. Worldwide, an estimated 50,000 turbines are generating power (AWEA unpubl. data; Ferdinand 2002), of which over 15,000 are currently in 29 states in the U.S. Turbine numbers are often difficult to track since statistics are generally presented in megawatts (MW) of electricity produced rather than number of turbines present. The latter statistic is of greater concern to ornithologists. In 1998, for example, Germany was the greatest producer with 2,874 MW of electricity produced by turbines, followed by the U.S. (1,884), and Denmark (1,450); (AWEA unpubl. data). While some project that the number of wind turbines in the U.S. may increase by another 16,000 in the next 10 years, current trends indicate an even greater potential growth. Although the U.S. presently produces less than 1% of its electrical energy from turbines – compared, for example, to Norway's 15% – 2001 was a banner year for U.S. turbine technology, doubling the previous record for installed wind production. Companies installed 1,898 turbines in 26 states, which will produce nearly 1,700 MW, at a cost of $1.7 billion for the new equipment (J. Cadogan, U.S. Department of Energy, 2002, pers. comm.). Over the past decade, wind power has been the fastest growing energy industry in the world. By 2020, the AWEA (unpubl. data) predicts that wind will provide 6% of this nation's electricity, serving as many as 25 million households. Enron Wind Corporation constructed some 1,500 of the 1,898 turbines installed in the U.S. in 2001. Although Enron is now bankrupt, General Electric purchased the company and is now producing wind turbines.

In March 2002, President Bush signed the Job Creation and Worker Assistance Act, extending the production tax credit to the wind industry for another two years. There are presently attempts in Congress to amend the reauthorization of this legislation for five or more years. However, even with a bright future for growth, and with low speed tubular-constructed wind turbine technology now being stressed, larger and slower moving turbines still kill raptors, passerines, waterbirds, other avian species, and bats. Low wind speed turbine technology requires much larger rotors, blade tips often extending more than 420 ft. above ground, and blade tips can reach speeds in excess of 200 mph under windy conditions (J. Cadogan, U.S. Department of Energy, 2002, pers. comm.). When birds

approach spinning turbine blades, "motion smear" – the inability of the bird's retina to process high speed motion stimulation – occurs primarily at the tips of the blades, making the blades deceptively transparent at high velocities. This increases the likelihood that a bird will fly through this arc, be struck by a blade, and be killed (Hodos et al. 2001).

What cumulative impact these larger turbines will have on birds and bats has yet to be determined. Johnson et al. 2002b raised some concerns about the impacts of newer, larger turbines on birds. Their data indicated that higher levels of mortality might be associated with the newer and larger turbines, and they indicated that wind power-related avian mortality would likely contribute to the cumulative impacts on birds. Since little research has been conducted on the impacts of large land-sited and offshore turbines on birds and bats, this newer technology is ripe for research.

Howell and Noone (1992) estimated U.S. avian mortality at 0.0 to 0.117 birds/turbine/yr., while in Europe, Winkelman (1992) estimated mortality at 0.1 to 37 birds/turbine/yr. Erickson et al. (2001) reassessed U.S. turbine impact, based on more than 15,000 turbines (some 11,500 in California), and estimated mortality in the range of 10,000 to 40,000 (mean = 33,000), with an average of 2.19 avian fatalities/turbine/yr. and 0.033 raptor fatalities/turbine/yr. This may be a considerable underestimate. As with other structural impacts, only a systematic turbine review will provide a more reliable estimate of mortality. While some have argued that turbine impacts are small (Berg 1996), especially when compared to those from communication towers and power lines, turbines can pose some unique problems, especially for birds of prey. Mortalities must be reduced, especially as turbine numbers increase. In addition to protections under the MBTA, Bald and Golden Eagles are afforded protections under the ESA for the former and the BGEPA for both raptors. As strict liability statutes, MBTA and BGEPA also provide no provisions for unauthorized "take." Wind farms can affect local populations of Golden Eagles and other raptors whose breeding and recruitment rates are naturally slow and whose populations tend to have smaller numbers of breeding adults (Davis 1995). Large raptors are also revered by Native Americans as well as by many others within the public. They are symbolic megafauna, and provide greater emotional appeal to many than do smaller avian species. Raptors also have a lower tolerance for additive mortality (Anderson et al. 1997). As with all other human-caused mortality, we have a responsibility to reverse mortality trends.

Until very recently, U.S. wind turbines have mostly been land-based. Perhaps following the European lead of siting wind turbines in estuarine and marine wetlands (van der Winden et al. 1999, van der Winden et al. 2000), and perhaps due to an assessment of a large number of potential offshore turbine locations in the U.S. (based on Weibull analyses of "good, excellent, outstanding, and superb" wind speed potentials [National Renewable Energy Laboratory 1987]), a new trend is evolving in North America. Several proposals for huge offshore sites are being submitted for locations on both Atlantic and Pacific coasts. These, at the very least, should require considerable research and monitoring to assess possible impacts to resident and migrating passerines, waterfowl, shorebirds, and seabirds. One site at Nantucket Shoals, offshore of Nantucket Island near Cape Cod, Massachusetts, is proposed by the Cape Wind Association to contain 170 turbines, many over 420 feet high, within a 25 $mi^2$ area (AWEA unpubl. data, Ferdinand 2002). What impacts this wind farm would have on wintering sea ducks and migrating terns, especially the Federally endangered Roseate Tern (*Sterna dougallii dougallii*), and on Northern Gannets (*Morus bassanus*), is unknown. The Long Island Power Authority is proposing a site offshore of Long Island, New York's south shore, covering as much as 314 $mi^2$. Other sites are being proposed for Portland, Maine, and Lake Erie. The largest proposed wind farm in North America is being planned for a 50 $mi^2$ area between Queen Charlotte Island, BC, and Alaska. It is being designed to contain 350 turbines, many exceeding 400 feet in height. The potential for significant offshore turbine impacts on waterbirds is great, virtually no research has been conducted in the United States to quell these concerns, and finding carcasses at sea is very challenging.

Europe presently has 10 offshore wind projects in operation, producing over 250 MW of electricity (British Wind Energy unpub. data, www.offshorewindfarms.co.uk). Many other projects are currently under review. To avoid citizen concerns regarding the "not in my backyard" complex, most European turbines are sited offshore or in estuaries, away from immediate human development (Larsen and Madsen 2000). While Europe is well ahead of the United States regarding turbine research, their study results are still generally inconclusive (T. Bowan, FWS, 2003 pers. comm.). Collision mortality, while generally unknown, is believed to be small because birds appear to avoid offshore wind farms. There are exceptions, including for Whooper Swans (*Cygnus Cygnus*; Larsen and Clausen 2002) that are susceptible to turbine strikes in the early mornings and evenings, especially in inclement weather. The collection of carcasses at offshore sites is more challenging than for land-based turbines since nets generally must be used to collect carcasses, tides and weather affect collection, and fog is a frequent problem. While habitat loss is not believed to be a serious concern, its impacts continue to be assessed. Disturbance may be problematic since some species such as Common Eiders avoid wind farms and may not return to a coastal area for several years (Guillemette and Larsen 2002). Disturbance may lead to displacement, and turbines may serve as barriers to

seaduck movements. Only a few studies have been conducted in Denmark, the Netherlands, and Sweden, so further research is needed. Studies deal mostly with wintering species (Noer et al. 2000, Percival 2001, Langstron and Pullan 2002, Christensen et al. 2002, and Bruns et al. 2002).

In an attempt to begin addressing the bird mortality issue – and ancillary to this, the issue of ESA-listed bat strikes – the National Wind Coordinating Committee was created in 1994 as part of President Clinton's Global Climate Change Action Plan (Colson 1995). Shortly following the creation of the Committee, the Avian Subcommittee (now called the Wildlife Work Group) was formed, co-founded by the Service. In 1999, the Avian Subcommittee published a *Metrics and Methods* document to study turbine impacts on birds (Anderson et al. 1999). The document provides an excellent resource for conducting research on proposed and existing turbines and wind farms.

**Appendix 8**

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Enclosure 2

FEDERAL THREATENED, ENDANGERED, AND CANDIDATE SPECIES
AND DESIGNATED CRITICAL HABITAT FOUND IN
WARD COUNTY, NORTH DAKOTA

## ENDANGERED SPECIES

Birds

Whooping crane (Grus Americana): Migrates through west and central counties during spring and fall. Prefers to roost on wetlands and stockdams with good visibility. Young adult summered in North Dakota in 1989, 1990, and 1993. Total population 140-150 birds.

Mammals

Gray wolf (Canis lupus): Occasional visitor in North Dakota. Most frequently observed in the Turtle Mountains area.

## THREATENED SPECIES

Birds

Piping plover (Charadrius melodus): Nests on midstream sandbars of the Missouri and Yellowstone Rivers and along shorelines of saline wetlands. More nest in North Dakota than any other state.

## CANDIDATE SPECIES

Invertebrates

Dakota skipper (Hesperia dacotae): Found in native prairie containing a high diversity of wildflowers and grasses. Habitat includes two prairie types: 1) low (wet) prairie dominated by bluestem grasses, wood lily, harebell, and smooth camas; 2) upland (dry) prairie on ridges and hillsides dominated by bluestem grasses, needlegrass, pale purple and upright coneflowers and blanketflower.

## DESIGNATED CRITICAL HABITAT

Birds

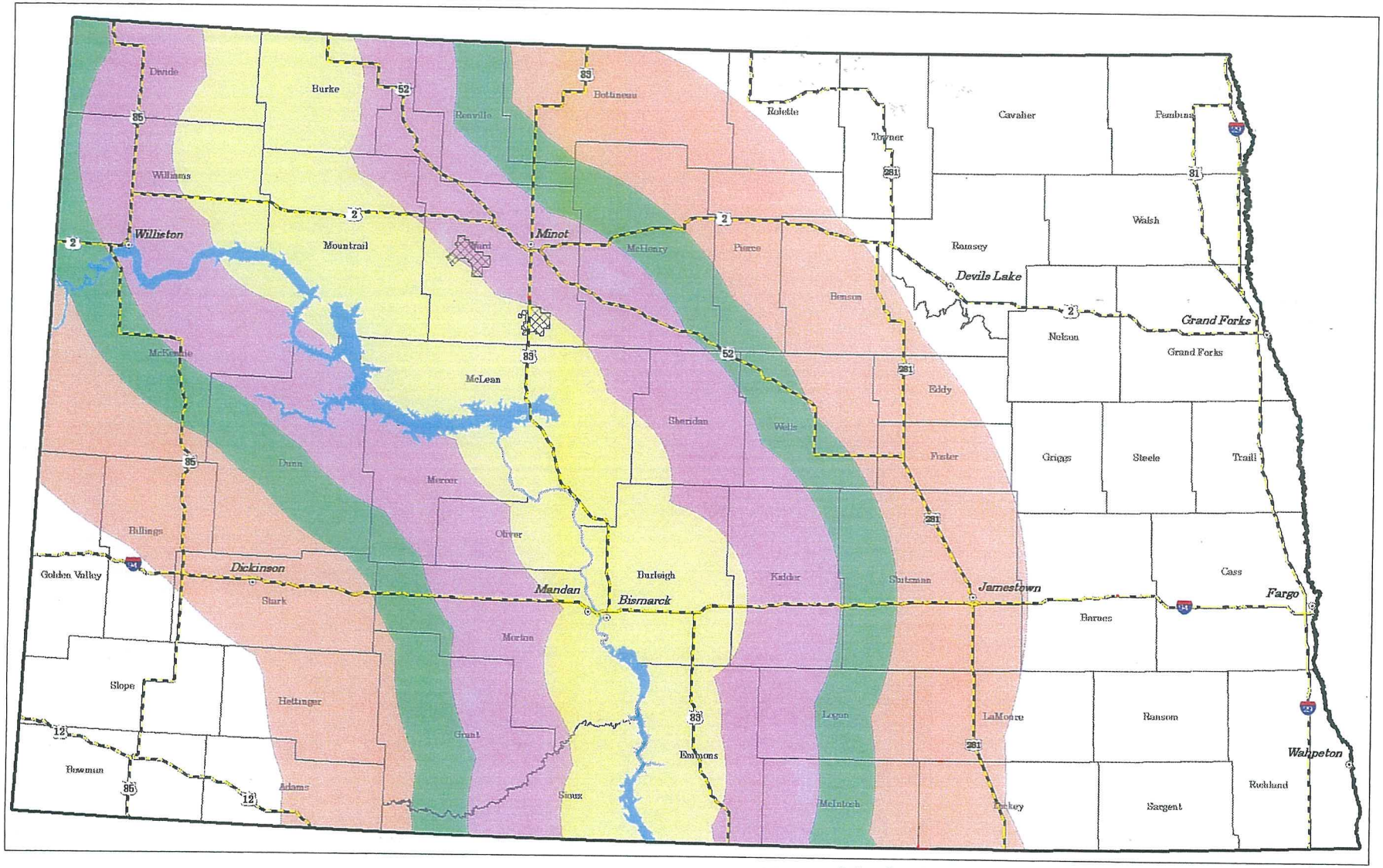
Piping Plover - Alkali Lakes and Wetlands - Critical habitat includes: (1) shallow, seasonally to permanently flooded, mixosaline to hypersaline wetlands with sandy to gravelly, sparsely vegetated beaches, salt-encrusted mud flats, and/or gravelly salt flats; (2) springs and fens along edges of alkali lakes and wetlands; and (3) adjacent uplands 200 feet (61 meters) above the high water mark of the alkali lake or wetland.

Enclosure 3

U.S. Fish & Wildlife Service

# Established and Proposed Wind Projects

North Dakota




PRODUCED BY ECOLOGICAL SERVICES
BISMARCK, NORTH DAKOTA
MAP DATE: 03/13/2008

0 12.5 25 50 Miles

0 12.5 25 50 Kilometers

## Map Features

- Wind Farm Project Area
  - Whooping Crane sightings through Spring 2007
- Major Roads
- County Boundaries
- Missouri/Yellowstone River System

Percent Whooping Crane Sightings
- Approx. 50% (40 mile corridor)
- Approx. 75% (90 mile corridor)
- Approx. 85% (120 mile corridor)
- Approx. 95% (180 mile corridor)

N

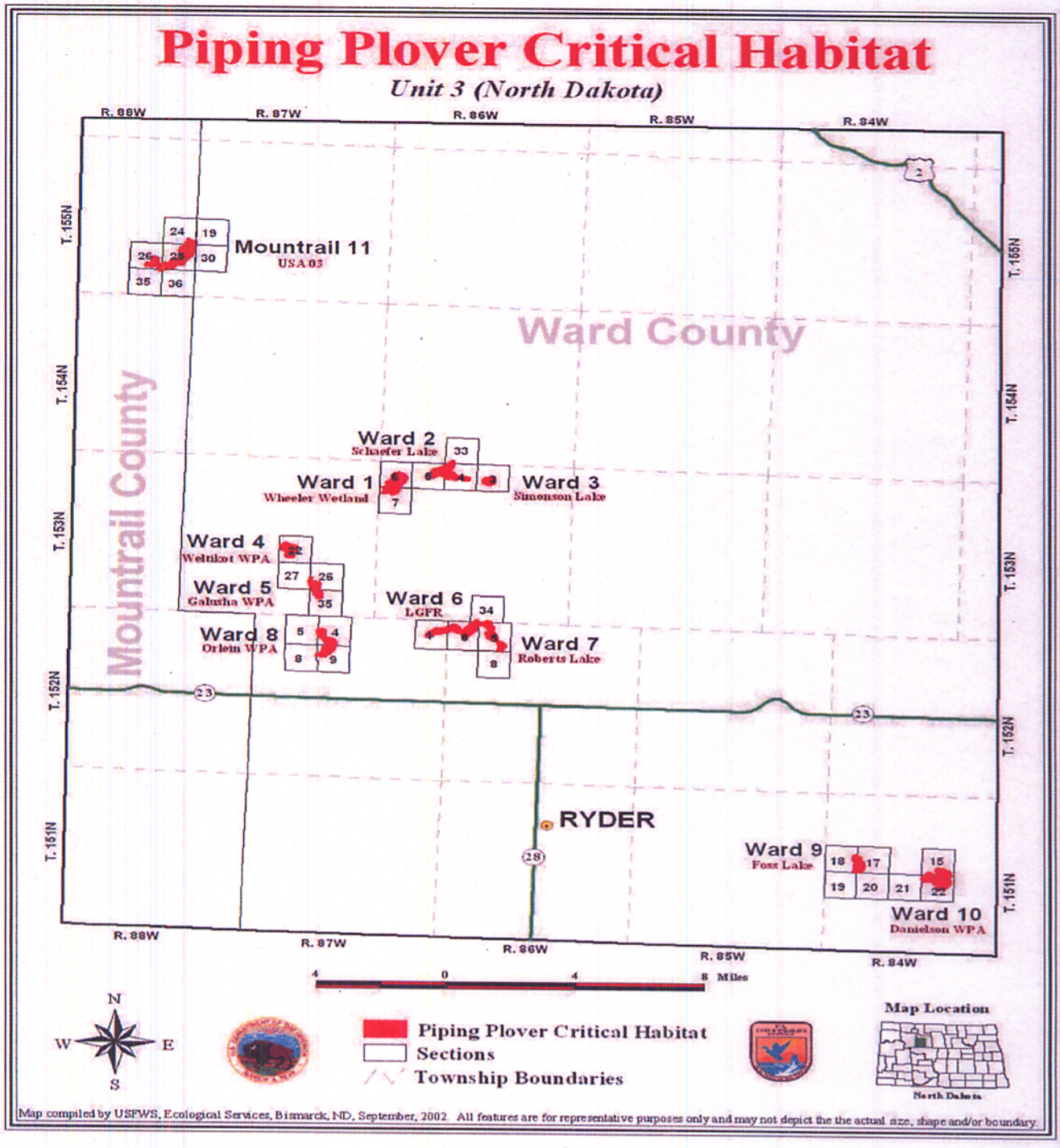
NAD 83
UTM ZONE 14

Enclosure 4

U.S. Fish & Wildlife Service

# Piping Plover Critical Habitat

## *Unit 3 (North Dakota)*

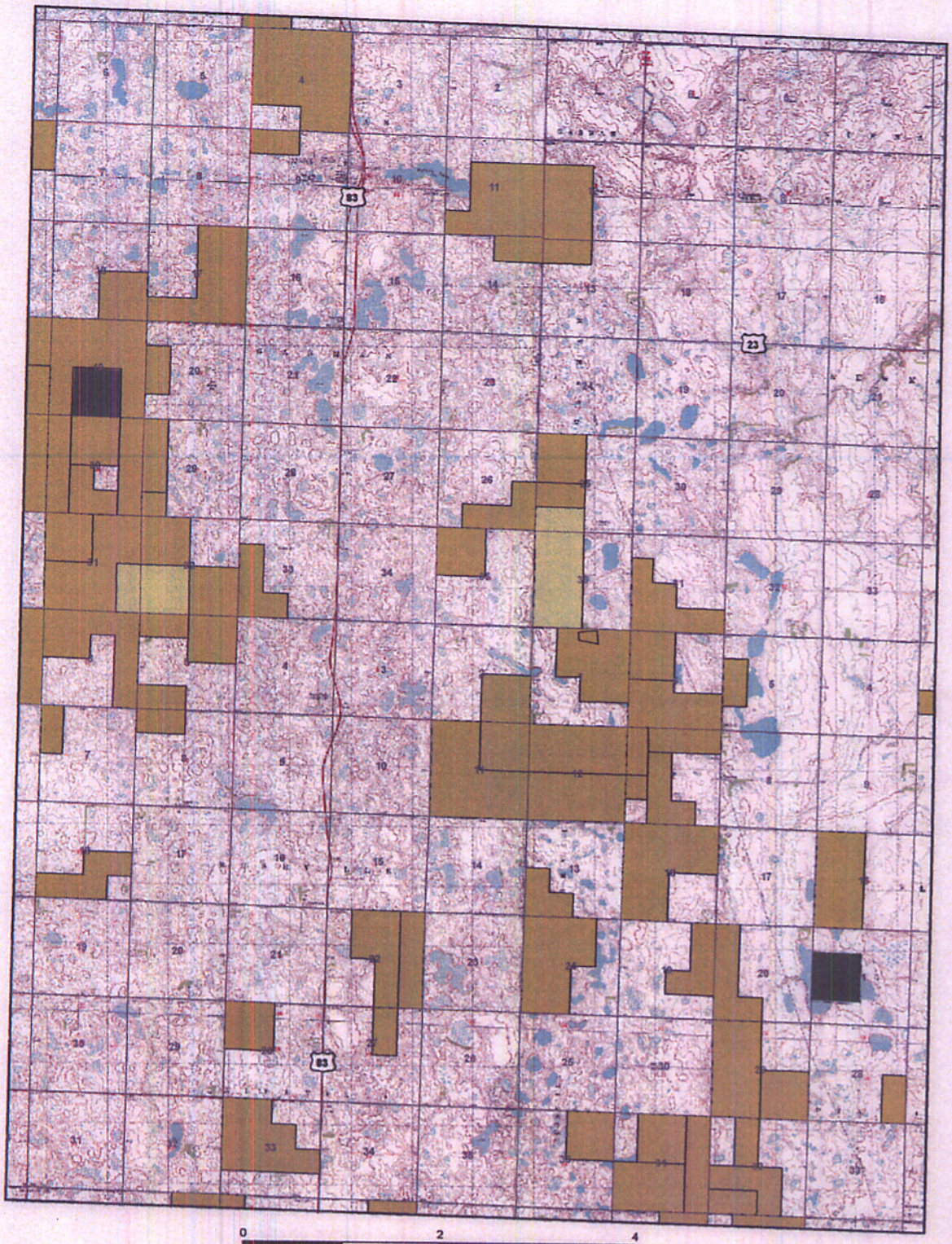



**Return to North Dakota Piping Plover Critical Habitat Page**

Enclosure 5

U. S. Fish & Wildlife Service

# Site A - Basin Electric, Ward County, North Dakota

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USFWS Refuge System Land Protection programs are continually purchasing easement and fee lands. Consequently, recent purchases may not be displayed and the date of map production does not necessarily reflect the current ness of the displayed data.

This map was produced by the HAPET Office, October, 2007.

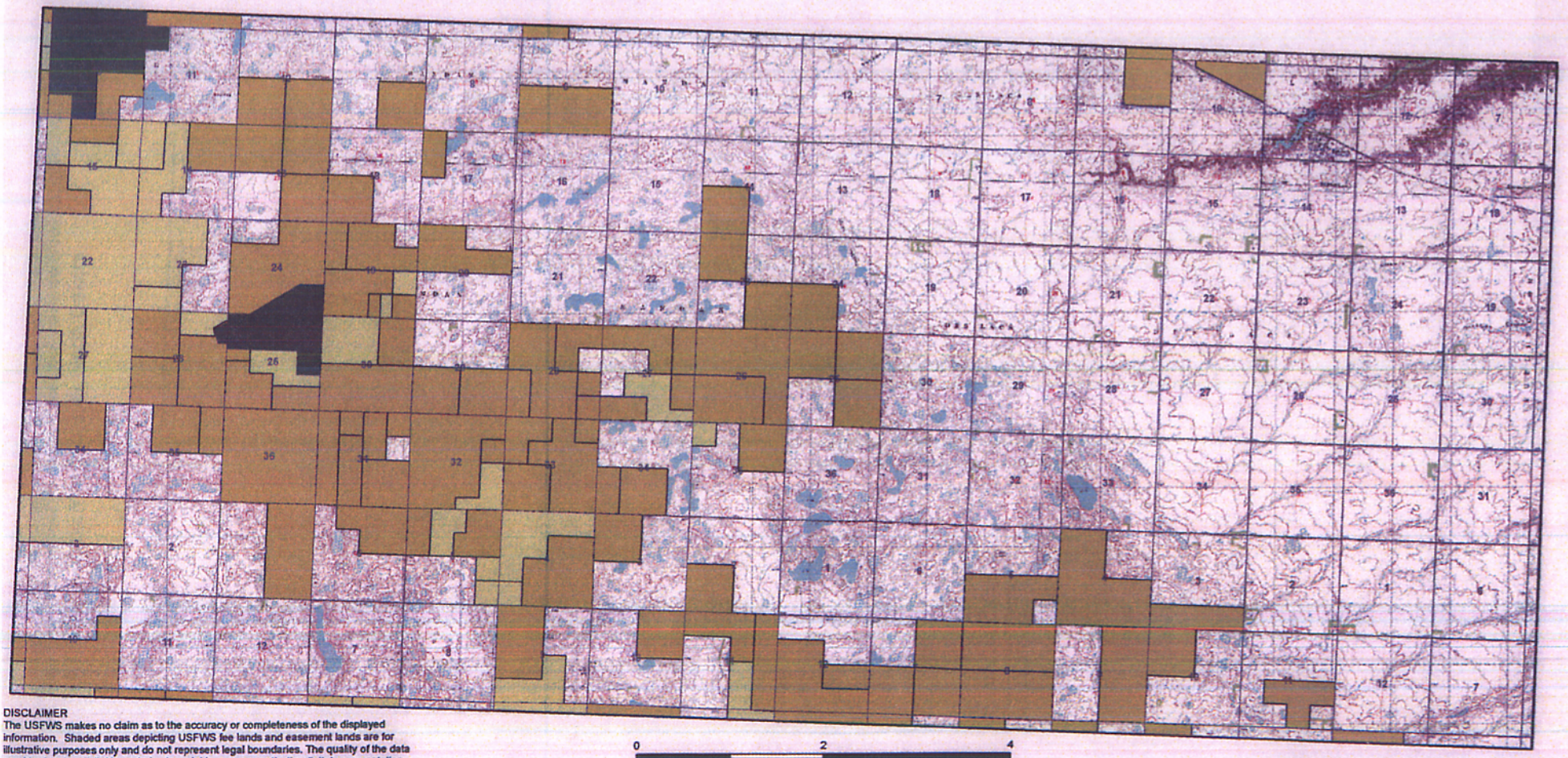
**Legend**

- Waterfowl Production Area
- Grassland Easement
- Wetland Easement

N

U. S. Fish & Wildlife Service

# Site B - Basin Electric, Ward County, North Dakota



0 2 4
Miles

**Legend**
- Waterfowl Production Area
- Grassland Easement
- Wetland Easement

N

**DISCLAIMER**
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