

**FATAL FLAW ANALYSIS  
PROPOSED GLACIER RIDGE WIND FARM  
BARNES COUNTY, NORTH DAKOTA**

**RENEWABLE ENERGY SYSTEMS AMERICAS, INC.**

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## CHAPTER 1 – BACKGROUND AND PROJECT DESCRIPTION

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### 1.1 Description of the Proposed Action

The proposed project would construct Glacier Ridge Wind Farm in Barnes County, North Dakota. The wind farm would convert wind energy into approximately 200 megawatts of electricity which would be transmitted to the regional power grid via a proposed transmission line. The study area lies directly north of Interstate 94, and directly west of North Dakota State Highway 32. ***Please refer to the Study Area Map located in Appendix A.***

The following report is not intended to be a comprehensive evaluation, but rather to identify potential barriers (fatal flaws) that may prohibit construction of the proposed wind farm. If the project study area is determined to be favorable for construction of a wind farm, this fatal flaw analysis will be used during the micrositing of turbines to avoid or minimize impacts to identified resources. Additional in depth field work, environmental review, and agency coordination should be completed if the developers decide to move forward with permitting and construction of the project.

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## CHAPTER 2 – SITE ANALYSIS

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### 2.1 Introduction

The purpose of this analysis is to identify potential issues within the proposed study area of the Glacier Ridge Wind Farm that could preclude development of the wind farm. Fatal flaw-type issues have been identified, along with other potential environmental concerns that should be avoided, minimized, or mitigated. The baseline criteria for the analysis were obtained from the *North Dakota Energy Conversion and Transmission Facility Siting Act*.

North Dakota Century Code Chapter 49-22, *Energy Conversion and Transmission Facility Siting Act*, requires that a Certificate of Site Compatibility be submitted to the North Dakota PSC (Public Service Commission) for energy conversion facilities capable of generating at least 100 megawatts of electricity.

The PSC regulations for energy conversion facilities exclusion areas include the following criteria:

- 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.
- Designated or registered state areas; parks; forests; forest management lands; historic sites; monuments; historical markers; archeological sites; grasslands; wild, scenic, or recreational rivers; game refuges; game management areas; management areas; and nature preserves.
- County parks and recreation areas; municipal parks; parks owned or administered by other governmental subdivisions; hardwood draws; and woodlands.
- Prime farmland & unique farmland (some exclusions apply).
- Irrigated land.
- Areas critical to the life stages of threatened & endangered animal or plant species.

- Areas where animal or plant species that are unique or rare to the state will be irreversibly damaged.

The PSC regulations for energy conversion facilities avoidance areas include the following criteria:

- Historical resources which are not designated as exclusion areas.
- Areas within the city limits of a city or the boundaries of a military installation.
- Areas within known floodplains as defined by the geographical boundaries of the hundred-year flood.
- Areas which are geologically unstable.
- Woodlands or wetlands.
- Areas of recreational significance which are not designated as exclusion areas.

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## CHAPTER 3 – FATAL FLAW ANALYSIS OF GLACIER RIDGE WIND FARM

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### 3.1 Public Services and Infrastructure

Data was gathered and analyzed to determine potential impacts to public services and infrastructure, including transportation right-of-way, known transmission lines, and telecommunication facilities. Several paved roadways are located in or adjacent to the study area, including: Interstate 94 along the southern study area border, North Dakota Highway 32 on the eastern study area border, and North Dakota Highway 26 crossing the study area in the northern half. Additional roadways include gravel surfaced county roadways and two-track trails used for agricultural purposes. There are two railroad tracks in the study area. One railroad track runs northwest/southeast diagonally through the very northern sections of the study area, and the other track runs east/west through the very southern sections. Additional transmission infrastructure includes several large overhead electrical lines and the Keystone Pipeline which crosses the southwestern parcels and parallels the western boundary of the study area.

Airports located within the general region of the proposed project include: Barnes County Municipal Airport, which is located approximately three miles east from the closest leased parcel; along with the Cooperstown and Page Airports, each located more than 15 miles from the closest leased parcel. In addition, two private runways were located within a few miles of leased parcels.

The Barnes County Municipal Airport is a general aviation facility that has clear zone distances of 5,000 feet from runway ends. If the facility was upgraded to a commercial facility, clear zone distances would be extended to 10,000 feet. Also, there are no radar facilities at this airport; therefore, the airport should not be a major concern in regards to the construction of the proposed wind farm. It is not anticipated that construction of the proposed wind farm would cause impacts to the Cooperstown and Page Airports or private runways. ***Please refer to the Public Services and Infrastructure Map located in Appendix A***

A search of microwave communications within a 40-mile radius of the study area revealed 151 microwave licenses owned by 35 companies. Microwave communications include both Microwave Broadcast Auxiliary and Fixed Microwave Services. It is anticipated that the majority of microwave communications identified would not be impacted by construction of the wind farm. Coordination

with the identified companies should take place prior to turbine micro-siting to identify specific interference the proposed wind farm may have on individual microwave communication systems. ***Please refer to the Microwave Beam Paths Map located in Appendix A.***

### **3.2 Cultural and Archeological Resources**

Preliminary coordination has taken place with the ND SHPO (North Dakota State Historic Preservation Officer) to identify cultural and archeological resources in the project area. Approximately 15 Class III Cultural Resource Inventories have been completed within the study area; however, much of the study has not been previously inventoried. An Arc-GIS shape file and associated table from the ND SHPO was analyzed to determine areas of known significant cultural material to help determine potential areas of avoidance. The data received from the ND SHPO identified known cultural resource sites, site leads, and previous cultural resource inventories with the study area. A Class III Cultural Resource Inventory will be needed prior to final micro-siting of turbines, access roads, and associated facilities to ensure construction will not impact cultural and archeological resources.

### **3.3 Recreational Resources**

Lake Ashtabula is located three miles east of the proposed study area at the closest point. Lake Ashtabula was created by the construction of Bald Hill Dam on the Sheyenne River approximately six miles north of Valley City. The lake is a popular recreational area during both the summer and winter months, and has several campgrounds and cabins surrounding the shoreline. Recreational activities associated with Lake Ashtabula include boating, fishing, bird watching, hunting, and numerous other uses. In addition, a vast amount of wetlands and larger water bodies are found throughout the study area. These areas may be used for hunting, bird watching, and potentially fishing purposes; however, they are not likely utilized for boating activities.

Coordination with the USFWS (United States Fish and Wildlife Service) revealed several waterfowl production areas within the study area. In addition, numerous USFWS easements are located throughout the study area. USFWS easements consist of easements on tracts of land to protect certain wetland basins on the property, and grassland easements which restrict grassland from being converted to cropland. While USFWS easements do not grant public access to the property, they do provide large amounts of habitat for wildlife species which naturally attracts outdoor enthusiasts to the surrounding area.

### **3.4 Hazardous Materials**

Coordination with the North Dakota Department of Health revealed no underground storage tanks or landfills within the study area. In addition, the North Dakota Department of Health records did not identify storage, disposal, or toxic releases of hazardous materials within the study area.

### **3.5 Land Use and Land-Based Economics**

The study area is located in a rural part of North Dakota used mostly for agricultural production. The majority of land use within the project study area is zoned agricultural. Cities close to the study area include Valley City (approximately one mile southwest), Pillsbury (approximately one mile east), Oriska (approximately three miles east), and Sibley (approximately four miles west). Valley City has a population of approximately 6,800, with the remaining towns consisting of less than 200 residents each. Residences are scattered throughout the study area with increased numbers being located on the outskirts of Valley City. ***Please refer to the Land Use Map located in Appendix A.***

### 3.6 Geologic and Groundwater Resources

Two aquifers are partially located within the study area. One aquifer, with a depth listed as greater than 500 feet, is located in the northern portion of the study area. The other aquifer is shallower, with a depth listed as 50 to 500 feet, and is located in the southern portion of the study area. The northern aquifer is approximately one mile wide and is aligned in a northwest/southeast direction. The southern aquifer is approximately one-half mile wide and also is aligned in a northwest/southeast direction.

The study area is located in a region of North Dakota known as the Coteau. The Coteau was formed by glaciers moving across the state that became stagnant, depositing rock debris, gravel, and fine grained sediments intermixed with large ice chunks. When buried ice chunks melted, wetlands were created. Due to these geologic sequences, the region in which the study area is located is commonly referred to as the prairie pothole region. The surface geology is considered part of the Coleharbor Formation which consists of glacial till formed during the Pleistocene Epoch. ***Please refer to the Geologic and Groundwater Resources Map located in Appendix A.***

### 3.7 Surface Water and Floodplain Resources

As described above, the study area occurs in the prairie pothole region of North Dakota. This region is dotted with wetland basins of various sizes and water regimes. In addition to the hundreds of small isolated wetlands, several larger open water basins occur in the study area with surface water acreages of over 100 acres. These small and larger water complexes may be used for hunting, bird watching, and potentially fishing purposes; however, they are likely not utilized for boating activities. A search revealed no flood rating maps compiled for the study area due to its rural location. ***Please refer to the Surface Water and Wetlands Map located in Appendix A.***

### 3.8 Wetlands

Numerous wetlands of various hydrology, soils, and vegetation exist within the study area. Many of the wetlands are isolated and would not fall under USACE (United States Army Corps of Engineers) jurisdiction. If wetlands are determined to be jurisdictional by the USACE, a 404 Permit would be needed prior to construction. In addition, numerous USFWS wetland easements exist in the study area, protecting certain wetland basins within each tract. Wind turbines may not be placed within the protected wetland basins; however, turbines are allowed to be placed on upland property outside the wetland boundaries. A field wetlands delineation should be completed prior to final micrositing of turbines, access roads, and associated facilities to determine impacts to wetland resources. A field wetlands delineation, in coordination with the USFWS, should also be completed on USFWS easement tracts to identify protected basins. ***Please refer to the Surface Water and Wetlands Map located in Appendix A.***

### 3.9 Vegetation

Land use in the study area consists mainly of agricultural use, with most land being seeded for crop production. Commodities grown in the study area consist mainly of corn, soybeans, and small grains, with limited amounts of alternative crops grown. Smaller tracts of rangeland exist where topography makes crop production difficult. The study area occurs in the mixed grass prairie region of the state, in which wheatgrass, needlegrass, and bluestem make up the majority of native upland vegetation.

### 3.10 Wildlife

The study area is located in the central flyway, considered a major migration route for waterfowl between their summer nesting grounds in the Northern Plains and Canada and their wintering grounds in the south. The prairie pothole region, in which the study area is located, is used extensively by waterfowl for breeding and nesting purposes due to the large quantity of wetlands. The area is also inhabited by numerous mammals including white tail deer, rabbits, fox, coyote, beaver, and weasel. In addition, game birds such as grouse, pheasant, and turkey, as well as song birds can be found in the study area.

### 3.11 Rare and Unique Natural Resources

The USFWS has listed two endangered species, the whooping crane and gray wolf, for Barnes County. The study area is located 25 miles outside the corridor in which 95 percent of all recorded whooping cranes sightings have taken place. Although only the western limits of Barnes County are within the 95 percent confirmed sighting corridor, there have been confirmed sightings of whooping cranes outside this corridor. Coordination should take place with the USFWS regarding the potential for impacts to threatened or endangered species prior to final micro-siting. ***Please refer to the Selected Percentages of Whooping Crane Sightings Map located in Appendix A.***

The NDNH (North Dakota Natural Heritage) biological conservation database identified the presence of several vegetative habitats and the Dakota skipper (*Hesperia dacotea*) adjacent to the study area. Vegetative communities of concern consist of native grassland and wetland areas. The Dakota skipper is a butterfly which is currently listed as a candidate species by the USFWS. Candidate species are those with potential to become listed as threatened or endangered in the future but receive no legal protection under the Endangered Species Act. Preferred habitat for the Dakota skipper includes expanses of undisturbed native vegetation that contain sufficient populations of wildflowers. There were no NDNH listed species or vegetative communities within the study area. ***Please refer to the Rare and Unique Resources Map located in Appendix A.***

### 3.12 Permitting Matrix

A permitting matrix was created showing potential federal, state, and local permits that may be needed prior to construction of a wind farm within the study area. ***Please refer to the Permitting Matrix located in Appendix B.***

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## CHAPTER 4 – SUMMARY

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### 4.1 Conclusions

Results of the analysis indicate no known fatal flaws within the study area that would prohibit construction of Glacier Ridge Wind Farm. Numerous exclusion and avoidance areas have been identified within the study area. Mitigation for impacts to avoidance areas may be allowed, depending on the resource and the extent of impacts. Agency coordination should take place prior to final micro-siting to quantify the extent of impacts and determine mitigation measures that may be taken. ***Please refer to the Combined Exclusionary and Avoidance Areas Map located in Appendix A***

In summation, the process and methodology that was used to conduct this preliminary fatal flaw analysis was based upon the best available information at this time. As mentioned above, additional

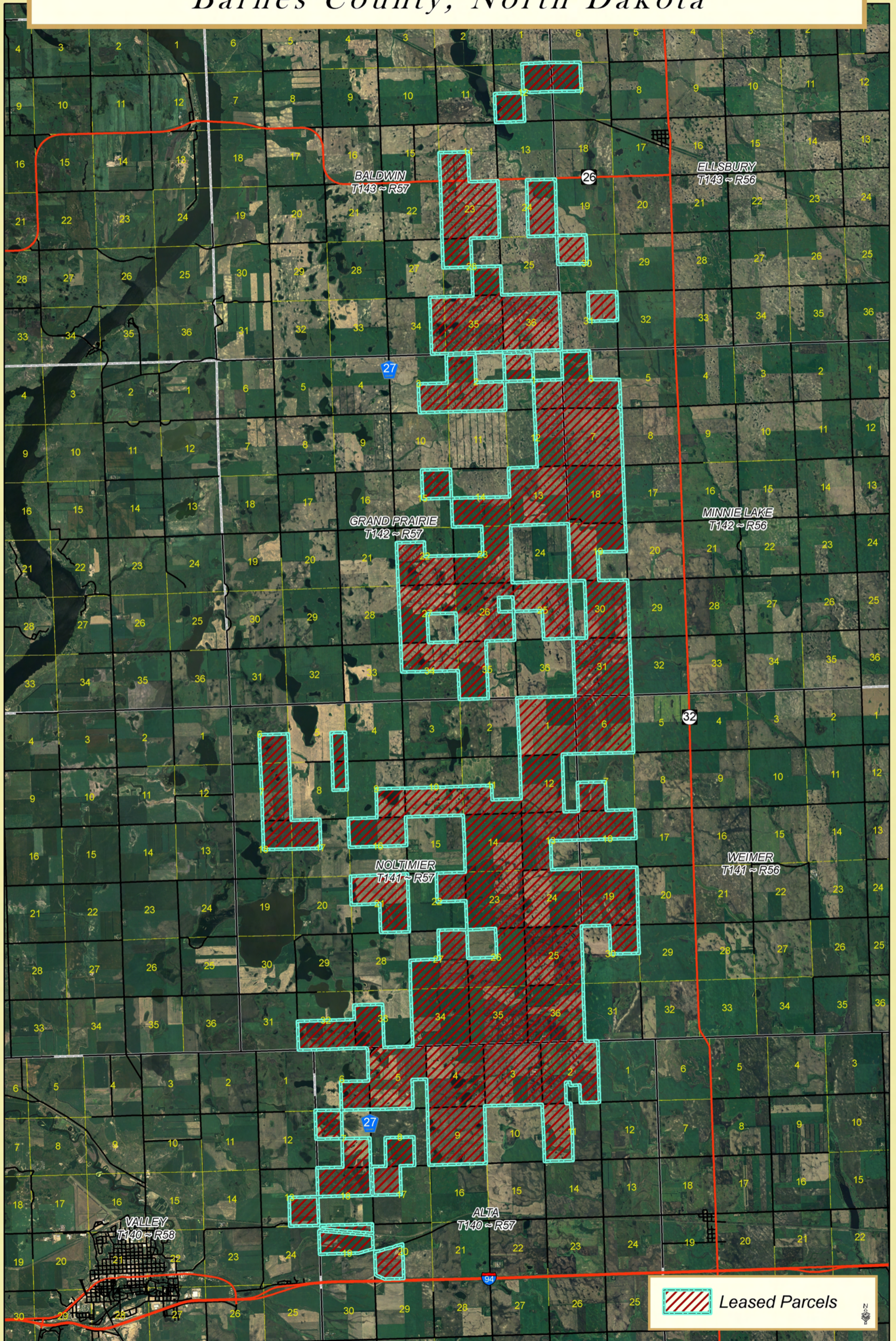
in depth field work, environmental review, and agency coordination should be completed if the developers decide to move forward with permitting and construction of the project. Strong project management, unified effort, public and agency involvement, landowner coordination and communication with the design team are recommended to minimize concerns addressed in this document.

# **APPENDIX A**

- Study Area Map
- Public Services and Infrastructure Map
- Microwave Beam Paths Map
- Land Use Map
- Geologic and Groundwater Resources Map
- Surface Water and Wetlands Map
- Selected Percentages of Whooping Crane Sightings Map
- Rare and Unique Resources Map
- Combined Exclusionary and Avoidance Areas Map

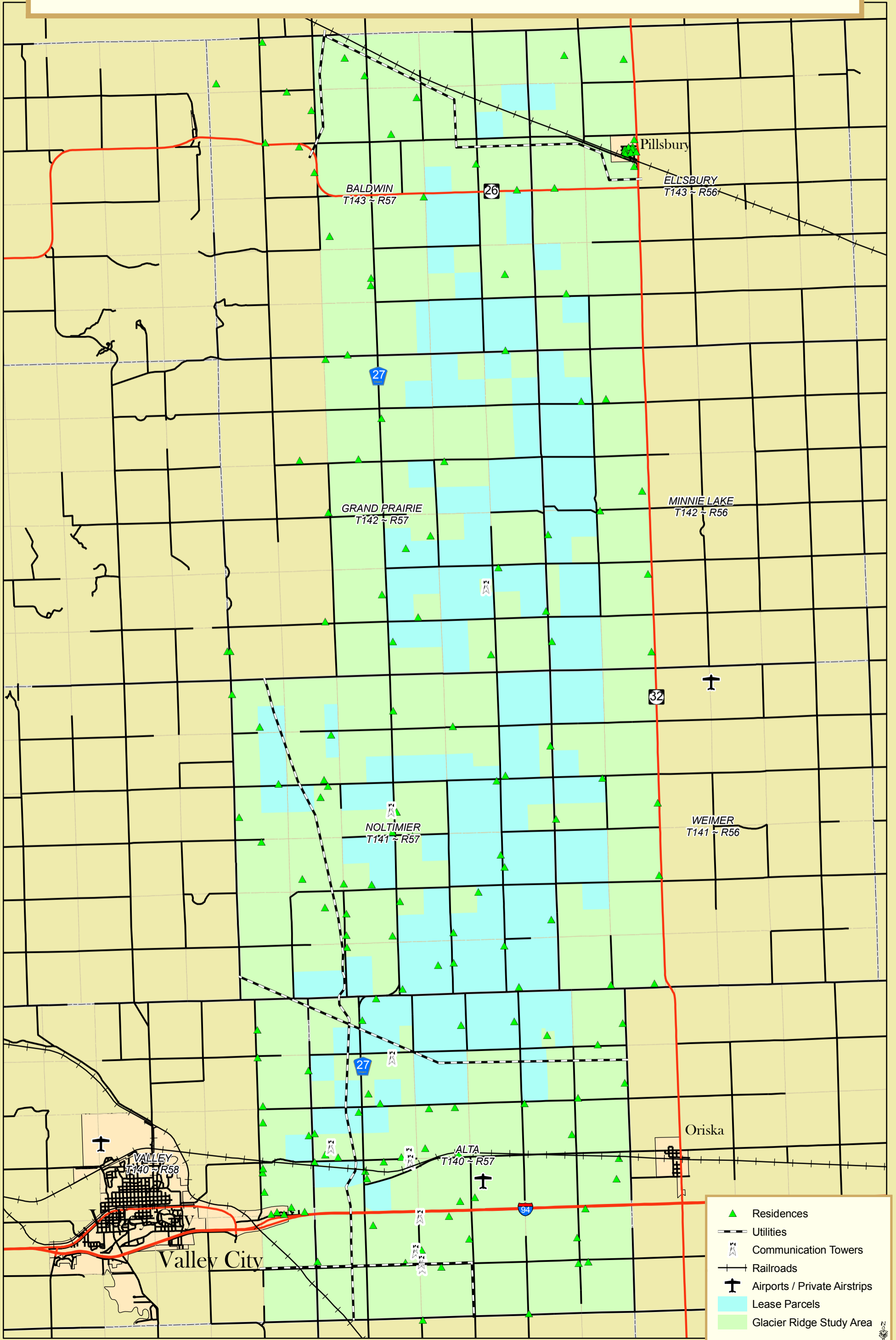
# Glacier Ridge Wind Farm

## Barnes County, North Dakota



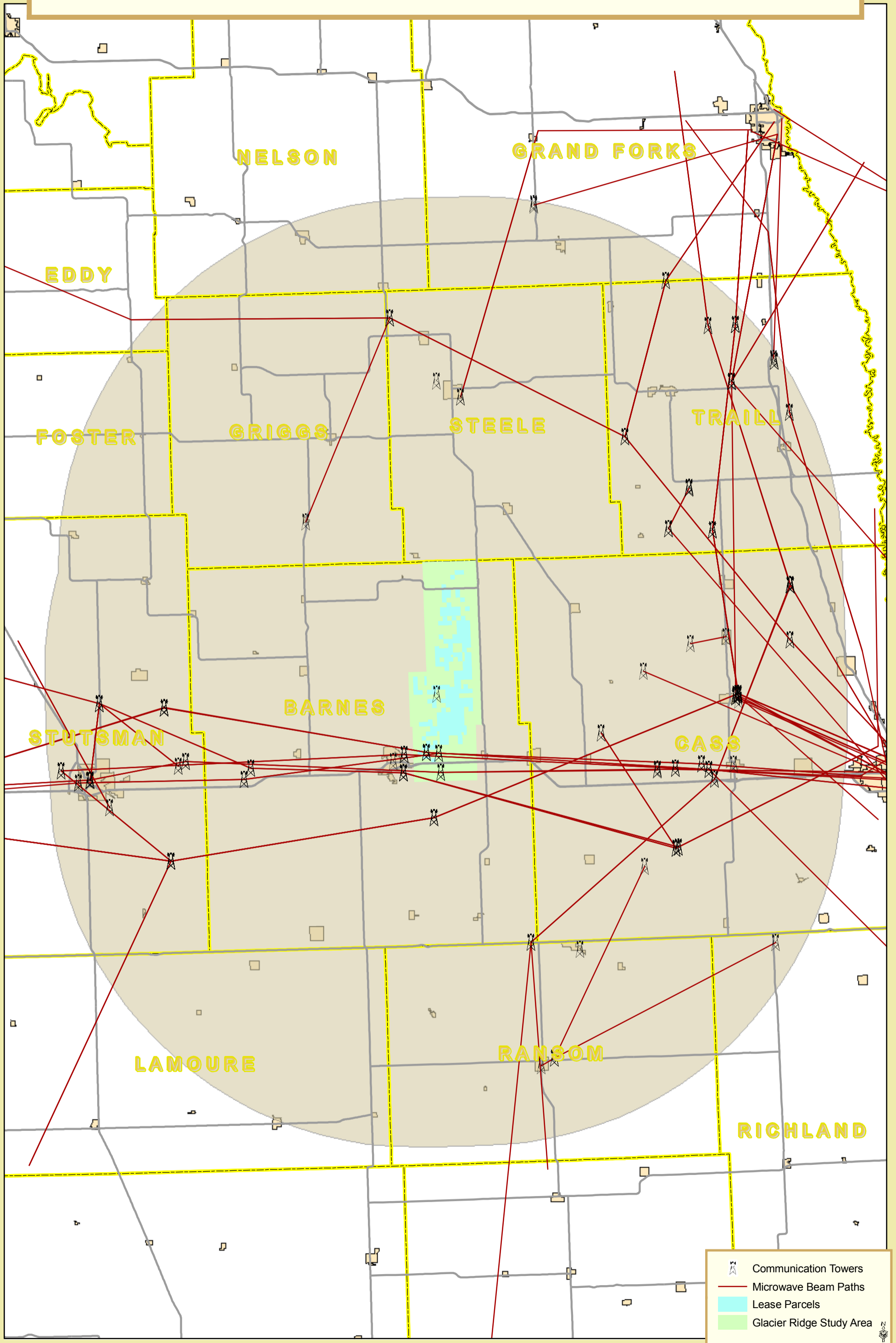
# Glacier Ridge Wind Farm

## Public Services and Infrastructure



# Glacier Ridge Wind Farm

## Microwave Beam Paths



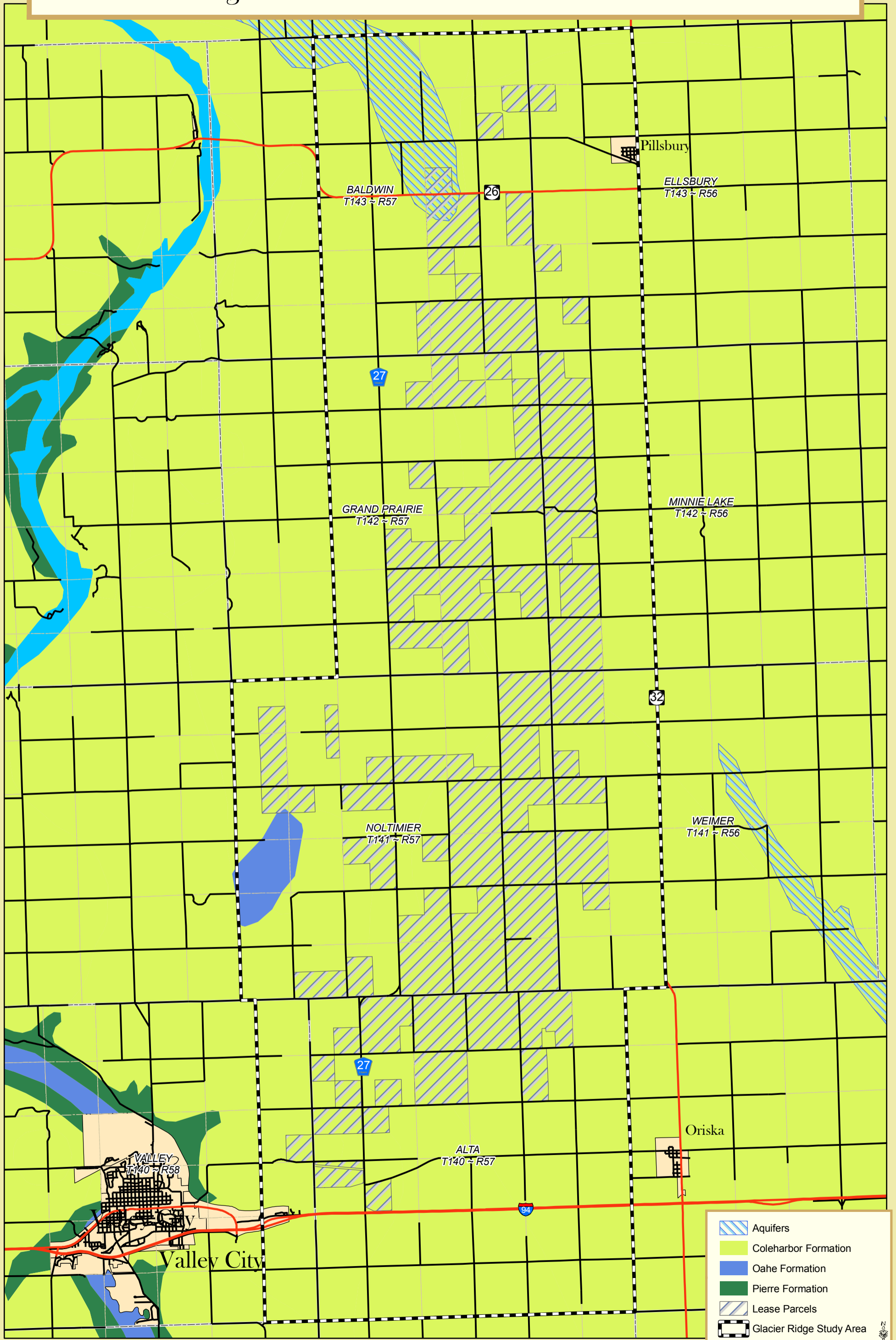
# Glacier Ridge Wind Farm

## Land Use and Land Based Economics



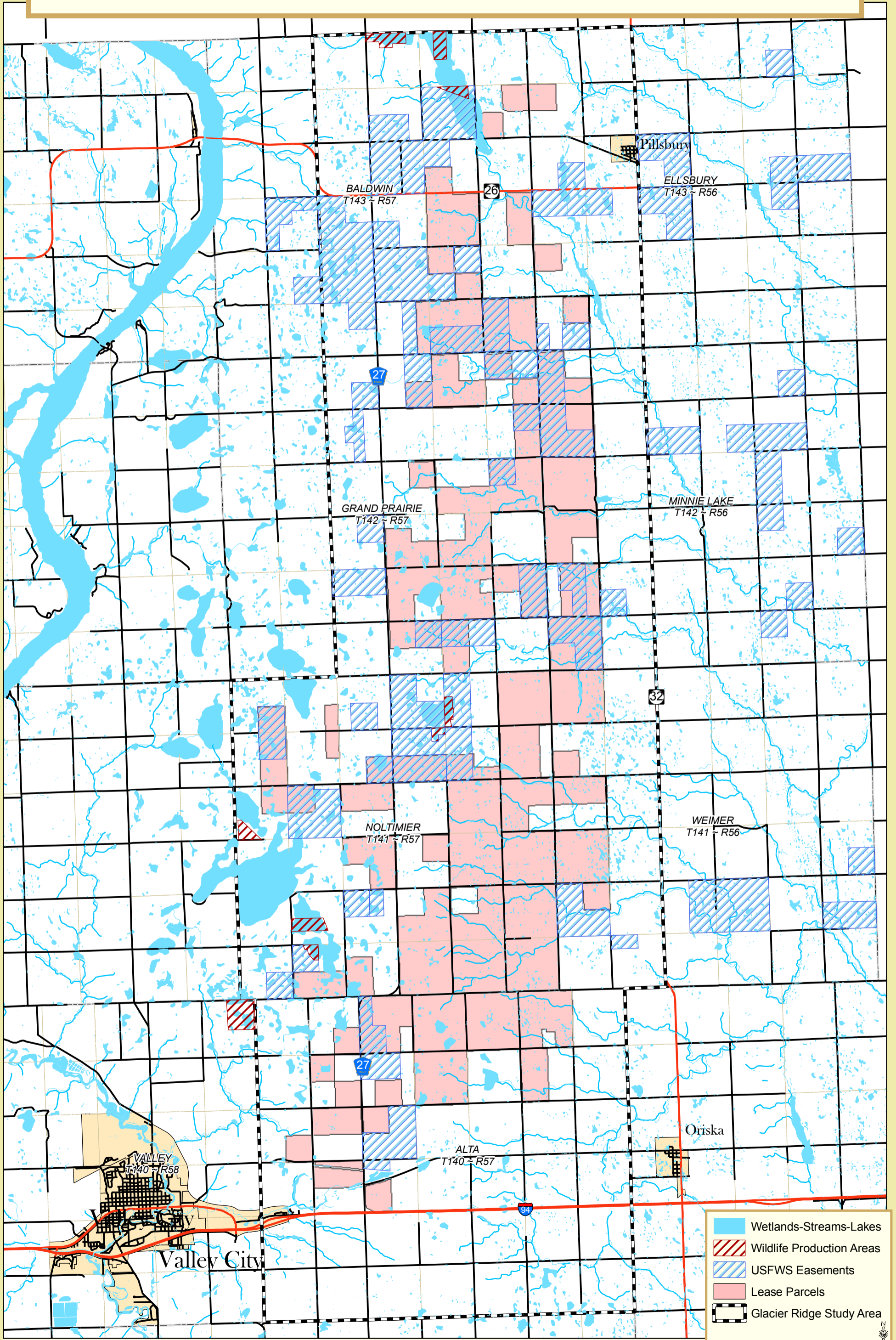
# Glacier Ridge Wind Farm

## Geologic and Groundwater Resources



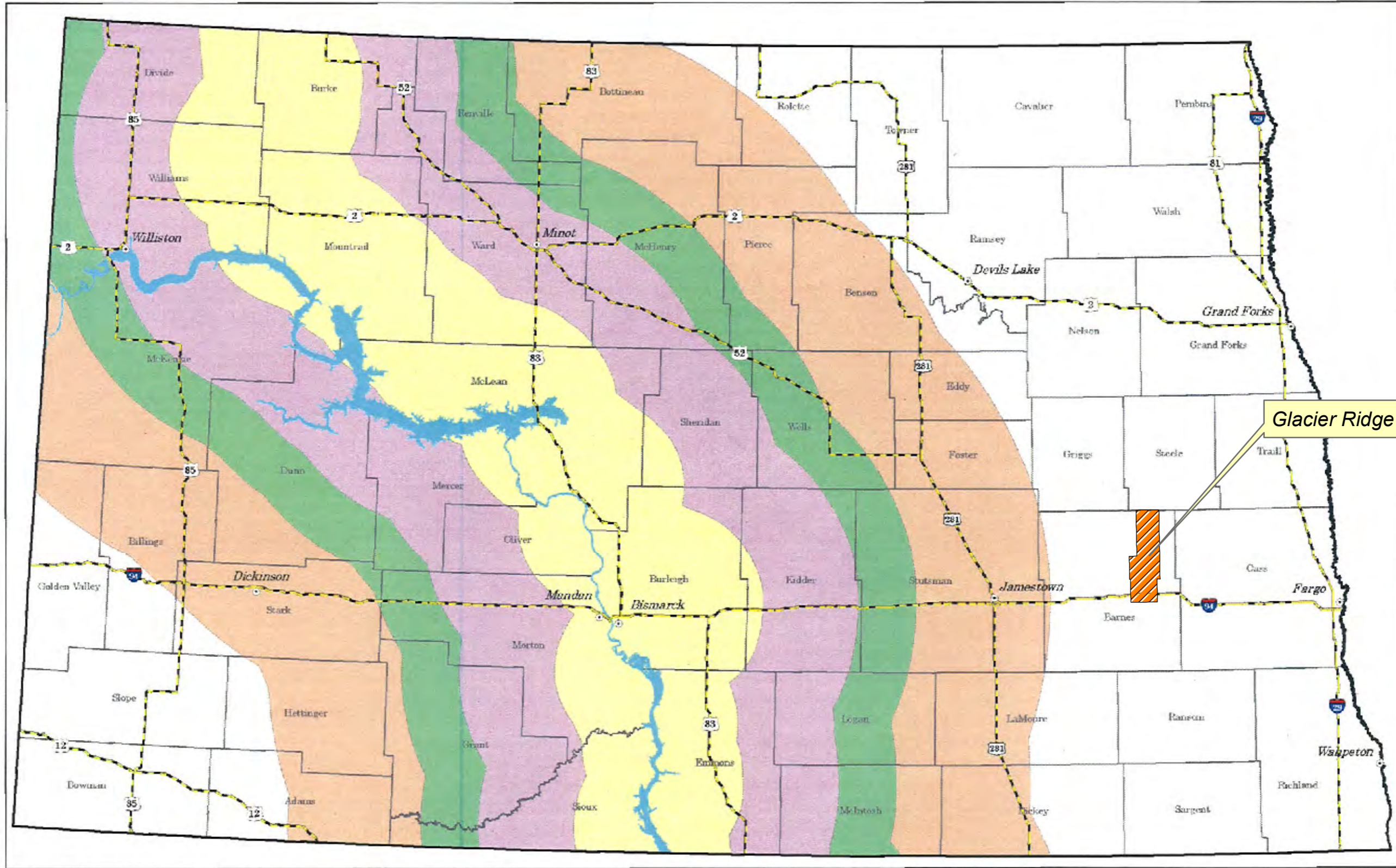
# Glacier Ridge Wind Farm

## Surface Water and Wetlands



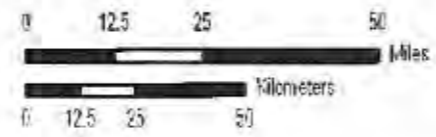
	Wetlands-Streams-Lakes
	Wildlife Production Areas
	USFWS Easements
	Lease Parcels
	Glacier Ridge Study Area





Glacier Ridge Wind Farm

PRODUCED BY ECOLOGICAL SERVICES  
 BISMARCK, NORTH DAKOTA  
 MAP DATE: 03/18/09  
 SIGHTINGS THROUGH SPRING 2007  
 FILE: TOWERS\_MLOCATIONS.MXD



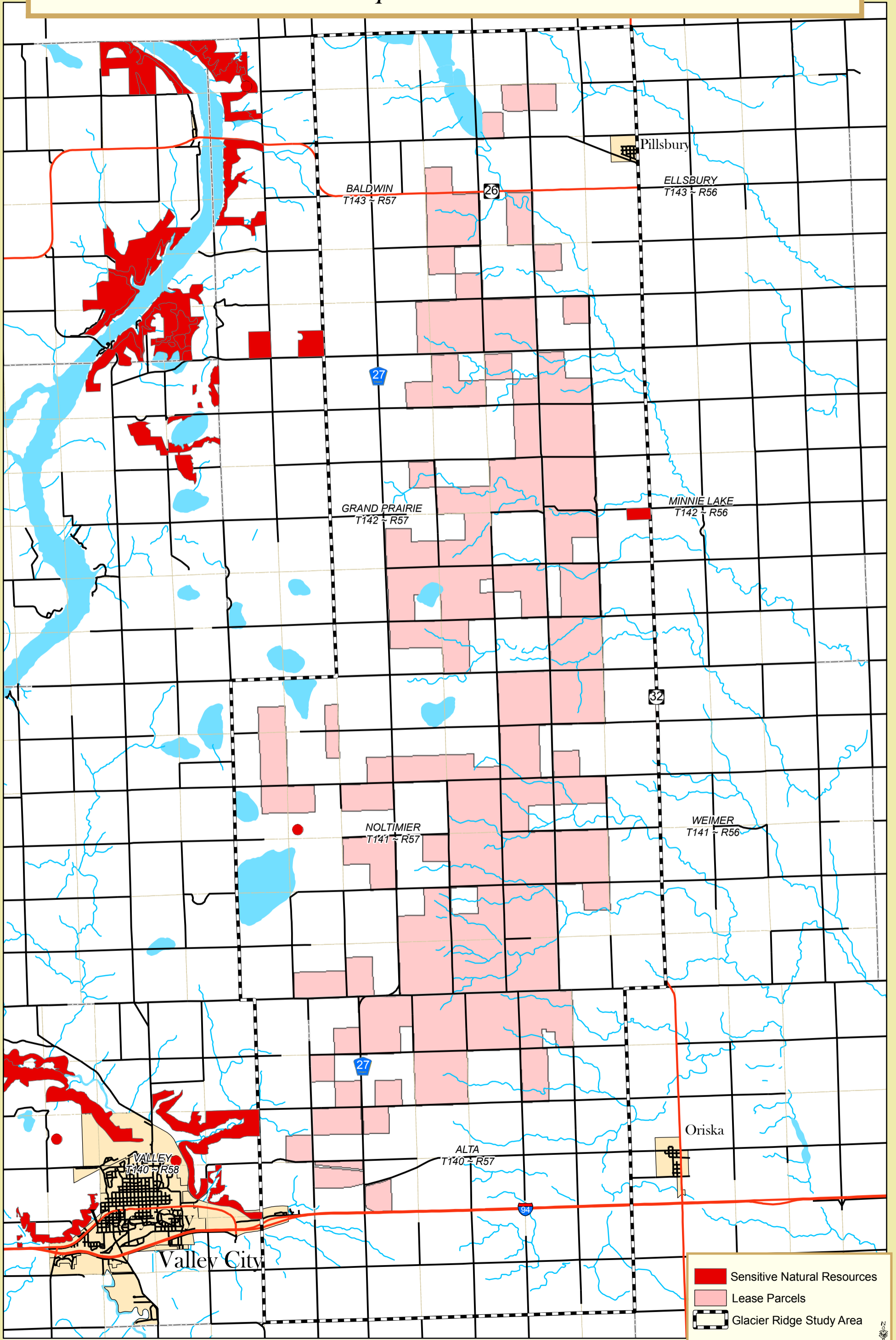
### Map Features

- Major Roads
- County Boundaries
- Missouri/Yellowstone River System
- Percent Whooping Crane Sightings
  - Approx. 80% (40 mile corridor)
  - Approx. 75% (60 mile corridor)
  - Approx. 85% (120 mile corridor)
  - Approx. 95% (180 mile corridor)

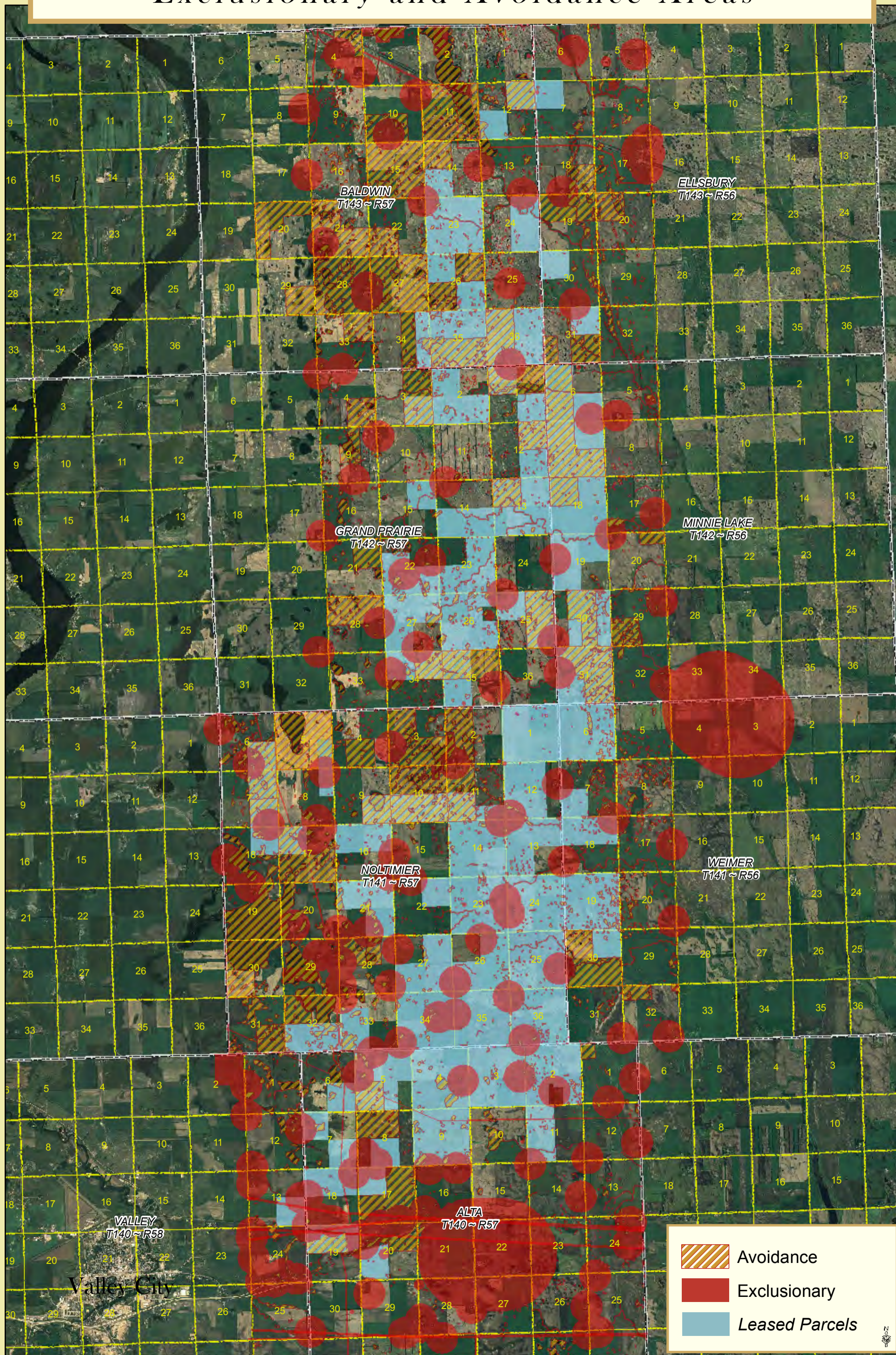


# Glacier Ridge Wind Farm

## Rare and Unique Natural Resources



# Glacier Ridge Wind Farm Exclusionary and Avoidance Areas



# **APPENDIX B**

- Permitting Matrix

<b>Federal Level Permits</b>		
<b>Agency / Permit</b>	<b>Applicability</b>	<b>Approximate time required to obtain permit.</b>
<b>FAA</b>		
Form 7460-1	Potential affected airspace determination	Approximately 60 days
Form 7460-2 Part I & II	Notice of actual construction begin and end dates	At least 10 days prior to start of construction & within 5 days of each wind turbine reaching their greatest height.
<b>USACE</b>		
Section 404 Permit / Section 401 Water Quality Certification	Permit for impacts to jurisdictional water of the US	Approximately 60 days
<b>USFWS</b>		
Incidental Take Permit	Permit for potential impacts to threatened or endangered species	Approximately 18 months if needed (not anticipated)
<b>US Dept of Ag</b>		
Form AD 1006 - .	Form used to track impacts to prime and unique farmland	Approximately 45 days
<b>FERC</b>		
Exempt Wholesale Generator Certification		
MBR Authorization		
<b>State Level Permits</b>		
<b>Agency / Permit</b>	<b>Applicability</b>	<b>Approximate time required to obtain the permit</b>
<b>North Dakota PSC</b>		
Site Certificate Application	Required by the PSC to construct an energy conversion facility	No more than 6 months after a completed application for certificate of site compatibility
Corridor Certificate & Route Permit Application	Required by the PSC to construct an transmission facility	No more than 3 months after a completed application for certificate of corridor compatibility
<b>ND Dept of Health</b>		
Stormwater Pollution Prevention Plan (SWPPP)	Required before construction	Seven days prior to start of construction
Air Quality Permit (Concrete Batch Plant)	Requested by State Health Department	Notice to State Health Department prior to start of construction.
Potable / Wastewater Permit		
State Electrical Board - Electric Permit		
<b>ND State Trans Dept.</b>		
Utility Crossing Permit(s)	Permit needed to cross roadways. Contact is dependent on the type of roadway being crossed.	<i>Dependent on the type of roadway</i>
Road Access / Approach Permits	Permit needed to install approaches in some counties.	1 week
Oversize / Overweight	Permit from District DOT for oversize loads	1 week
<b>Local Permits</b>		
<b>Agency / Permit</b>	<b>Applicability</b>	<b>Approximate time required to obtain the permit.</b>
<b>County/Townships</b>		
Potable Water / Wastewater (Septic) Permit		
Electrical Permit		
Approach Permits	Permit needed to install approaches in some counties.	1 week
Building Permits – Griggs & Barnes Counties	Permit to construct infrastructure on property	<i>Approximately 45 days</i>
Conditional Use Permits	Permit to allow change in land use/zoning	<i>Approximately 45 days</i>
Road Inspections / Review		
Utility Crossing Permits	Permit needed to cross roadways. Contact is dependant on the type of roadway being crossed.	<i>Dependant on the type of roadway</i>