Draft Environmental Impact Statement For Coyote Wind Project Coyote Wind, LLC

Sweet Grass County, Montana

Montana Department of Natural Resources and Conservation
Southern Land Office
Airport Industrial Park
1371 Rimtop Drive
Billings, MT 59105

August 2009

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DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

BRIAN SCHWEITZER, GOVERNOR

SOUTHERN LAND OFFICE

STATE OF MONTANA

PHONE: (406) 247-4400
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AIRPORT INDUSTRIAL PARK
1371 RIMTOP DRIVE
BILLINGS, MONTANA 59105-1978

Dear Sir/Madam:

The Montana Department of Natural Resources and Conservation (DNRC) presents the attached draft environmental impact statement (EIS) for a wind energy development proposed by Coyote Wind, LLC for construction on state-owned school Trust land and adjoining private lands located approximately 3 miles northeast of Springdale, MT in Sweet Grass County. This analysis is conducted under the provisions of the Montana Environmental Policy Act (MEPA). An 81.2 megawatt (MW) wind energy farm is proposed on private land owned by Crazy Mountain Cattle Company and an adjoining state school Trust land section. The proposed Coyote wind farm contains 66.8 MW on private land and 14.4 MW on state-owned school Trust land.

The draft EIS contains two alternative courses of action. The Proposed Action alternative analyses the environmental effects of construction of the wind farm on the school Trust land as a part of the overall project that also includes adjoining private land. The No Action alternative is an analysis of the wind farm on private land only, with no wind turbines located on the school Trust Land.

The DNRC has no authority to make any decision regarding the use of private lands, so wind energy development on the private land can occur regardless of the decision made for the use of the school Trust Land. Therefore, the decision before the DNRC is whether the school Trust land is included with the adjoining private land as part of the overall Coyote Wind Farm project.

The public is invited to submit written comments regarding the draft EIS. Comments will be accepted until 5:00 p.m. Mountain Time, Friday, 11 September 2009. Please submit comments to:

Montana DNRC
Southern Land Office
Coyote Wind Farm
1371 Rimtop Drive
Billings, MT 59105

Comments may also be emailed to jbollman@mt.gov .

In addition, the DNRC will host a **public meeting** where the public can submit written or oral comments on Wednesday, 2 September 2009 from 4:00 p.m. to 8:00 p.m. at the Big Timber Carnegie Library, 314 McLeod Street. There will be two presentations on the project at 4:30 p.m. and 6:00 p.m. at this public meeting.

Questions regarding this draft EIS may be directed to Jeff Bollman at the DNRC Southern Land Office at jbollman@mt.gov or 406-247-4404.

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Executive Summary

Introduction

This draft Environmental Impact Statement (DEIS) has been prepared by the Montana Department of Natural Resources and Conservation (DNRC) to assess the impacts of leasing 640 acres of school trust land in Sweet Grass County (Section 36, Township 1 North, Range 12 East) to Coyote Wind, LLC (Coyote Wind) for the placement of approximately eight wind turbines to generate electricity (Figure E-1). This section of land was previously identified in a statewide study of Trust lands (Wilde 2005) as having characteristics that would be conducive to wind energy development. Coyote Wind is owned by Enerfin Energy Company (Enerfin; 95% ownership) and Alternity Wind Power (AWP; 5% ownership). It is Enerfin's intention to be the owner/operator for the life of the project. The Proposed Action would be implemented in 2010, and would continue annually for 20-30 years.

Purpose and Benefits of the Proposed Action

Article X, Section 4 of the Montana Constitution provides that the Board of Land Commissioners "…has the authority to direct, control, lease, exchange, and sell school lands and lands which have been or may be granted for the support and benefit of the various state educational institutions, under such regulations and restrictions as may be provided by law." The Land Board is composed of the Governor, Secretary of State, Attorney General, Auditor and Superintendent of Public Instruction. Section 77-1-202 of the Montana Code Annotated (MCA) further states explains the Land Board's powers and duties: *"In the exercise of these powers [of the board], the guiding principle is that these lands and funds are held in trust for the support of education and for the attainment of other worthy projects helpful to the well-being of the people of this state as provided in The Enabling Act. The board shall administer this trust to secure the largest measure of legitimate and reasonable advantage to the state and provide for the long-term financial support of education."*

Also, as specified in MCA 77-1-303 "Under direction of the board, the department [DNRC] has charge of the selecting, exchange, classification, appraisal, leasing, management, sale, or other disposition of the state lands. It shall perform such other duties the board directs, the purpose of the department demands, or the statutes require." Montana state law mandates the "highest development of state-owned lands in order that they might be placed to their highest and best use and thereby derive greater revenue for the support of the common schools" (77-1-601; MCA 2007a). DNRC's stated objectives in issuing RFPs for wind development on school trust lands are:

- To lease state trust lands for wind exploration and new commercial-scale wind facilities
- To generate income for state trust beneficiaries that reflects fair market value of the use of trust lands for wind energy development
- To achieve commercial operation of the wind projects as soon as possible, with minimal impacts to the environment (DNRC 2008)

In 2003, the Montana Wind Energy Working Group was formed, and included representatives of state government agencies (including Montana Department of Environmental Quality [DEQ] and DNRC), utilities, and other wind resource groups. Its stated goal was "to promote wind power purchases to utilities and other power purchasers and to proactively support projects and initiatives that will stimulate development of Montana's wind resources" (Montana Wind Working Group 2003). The purpose of the Coyote Wind Project is to fulfill the school trust land management mandate and the Montana Wind Working Group goal.

Alternatives Description

Two alternatives are evaluated in detail in this DEIS:

- The Proposed Action Alternative describes the wind development on the state parcel including associated facilities and roads, construction activities, operation and maintenance activities, mitigation inherent in project design, and decommissioning.
- The No Action Alternative assumes the DNRC would not lease the state parcel to Coyote Wind, and land use and revenue for that parcel would continue in its current state. Coyote Wind is constructing 36 wind turbines on private land to the south and west of the state parcel. Development on private land is not part of the action being evaluated in this EIS. It is, however, considered in the effects analysis as part of the existing condition under the No Action Alternative.

Proposed Action Alternative

As proposed, a commercial lease would be entered into between DNRC and Coyote Wind, and the state parcel would have 8 wind turbines installed on the western and central portions of the parcel (Figure E-1). These locations were chosen to maximize the robust wind resource in unobstructed locations, including maximizing the energy capture and minimizing the wake and losses caused by the array of turbines on the parcel.

The significant proposed infrastructure improvements on the state parcel would include:

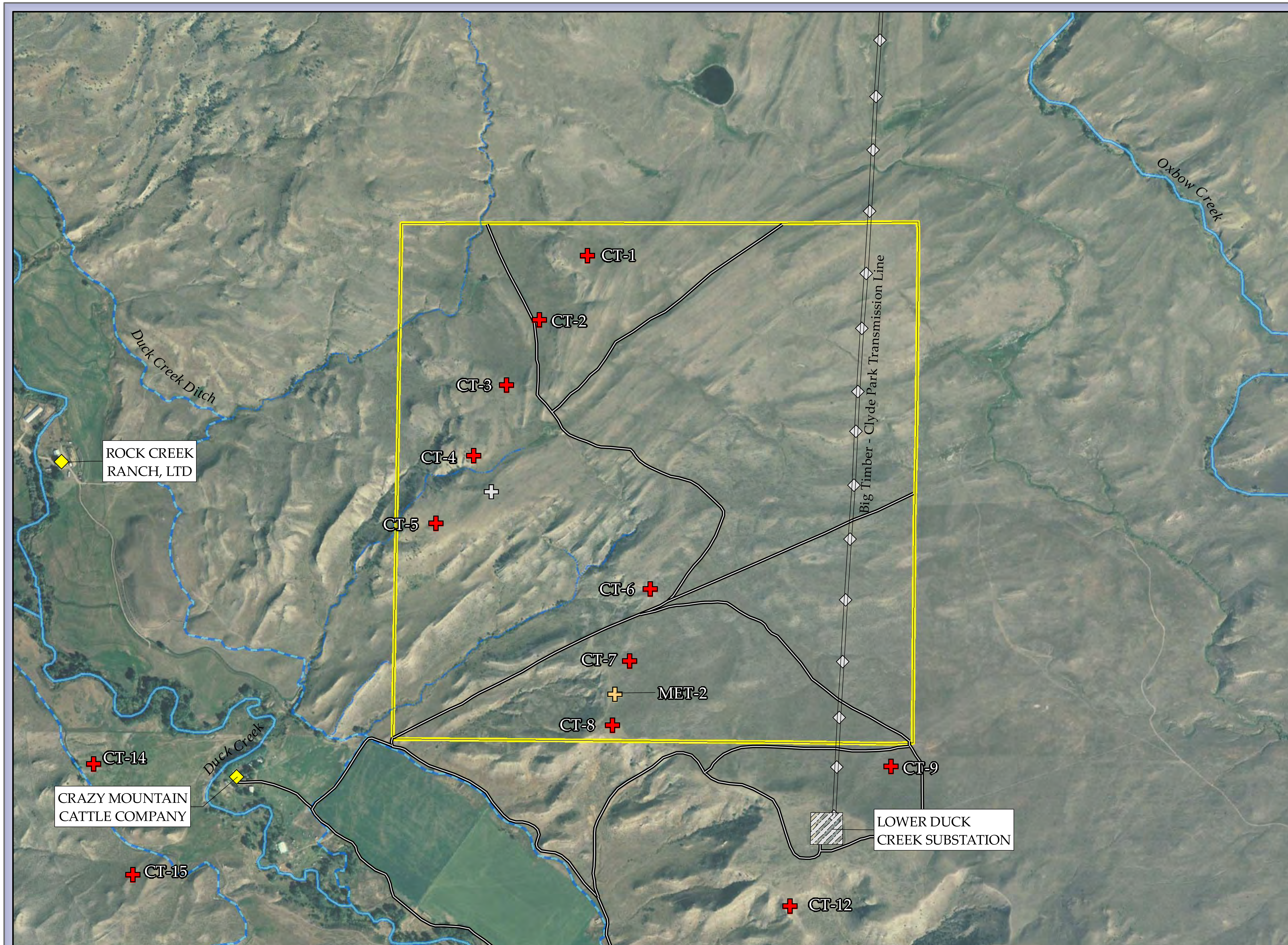
- roads
- wind turbine foundations
- underground electrical collection system

The state parcel would be accessed via Interstate 90 and county roads. Access to turbines located on the parcel would be achieved via a primary graveled access road with branches to the individual turbine locations. The wind turbines planned for the site are manufactured by Vestas and are the V90-1.8 MW model. The capacity of the Project is 14.4 MW on the state parcel. The power produced would connect to the transmission system through the Lower Duck Creek Sub-Station and NorthWestern Energy's Big Timber-Clyde Park transmission line.

The Project would begin construction in 2010. The basic infrastructure, including roads and turbine foundations would be constructed first, then the wind turbines would be erected with the expectation the Project would come on line in 2010. The Project would be in operation 24 hours per day, 365 days per year unless off-line for maintenance due to malfunction. The expected life of the Project is approximately 20 years. At the end of this period DNRC and Coyote Wind may

FIGURE E-1.
STATE PARCEL PROPOSED TO BE LEASED FOR THE COYOTE WIND PROJECT

Sweet Grass County, Montana
T1N R12E Section 36



Map Legend:

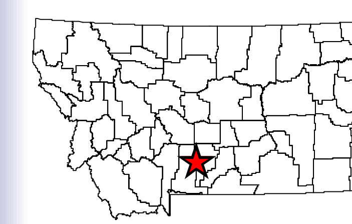
- Proposed Project Area
- Proposed Turbine Location
- Proposed Met Tower
- Existing Met Tower
- Access Road
- Creek
- Ditch
- Intermittent Stream
- T-Line
- Substation
- T-Line Towers
- Residence

N W E S

0 250 500 1,000 1,500 2,000 ft

0 100 200 400 600 m

One Inch is Equal to 1,000 Feet



GANDA

SOURCES:
MONTANA NATURAL RESOURCE INFORMATION SYSTEM (NRIS)
ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE (ESRI)
USDA-FSA ORTHO PHOTO FLIGHT: AUGUST 25, 2005

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choose to renew the lease agreement in which case the equipment would likely be upgraded. If the lease is not renewed, Coyote Wind would decommission the Project, remove the turbines and the associated infrastructure, and reclaim and restore the site as closely as possible to its natural state.

No Action Alternative

Under the No Action alternative, DNRC would not issue a lease to Coyote Wind for the development of wind energy on the state parcel. Land use on the state parcel would continue as is. There would be no wind turbines on the state parcel, however the wind project on the adjacent private land would continue. The state land trust beneficiary, the Common Schools Trust, would generate no revenue from wind development.

Table E-1 provides a comparison of activities under each alternative.

Table E-1. Comparison of wind development activity under No Action and Proposed Action alternatives, Coyote Wind Project, Sweet Grass County, MT.

	No Action		**Proposed Action**	
	Private Land Only	Private and State Land	Private Land Only	Private and State Land
Approximate number of turbines	36	36	36	44
Approximate capacity of wind Project	64.8 MW	64.8 MW	64.8 MW	79.2 MW
Approximate acreage in development	2,400	2,400	2,400	3,040
Approximate miles of improved roads	11	11	11	13
Number of meteorological towers	1	2	1	2
Number of new buildings to support Project	1	1	1	1
Temporary Disturbance				
Approximate acreage of disturbance due to turbine foundation construction	7.15	7.15	7.15	8.74
Approximate acreage of disturbance due to trenching	8.39	8.39	8.39	9.74
Permanent Loss				
Approximate acreage lost to road development	36	36	36	42.15
Approximate acreage lost to turbine foundations	1.01	1.01	1.01	1.24
Approximate acreage lost to trenching	0	0	0	0
Approximate acreage lost to support buildings	<0.25	<0.25	<0.25	<0.25
TOTAL ACREAGE LOST	37.26	37.26	37.26	43.64
PERCENT OF ACREAGE IN DEVELOPMENT	1.55	1.55	1.55	1.44
Workers and vehicles				
Average no. of vehicles on site daily during construction	75	75	75	75
Average no. of workers on site daily during construction	400	400	400	400
Average no. of vehicles on site daily during operation	2	2	2	2
Average no. of workers on site daily during operation	4	4	4	4

Affected Environment

The affected environment section provides a baseline of information from which to analyze and compare the effects of the alternatives. The environmental components described in the affected environment include geology, soils, water, land use, recreation, socioeconomics, vegetation, wildlife, cultural resources, noise, visual resources, and aviation.

Geology and Soils

The state parcel is located in the Kelly Hills portion of the Crazy Mountains Basin and is dominated by the Livingston and Hell Creek formations, consisting of layers of calcareous sandstone and mudstone sedimentary rock. Sandstone ridges and shale/siltstone swales dominate the topography. Depth to bedrock ranges from 0 inches on the ridge tops to greater than 60 inches in the swales. Soils in the study area are characterized by a relatively short growing season, with the average annual frost-free period ranging from 95 to 125 days per year. The mean annual temperature ranges from 43 to 46 degrees Fahrenheit, and mean annual precipitation ranges from 10 to 14 inches.

Hydrology

The state parcel has no permanent flowing water. Along the western edge are several ephemeral drainages, which direct seasonal water toward the ditch paralleling Duck Creek (Figure E-1). Precipitation percolates through the soil, encounters bedrock, and is directed toward the ditch and Duck Creek. The ditch flows for approximately one to one-and-a-half miles before joining Duck Creek south of the state parcel. From this juncture Duck Creek flows just under two miles before joining the Yellowstone River. Run-off from existing access roads to the state parcel may also flow into the ditch and/or directly into Duck Creek. There are isolated closed depressions that form seasonal wetlands, and one non-jurisdictional perennial wetland formed from a developed spring.

Land Use and Recreation

The 640 acres of state land on which the proposed wind project would be developed is currently open rangeland habitat. The primary active use of the land is grazing, under a lease agreement with the Crazy Mountain Cattle Company (CMCC), owner of the land abutting the state property on the south. Other uses and use rights applicable to the site include (Bollman pers. com. 2008a):

- An oil and gas lease covering the whole site, sold to Pacer Energy LLC
- An electric power transmission line traversing the eastern half of the site in a north-south direction, within a right-of-way (ROW) granted to Park Electric Cooperative, Inc.
- A buried pipeline installed in a ROW granted to Yellowstone Pipeline Company, traversing the southern half of the site in a northeast to southwest direction
- A buried utility line constructed in a ROW granted to US West Communications (Moore pers. com. 2009)

The only road access to the state parcel for recreation is from the south, through the private holdings of the CMCC and requires permission of the landowner. Recreational access could also be gained by crossing the other adjoining private land with the permission of the landowner. The large private landholdings surrounding the state parcel are predominantly open, undeveloped range and native habitat lands. The only developed uses in the area are irrigated agriculture, isolated farm/ranch complexes (including residences), and electric power system facilities including a substation and transmission lines. All private land surrounding the project site is located in Sweet Grass County.

Transportation

The most direct route to the site is from the southwesterly direction, from I-90 Exit 354 (Springdale) to the southern site boundary. This route follows approximately 5.6 miles of county road (Convict Grade and North River roads) to the main entrance to the CMCC property, and approximately one mile of private road within the CMCC property. The second route to the site is from an easterly direction, extending approximately 8.6 miles from I-90 Exit 362 (DeHart) to the southern site boundary. From the I-90 exit, this route follows State Highway 10 east for approximately two thirds of mile, the Exit 362 Road for approximately one mile, and North Yellowstone Trail Road for 6 miles to the entrance to the CMCC property. The final one mile to the site is via the same private road within CMCC property as the route described above.

Socioeconomics

The state parcel had an appraised value of $20,678 in 2003 (CAMA 2008). The State generates annual income from the parcel from the following sources: grazing lease; oil and gas leases; sales of rights-of-way for overhead electric power lines, a petroleum pipeline, and buried telephone lines; and Land Use License (LUL) to Coyote Wind for this wind project. The total revenue generated in 2008 from the LUL, grazing, and oil and gas leases, was $2,958.53.

Terrestrial Vegetation and Habitats

The project area contains three broad vegetative communities: grasses, forbs, and sage species (*Artemisia* spp.); woody vegetation: trees and shrubs (excluding *Artemisia* spp.); and wetlands. It is likely that none of the wetlands on the state parcel are jurisdictional because they have no connections to waters of the US. Noxious weed communities exist throughout the study area in isolated islands of typically less than one acre, with larger infestations inhabiting the ephemeral draws and the vicinity of the wetland areas. The MNHP database lists no vascular or non-vascular plant species of concern as occupying Township 1 North, Range 12 East.

Wildlife

Based on the habitat types in the project area, the site is expected to provide habitat primarily for species associated with grassland/sagebrush habitat and wetlands. The majority of the habitat is dominated by shrubs and herbaceous vegetation of both native and invasive origin; primarily big sagebrush, fringed sage and rubber rabbitbrush. The understory is composed of a mix of grasses and forbs such as bluebunch wheatgrass, Idaho fescue, cheatgrass, needle and thread and purple prairie clover. The sagebrush plant communities are mostly intact in the project area, while surrounding private sections appear to have been treated with herbicides to remove sagebrush for enhanced grass growth for grazing. Small, isolated, remnant linear strips of sagebrush remain on private land. A black-tailed prairie dog (*Cynomys ludoviscianus*) colony is located on the central-eastern portion of the section, and there is reduced grass cover in the immediate area of the colony.

No raptor nests were found on the state parcel during aerial surveys; 10 active raptor nests were found within a four-mile radius of state and private land considered in the No Action and Proposed Action alternatives. No suitable sage grouse habitat was found. Sixty-two individual birds of 20 species were documented on breeding bird point count surveys on the state parcel. The four most frequently observed bird species were western meadowlarks, red-winged blackbirds, horned larks, and vesper sparrows. The most frequently observed bird species on Bird Use Counts on the state parcel conducted in all four seasons were golden eagles and common ravens. Higher counts in the spring and fall indicated higher bird use during migratory seasons. Acoustic surveys for bats, conducted in the fall, documented silver-haired and hoary bats (both state listed species of concern) on the state parcel, as well as species in the 25 and 40 kilohertz phonic groups but not identifiable to species.

No federally listed threatened or endangered wildlife species have been documented within the project area, and no federally designated critical habitat occurs in the project area. The gray wolf and grizzly bear are the only federally listed species with the potential to occur on the state parcel, and their presence would likely be very occasional and transient. Five bird species of special concern were documented on surveys for this project.

Cultural Resources

Cultural resources on the state parcel were documented by the DNRC in a study conducted in 2005 ((Rennie 2006; Appendix E to the DEIS). This study resulted in the identification, evaluation, and formal recordation of five cultural resources. The significance of the findings were evaluated based on National Register of Historic Places criteria, and were found to be “ineligible” for listing to the National Register. The Lewis and Clark Trail and the Bozeman Trail are historically significant trails that are located in the vicinity of the project area.

Noise

Existing noise sources in the project area include wind-generated noise through grass and trees, farm equipment, wildlife and insects, aircraft flying overhead, water flowing in the Yellowstone River and nearby creeks, traffic on local roads and I-90, and trains on the tracks south of the Yellowstone River. Ambient noise levels were measured at three locations, and the ambient noise levels versus wind speeds at 32 feet above ground level were estimated based on data for typical rural areas (ETSU 1996).

Visual Resources

Overall, the study area contains visual resources such as rolling foothills and the Crazy Mountains in prominent view north of I-90. The area is rural in character, and the buildings are limited to the small community of Springdale, and scattered ranch buildings and homes. The railroad parallels I-90 to the north and the tracks are visible from I-90. The Yellowstone River is also visible; I-90 follows the river corridor as it passes by the project area.

Visual simulations were conducted by combining photographs taken at the site with technical renderings of the proposed turbine locations. Simulations were completed for day and night. The night simulation included FAA required turbine lighting.

Airfields

There are two airfields located within 15 miles of the Project; the Big Timber Airport 9.5 miles to the east-southeast, and Park County's Mission Field Airport 14.7 miles to the west-southwest. In addition, there are eleven publicly owned and six privately owned airstrips within a 75 mile radius of the Project. The geographic position of the Proposed Action alternative is in alignment with three FAA designated routes.

Comparison of Alternatives and Impacts

This DEIS evaluates the Proposed Action and the No Action alternatives. The No Action Alternative in this DEIS is unique because it analyzes the impacts associated with wind energy development on private land. Table E-2 displays an annotated comparison of impacts across both alternatives and all resource areas.

Table E-2. Summary of predicted environmental effects, Coyote Wind Project, Sweet Grass County, Montana.

Resource Area / Issue	No Action Alternative	Proposed Action Alternative
Geology and Soils		
Geology	Minimal impacts	Minimal impact
Soil quality	Net effects minimal. Possible soil compaction during construction and maintenance. Potential increase for point-source pollution near roads and in heavy equipment work areas.	Similar to No Action. Slightly, but not significantly, greater due to additional area of disturbance.
Soil erosion	Possible soil erosion in localized areas. Potential for noxious weeds to colonize disturbed soil areas would increase risk of soil erosion.	Similar to No Action. Slightly, but not significantly greater due to additional area of disturbance.
Hydrology and Water Quality		
Water quality - general	Generally minimal impacts mitigated by terms of MPDES permit. Possible accidental leaks or spills into water bodies of any toxic materials used or stored on site during construction and operation. Erosion from road construction could contribute sediment to Duck Creek.	Similar to No Action. Slightly increased potential for impacts due to larger development area.

Table E-2. Summary of predicted environmental effects, Coyote Wind Project, Sweet Grass County, Montana.

Resource Area / Issue	No Action Alternative	Proposed Action Alternative
Land Use and Recreation		
Land ownership	No impact on private land ownership or on use of state parcel.	Same as No Action.
Land use – grazing, right-of-ways	No impact to grazing leases or ROWs on state parcel.	Minimal impacts on existing land use of state parcel. Possible restrictions on grazing during construction. Possible damage to pipeline or utility lines – mitigated by upfront agreements and coordination with ROW holders.
Land use – consistency with existing plans	Consistent with Sweet Grass County Plan.	Same as No Action. Also consistent with DNRC Real Estate Management Plan.
Recreation	No impact to recreation.	State parcel would be closed to recreational use. Minimal impact since current access only by permission of adjacent landowners.
Transportation		
Miles of improved roads within site boundaries	~11	~13
Acreage lost to road development	~36	~42.15
Traffic volume	During construction – additional personal transport for approximately 400 workers per day on site and on access roads to site. Approximately 75 construction vehicles per day including heavy equipment. During operation – increase of 4 pick-up type vehicles on local and private roads daily.	Same as No Action – overall time for construction extended due to construction of additional 8 turbines.
Roadway engineering and maintenance	County, private, and possible state roads would require upgrading to accommodate large, heavy loads associated with construction. Construction contractor would have agreement with state and county road departments regarding upgrades and maintenance during construction. Net impact on county roads expected to be positive. During operation, minimal impact, equivalent to existing local traffic.	Same as No Action.
Public safety	Public safety due to increased traffic, large loads, and detours or delays during construction would be addressed consistent with state and county regulations. No	Same as No Action.

Table E-2. Summary of predicted environmental effects, Coyote Wind Project, Sweet Grass County, Montana.

Resource Area / Issue	No Action Alternative	Proposed Action Alternative
	increased impacts during operation.	
Socioeconomics		
Employment	400 construction related jobs created with an attempt to maximize local engagement. 4 permanent jobs.	Same as No Action, but temporary employment would be for a slightly longer period.
Income	Likely some increase in local income during construction phase, not quantifiable at present.	Some increase over No Action during construction due to longer construction period.
Revenue from sales receipts	Likely increase in sales receipts during construction phase.	Some increase over No Action during construction due to longer construction period.
Revenue to county from property taxes	Likely significant increase, ~$0.95 to 1.25 million annually without figuring in possible tax incentive programs.	Possible increase over No Action of $0.21 to $0.28 million annually without figuring in tax incentive programs.
Revenue to local government and schools	Increase during first 3 years of operation if impact fee is levied. Up to 0.5% of construction costs.	Same as No Action, but potential for greater total since increased construction costs.
Revenue to State, including to School Trust Fund	Likely increase in bed tax if increase in rooms rented during construction. Increase in wholesale energy transaction taxes if electricity is sold across transmission line (0.015 cents per kwh minus 5% if sold out of state). No impact to School Trust Fund.	Likely slight increase in bed tax (over No Action) due to longer construction period, increase in wholesale energy transaction tax due to greater energy production. Minimum increase in monies to School Trust Fund in Year 1 is estimated to be $36,000; and the minimum increase in subsequent years is estimated to be $21,600/year in nominal dollars
Regional property values	Likely minimal impacts to adjacent land values. Minimal impact on housing prices in Sweet Grass and Park counties.	Same as No Action.
Terrestrial Vegetation and Habitats		
Permanent loss of vegetation	Approximately 37 acres – 1.6 % of wind resource area.	Additional 6.4 acres - Approximately 1.0 % of state parcel and 1.4% of wind resource area.
Habitat fragmentation	Minimal – temporary to permanent fragmentation of native habitats would occur near roadways.	Same as No Action, slight increase in fragmentation due to more roads.

Table E-2. Summary of predicted environmental effects, Coyote Wind Project, Sweet Grass County, Montana.		
Resource Area / Issue	**No Action Alternative**	**Proposed Action Alternative**
Noxious weeds	Potential for increase.	Potential for increase.
Effects to species of special concern	Minimal or no effect.	Minimal or no effect.
Wildlife		
Construction	36 turbines, approximately 11 miles of roads, and approximately 52 acres of ground disturbance.	Additional 8 turbines, 2 miles of roads, and 9 acres of ground disturbance.
Birds	Injury or mortality from collision (with vehicles, cranes, turbines, meteorological towers, guy wires) or when machinery disturbs ground vegetation.	Similar to No Action, but mortality may also occur on state land.
Bats	No impacts are expected.	Similar to No Action
Big game and general wildlife	Possible direct mortality of small mammals, reptiles, amphibians, and ground-dwelling birds.	Similar to No Action, but mortality may also occur on state land
Species of concern	Impacts similar to those discussed in the above sections.	Similar to No Action
Operation	Permanent loss of approximately 37 acres.	Additional permanent loss of approximately 6 acres.
Birds	Potential for fatalities from collisions with turbines or met towers. Reduced reproduction or recruitment from displacement, habitat loss or fragmentation.	Similar to No Action, but potential for nominal increased impacts, and occurrences on state land.
Bats	Potential for fatalities due to collisions with blades and effects of barotraumas. Possible reduced reproduction or recruitment from changes in migration and foraging behavior.	Similar to No Action, but potential for nominal increased impacts, and occurrences on state land.
Big game and general wildlife	Mortality of small mammals, reptiles, amphibians, and ground-dwelling birds could result from collisions with maintenance vehicles. Possible reduced	Similar to No Action, but impacts may also occur on state land.

Table E-2. Summary of predicted environmental effects, Coyote Wind Project, Sweet Grass County, Montana.		
Resource Area / Issue	**No Action Alternative**	**Proposed Action Alternative**
	reproduction or recruitment from habitat loss or fragmentation.	
Species of Concern	Impacts similar to those discussed in the above sections.	Similar to No Action.
Cultural Resources		
Historical and archeological sites	No previous cultural resources inventory, so impacts not known. Possible impacts to previously unknown resources from ground disturbance due to construction. Mitigated by commitment to call an archaeologist if any resource found. Possible minimal impact to Lewis and Clark National Historic Trail if increased noise or turbine visibility.	Same as No Action for private land and for any new resources on state parcel. Known resources do not meet National Register eligibility, so any impacts would be minimal.
Noise		
Construction	Increase in audible noise due to construction activities. Noise levels depend on distance to receptor and on number and types of equipment being operated simultaneously. Difficult to quantify because equipment would move around the site over the construction period.	Same as No Action.
Operation	At lower wind speeds turbines audible at residences located within 0.75 miles downwind or crosswind (i.e., north, east and south). At higher wind speeds, turbines unlikely to be heard. Turbines may be audible along Yellowstone River if calm water and low wind speeds.	Additional turbines of the Proposed Action Alternative would provide an incremental increase in noise, but are not predicted to change the turbine noise levels at the residences or along the Yellowstone River compared to the No Action Alternative.
Visual Impacts		
Construction	Equipment visible from I-90 and county roads.	Same as No Action.
Operation	Turbines visible from I-90 but do not block views of Crazy Mountains. At night, turbine lighting may be visible, but faint.	Similar to No Action for visibility from I-90. Looking toward the state parcel from N. River Road near CMCC, 3 more turbines would be visible.

Table E-2. Summary of predicted environmental effects, Coyote Wind Project, Sweet Grass County, Montana.		
Resource Area / Issue	**No Action Alternative**	**Proposed Action Alternative**
Aviation		
	No impact to any airport operations. Lighting on the turbines would mitigate any impacts to aviation.	Similar to the No Action alternative.

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Tables and Figures:

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Appendices:

Glossary: Acronyms, Abbreviations, and Useful Terminology

APE	Area of Potential Effect
AUM	Animal Unit Months
AWP	Alternity Wind Power
BLM	United States Bureau of Land Management
BLS	Bureau of Labor Statistics
BMP	Best Management Practices
BUC	Bird Use Count
CMCC	Crazy Mountain Cattle Company
CDFG	California Department of Fish and Game
CEC	California Energy Commission
CRABS	Cultural Resource Annotated Bibliography System
CRIS	Montana Cultural Resource Information System
CWA	United States Clean Water Act
dB	decibels
dBa	A-weighted decibel (see below)
DEQ	Montana Department of Environmental Quality
DNRC	Montana Department of Natural Resources and Conservation
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FS	United States Department of Agriculture Forest Service
FWP	Montana Department of Fish, Wildlife, and Parks
FWS	United States Fish and Wildlife Service
HZ	Hertz (A unit of frequency equal to one cycle per second)
I-90	United States Interstate Highway 90
JGWEC	Judith Gap Wind Energy Center
kHz	Kilohertz (measurement of frequency equal to 1000 hertz)
kV	Kilovolt (equivalent to 1,000 volts)
kWh	Kilowatt hour
$\mathbf{L_{eq}}$	Equivalent continuous noise level (see below)
$\mathbf{L_{90}}$	90^{th} percentile-exceeded noise level (see below)
LUL	Land Use License
MCA	Montana Code Annotated
MDT	Montana Department of Transportation
MEPA	Montana Environmental Policy Act
MNHP	Montana Natural Heritage Program
MPDES	Montana Pollutant Discharge Elimination System
MV	Millivolt (equivalent to one thousandth of a volt)
n or **N**	A common symbol to use in mathematical equations to stand for a *count* or *value*
NPDES	National Pollutant Discharge Elimination System

NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRIS	National Resource Information System
PII	Potential Impact Index
REMP	Real Estate Management Plan
RFP	Request for Proposals
ROD	Record of Decision
ROW	Right-of-Way
SBC	Small Bird Count
SCADA	Supervisory Control and Data Acquisition
SHPO	State Historic Preservation Office
SWPPP	Storm Water Pollution Prevention Plan
TAC	Technical Advisory Committee
USC	United States Code
USGS	United States Geological Survey

Agglomerate A volcanic rock consisting of rounded and angular fragments fused together.

Ambient noise
The surrounding noise associated with any given environment. The composite of all sound present in a given environment, from many sources near and far.

Andesite The most common volcanic rock after basalt. It consists of coarse crystals embedded in a granular or glassy matrix. Its character typically is a result of the melting and assimilation of rock fragments by magma rising to the surface.

Anticline Usually recognized by a sequence of rock layers that are progressively older toward the center of the fold. The strata dip away from the center, or crest, of the fold.

Bedrock The solid rock that underlies the soil and other unconsolidated material or that is exposed at the Earth's surface.

Class III A Class III level inventory is a systematic, detailed field inspection done by, or under the direct supervision of professional architectural historians, historians, archeologists, and/or other appropriate specialists. This type of study is usually required to formulate a preliminary determination of the significance of resources and their eligibility for listing in the National Register of Historic Places. It is preceded by adequate literature search (Class I), and, sometimes, by a reconnaissance effort (Class II).

Cuesta A ridge composed of steeply tilted rock protruding from the surrounding area. Similar to a hogback (see below), but with a more gentle dip slope.

dBA Noise levels are quantified using units of decibels (dB). To the human ear, noise with significant measured levels (in dB) at high or low frequencies will not be as annoying as it would be when its energy is concentrated in the middle frequencies. In other words, the measured noise levels in dB will not reflect the actual human perception of the loudness of the noise. In noise analysis studies, a specific circuit is added to the sound level meter to correct its reading in regard to this concept. This reading is the noise level in dBA. The letter A is added to indicate the correction that was made in the measurement. The "A-weighting" of noise levels, or A-weighted decibels (dBA), closely correlates to the frequency response of normal human hearing (250 to 4,000 hertz)

Diorite A grey to dark grey intermediate intrusive igneous rock composed principally of feldspar. The extrusive volcanic equivalent rock type is andesite**.**

Echolocation Also called biosonar, is the biological sonar used by most bats. Echolocating bats emit calls out to the environment and listen to the echoes of those calls that return from various objects in the environment. They use these echoes to locate, range, and identify the objects, as well as navigation and for foraging (or hunting) in various environments.

Ephemeral Stream/Drainage
A stream or reach of a stream that flows briefly only in direct response to rainfall or snowmelt in the immediate locality and whose channel is at all times higher than the water table.

Fluvial Refers to the processes associated with rivers and streams and the deposits and landforms created by them.

Forb Broad-leaved, non-woody plants growing in fields and meadows; does not includes grasses.

Groundwater Water occupying the voids within a geologic stratum (layer) and within the zone of saturation.

Hogback A ridge composed of steeply tilted rock protruding from the surrounding area. The name comes from the ridge resembling the high, knobby spine between the shoulders of a hog. In most cases, the two strata that compose a hogback are different types of sedimentary rock with differ in weathering rates. The softer rock erodes more quickly than overlying hard rock. Over time, the softer rock retreats to a point where the hard and soft rock strata are adjacent. This creates cliffs that steepen as the softer rock continues to erode. Hogbacks are often found as ridges along the "eroded flanks of large, tightly folded anticlines and synclines. The defining characteristics of a hogback a steep dip slope that is greater than 30° - 40° with a near symmetric slope on each ridge face.

Hydrogeology
The scientific discipline that studies the distribution and movement of groundwater in the soil and rocks of the Earth's crust, (commonly in aquifers).

Igneous rock A rock made from molten (melted) or partly molten material that has cooled and solidified.

Lacustrine Of or having to do with lakes.

Laramide Deformation
The collision of an oceanic plate with North America, which formed the Rocky Mountains. It is the series of mountain-building events that affected much of western North America around 65 million years ago.

L_{eq} Environmental, or community noise is constantly changing in level and duration. L_{eq} (Equivalent sound level) represents a steady-state sound that has the same energy and A-weighted level as the environmental or community noise over a given time interval. For example, one could measure their home or office and determine the day-night averaged sound level of a 24-hour period.

L_{90} The L_{90} represents the A-weighted sound level that occurred at 90% or more of the time of the measurement.

Mitigation An action taken to moderate or alleviate an impact.

Nacelle The structure at the top of the wind turbine tower just behind the wind turbine blades This structure, or shell casing, covers the gearbox, generator, blade hub, and other parts.

Parent material
The underlying geological material (generally bedrock or a superficial or drift deposit) in which soil horizons form. Soils typically get a great deal of structure and minerals from their parent material. Parent materials are made up of consolidated or unconsolidated mineral material that has undergone some degree of physical or chemical weathering.

Perennial Stream/Drainage
A perennial stream has flowing water year-round during a typical water year. In contrast to an ephemeral stream, the water table in a perennial stream is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow; while runoff from rainfall and snowmelt are supplemental source of water for stream flow.

Phonic Group
Specific frequency ranges of individual bat species. These frequency ranges, or groups, is used by researchers to identify bats flying in an area simply by recording their calls with ultrasonic recorders known as 'bat detectors', and comparing the recordings to known reference calls.

Physiographic province
A region of the landscape with distinctive geographical features. A contiguous area characterized by similar elevations, relief, geologic structure and geologic history.

Section 106 The section of the National Historic Preservation Act requiring federal agencies to consider the effects of a proposed project or undertaking on historic properties and afford the Advisory Council on Historic Preservation an opportunity to comment on the project or undertakings.

Sedimentary Rock
Sedimentary rock is formed by the deposition and consolidation of mineral and organic material and from precipitation of minerals from solution. They form at the surface in environments such as beaches, rivers, the ocean, and anywhere that sand, mud, and other types of sediment collect. Sedimentary rocks account for 75-

80% of the Earth's land area, and includes common types such as limestone, chalk, dolostone, sandstone, conglomerate, some types of breccia, and shale.

Strata A layer of rock or soil with internally consistent characteristics that distinguishes it from contiguous layers. Each layer is generally one of a number of parallel layers that lie one upon another, laid down by natural forces. Strata are typically seen as bands of different colored or differently structured material exposed in cliffs, road cuts, quarries, and river banks. Individual bands may vary in thickness. Each band represents a specific mode of deposition.

Syncline A fold of rock layers that slope upward on both sides of a common low point. Synclines form when rocks are compressed by plate-tectonic forces. They can be as small as the side of a cliff or as large as an entire valley.

Viewshed A viewshed is an area of land, water, and other environmental elements that is visible from a fixed vantage point. In urban planning, for example, viewsheds tend to be areas of particular scenic or historic value that are deemed worthy of preservation against development or other change.

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Chapter 1: Purpose and Benefits of Proposed Action

1.1 Introduction

The “Purpose and Benefits” section of an Environmental Impact Statement (EIS) prepared under the Montana Environmental Policy Act (MEPA) provides the context for the decision to be made. The Montana Department of Natural Resources and Conservation (DNRC) is evaluating whether to lease 640 acres of school trust land in Sweet Grass County (Section 36, Township 1 North, Range 12 East) to Coyote Wind, LLC (Coyote Wind) for the placement of approximately eight wind turbines to generate electricity (Figure 1.1-1). This section of land was previously identified in a statewide study of Trust lands (Wilde 2005) as having characteristics that would be conducive to wind energy development. The Proposed Action would be implemented in 2010, and would continue for 20-30 years.

Chapter 1 presents the background and procedural framework of wind energy development on state trust lands in Montana; a list of any other local, state, or federal agencies that have overlapping or additional jurisdiction or responsibility for the Proposed Action, and a list of all necessary permits and licenses; a description of any other environmental review documents that influence or supplement this document; and the scope of analysis and specific issues to be addressed in this EIS.

1.2 Wind Development on Lands Owned by the State of Montana

In 2003, the Montana Wind Energy Working Group was formed, and included representatives of state government agencies (including Montana Department of Environmental Quality [DEQ] and DNRC), utilities, and other wind resource groups. Its stated goal was “to promote wind power purchases to utilities and other power purchasers and to proactively support projects and initiatives that will stimulate development of Montana’s wind resources” (Montana Wind Working Group 2003).

In 2004, the DEQ conducted studies to rank the wind resource for windy regions in Montana containing school trust land (Wilde 2005). The study ranked Judith Gap as the overall best location, with the Coyote Wind state parcel being addressed in this EIS (previously called Springdale) as a close second. DEQ conducted further studies on the Coyote Wind state parcel including an initial biological evaluation (Wilde 2004), and one year of meteorological data collection (Wilde 2005). In 2005, DNRC issued a Request for Proposals (RFP) for parties interested in leasing this parcel of state land for wind development. Coyote Wind, LLC responded to the RFP and was selected as the successful applicant. Other wind development on school trust land in Montana includes the Judith Gap Wind Farm which went on line in 2005 and the Martinsdale Wind Farm which is expected to begin construction in 2010.

Coyote Wind is owned by Enerfin Energy Company (Enerfin; 95% ownership) and Alternity Wind Power (AWP; 5% ownership). It is Enerfin’s intention to operate the project for the full life of the project. Information on Enerfin is provided in Appendix A. In addition to the development being evaluated in this EIS, Coyote Wind is constructing 36 wind turbines on private land to the south and west of the state parcel. Development on private land is not part of the action being evaluated in this EIS. It will, however, be considered in the effects analysis as part of the existing condition under the No Action Alternative described in Chapter 4.

1.3 Purpose and Benefits of Proposed Action

The school trust land is managed by DNRC for the State of Montana. Montana state law mandates the “highest development of state-owned lands in order that they might be placed to their highest and best use and thereby derive greater revenue for the support of the common schools” (77-1-601; MCA 2007a). DNRC’s stated objectives in issuing RFPs for wind development on school trust lands are:

- To lease state trust lands for wind exploration and new commercial-scale wind facilities;
- To generate income for state trust beneficiaries that reflects fair market value of the use of trust lands for wind energy development;
- To achieve commercial operation of the wind projects as soon as possible, with minimal impacts to the environment (DNRC 2008).

The purpose of the Coyote Wind Project is to fulfill the school trust land management mandate and the Montana Wind Working Group goal (Section 1.2).

1.4 Applicable Laws and Regulations

1.4.1 Montana Department of Environmental Quality

DEQ does not administer permits specific to wind development as an energy facility. However, other permits may apply, depending on the project circumstances. The following permits and regulations are, or may be, applicable to the Coyote Wind Project.

Montana Pollutant Discharge Elimination System Permit

In Montana, DEQ administers the National Pollutant Discharge Elimination System (NPDES) permitting process as required by the US Clean Water Act (CWA). The CWA prohibits the discharge of any pollutant to waters of the United States unless the discharge is authorized by a permit. The NPDES Program in Montana is administered under the Montana Pollutant Discharge Elimination System (MPDES) Program.

Construction activities disturbing five acres or more of land are required to get an MPDES permit. As part of their permit application, the applicant must provide a Storm Water Pollution Prevention Plan (SWPPP) which includes three major components:

1. Assessment of the characteristics of the site such as nearby surface waters, topography, and storm water runoff patterns;
2. Identification of potential sources of pollutants such as sediment from disturbed areas, and stored wastes or fuels; and
3. Identification of Best Management Practices (BMPs) which will be used to minimize or eliminate the potential for these pollutants to reach surface waters through storm water

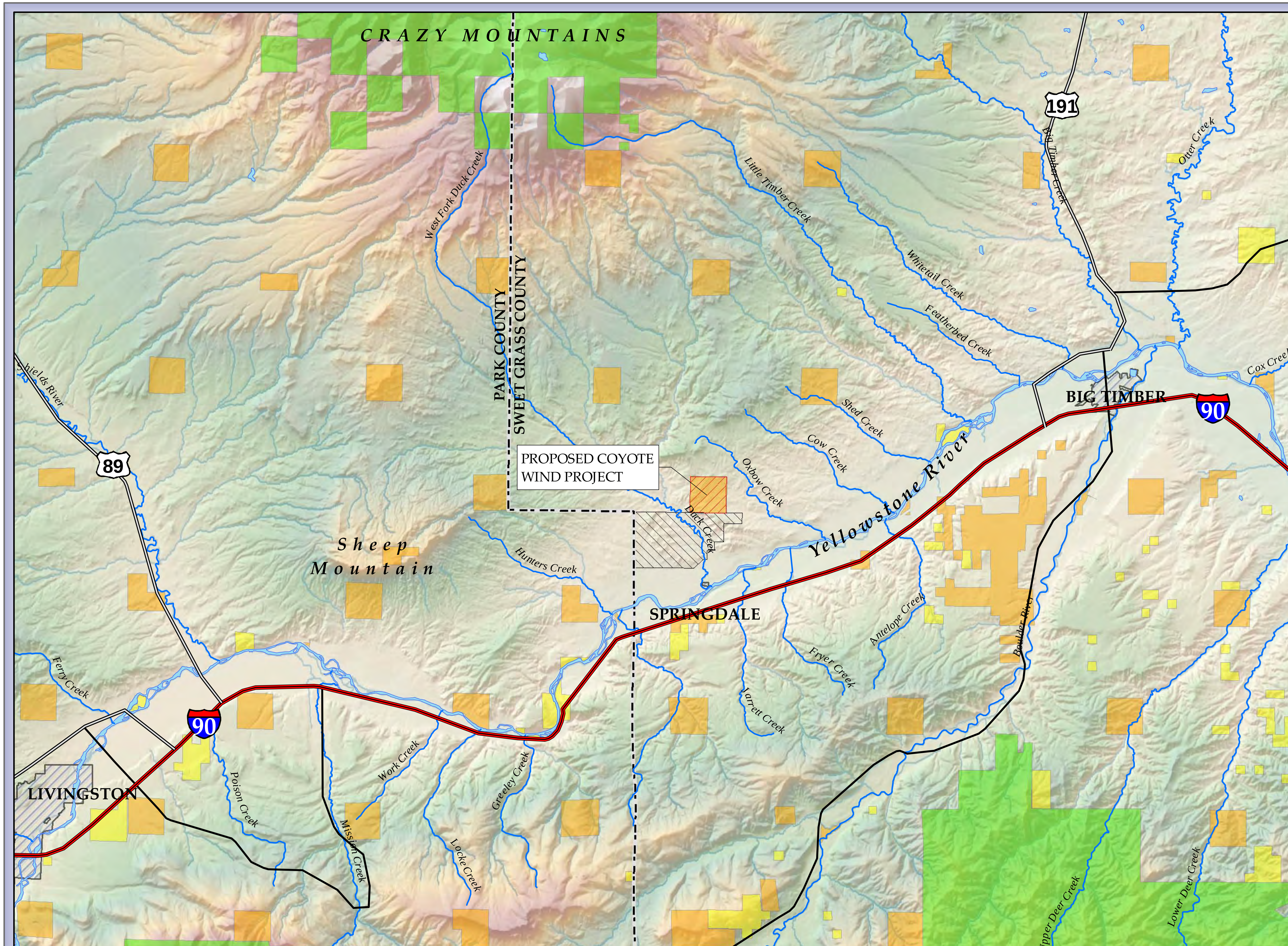

FIGURE 1.1-1.
LOCATION OF PROPOSED COYOTE WIND PROJECT

Sweet Grass County, Montana
T1N R12E Section 36

SOURCES:
MONTANA NATURAL RESOURCE INFORMATION SYSTEM (NRIS)
ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE (ESRI)

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runoff. BMPs at construction activity sites typically consist of various erosion and sediment control measures.

Coyote Wind is preparing its MPDES permit application for submittal to DEQ.

Stream Permitting
Projects that infringe on the streams or their floodplains, or wetlands require special permits. However, the Coyote Wind Project has been planned to avoid such infringement, so these permits will not apply.

1.4.2 United States Fish and Wildlife Service

The US Fish and Wildlife Service (FWS) typically becomes involved in a wind project when a federal action is being evaluated under the National Environmental Policy Act (NEPA). There is no federal action invoking NEPA for the Coyote Wind Project. However, the FWS may still play a role as administrators of the following wildlife laws.

Endangered Species Act
Section 9 of the Endangered Species Act (ESA) of 1973 (16 USC 1531-1544) prohibits anyone, private parties and federal agencies, from "taking" endangered or threatened wildlife or plants. "Take" includes "harming" a listed species and "harm" is defined by FWS to include habitat alteration. Any party engaging in an activity that might incidentally harm a listed species may apply for an “incidental take permit” from the FWS. Parties may also apply for “enhancement of survival” permits. These are agreements to encourage landowners to take actions to benefit species while providing assurances they will not be subject to additional regulatory restrictions. The Coyote Wind Project is not expected to affect any federally listed species (see Chapter 4).

Migratory Bird Treaty Act
The Migratory Bird Treaty Act (16 USC 703-712) declares that it is unlawful to take, kill, or possess migratory birds. The Secretary of the Interior through the FWS is authorized to determine when, to what extent, and by what means; it is compatible with the terms of the conventions to allow taking or killing of migratory birds. For projects such as wind farms, FWS will make a determination based on the good faith effort of the project operator to minimize and avoid such take.

Bald and Golden Eagle Protection Act
The Bald and Golden Eagle Protection Act (16 USC 668-668d, 54 Stat. 250) as amended, provides for the protection of the bald eagle and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. This act is enforced by the Secretary of the Interior via the FWS. In determining the amount of the penalty, the gravity of the violation, and the demonstrated good faith of the person charged shall be considered by the Secretary (FWS 2008).

1.4.3 Other Applicable Laws and Regulations

Montana County Weed Control Act (Title 7, Chapter 22 Part 21)

This law requires counties to develop a long term management plan for the control of noxious weeds in their county. Sweet Grass County has a weed control plan developed to comply with this Act. Since the proposed project is on state land, DNRC would cooperate with Sweet Grass County on weed management requirements. Coyote Wind would be responsible for weed control.

Federal Aviation Administration (FAA)
The Code of Federal Regulations Title 14 Part 77 states that any person or organization who intends to sponsor any construction or alterations on or near an airport must notify the Administrator of the FAA of any construction or alteration exceeding 200 feet above ground level. Additionally, the FAA has standards for marking and lighting structures such as wind turbines, met towers, and supporting structures (FAA 2007). When relevant information about a project is filed, the FAA makes a determination of whether the project should have any marking or lighting to increase aviation safety in the area of the wind facility. Coyote Wind would prepare required notices and comply with all required lighting and marking.

1.5 Other Related Environmental and Planning Documents

DNRC Real Estate Management Plan
The Trust Land Management Division of the DNRC completed a programmatic EIS and Record of Decision (ROD) (DNRC 2005) analyzing alternatives for the selection and management of real estate development on School Trust Lands. The ROD serves as the Real Estate Management Plan and provides policy, direction, and guidance for activities related to the leasing, exchanging, or selling of School Trust Lands for residential, commercial, industrial, and conservation purposes. Wind development is considered an industrial use and is listed as one possible use of School Trust land.

Sweet Grass County Growth Policy
The Project's relationship to the county growth policy is addressed in detail in the Land Use sections of Chapter 3 and 4. DNRC coordinates the use of School Trust Lands so as to be consistent with city and county growth policies. The project was presented to the Sweet Grass County commissioners in 2006 and there were no objections.

1.6 DNRC's Responsibilities and Decisions

DNRC must prepare a thorough EIS to disclose the potential impacts of the No Action and the Proposed Action alternatives. Based on this EIS, the DNRC Southern Land Office Area Manager will issue a ROD. The ROD is a concise public notice of DNRC's decision, explaining the reasons for the decision and any special conditions surrounding the decision or its implementation (Mundinger and Everts 2004). Throughout the entire process, MEPA requires open disclosure for the involvement of the public in the EIS process.

1.7 Scope of Analysis

The geographic scope of this EIS includes the state-owned parcel of land and adjacent lands as relevant to the specific resources being evaluated. This geographic scope is defined for each resource area in Chapter 3. The EIS presents descriptions of the No Action and Proposed Action alternatives (Chapter 2); descriptions of the affected environment for all potentially affected resources (Chapter 3); and an analysis of the impacts of alternatives (Chapter 4).

1.8 Public Involvement

One of MEPA's objectives is to ensure that the public is informed of, and participates in, the review process (Mundinger and Everts 2004). The MEPA Model Rules require agencies to invite public participation in the determination of the scope of an EIS; provide a 30-day public review period for the Draft EIS; and include public comments and the agency's response to substantive public comments in the Final EIS (Mundinger and Everts 2004). A public hearing on the Draft EIS will be held during the public review period.

1.9 Issues Identified During Scoping

DNRC opened the scoping period for the Coyote Wind Project EIS on May 12, 2008. On May 29, 2008, DNRC held a public meeting in Big Timber, Montana, at the Carnegie Public Library. Comments made at the meeting were collected and entered into the project record, as were comments received via postal mail or e-mail. The scoping period closed on June 13, 2008. The scoping report was posted on DNRC's website (http://dnrc.mt.gov/trust/wind/springdale.asp) in December 2008.

The intent of scoping is to solicit participation from the public and interested agencies regarding the direction, breadth, and extent of the analysis contained in an EIS. Comments are evaluated based on their content and relevance, and on the jurisdiction of DNRC and associated agencies. Public scoping comments may redirect the analysis in an EIS or assist in the development of alternatives.

Seven individuals or entities submitted written comments, in addition to the many oral comments recorded at the scoping meeting. Most comments were from individual citizens. Government agencies contacted during the scoping period, and those who participated in the development of the draft EIS, are included in Chapter 6.

The substantive issues resulting from scoping are described below.

1.9.1 Socioeconomics

Several commenters specifically mentioned the potential effect that the project would have on employment in Sweet Grass County. One commenter stated that the level of employment in the county was high enough that no economic benefit would be gained by adding the jobs for the wind project. The potential for changes in employment in Sweet Grass County and the types and numbers of jobs likely to be generated by the proposed project are included in this EIS (section 4.6).

Three comments were received requesting that the effect of the proposed wind project on the local economy in general be evaluated. Other commenters asked for specific effects of the project on sectors of the economy such as roads, real estate, jobs, tax base, etc. Some commenters expressed support for the economic benefits of "clean" energy while others opposed the project because they thought the majority of the economic benefits would go to the operator rather than the DNRC. Several owners of land near the proposed project voiced concerns about effects of the project on land values. Potential economic effects on the local economy and the projected property tax revenues from the entire wind project development are addressed in this EIS (sections 3.6 and 4.6).

One comment questioned how the state calculates the annual fee for the lease. Another comment raised the issue of whether the economic benefit to the state was worth the potential cost. The action evaluated in this EIS is the action of DNRC leasing the land for the purpose of wind power generation. Relevant financial information pertaining to that action is described, including the projected revenue to the Trust (sections 3.6 and 4.6).

1.9.2 Land Use and Recreation

Comments related to land use requested the scope of analysis in the EIS include:

1. Land boundary management (fences, access);
2. Impacts on adjacent land uses such as agriculture (e.g. grazing, irrigation);
3. Impacts to county roads due to construction, operation and ongoing road maintenance;
4. Potential for restricting future subdivision of neighboring lands;
5. Assessment of “takings” and property rights issues related to land use impacts and restrictions on future land use of adjacent private lands.

One commenter stated that wind leases were preferable to subdividing ranch lands to generate income from the private lands.

Comments on land use within the state parcel focused on current and future use of the land. Several comments were made regarding the choice of this particular parcel of State School Trust land for wind energy development. Commenters requested information on how other uses of the state parcel, such as existing grazing leases, may be affected. One comment stated that the proposed project would violate the Sweet Grass County Growth Policy. Concern was expressed regarding whether there would be a change in access to the state parcel for wildlife viewing, hunting, hiking, picnicking, or camping. Most of the comments on use of the state parcel addressed concerns included in the scope of analysis of this EIS (sections 3.4 and 4.4; also see section 1.9 for exceptions regarding the “takings” issue and county roads).

1.9.3 Water Quality

One commenter wanted information on permitting and the potential for sediment and pollutants to be delivered to Duck Creek, a tributary of the Yellowstone River. The effect of the project on water quality is addressed in the EIS (section 4.3).

1.9.4 Cultural Resources

One comment addressed the impacts of the project to cultural and archeological resources on the state parcel. Several comments were raised as to the project’s impacts on the Lewis and Clark National Historic Trail and the viewshed from the trail. One comment was specifically concerned about the effect of the project on people floating down the Yellowstone River. In addition to impacts on the viewshed, comments addressed how traffic and noise from the project would affect users of the historic trail, and how the project might affect wildlife along the trail.

DNRC conducted a Class III cultural resources survey of the state parcel in 2005 (Rennie 2006; Appendix E). A Class III inventory includes a pedestrian survey of the entire parcel. Survey results are included in this EIS (section 3.9 and Appendix E). Several related comments on impacts to historical resources are covered in other resource areas of the EIS (aesthetics-section 4.11; traffic-section 4.5; noise-section 4.10; and wildlife section 4.8). Impacts to historical resources are addressed to the extent they are related to the proposed action.

1.9.5 Wildlife and Terrestrial Resources

There were two comments from the May 29 scoping meeting that mentioned wildlife, and numerous others comments sent directly to DNRC. Concerns about wildlife issues addressed the extent of studies and methodology for evaluating existing use of the parcel and surrounding lands by birds, bats and other wildlife. There were comments about turbine placement and measures the project could implement to minimize impacts to wildlife including post-construction mitigation measures. A number of comments voiced concern about the proximity of the project to the Yellowstone River, and the river corridor's value to wildlife.

There were several comments related to vegetation: 1) a comment that the state should require that all vegetative restoration work for native habitats use native plants, and 2) that the project's effect on the flora and on noxious weeds should be assessed.

The environmental impacts to wildlife and vegetation of the Proposed Action and No Action alternatives are fully addressed in the EIS (sections 4.7 and 4.8). Methods for all wildlife field studies are included in Appendix B, and the post-construction monitoring plan for birds and bats is included in Appendix F. Coyote Wind would be required to submit a noxious weed control plan to comply with all existing laws.

1.9.6 Aesthetics and Noise

The key concerns expressed in comments were the effects of the project on the general scenery and aesthetics of the area, and noise and lighting impacts from construction and operation of the project. These effects are addressed in the EIS (sections 4.10 and 4.11 and Appendix G).

1.9.7 Project Design and Engineering

Comments generally addressed the need for a detailed description of the Proposed Action, time line for construction and operation, questions about any new transmission lines or connectivity to existing lines, total number of turbines proposed including those on adjacent private land, height of turbines, effects on existing substation, how much energy would be produced, markets for the power, requirement for a construction bond and reclamation. If relevant, these issues are addressed in the description of the Proposed Action in enough detail so that all impacts can be assessed (Chapter 2). The EIS also includes a description of development on adjacent private land, though that development is not the subject of the Proposed Action evaluated in this EIS.

1.10 Issues Considered but Not Studied in Detail

Although every comment received was read and assessed as part of the public involvement phase of this EIS, some comments were outside of the scope of work of the EIS analysis.

The comments on land use that are not covered in detail in this EIS address the potential for restricting future subdivisions, takings, and property rights issues. There are no subdivisions currently in the planning process that would be affected by the Proposed Action. Discussion of “takings” or property rights issues in general is a complex legal arena outside the scope of this EIS.

County road maintenance is outside of the jurisdiction of DNRC. The agency has no authority to impose fees on, or limit use of, county roads. Coyote Wind would have separate agreements with the County or the State regarding road use, road upgrades, and repair of any project caused damage. Planned road upgrades and maintenance, to the extent known, is discussed in sections 3.5 and 4.5.

There was a comment that Conservation Reserve Program (CRP) land disturbed by the project should be replanted back to native grass varieties as much as possible. There is no CRP land on the state parcel so this issue will not be addressed.

One comment was received stating that no information was provided at the scoping meeting regarding the specific financial ability of the developer to complete this project. MEPA does not require such information and thus it is outside the scope of this EIS.

Chapter 2: Description of Alternatives

2.1 Overview

This chapter describes the Proposed Action and the No Action project alternatives, and compares the alternatives by summarizing the environmental consequences by discipline. Any potential alternatives have to meet the purpose and benefits of the proposed action, and have to be reasonable. Reasonable is defined under Montana State law as being achievable under current technology and being economically feasible as determined solely by the economic viability for similar projects having similar conditions and physical locations (75-1-201 MCA).

Two alternatives are evaluated in detail:

- The Proposed Action Alternative describes the wind development on the state parcel including associated facilities and roads, construction activities, operation and maintenance activities, mitigation inherent in project design, and decommissioning.
- The No Action Alternative assumes the DNRC would not lease the state parcel to Coyote Wind, and land use and revenue for that parcel would continue in its current state. Coyote Wind would still develop the wind project on the adjacent private land.

Issues raised during scoping (Garcia and Associates 2008; summarized in Chapter 1) guided the analysis conducted in this EIS. However, these issues did not require development of another alternative. The DNRC has a Land Use License with Coyote Wind for exclusive wind energy exploration rights on the state parcel. Coyote Wind considered environmental concerns identified in previous site assessments when developing the scenario presented under the Proposed Action Alternative (Wilde 2005; Appendix C). The Proposed Action meets the purpose and benefits of leasing the state parcel for wind development.

2.2 Proposed Action Alternative

DNRC proposes to lease the 640-acre state parcel of land in Sweet Grass County, Montana (Section 36, T1N, R12E) to Coyote Wind to be used as a portion of the Coyote Wind Project (Figure 2.2-1). This land is held in trust by the State of Montana for the benefit of the Common School Trust. The term of the lease would likely be 20-30 years and the land would be used by Coyote Wind exclusively for the purpose of generating electricity using wind power.

The state parcel has all the key elements required for the development of a successful wind power project:

- robust and stable wind resource
- access to high voltage transmission lines
- good transportation access
- compatible land use
- supportive county government

2.2.1 Project Site Description

The general area is characterized by rocky grasslands, irrigated and dry farm land, grazing land and areas covered with a mixture of sagebrush and woody vegetation typically in draws (see section 3.7). The overall population density in the area is very low and few dwellings exist in the vicinity of the state parcel.

Land use in the area consists of open space, ranching and farming on privately-owned and state-owned property. The private property is owned by a few large landholders. The locations of private residences in relationship to the Project are shown on Figure 2.2-1. The closest private residence to a proposed turbine location on the state parcel is 0.6 miles (the closest residence to a turbine location proposed for private land is 0.3 miles). A more detailed description of land use can be found in Section 3.4 of this document.

The state parcel offers direct interconnection to the high-voltage transmission system through the Park Electric Cooperative's (Park) Lower Duck Creek Sub-Station and the NorthWestern Energy-Montana's (NWMT) 161 kV Big Timber-Clyde Park Transmission Line (Figure 2.2-1).

2.2.2 Site Control

Coyote Wind was selected to lease the wind development rights to the state parcel through a competitive bid process run by DNRC. In 2008, the DNRC issued Land Use License No. 6164 (LUL) to Coyote Wind for:

- meteorological and avian data gathering
- exclusive wind energy exploration rights
- geotechnical investigations by licensed soils engineers

Coyote Wind and the DNRC are discussing the final form and substance of the long-term lease between the parties. This document would be completed and executed prior to the initiation of any activities not presently identified in the LUL, including construction of the wind project.

Development on the state parcel is part of a larger wind power development which includes wind energy development on approximately 2,400 acres of adjacent private land. The private development is described under the No Action Alternative.

2.2.3 Site Layout

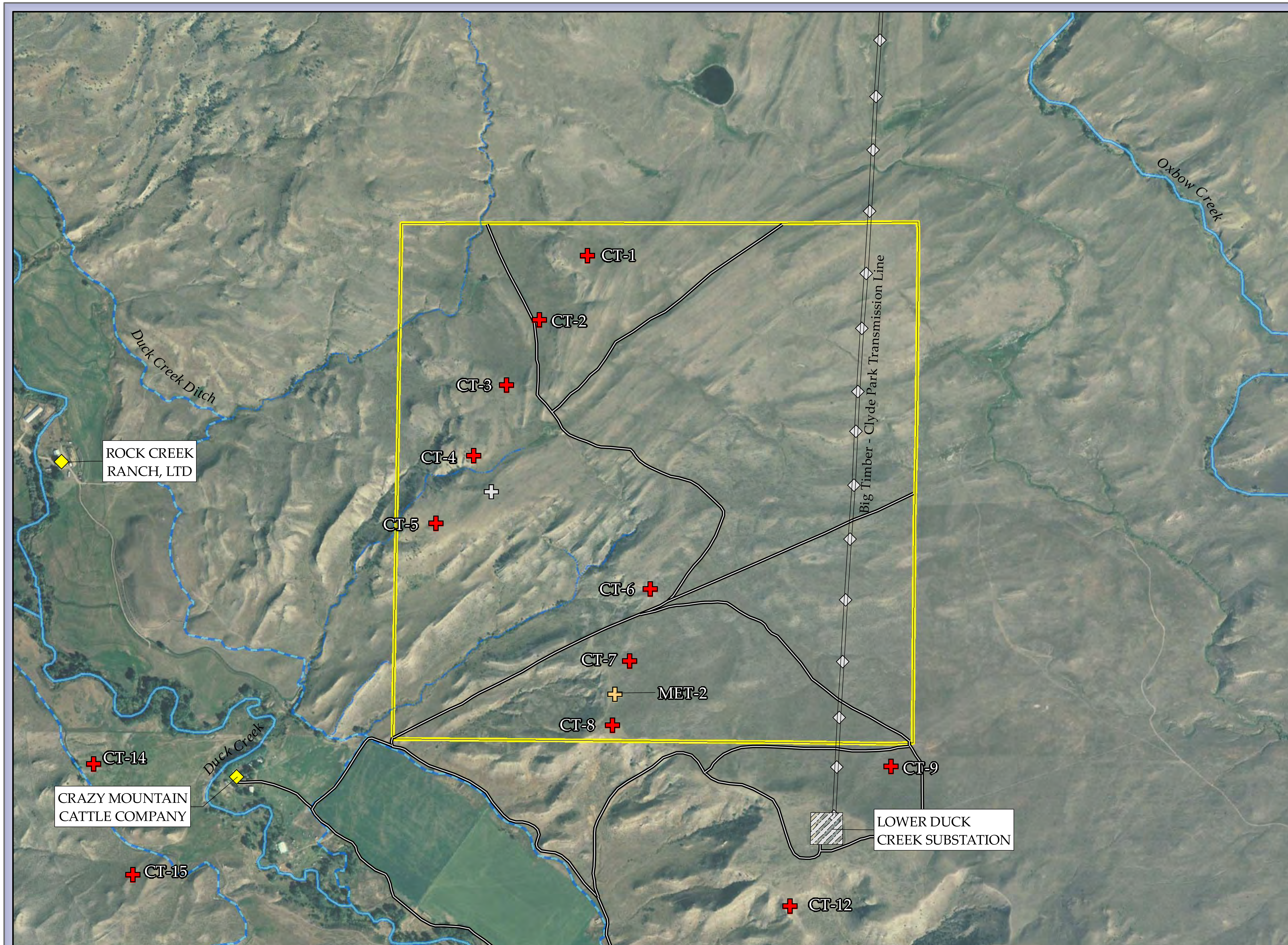
As proposed, the state parcel would have 8 wind turbines installed on the western and central portions of the parcel. These locations were chosen to maximize the robust wind resource in unobstructed locations, including maximizing the energy capture and minimizing the wake and losses caused by the array of turbines on the parcel.

The significant proposed infrastructure improvements on the state parcel would include:

- roads
- wind turbine foundations
- underground electrical collection system

FIGURE 2.2-1.
STATE PARCEL PROPOSED TO BE LEASED FOR THE COYOTE WIND PROJECT

Sweet Grass County, Montana
T1N R12E Section 36



Map Legend:

- Proposed Project Area
- Proposed Turbine Location
- Proposed Met Tower
- Existing Met Tower
- Access Road
- Creek
- Ditch
- Intermittent Stream
- T-Line
- Substation
- T-Line Towers
- Residence

N
W E
S

0 250 500 1,000 1,500 2,000 ft

0 100 200 400 600 m

One Inch is Equal to 1,000 Feet

GANDA

SOURCES:
MONTANA NATURAL RESOURCE INFORMATION SYSTEM (NRIS)
ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE (ESRI)
USDA-FSA ORTHO PHOTO FLIGHT: AUGUST 25, 2005

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2.2.4 Project Facilities and Technology

2.2.4.1 Roads and Civil Construction Work

The state parcel would be accessed via Interstate 90 and county roads (see Figure 2.2-1). Access to turbines located on the parcel would be achieved via a primary graveled access road with branches to the individual turbine locations (Figure 2.2-2). The roads are designed to allow heavy equipment to traverse the parcel and would be used for the duration of the lease to allow access to and from the wind turbines and meteorological monitoring towers. Approximately 2 miles of road would be constructed or improved on the state parcel.

The road layout on the parcel would minimize the overall disturbance footprint and avoid erosion risks. Wherever practical, existing road corridors would be used to minimize new ground disturbance. Most roads would consist of a 20-foot wide compacted graveled surface, and up to a 34-foot wide leveled surface in other areas to support the large equipment used to erect the wind turbines. In the areas of steeper grades, a cut-and-fill design would be implemented to keep grades below 15% to help prevent potential erosion (Figure 2.2-2).

Coyote Wind would be responsible for controlling noxious weeds introduced by the Project's activities and would comply with the Montana County Noxious Weed Management Act. They would submit to the Sweet Grass County weed board and the DNRC a written plan specifying the methods to accomplish re-vegetation including the time and method of:

- seeding
- fertilization
- recommended native plant species
- use of weed-free seed
- weed management procedures to be used

The Plan must be approved by the weed board and must be signed off by the Chairperson of the board.

2.2.4.2 Turbine Foundations

Coyote Wind, prior to construction, would perform a formal geotechnical investigation to analyze soil conditions and test for homogeneous ground conditions. The foundation design would be based on the results of the geotechnical investigation and would be certified by an experienced and qualified, state-registered civil/structural engineer. The foundation design would be tailored to suit the soil and subsurface conditions at the various wind turbine locations. The footprint of the area disturbed to construct the foundations would be approximately 8,655 square feet per turbine for a total of 69,240 square feet (1.59 acres). However, the approximate acreage permanently lost to turbine foundations is 1,228 square feet per turbine for a total of 9,824 square feet (0.23 acres).

Electrical Collection System Infrastructure

The electrical energy generated by the wind turbines would be collected through a network of underground cables that follow the Project roadway through the state parcel. The energy would be conveyed via these cables to the interconnection point which is outside of the parcel's boundary.

Electrical energy from the wind turbines at 34.5 kV would be fed through a breaker-switch-disconnect located adjacent to the base of each wind tower. The electrical collection cables would be installed in a trench that runs adjacent to the road on the state parcel. Depending on the geotechnical analysis of the parcel's soil, native material or a clean fill material such as sand or fine gravel would be used to cover the collector cable before the native soil and rock are backfilled to close the cable trench.

Supervisory Control and Data Acquisition (SCADA) System

Each wind turbine on the state parcel would be connected to a centralized SCADA system through a network of underground fiber optic cable. The SCADA system allows for remote control monitoring of the individual wind turbines located on the parcel. In the event of faults in the turbines, the SCADA system can also send signals/messages to a fax, pager, or cell phone to alert the operations staff.

2.2.4.3 Wind Turbines

The wind turbines planned for the site are manufactured by Vestas and are the V90-1.8 MW model. This machine is "best-in-class" on a worldwide basis and has a significant number of operational hours in projects on the different continents. The machines would have a "cold-weather" package for use in the Montana environment.

This turbine is a pitch regulated upwind turbine with active yaw and three-blade rotors. The Vestas V90-1.8 MW turbine has a rotor diameter of 295 feet (90 meters) with a rotor swept area of 1.57 acres (6362 m^2). The main shaft of the turbine is 262 feet (80 meters) (base to hub). The turbine uses a microprocessor pitch control system allowing the wind turbine to operate the rotor at variable speed (RPM). The blades are always pitched at the optimal angle for the current wind conditions, thus optimizing power production and minimizing noise levels [(V90-1.8MW Vestas Converter Unity System (VCUS)] (Vestas 2008)].

Turbine lighting would be installed as required by the FAA and would meet its specifications.

2.2.4.4 Meteorological Towers

There is one meteorological tower (met tower) currently located on the state parcel (see Figure 2.2-1). It is 161 feet high and has multiple sensors which collect wind and temperature data. The tower is supported with guy wires. This tower would be replaced with one that is 263 feet tall and would have a lattice or monopole construction with no guy wires.

2.2.5 Power Produced

The capacity of the Project is 14.4 MW on the state parcel (64.8 MW on private land for a total of 79.2 MW). As mentioned, the power would connect to the transmission system through the Lower Duck Creek Sub-Station and NorthWestern Energy's Big Timber-Clyde Park transmission line. This power would contribute to the state of Montana's commitment to have 15% of power generated in the state to be from renewable sources by 2015, and to Governor Schweitzer's support for the national renewable energy goals of having 25% of the United

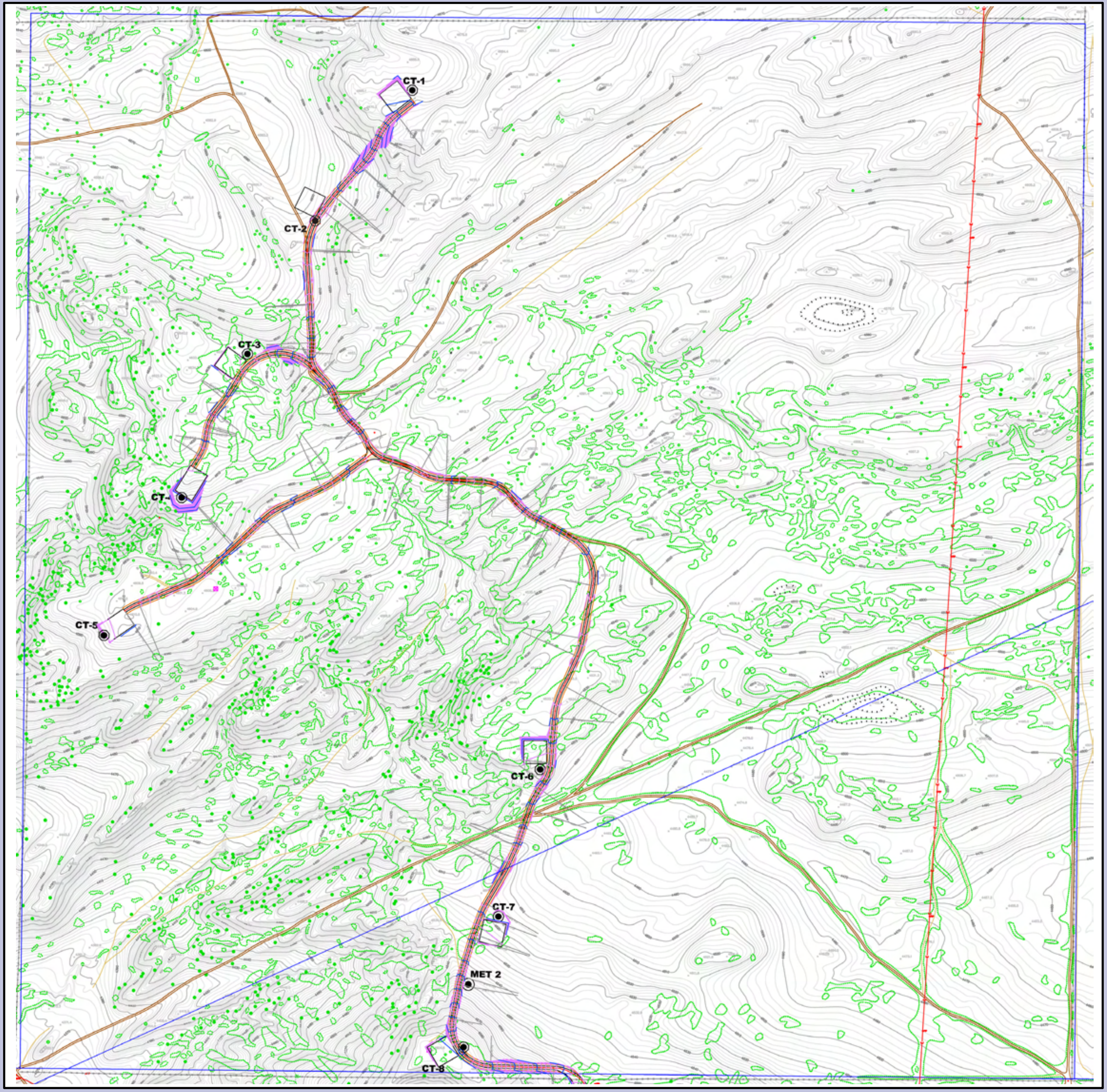
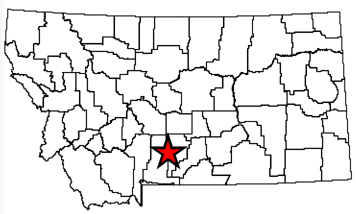


FIGURE 2.2-2.
PROPOSED ROADS AND CUT AND FILL FOR STATE PARCEL
Sweet Grass County, Montana
T1N R12E Section 36

<u>Map Legend:</u>

Proposed Contours (e.g cut and fill)

Access Roads



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SOURCE:
ENERFIN ENERGY COMPANY

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States' energy demand supplied by renewable energy by 2025 (Governor's Office of Economic Development 2006).

2.2.6 Project Schedule

The Project would begin construction in 2010. The basic infrastructure including roads and turbine foundations would be constructed first, then the wind turbines would be erected with the expectation the Project would come on line in 2010. Construction on the state parcel would occur at the same time as construction on the private land to the extent possible.

2.2.7 Project Construction

The main activities occurring during construction are:

- road construction
- turbine foundation construction
- turbine erection
- electrical system construction

Road construction begins with the installation of erosion control measures in compliance with the Best Management Practices (BMPs) that would be outlined in Coyote Wind's MPDES permit. Public roads would be upgraded first, followed by new access roads and then turbine sites.

Turbine foundation sites would be excavated, reinforcing steel installed, and concrete poured. The material removed from foundation sites would be used to backfill and re-grade the existing area of impact. The foundation pedestal would then be formed and cured. When the foundation is complete, the turbines would be erected, and wiring and transformers installed and connected. At the same time, the underground facilities (SCADA system and electrical collection system) would be constructed. Underground construction includes trench excavation, laying cables, and the backfilling of trenches. Approximately 3 turbines would be erected per week.

Table 2.2-1 shows the projected types and number of vehicles on site during construction of the Project. These numbers are rough approximations as these details are not yet available.

Table 2.2-1. Approximate number and types of construction equipment on site during construction, Coyote Wind Project, Sweet Grass County, Montana.

Types of equipment	**Approximate number per day**
Cranes (500 ton and 350 ton)	4 of each
Support crane	2
Backhoes	8
Vehicles (4x4 light truck)	16
Trenchers	1
Dump trucks	6
Concrete portable plant	30 in concrete phase
Trucks (material & equipment transport)	8 in assembly phase

The construction crew would be on site approximately 10 hours per day, 6 days a week, and may be housed in Big Timber or Livingston.

2.2.8 Operations and Maintenance

The Project would be in operation 24 hours per day, 365 days per year unless off-line for scheduled or unscheduled maintenance. During operation, there would be at least 4 people with 2 vehicles working on the site, five days a week. These people would be working on both the state parcel, and the adjacent private land. There would be someone on duty 24 hours a day at the wind project site in case of an incident requiring a response.

2.2.9 Project Decommissioning

The expected life of the Project is approximately 20 years. At the end of this period DNRC and Coyote Wind may choose to renew the lease agreement in which case the equipment would likely be upgraded. If the lease is not renewed, Coyote Wind would decommission the Project and restore the site as closely as possible to its natural state. Restoration requirements would be stipulated in the lease agreement.

2.3 No Action Alternative

Under the No Action alternative, DNRC would not issue a lease to Coyote Wind for the development of wind energy on the state parcel. This may be due to DNRC's decision, or to Coyote Wind's decision based on the final terms and stipulations of the lease agreement. Land use on the state parcel would continue as is (see section 3.4). There would be no wind turbines on the state parcel, however the wind project on the adjacent private land would continue. The State of Montana would generate no revenue from wind development.

Table 2.3-1 provides a comparison of the Proposed Action and the No Action alternatives.

Table 2.3-1. Comparison of wind development activity under No Action and Proposed Action alternatives, Coyote Wind Project, Sweet Grass County, MT.

	No Action		**Proposed Action**	
	Private Land Only	Private and State Land	Private Land Only	Private and State Land
Approximate number of turbines	36	36	36	44
Approximate capacity of wind Project	64.8 MW	64.8 MW	64.8 MW	79.2 MW
Approximate acreage in development	2,400	2,400	2,400	3,040
Approximate miles of improved roads	11	11	11	13
Number of meteorological towers	1	2	1	2
Number of new buildings to support Project	1	1	1	1
Temporary Disturbance				
Approximate acreage of disturbance due to turbine foundation construction	7.15	7.15	7.15	8.74
Approximate acreage of disturbance due to trenching	8.39	8.39	8.39	9.74
Permanent Loss				
Approximate acreage lost to road development	36	36	36	42.15
Approximate acreage lost to turbine foundations	1.01	1.01	1.01	1.24

Approximate acreage lost to trenching	0	0	0	0
Approximate acreage lost to support buildings	<0.25	<0.25	<0.25	<0.25
TOTAL ACREAGE LOST	37.26	37.26	37.26	43.64
PERCENT OF ACREAGE IN DEVELOPMENT	1.55	1.55	1.55	1.44
Workers and vehicles				
Average no. of vehicles on site daily during construction	75	75	75	75
Average no. of workers on site daily during construction	400	400	400	400
Average no. of vehicles on site daily during operation	2	2	2	2
Average no. of workers on site daily during operation	4	4	4	4

2.4 Related Future Actions

This section defines related future actions that are considered in the cumulative impact analysis sections of Chapter 4 of this EIS. Under MEPA, cumulative impact analysis includes “a review of all state and non-state activities that have occurred, are occurring, or may occur that have impacted or may impact the same resource as the proposed action” (Mundinger and Everts 2006). A related future action is one undergoing concurrent review by any agency.

The most relevant related future action is the development of the adjacent private lands as part of the Coyote Wind Project. This development is undergoing concurrent review of an MPDES permit application by DEQ, and is described under the No Action Alternative.

There are no other known related future actions affecting the same resources (Bollman, pers. com. 2008a).

2.5 Summary of Potential Impacts by Alternative

Table 2.5-1 summarizes the potential impacts by alternative.

Table 2.5-1. Summary of predicted environmental effects, Coyote Wind Project, Sweet Grass County, Montana.

Resource Area / Issue	No Action Alternative	Proposed Action Alternative
Geology and Soils		
Geology	Minimal impacts	Minimal impact
Soil quality	Net effects minimal. Possible soil compaction during construction and maintenance. Potential increase for point-source pollution near roads and in heavy equipment work areas.	Similar to No Action. Slightly, but not significantly, greater due to additional area of disturbance.
Soil erosion	Possible soil erosion in localized areas. Potential for noxious weeds to colonize disturbed soil areas would increase risk of soil erosion.	Similar to No Action. Slightly, but not significantly, greater due to additional area of disturbance.

Table 2.5-1. Summary of predicted environmental effects, Coyote Wind Project, Sweet Grass County, Montana.

Resource Area / Issue	No Action Alternative	Proposed Action Alternative
Hydrology and Water Quality		
Water quality - general	Generally minimal impacts mitigated by terms of MPDES permit. Possible accidental leaks or spills into water bodies of any toxic materials used or stored on site during construction and operation. Erosion from road construction could contribute sediment to Duck Creek.	Similar to No Action. Slightly increased potential for impacts due to larger development area.
Land Use and Recreation		
Land ownership	No impact on private land ownership or on use of state parcel.	Same as No Action.
Land use – grazing, right-of-ways	No impact to grazing leases or ROWs on state parcel.	Minimal impacts on existing land use of state parcel. Possible restrictions on grazing during construction. Possible damage to pipeline or utility lines – mitigated by upfront agreements and coordination with ROW holders.
Land use – consistency with existing plans	Consistent with Sweet Grass County Plan.	Same as No Action. Also consistent with DRNC Real Estate Management Plan.
Recreation	No impact to recreation.	State parcel would be closed to recreational use. Minimal impact since current access only by permission of adjacent landowners.
Transportation		
Miles of improved roads within site boundaries	~11	~13
Acreage lost to road development	~36	~42.15
Traffic volume	During construction – additional personal transport for approximately 400 workers per day on site and on access roads to site. Approximately 75 construction vehicles per day including	Same as No Action – overall time for construction extended due to construction of additional 8 turbines.

Table 2.5-1. Summary of predicted environmental effects, Coyote Wind Project, Sweet Grass County, Montana.

Resource Area / Issue	No Action Alternative	Proposed Action Alternative
	heavy equipment. During operation – increase of 4 pick-up type vehicles on local and private roads daily.	
Roadway engineering and maintenance	County, private, and possible state roads would require upgrading to accommodate large, heavy loads associated with construction. Construction contractor would have agreement with state and county road departments regarding upgrades and maintenance during construction. Net impact on county roads expected to be positive. During operation, minimal impact, equivalent to existing local traffic.	Same as No Action.
Public safety	Public safety due to increased traffic, large loads, and detours or delays during construction would be addressed consistent with state and county regulations. No increased impacts during operation.	Same as No Action.
Socioeconomics		
Employment	400 construction related jobs created with an attempt to maximize local engagement. 4 permanent jobs.	Same as No Action, but temporary employment would be for a slightly longer period.
Income	Likely some increase in local income during construction phase, not quantifiable at present.	Some increase over No Action during construction due to longer construction period.
Revenue from sales receipts	Likely increase in sales receipts during construction phase.	Some increase over No Action during construction due to longer construction period.
Revenue to county from property taxes	Likely significant increase, ~$0.95 to 1.25 million annually without figuring in possible tax incentive programs.	Possible increase over No Action of $0.21 to $0.28 million annually without figuring in tax incentive programs.

Table 2.5-1. Summary of predicted environmental effects, Coyote Wind Project, Sweet Grass County, Montana.

Resource Area / Issue	No Action Alternative	Proposed Action Alternative
Revenue to local government and schools	Increase during first 3 years of operation if impact fee is levied. Up to 0.5% of construction costs.	Same as No Action, but potential for greater total since increased construction costs.
Revenue to State, including to School Trust Fund	Likely increase in bed tax if increase in rooms rented during construction. Increase in wholesale energy transaction taxes if electricity is sold across transmission line (0.015 cents per kwh minus 5% if sold out of state). No impact to School Trust Fund.	Likely slight increase in bed tax (over No Action) due to longer construction period, increase in wholesale energy transaction tax due to greater energy production. Minimum increase in monies to School Trust Fund in Year 1 is estimated to be $36,000; and the minimum increase in subsequent years is estimated to be $21,600/year in nominal dollars
Regional property values	Likely minimal impacts to adjacent land values. Minimal impact on housing prices in Sweet Grass and Park counties.	Same as No Action.
Terrestrial Vegetation and Habitats		
Permanent loss of vegetation	Approximately 37 acres – 1.6 % of wind resource area.	Additional 6.4 acres - Approximately 1.0 % of state parcel and 1.4% of wind resource area..
Habitat fragmentation	Minimal – temporary to permanent fragmentation of native habitats would occur near roadways.	Same as No Action, slight increase in fragmentation due to more roads.
Noxious weeds	Potential for increase.	Potential for increase.
Effects to species of special concern	Minimal or no effect.	Minimal or no effect.
Wildlife		
Construction	36 turbines, approximately 11 miles of roads, and approximately 52 acres of ground disturbance.	Additional 8 turbines, 2 miles of roads, and 9 acres of ground disturbance.
Birds	Injury or mortality from collision (with vehicles, cranes, turbines,	Similar to No Action, but mortality may also occur on state land.

Table 2.5-1. Summary of predicted environmental effects, Coyote Wind Project, Sweet Grass County, Montana.

Resource Area / Issue	No Action Alternative	Proposed Action Alternative
	meteorological towers, guy wires) or when machinery disturbs ground vegetation.	
Bats	No impacts are expected.	Similar to No Action
Big game and general wildlife	Possible direct mortality of small mammals, reptiles, amphibians, and ground-dwelling birds.	Similar to No Action, but mortality may also occur on state land
Species of concern	Impacts similar to those discussed in the above sections.	Similar to No Action
Operation	Permanent loss of approximately 37 acres.	Additional permanent loss of approximately 6 acres.
Birds	Potential for fatalities from collisions with turbines or met towers. Reduced reproduction or recruitment from displacement, habitat loss or fragmentation.	Similar to No Action, but potential for nominal increased impacts, and occurrences on state land.
Bats	Potential for fatalities due to collisions with blades and effects of barotraumas. Possible reduced reproduction or recruitment from changes in migration and foraging behavior.	Similar to No Action, but potential for nominal increased impacts, and occurrences on state land.
Big game and general wildlife	Mortality of small mammals, reptiles, amphibians, and ground-dwelling birds could result from collisions with maintenance vehicles. Possible reduced reproduction or recruitment from habitat loss or fragmentation.	Similar to No Action, but impacts may also occur on state land.
Species of Concern	Impacts similar to those discussed in the above sections.	Similar to No Action.
Cultural Resources		
Historical and archeological sites	No previous cultural resources inventory, so impacts not known. Possible impacts to previously unknown resources from ground disturbance due to construction. Mitigated by commitment to call an archaeologist if any resource found.	Same as No Action for private land and for any new resources on state parcel. Known resources do not meet National Register eligibility, so any impacts would be minimal.

Table 2.5-1. Summary of predicted environmental effects, Coyote Wind Project, Sweet Grass County, Montana.

Resource Area / Issue	No Action Alternative	Proposed Action Alternative
	Possible minimal impact to Lewis and Clark National Historic Trail if increased noise or turbine visibility.	
Noise		
Construction	Increase in audible noise due to construction activities. Noise levels depend on distance to receptor and on number and types of equipment being operated simultaneously. Difficult to quantify because equipment would move around the site over the construction period.	Same as No Action.
Operation	At lower wind speeds turbines audible at residences located within 0.75 miles downwind or crosswind (i.e., north, east and south). At higher wind speeds, turbines unlikely to be heard. Turbines may be audible along Yellowstone River if calm water and low wind speeds.	Additional turbines of the Proposed Action Alternative would provide an incremental increase in noise, but are not predicted to change the turbine noise levels at the residences or along the Yellowstone River compared to the No Action Alternative.
Visual Impacts		
Construction	Equipment visible from I-90 and county roads.	Same as No Action.
Operation	Turbines visible from I-90 but do not block views of Crazy Mountains. At night, turbine lighting may be visible, but faint.	Similar to No Action for visibility from I-90. Looking toward the state parcel from N. River Road near CMCC, 3 more turbines would be visible.
Aviation		
	No impact to any airport operations. Lighting on the turbines would mitigate any impacts to aviation.	Similar to the No Action alternative.

Chapter 3: Affected Environment

3.1 Introduction

Chapter 3 describes components of the existing environment that could be affected by the Proposed Action or the No Action alternatives. The Proposed Action is described in detail in Section 2.2 of Chapter 2.

Chapter 3 serves three purposes: (1) it provides a baseline from which to analyze and compare alternatives and their impacts; (2) it ensures a clear understanding of the environment potentially affected by the Proposed Action; and (3) it provides the public information to evaluate the agency's alternatives, including the Proposed Action. The environmental components described in this chapter include geology, soils, water, land use, recreation, socioeconomics, vegetation, wildlife, cultural resources, noise, visual resources and aviation. In general, the affected environment is defined by the extent to which the implementation of the Proposed Action would affect each resource. The study areas are discussed in the sections for each resource component, since they vary in location and extent by component.

3.2 Geology and Soils

3.2.1 Regional Geology

This section outlines the site-specific geology of the study area and includes a more generalized regional geology discussion. The study area for geology is defined as the state parcel.

Readily available documents referencing the geology for the study area were reviewed, and include basic geologic maps and soil survey data. General geologic information was provided by Alt and Hyndman (1995). Site-specific geologic and topographic information was gathered from maps and digital spatial data produced by the US Geological Survey (USGS) (USGS 2005) and the US Department of Agriculture Natural Resources Conservation Service (NRCS) (NRCS 2007). A visual on-site investigation of geology was conducted by Garcia and Associates staff in August 2008.

The study area is located in the Kelly Hills portion of the Crazy Mountains Basin as noted in Alt and Hyndman (1995). The Kelly Hills are bounded to the north by the Crazy Mountains, a deep synclinal range with a number of overturned anticlinal folds occurring during the Laramide Deformation 70 to 30 million years ago (USGS 2005). Folding of the overlaying geologic strata occurred when a large intrusion of andesitic and dioritic igneous rock uplifted and overturned the surrounding sedimentary rock during the Tertiary period, ranging from 65 to 1.8 million years ago. This process caused a breaking of the surrounding topography resulting in the cuesta/hogback formations of the Kelly Hills.

The Crazy Mountains are an "island" mountain range east of the Continental Divide, reaching 11,209 feet in elevation; and nearly 6,000 feet above the surrounding topography. They were intensively glaciated during Pleistocene times (1.8 million to 10,000 years ago); however, the Kelly Hills were not directly affected by either continental or montane glaciation. The southern portion of the Crazy Mountains Basin is bounded by the Yellowstone River and its floodplain, consisting of late Pleistocene to Holocene fluvial deposits (less than 10,000 years old) and late Pleistocene glacial-fluvial deposits.

The study area is dominated by the Livingston and Hell Creek formations, consisting of layers of calcareous sandstone and mudstone sedimentary rock with angular chunks of andesitic agglomerate (Alt and Hyndman 1986). Rocks are all of Cretaceous age, ranging from 145 to 65 million years old (USGS 2005). Geologic strata radiate away from the Crazy Mountains at a dip angle of roughly 30 degrees from horizontal, trending roughly northeast-southwest. This radiation creates a series of sandstone ridges and shale/siltstone swales that dominate the topography. Depth to bedrock ranges from 0 inches on the ridge tops to greater than 60 inches in the swales. The sandstone ridges show signs of physical weathering in the form of freeze-thaw action and exfoliation of the sandstone as it is exposed. This physical weathering is evidenced by channery (flat, fragmented pieces of sandstone and siltstone) at the surface and subsurface. Chemical weathering is also occurring; evidence of taffoni (cavernous, karst-like weathering of sandstone) can be seen on many of the sandstone outcrops.

Hydrogeologic processes are minimal in the study area. There are no perennial streams on the parcel, but the swales are dissected by ephemeral stream channels that show signs of deep head cutting during peak storm runoff events. This head cutting is likely due to the low-permeability sandstone ridges directing runoff water and sediment to the swale areas. There are isolated closed depressions that form seasonal wetlands, and one non-jurisdictional perennial wetland formed from a spring development (see Section 3.6, Vegetation).

3.2.2 Soils

This section outlines the soil types and associated soil characteristics within the study area. The study area for soils is defined as the state parcel. Readily available documents referencing soil classification, parent materials, hydrologic and chemical characteristics, and profiles were reviewed in November 2008.

The NRCS completed a detailed soil survey on the area encompassing the site and adjacent lands, revised in August, 2006 (NRCS 2007). This dataset is the most current and complete available for all soils in Sweet Grass County. Spatial and attribute data from this soil survey were collected and summarized.   General information found in Alt and Hyndman (1986) was also reviewed.

All soils in the study area are classified as well drained. Soil permeability ranges from slow to moderately rapid, with a restrictive bedrock layer located 14-27 inches below the surface in most soil units. There are no soils present that are characterized as susceptible to flooding or ponding hazards, and the seasonal high water table for all soils in the section is categorized as being greater than 60 inches from the surface (NRCS 2007).

Soils in the study area are characterized by a relatively short growing season, with the average annual frost-free period ranging from 95 to 125 days per year. The mean annual temperature ranges from 43 to 46 degrees Fahrenheit, and mean annual precipitation ranges from 10 to 14 inches.

There are 16 soil map units or map unit complexes located in the study area. These units and complexes are summarized Table 3.2-1, and are categorized by the relative extent of each soil type found at the site (NRCS 2007).

Table 3.2-1. Soil map units or map unit complexes found on the Coyote Wind Project state parcel, Sweet Grass County, MT (NRCS 2007).

Map Unit/Complex Name:	Extent (acres):	Extent (%):
Tanna, calcareous - Rentsac complex, 8-15% slopes	118.41	18.50%
Ethridge clay loam, 4-8% slopes	97.45	15.23%
Rentsac-Tanna complex, 2-15% slopes	61.29	9.58%
Rentsac-Reedpoint complex, 2-15% slopes	59.81	9.35%
Yawdim-Rentsac complex, 15-60% slopes	57.08	8.92%
Rentsac-Reedpoint complex, 15-35% slopes	51.33	8.02%
Tanna clay loam, 2-8% slopes	40.9	6.39%
Yawdim-Rentsac-Cabbart complex, 2-15% slopes	37.52	5.86%
Rentsac-Tanna-Rock Outcrop complex, 8-35% slopes	28.95	4.52%
Kobase-Rentsac-Megonot complex, 4-25% slopes	24.98	3.90%
Rentsac-Tanna complex, 15-35% slopes	24.47	3.82%
Cabbart-Rock Outcrop complex, 15-60% slopes	13.89	2.17%
Work-Castner complex, 8-15% slopes	10.89	1.70%
Tanna-Hinterland clay loams, 8-15% slopes	6.71	1.05%
Hinterland-Rentsac-Cabbart complex, 15-60% slopes	6.51	1.02%
Yawdim-Rock Outcrop complex, 8-15% slopes	0.48	0.08%

3.3 Hydrology and Water Quality

3.3.1 Overview

This section describes existing surface water hydrology and water quality in the study area. The study area for hydrology and water quality is defined as the state parcel and the key water bodies that would be affected by run-off from the state parcel and access routes. The study area thus includes the ephemeral drainages and wetlands on the state parcel, the ephemeral drainages as they flow into the ditch paralleling Duck Creek, and Duck Creek at it flows towards its confluence with the Yellowstone River.

3.3.2 Inventory Methods

Key sources used for this assessment were topographic maps and aerial photographs, and visual inspection of the state parcel by Garcia and Associates in 2008.

3.3.3 Inventory Results

The state parcel has no permanent flowing water. Along the western edge are several ephemeral drainages, which direct seasonal water toward the ditch paralleling Duck Creek (Figure 3.3-1). On average, there is a 175-foot elevation change between the ridgeline and the valley below. This western third of the state parcel is characterized by very shallow, permeable soils over bedrock. As a result, precipitation percolates through the soil, encounters bedrock, and is directed more rapidly toward the ditch and Duck Creek, than would be expected in thicker soil layers. The ephemeral drainages flow approximately 400 to 2,300 feet before reaching the ditch. The ditch flows for approximately one to one-and-a-half miles before joining Duck Creek south of the state parcel. From this juncture Duck Creek flows just under two miles before joining the Yellowstone River. Run-off from existing access roads to the state parcel may also flow into the ditch and/or directly into Duck Creek.

The topography trends from higher to lower in elevation as one moves from the central third of the state parcel to the east. Soil layers are thicker, and several non-jurisdictional wetland features are present in enclosed depressions. These wetlands include two seasonal wetlands, a perennial wetland created from a stock watering tank, and a wetland with open water from a spring development (see also Section 3.6, Vegetation) (Figure 3.3-1).

Duck Creek is a tributary to the Yellowstone River, entering from the north. No hydrology or water quality assessments have been completed. Montana FWP currently manages the mainstem and west fork of Duck Creek as trout water, while the east fork of Duck Creek remains undesignated (NRIS 2009a). Salmonid species with the potential to occur in Duck Creek are presented in Table 3.3-1.

Table 3.3-1. Expected Salmonid Distribution in Duck Creek, Sweet Grass County, Montana (NRIS 2009a).

Species	Duck Creek Mainstem	West Fork Duck Creek	East Fork Duck Creek
Brook trout – *Salvelinus fontinalis*		R	C
Brown trout – *Salmo trutta*	C	C	
Mountain whitefish – *Prosopium williamsoni*		C	
Rainbow trout – *Oncorhynchus mykiss*	C	C	
Yellowstone cutthroat trout – *Oncorhynchus clarkii bouvieri*	R	R	C
Yellowstone cutthroat trout x Rainbow trout		R	C

C=common; R=rare

The Yellowstone River is one of the longest free-flowing rivers in the US. The river and its associated riparian habitats are important to a variety of wildlife and support an outstanding trout fishery. The Yellowstone cutthroat trout is a Montana State species of concern and are documented in the east fork of Duck Creek and the Yellowstone River, proximal to the Project (NRIS 2009a). Water quality in the Yellowstone River is good, and there are no listed impaired water bodies in the Upper Yellowstone watershed (EPA 2009).

3.4 Land Use and Recreation

3.4.1 Inventory Methods

The study area for land use and recreation covers the state parcel and adjacent lands out to a distance of approximately two miles from the state land boundary. The affected environment from the standpoint of land use and recreation is described from the following perspectives:

- land ownership (i.e., ownership patterns surrounding the subject state parcel)
- existing land use and recreation (both on the state parcel and on surrounding lands)
- relevant land use plans and regulations (both related to the state site and to surrounding lands)

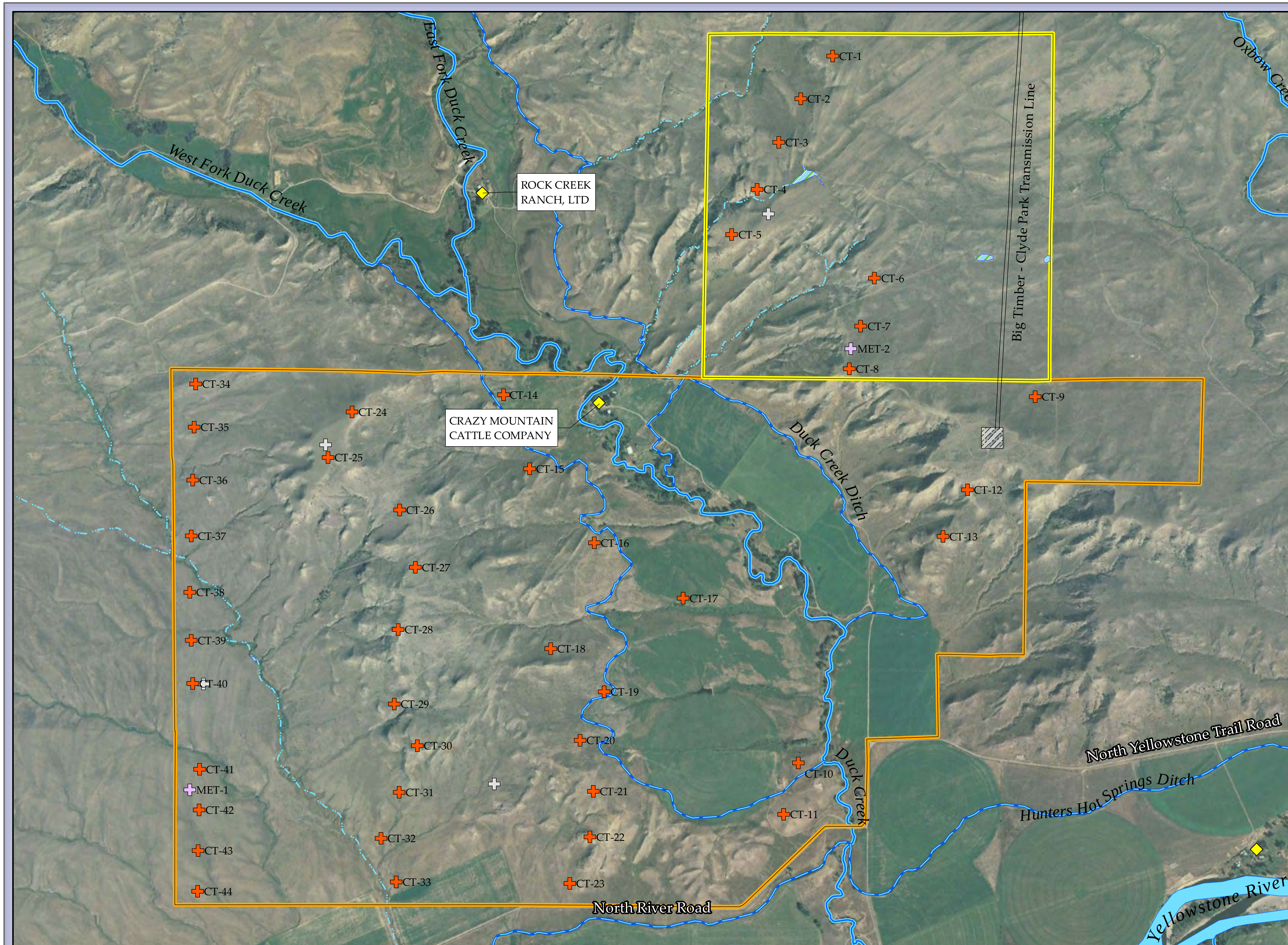
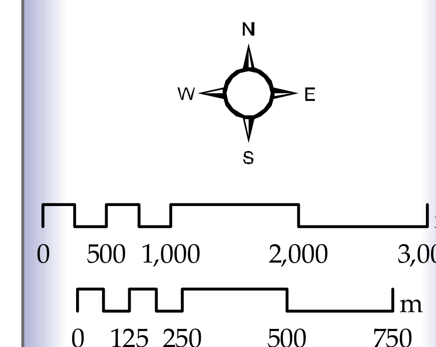


FIGURE 3.3-1.
HYDROLOGICAL FEATURES IN THE PROJECT REGION;
COYOTE WIND PROJECT

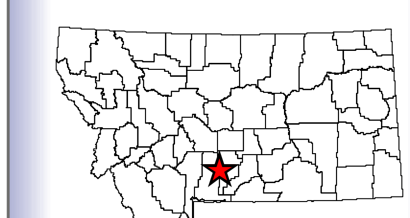
Sweet Grass County, Montana

Map Legend:

- State Parcel
- Private Parcel
- Creek
- Ditch
- Ephemeral Drainage
- Wetlands
- Transmission Line
- Substation
- Proposed Turbine
- Proposed Met Tower
- Existing Met Tower
- Residence



One Inch is Equal to 1,500 Feet



GANDA

SOURCES:
MONTANA NATURAL RESOURCE INFORMATION SYSTEM (NRIS)
ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE (ESRI)
USDA-FSA ORTHO PHOTO FLIGHT: AUGUST 25, 2005

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Land use and recreation information has been derived exclusively from existing published sources, interviews with knowledgeable agency personnel, and limited field reconnaissance.

3.4.2 Inventory Results

3.4.2.1 Current Land Ownership

Project Site

The project site is State School Trust land (trust land), granted to Montana by Congress for the purpose of generating revenue to support common schools, and other educational and state institutions (trust beneficiaries). Such revenue can be generated by sale, rental, leasing, licensing or other means; and all trust land must be used for maintenance and support of the beneficiaries (DNRC 2005). In this regard, there are a number of leases and rights-of-way in force on the site, as described below.

Surrounding Lands

Land surrounding the subject state parcel is entirely privately owned, with a pattern of large-acreage holdings by a small number of owners. There are no other publicly-owned lands within a two-mile radius of the state parcel.

3.4.3.2 Existing Land Use and Recreation

Project Site

The 640 acres of state land on which the proposed wind project would be developed is currently open rangeland habitat. The primary active use of the land is grazing, under a lease agreement with the Crazy Mountain Cattle Company (CMCC), owner of the land abutting the state property on the south. This lessee has fenced the boundaries of the state property as part of their herd management activities. Other uses and use rights applicable to the site include (Bollman pers. com. 2008a):

- An oil and gas lease covering the whole site, originally issued to Pacer Energy LLC and assigned to Devon Energy Production Company, LP in March of 2009. This lease is in force but is not being actively used for exploration or production at present.
- An electric power transmission line traversing the eastern half of the site in a north-south direction, within a right-of-way (ROW) granted to Park Electric Cooperative, Inc.
- A buried pipeline installed in a ROW granted to Yellowstone Pipeline Company, traversing the southern half of the site in a northeast to southwest direction. This is an active pipeline carrying refined petroleum products; it is operated by Conoco Phillips (Ostwald pers. com. 2009)
- A buried utility line constructed in a ROW granted to US West Communications (Moore pers. com. 2009).

From the standpoint of recreation, the only access to the state parcel is from the south, through the private holdings of the CMCC. There is no open public access to the state parcel for recreation or any other purpose. The general public must receive permission to cross adjacent private land to access the state land. Historically, some hunting use of the state land has occurred, but only at the discretion of the adjoining private landowners (Bollman pers. com. 2008a).

Surrounding Lands

The large private landholdings surrounding the state parcel are predominantly open, undeveloped range and native habitat lands. The only developed uses in the area are irrigated agriculture, isolated farm/ranch complexes (including residences), and electric power system facilities including a substation and transmission lines. Irrigated agriculture is located in the Duck Creek valley, which passes close to the west and south edges of the state parcel, and along the Yellowstone River, approximately two miles to the south.

Farm/ranch complexes within one mile of the state parcel include (Figure 3.4-1):

- Rock Creek Ranch to the west
- Wild Eagle Mountain Ranch to the north
- Engwis Investment Company to the east
- CMCC to the south.

An electric power substation is located near the southeast boundary of the site (the Park Electric Cooperative Lower Duck Creek Substation). The transmission line traversing the state parcel connects to this substation. There are several other transmission lines located south of the site, including a major connection passing in an east/northeast to west/southwest orientation.

3.4.2.3 Relevant Land Use Plans and Regulations

Project Site

Trust land is managed by the DNRC, Trust Land Management Division. DNRC’s 2005 Real Estate Management Plan (REMP) (DNRC 2005) provides the latest policy, direction, and guidance in the selection and management of real estate activities (residential, commercial, industrial and conservation) on state trust lands.

The goals of the REMP are to:

- increase revenue for trust beneficiaries
- share in expected community growth (i.e. capture on state trust lands a share of the market for development to accommodate population growth in Montana through 2025)
- plan proactively (identifying and pursuing high suitability opportunities for development and other revenue generating activities, in cooperation with local communities)

The REMP identifies urban growth areas as the primary focus of attention for development/revenue-generating activities. However, development in rural areas is also anticipated, including commercial resorts, development for public purposes such as sewer or water, natural resource based development, and conservation opportunities. The REMP notes

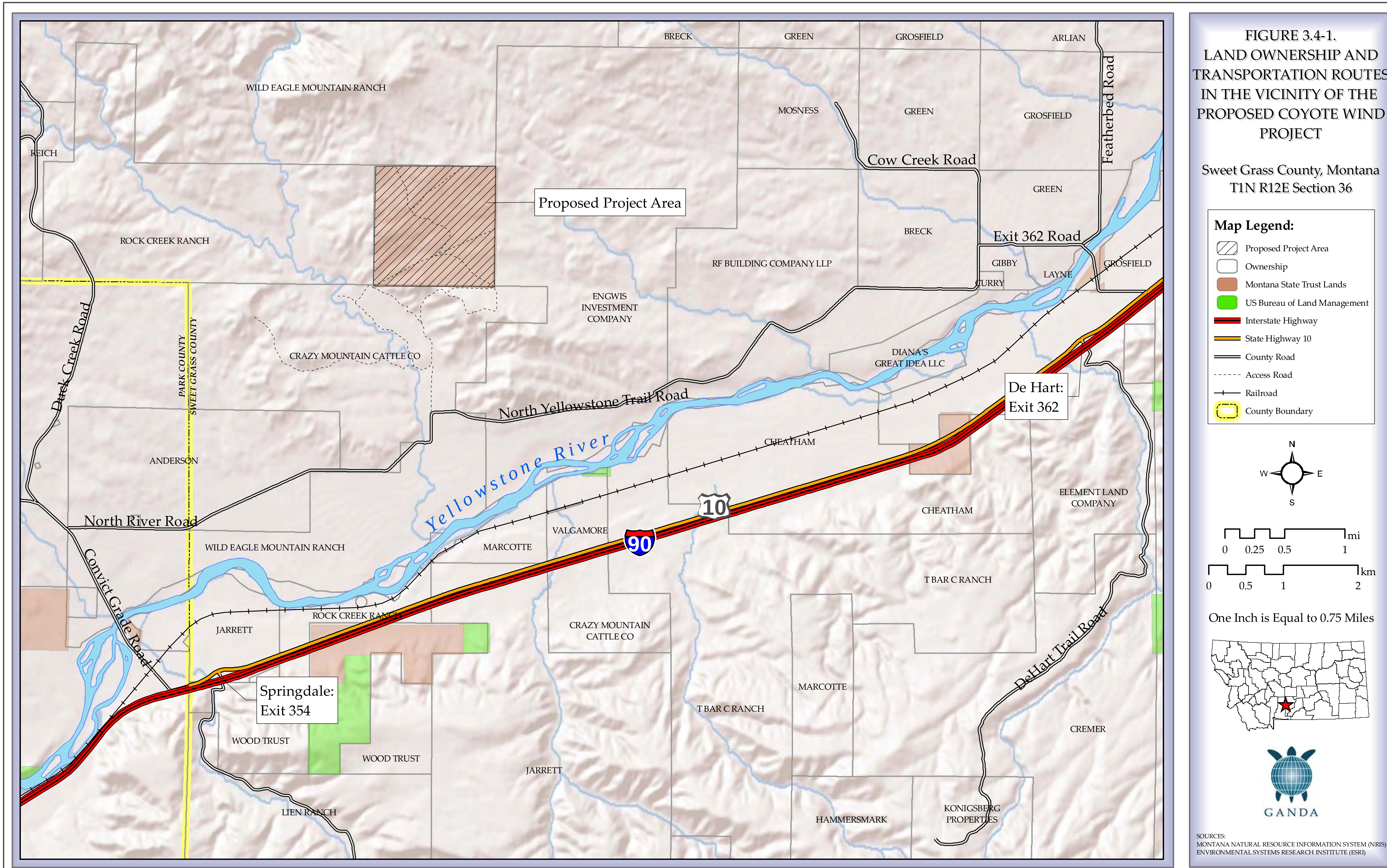
FIGURE 3.4-1.
LAND OWNERSHIP AND TRANSPORTATION ROUTES IN THE VICINITY OF THE PROPOSED COYOTE WIND PROJECT
Sweet Grass County, Montana
T1N R12E Section 36
Map Legend:
Proposed Project Area
Ownership
Montana State Trust Lands
US Bureau of Land Management
Interstate Highway
State Highway 10
County Road
Access Road
Railroad
County Boundary
N
W
E
S
0
0.25
0.5
1
mi
0
0.5
1
2
km
One Inch is Equal to 0.75 Miles
GANDA
SOURCES:
MONTANA NATURAL RESOURCE INFORMATION SYSTEM (NRIS)
ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE (ESRI)
Proposed Project Area
Springdale:
Exit 354
De Hart:
Exit 362
Yellowstone River
North Yellowstone Trail Road
North River Road
Duck Creek Road
Convict Grade Road
Cow Creek Road
Exit 362 Road
Featherbed Road
DeHart Trail Road
PARK COUNTY
SWEET GRASS COUNTY
90
10
BRECK
GREEN
GROSFIELD
ARLIAN
WILD EAGLE MOUNTAIN RANCH
MOSNESS
REICH
ROCK CREEK RANCH
RF BUILDING COMPANY LLP
GIBBY
CURRY
LAYNE
ENGWIS
INVESTMENT
COMPANY
CRAZY MOUNTAIN CATTLE CO
DIANA'S
GREAT IDEA LLC
ANDERSON
CHEATHAM
ELEMENT LAND
COMPANY
VALGAMORE
MARCOTTE
T BAR C RANCH
JARRETT
ROCK CREEK RANCH
CRAZY MOUNTAIN
CATTLE CO
WOOD TRUST
CREMER
LIEN RANCH
HAMMERSMARK
KONIGSBERG
PROPERTIES

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that some industrial uses may be sited at locations convenient to the resource base, including wood product mills, generation plants, and wind projects. Regarding conservation, opportunities will be pursued wherever possible, especially for those trust lands in the vicinity of other lands with conservation designations, to protect conservation values and seek to maintain traditional/historic uses and revenues of the land.

To implement the REMP, DNRC uses a “performance-based filtration system” to identify sites with the highest suitability for development activities (including compliance with local government growth policies). For high suitability opportunities, a Request for Proposals (RFP) process is used to help identify the highest and best use of property, provide a competitive approach for competing interests, define market value, and identify development standards.

Specifically related to the project site, prior work of the Montana Wind Energy Working Group and the DEQ (in 2003-2004, as described in Chapter 1) had identified the Coyote Wind area as one of the highest ranked in the state for wind power development. This work was carried forward through the REMP process, with DNRC issuing an RFP for wind power development on the state parcel, and the proposed project emerging in response to that RFP.

Surrounding Lands

All private land surrounding the project site is under the jurisdiction of Sweet Grass County. The relevant countywide plan governing land use and development is the Sweet Grass County Growth Policy (Sweet Grass County 2003). The Growth Policy identifies the area in which the project site is located as “Open and Resource Lands”, defined as generally open space areas and land of agricultural production (classified by the Montana Department of Revenue as agricultural or timber lands).

Goals, objectives and policies/actions contained in the Sweet Grass County Growth Policy that are relevant to the proposed project include:

Land Use Goal:

- To protect, encourage and support the agricultural base of the county and its agricultural resources, and to achieve the most appropriate use of land within the County so sufficient areas are provided for existing and future residential, commercial and industrial needs, and, at the same time, to enhance ecological and environmental values.
- To encourage future residential, commercial, and industrial growth within or near the presently existing communities of the county in a manner that provides for efficient use of the county’s infrastructure and services.

Land Use Objectives, Policies and Actions:

- Encourage future uses where they are compatible with the best use of the land and natural resources in terms of social, economic, engineering, ecological, and planning principles.

- Maintain the pleasant environment of the area by assuring future open space and development to enhance the beauty of the area.

Environment and Natural Resources Goal:

- To maintain, preserve, and enhance the environmental, ecological, aesthetic, and historical qualities of Sweet Grass County.

Environment and Natural Resources Objectives, Policies and Actions:

- Protect areas of environmental significance such as wetlands, floodplains and critical wildlife habitat.
- Noxious Weed Control:
  - Contain the existing infestation of weeds with the goal of control and strive to prevent the infestation of new weeds.
  - Monitor road, utilities, and highway construction activities to ensure all is being done to prevent new infestation and the spread of existing ones.
  - Coordinate weed control and education efforts with other governmental agencies.
  - Require state, federal, railroad, utility companies and private landowners performing construction or disturbance within county ROWs to file an individual weed management plan and/or request prepayment to implement the county's weed plan.

Economic Development Goal:

- To pursue diverse employment opportunities, with the objective of supporting economic development that would create more jobs.

3.5 Transportation

3.5.1 Inventory Methods

The study area for transportation includes road access to the state parcel from Interstate Highway 90 (I-90), with emphasis on the public roadways that would be used for project development, operation and maintenance. Transportation information has been derived exclusively from existing published sources, interviews with knowledgeable agency personnel, and limited field reconnaissance.

3.5.2 Inventory Results

3.5.2.1 Site Access

Regional access to the project site is from I-90 through Sweet Grass and Park counties. I-90, completed in 1980, is a four-lane divided highway, and is the major east-west route through these counties (Sweet Grass County 2003). From I-90, two routes are available to the state parcel (see Figure 3.4-1).

The most direct route to the site is from the southwesterly direction, extending approximately 6.6 miles from I-90 Exit 354 (Springdale) to the southern site boundary. This route follows approximately 5.6 miles of county road (Convict Grade and North River roads) to the main entrance to the CMCC property, and approximately one mile of private road within the CMCC property.

Convict Grade Road is a two-lane paved rural road. North River Road, beyond a short paved distance east of the Convict Grade intersection, is a two-lane gravel road for its full distance to the CMCC property. Other relevant features of these roads include:

- two bridges, one on Convict Grade Road, across the Yellowstone River, approximately three-quarters of a mile north of I-90, and the other along North River Road, across Duck Creek, approximately one-third of a mile south/southwest of the CMCC property entrance
- a railroad crossing at Springdale
- a drainage culvert west of the Duck Creek bridge

The second route to the site is from an easterly direction, extending approximately 8.6 miles from I-90 Exit 362 (DeHart) to the southern site boundary. From the I-90 exit, this route follows State Highway 10 east for approximately two thirds of mile, the Exit 362 Road for approximately one mile, and North Yellowstone Trail Road for 6 miles to the entrance to the CMCC property. The final one mile to the site is via the same private road within CMCC property as the route described above.

Approximately the first 2.3 miles of this route (starting from I-90 Exit 362) is a two-lane paved road. The remaining distance is a two-lane gravel road. Other relevant aspects and features of this route include:

- a railroad crossing along Exit 362 Road south of the Yellowstone River
- two bridges, one crossing the Yellowstone River along Exit 362 Road, and the other approximately 3 miles east of the CMCC property entrance
- two irrigation canal/ditch crossings (via culverts) at approximately 2.1 and 3.6 miles from the I-90 interchange.

3.5.2.2 Road Capacity/Traffic Conditions

All roads providing access to the project site, including I-90, are currently operating well below their capacities for traffic load. There are no roadway or intersection level-of-service issues or constraints (Skinner pers. com. 2008; Wordell pers. com. 2008).

3.5.2.3 Road System Regulations and Operation and Maintenance Responsibilities

I-90 is under the jurisdiction of, and is maintained by, the Montana Department of Transportation (MDT). The MDT Motor Carrier Services Division administers state policies, standards and permitting related to carrier operations (e.g. safety concerns) and vehicle weight and size limitations.

On the southwesterly route to the state parcel (the first route described above), all roads beyond I-90 to the private road on CMCC property are county roads, within the jurisdiction of Park and Sweet Grass counties. As shown on Figure 3.4-1, Convict Grade Road and the westernmost mile of North River Road are within Park County. The remainder of this route, along North River Road to the CMCC property, is within Sweet Grass County.

Similarly, all roads along the easterly route to the site (the second described above) from I-90 to the CMCC property are county roads. This entire route lies within Sweet Grass County.

Both Park and Sweet Grass counties, through their respective road departments, are responsible for operation and maintenance of the county roads and bridges within their jurisdictions. The county road departments enforce applicable local road and bridge design, engineering, and construction standards. They review proposals for alteration or other construction involving the county roads, and issue required permits.

3.6 Socioeconomics

3.6.1 Overview

Most study areas for EISs do not match the scales and boundaries for available secondary data. Secondary data such as those collected on a regular basis by the US Census tend to follow political boundaries such as county or state lines, rather than natural features of individual parcels. The study area for socioeconomics is Sweet Grass County and Park County. The proposed site is located in Sweet Grass County, but persons employed in the construction and operation of the project may locate in either Park or Sweet Grass counties. In general, unless primary data collection is undertaken, data sets are not available for a spatial area smaller than a county.

MEPA requires a review of the beneficial aspects and economic advantages and disadvantages of a proposed action and the alternatives under consideration. In order to establish context for this review, information is included on the existing economic environment in the area surrounding the proposed project. Information related to demographics, income sources, population and the economic value of natural resources in the area is provided to allow the reader to evaluate the potential impacts described in Chapter 4.

3.6.2 Inventory Methods

The following data are obtained from secondary published data sources. Primary data collection is outside the scope of this EIS. The sources of data used were the US Census, the Quarterly Census of Employment and Wage undertaken by the Bureau of Labor Statistics (BLS) and county profiles developed by Headwaters Economics and the Montana Department of Labor and Industry (that both rely heavily on Census information and statistics from the BLS).

3.6.3 Inventory Results

3.6.3.1 Population

According to the Montana Department of Labor and Industry, and Census and Economic Information Center (CEIC 2007, 2008), Sweet Grass County is the 39th most populous county, and Park County is the 12th most populous county out of 56 total counties in the state of Montana. The population of Sweet Grass County increased by 4.2% between the years 2000 and 2006 (Table 3.6-1). This increase was not evenly distributed across the county. The small metropolitan area of Big Timber saw larger population growth (7.2%) while the remaining rural areas grew significantly more slowly (1.9%) (CEIC 2008). A similar picture can be described for Park County. Population increased by 2.5% between the years 2000 and 2006, with larger population growth in the metropolitan area of Livingston (6.5%) and a small decline in rural population (CEIC 2007, 2008). Between the years 2000 and 2006, the average population growth of across both counties was slower than the average increase of 4.7% across the state of Montana (Headwaters Economics 2009a and b, US Census Bureau 2008a). The median population age in Sweet Grass County in the year 2000 was 41.2 years (CEIC 2007) and in Park County 40.6 years. The median population age is slightly higher than the median for Montana, 38.5 years, over the same period (US Census 2008a).

Table 3.6-1. Population of Sweet Grass and Park counties, and Big Timber and Livingston, MT (MT Dept. of Labor and Industry and CEIC, 2007 and 2008).

Area	Population April 1, 2000	Population July 1, 2006	Change (percent)	Median Age in 2000
Sweet Grass County	3,609	3,760	4.2	41.2 years
Big Timber City	1,650	1,768	7.2	(unavailable)
Remaining Area Sweet Grass County	1,959	1,992	1.7	(unavailable)
Park County	15,694	16,084	2.5	40.6 years
Livingston City	6,851	7,279	6.2	(unavailable)
Remaining Area Park County	8,843	8,805	-0.4	(unavailable)

3.6.3.2 Income

Table 3.6-2 presents the sources of income for residents of Sweet Grass and Park counties. The two main income sources are (1) net earnings from wages and salary, and (2) dividends, interest, and rental income. Together these account for 83% of income in both Sweet Grass County and Park County. The other significant source of income in both counties is retirement income which accounts for a little more than 15.5% of income in both locations.

Table 3.6-2. Sources of income in Sweet Grass and Park counties, MT in 2006 (Bureau of Economic Analysis 2008).

Sources of Income	Sweet Grass County (Dollars)	Sweet Grass County (Percentage)	Park County (Dollars)	Park County (Percentage)
Net Earnings[1]	44,812,000	46.08	285,594,000	59.68
Income Maintenance[2]	778,000	0.80	5,117,000	1.06
Unemployment Insurance	228,000	0.23	1,599,000	0.33

Retirement and Other	15,076,000	15.50	74,314,000	15.52
Dividends, Interest and Rent	36,364,000	37.39	111,896,000	23.38
Total Personal Income	97,258,000	100.00	478,520,000	100.00

[1] Net earnings is the sum of wage and salary disbursements, supplements to wages and salaries, and proprietors' income; minus contributions for government social insurance, and adjusted to place of residence (e.g. to account for those living and working in different counties)
[2] Income Maintenance Payments consist largely of supplemental security income payments, family assistance, food stamp payments, and other assistance payments, including general assistance.

3.6.3.3 Personal Income and Employment

Personal Income

The annual average wage from non-government employment in Sweet Grass County in 2007 was $47,613, and in Park County was $25,398 (MT Dept. of Labor and Industry 2008a). Annual average wages are higher in Sweet Grass County because of the high proportion of positions within the mining industry (see Table 3.6-3). Given the recent layoffs at the mine, it is possible that the average annual income in Sweet Grass County may be declining.

Employment Patterns

Employment in Sweet Grass County is characterized by several small service-related businesses and the largest private employer, the Stillwater Mining Company. The Stillwater Mining Company provides more jobs than the other nine top ten private employers together (Table 3.6-3). In November 2008 the Stillwater Mining Company announced a workforce reduction for the mine that will reduce employment opportunities within the area (Livingston Job Service Workforce Center 2008). Employment in Park County follows a similar pattern but with the addition of opportunities in healthcare, recreation (Chico Hot Springs) and the Church Universal and Triumphant (Table 3.6-4).

Table 3.6-3. Top ten private employers in Sweet Grass County, MT; second quarter 2007 (CEIC 2008).

Business Name	Number of employees (range)
Big T IGA	20-49
Big Timber Water Slide	20-49
Country Skillet Restaurant	20-49
The Fort	20-49
Frosty Freez	20-49
The Grand Hotel and Restaurant	20-49
Prospector Pizza	10-19
Sharps Rifles-Shiloh Rifle Manufacturing Company	20-49
Stillwater Mining	500-999
Town Pump	20-49

Table 3.6-4. Top ten private employers in Park County, MT; second quarter 2007 (CEIC 2007).

Business Name	Number of employees (range)
Albertson’s	50-99
Best Western by Mammoth Hot Springs	50-99
Chico Hot Springs	100-249
Church Universal and Triumphant	100-249

Table 3.6-4. Top ten private employers in Park County, MT; second quarter 2007 (CEIC 2007).

Business Name	Number of employees (range)
Community Health Partners	50-99
Evergreen Healthcare	50-99
Livingstone Healthcare	250-499
Montana Rib and Chop House	50-99
Mountain Sky Guest Ranch	50-99
Printing for Less	100-249

A detailed summary of employment by industry in Sweet Grass and Park counties is presented in Appendix D.

Unemployment

Table 3.6-5 shows the unemployment rate for Sweet Grass and Park counties in comparison to the state of Montana as a whole. Both counties have lower rates of unemployment than the state rate of 4.3%. Park County's unemployment rate is 4.0% while the unemployment rate in Sweet Grass County is 2.3% as of October 2008. Due to the Stillwater Mining Company's recent layoffs, the Sweet Grass County rate may increase in the near future.

Table 3.6-5. Labor force and unemployment, in state of Montana, and Sweet Grass and Park counties, MT, October 2008 (Montana Department of Labor and Industry 2008b).

Area	Labor Force	Employed	Unemployed	Unemployment Rate
Montana	506,023	484,426	21,597	4.3
Sweet Grass County	2,913	2,846	67	2.3
Park County	8,998	8,637	361	4.0

Housing and Housing Affordability

An issue identified during scoping, was the impact of the Proposed Action on property values. This issue can be broken down as follows: (1) the possibility of changes in property values as a result of new jobs and employment coming to the area, and (2) the potential impacts on adjacent property values as a result of changing environmental amenities.

To address the first issue current housing affordability and property prices within the impact area were evaluated. According to data from the 2000 US Census, Sweet Grass County is affordable because the income necessary to purchase the median house is only 18% of the median income for the county (Table 3.6-6). This percentage is less than the 25% of median income often used as a measure of housing affordability (National Association of Realtors 2009). The homeowner and rental vacancy rates in the year 2000 were close to the average for Montana as a whole. More recent data on vacancy rates is unavailable.

Table 3.6-6. Housing affordability in Sweet Grass and Park counties, MT in 2000 (Headwaters Economics 2009a, 2009b; US Census Bureau 2008b, 2008c).

Owner Occupied Housing affordability	Sweet Grass County	Park County
Median Value – owner occupied housing units	$97,000	$97,900
Percentage of median income necessary to purchase a	18%	17%

Table 3.6-6. Housing affordability in Sweet Grass and Park counties, MT in 2000 (Headwaters Economics 2009a, 2009b; US Census Bureau 2008b, 2008c).

Owner Occupied Housing affordability	Sweet Grass County	Park County
house		
Income required to qualify for median house	$27,635	27,664
Housing affordability index[1]	140	147
Vacancy Rate (Homeowner) – percent[2]	2.1	2.3
Vacancy Rate (Rental) – percent[3]	10.3	7.4

[1] 100 or above means that the median family can afford the median house
[2] Homeowner vacancy rate for Montana is 2.2 percent
[3] Rental vacancy rate for Montana is 7.6 percent

The home ownership rate in the year 2000 was 74.1% in Sweet Grass County, and 66.4% in Park County. The average for Montana as a whole is 69.1% (US Census Bureau 2008b; 2008c).

The impacts of wind energy projects on property values are dependent on many site specific factors; for example, the viewshed for adjacent properties and the primary use of adjacent properties and their current value. Individual preferences and aesthetic values play a key role. The existing conditions for aesthetics and for land use are addressed in Sections 3.10 and 3.4 of Chapter 3.

3.6.3.4 Revenue Generated by State Parcel

The state parcel that would be affected by the proposed project had an appraised value of $20,678 in 2003 (CAMA 2008). The land is described as being a vacant lot, with no river frontage and is agricultural land, primarily used for grazing. In addition to a grazing lease, there are also oil and gas leases, some sales of rights-of-way for overhead electric power lines, a petroleum pipeline and buried telephone lines. There is also an active LUL to Coyote Wind for this wind project, which, at $1.50/acre, currently generates $960/year. (Bollman pers. com. 2008b). The grazing lease is for 149 animal unit months (AUMs) currently leased at $6.97/AUM, but this rate adjusts every year. The total revenue in 2008 generated from this grazing lease was $1,038.53. Since 2003 the rate has ranged between $5.48 to $7.87/AUM (Bollman pers. com. 2009). The rate for the oil and gas lease (established September 2008) is currently $1.50/acre and will remain at this level for the first 5 years of the lease. Annual revenue from the oil and gas lease for the section is currently $960. The total revenue generated in 2008 from the LUL, grazing, and oil and gas leases was $2,958.53.

3.7 Terrestrial Vegetation and Habitats

The study area for terrestrial vegetation and habitat is defined as the state parcel. This section outlines the vegetative community types and noxious weed species in the study area, and discusses potential for species of special concern to occur on the state parcel.

3.7.1 Inventory Methods

Inventory methods consisted of conducting a literature and database review to identify vegetative communities, noxious weeds, and plant species of concern which may occur on the state parcel. This preliminary information was verified on a site visit on August 20, 2008. No species specific rare plant surveys were conducted.

Major sources of information were obtained from the Montana Natural Heritage Program (MNHP), NRCS, and Whitson et al. (2002). The scientific names provided in the text are the current nomenclature, as provided by the NRCS PLANTS Database (2008a) and the Integrated Taxonomic Information System (ITIS 2008).

The vegetation information provided is separated into sections according to vegetation community types, noxious weeds, and species of special concern. Vegetative communities describe the vegetation type and general distribution within the study area. Noxious weeds include species present in the study area and their general locations. Species of concern within the study area and adjacent lands are also discussed.

3.7.2 Inventory Results

3.7.2.1 Vegetation Community Types

The project area contains three broad vegetative communities summarized below (Figure 3.7-1):

- grasses, forbs, and sage species (*Artemisia* spp.)
- woody vegetation: trees and shrubs (excluding *Artemisia* spp.)
- wetlands

Grassland/Sagebrush Community

This vegetative community is present throughout the entire study area with the exception of wetlands and exposed bedrock. On the state parcel this community is characterized by shallow, well-drained, soils in a precipitation regime of 10-14 inches annually (NRCS 2007). The study area consists of a mix of native and non-native grasses and forbs. Much of the vegetation has been heavily grazed and no permanent fences are currently in place to facilitate a grazing management rotation. Some areas near water and cover for domestic livestock are seriously denuded or devoid of vegetation due primarily to grazing and soil compaction. Other areas are barren or exhibit sparse vegetation cover due to very shallow soils, high percentages of rock fragments, and exposed bedrock.

Twenty-five species of grasses and forbs were identified during field reconnaissance in the study area, including sage species and all weed species not currently classified as a noxious weed by the NRCS or the Montana State University Weed Extension Service (Table 3.7-1). These species are listed alphabetically.

Table 3.7-1. Grasses and forbs found on the state parcel, Sweet Grass County, MT, August 2008.

Common Name	***Scientific Name***	**Common Name**	***Scientific Name***
Big sagebrush	*Artemisia tridentata*	Prairie prickly pear	*Opuntia P.* spp.
Bluebunch wheatgrass	*Pseudoroegneria spicata*	Rough fescue	*Festuca altaica*
Blueweed	*Echium vulgare*	Rubber rabbitbrush	*Ericameria nauseosa*
Canada Goldenrod	*Solidago canadensis*	Sandberg bluegrass	*Poa secunda*
Cheatgrass	*Bromus tectorum*	Silver sagebrush	*Artemisia cana*
Club moss	*Lycopodium clavatum*	Slender wheatgrass	*Elymus trachycaulus*
Fringed sagebrush	*Artemisia frigida*	Sticky geranium	*Geranium viscosissimum*

Table 3.7-1. Grasses and forbs found on the state parcel, Sweet Grass County, MT, August 2008.

Common Name	***Scientific Name***	**Common Name**	***Scientific Name***
Idaho fescue	*Festuca idahoensis*	Sunflower	*Helianthus annuus*
Intermediate wheatgrass	*Elytrigia intermedia*	Thickspike wheatgrass	*Elymus macrourus*
Needle and thread	*Hesperostipa comata*	Timothy	*Phleum pratense*
Purple prairie clover	*Dalea lasiathera*	Vetch	*Astragalus* spp.
Prairie coneflower	*Ratibida columnifera*	Western wheatgrass	*Pascopyrum smithii*
Prairie junegrass	*Koeleria macrantha*		

Woody Tree/Shrub Communities

This vegetative community primarily exists in the ephemeral draws that dissect the study area and on north-facing hillsides. Typically these sites are characterized by deeper, more developed soils with greater available water-holding capacity than soils on the surrounding topography. Isolated island communities of trees and shrubs exist elsewhere throughout the site where there is adequate subsurface moisture, especially adjacent to wetlands. Similar to the grass/forb communities, many of the deciduous trees and shrubs observed have been browsed by domestic livestock and wildlife to at least first-year growth.

Six primary tree or shrub species were identified during field visits (Table 3.7-2). These are listed alphabetically by common name below.

Table 3.7-2. Tree and shrub species observed on the state parcel, Sweet Grass County, MT, August 2008.

Common Name	***Scientific Name***	**Common Name**	***Scientific Name***
Black cottonwood	*Populus nigra*	Snowberry	*Symphoricarpos albus*
Douglas fir	*Pseudotsuga menziesii*	Western serviceberry	*Amelanchier alnifolia*
Rocky Mountain juniper	*Juniperus scopulorum*	Willow	*Salix* spp.

Wetland Communities

Typical definitions of wetlands contain three criteria: the presence of water either at the surface or in the plant root zone, unique soil conditions that differ from adjacent uplands, and hydrophytic vegetation (Mitch and Gosselink 2000). For the purposes of this evaluation, only the vegetative and hydrologic characteristics were considered. There are no soils within the study area that meet hydric criteria according to the NRCS soil survey. Wetland delineation by digging test pits would be necessary to determine if the areas exhibiting hydrophytic vegetation and hydrologic characteristics also have soil conditions qualifying them as wetlands. It is likely that none of the wetlands on the state parcel are jurisdictional because they have no connections to waters of the US.

There are two distinct vegetative regimes that exhibit wetland characteristics on the state parcel. These consist of seasonal wetlands (characterized by closed depressions based on geologic structure and low-permeability soil parent material) and perennial wetlands that are proximal to livestock spring developments or the open water pond. Four specific areas exhibited seasonal or perennial wetland vegetation. As is the case with the rangeland, the fringes of the wetland areas appear to be grazed heavily as evidenced by soil pedistoling, compaction, and the influx of invasive species. Unlike the rangeland, however, there is very little bare ground in the perennial wetlands, probably due to thicker, more developed soil and more available water for plants. In the seasonal wetlands/closed depressions, however, some claypan characteristics have formed, resulting in a few annual grasses growing in the depressions and conditions similar to the rangeland on the perimeter of the wetlands.

Nine wetland plant species were identified during field visits (not including weed species currently classified as noxious by the NRCS or the Montana State University Weed Extension Service), and are summarized in Table 3.7-3 below. The wetland indicator status (Lesica and Husby 2001) assigned to each species reflects the range of estimated probabilities (expressed as a frequency of occurrence) of a species occurring in wetlands versus non-wetland across the entire distribution of the species. The wetland indicator categories should not be equated to degrees of wetness; for example, there are numerous obligate wetland species that occur in permanently or semi-permanently flooded wetlands, while a number of obligates are restricted to wetlands which are only temporarily or seasonally flooded (NRCS 2008a).

Table 3.7-3. Plant species associated with wetlands on the state parcel, Sweet Grass County, MT, August 2008.

Common Name	***Scientific Name***	**Wetland Indicator Status**[1]
Beaked sedge	*Carex rostrata*	OBL
Cattail	*Typha latifolia*	OBL
Field Horsetail	*Equisetum arvense*	FAC
Foxtail barley	*Hordeum jubatum*	FAC
Meadow foxtail	*Alopecurus pratensis*	FACW
Reed canarygrass	*Phalaris arundinacea*	FACW
Rush	*Juncus* spp.	FAC or OBL
Smooth scouring rush	*Equisetum laevigatum*	FACW
Wild licorice	*Glycyrrhiza lepidota*	FACU

[1]Wetland Indicator Status:
Obligate Wetland Species (OBL); > 99% of occurrences in wetlands
Facultative Wetland Species (FACW); 67-99% of occurrences in wetlands
Facultative Species (FAC); 34-66% of occurrences in wetlands
Facultative Upland Species (FACU); 1-33% of occurrences in wetlands

3.7.2.2 Noxious Weeds

A noxious weed is defined as "…an invasive species that is introduced into a non-native ecosystem and which causes, or is likely to cause, harm to the economy, environment or human health" (FWS 2008b). This vegetative community exists throughout the study area in isolated island communities of typically less than one acre, with larger infestations inhabiting the ephemeral draws and the vicinity of the wetland areas. Noxious weeds present a threat throughout the study area and beyond, due to three primary factors: competition for nutrients, water, and sunlight; adaptivity to changing climatic conditions (such as drought); and vigorous reproduction of seed or rhizomatous roots systems (Zero Spread 2007). Six plant species classified as noxious weeds by the NRCS were observed during field visits in August 2008, consisting of five upland species and one wetland species. Three are classified as Category One noxious weeds, considered to be widely established with widespread infestations in many Montana counties. Three others are classified as Category Two noxious weeds; those species that have recently been introduced and are rapidly spreading from their current infestation sites (NRCS 2008b).

The noxious weed species within the study area are summarized alphabetically by common name below (3.7-4).

Table 3.7-4. Noxious weeds identified on the state parcel, August 2008, and their category (NRCS 2008b).

Common Name	***Scientific Name***	**Category**
Canada thistle	*Cirsium arvense*	One
Field bindweed	*Convolvulus arvensis*	One
Houndstongue	*Cynoglossum officinale*	One
Perennial pepperweed	*Lepidium latifolium*	Two
Saltcedar (wetland species)	*Tamarix ramosissima*	Two
Spotted knapweed	*Centaurea maculosa*	Two

The most egregious and wide spread noxious weed observed in the study area is Canada thistle (*Cirsium arvense).* This plant is known to spread 10% annually (Zero Spread 2007). Infestations were particularly dense adjacent to the open water wetland in the northwestern corner of the state section. This is probably due to the plant's deep and extensive rhizomatous root structure, combined with more available water and deeper soils associated with the wetland.

In addition to the species outlined above, there was one very small patch of Dyer's woad (*Isatis tinctoria*) observed directly adjacent to the southern boundary of the state parcel near the substation. Dyer's woad is considered to be a Category Two noxious weed in Montana (Zero Spread 2007). While this infestation is currently outside of the study area, it is mentioned here due to the proximity and probability of further infestation that could include the state parcel.

3.7.2.3 Species of Concern

Species of concern, for the purposes of this EIS, include those identified by the State of Montana or the FWS as being at-risk or potentially at-risk due to rarity, restricted distribution, habitat loss, or other factors. The US Bureau of Land Management (BLM) and USDA Forest Service (FS) also have special status designations, but they are not included here as these agencies do not have jurisdiction on the state parcel or surrounding lands. Designation as a Montana species of concern is not a statutory or regulatory classification. Rather, these designations provide information that helps resource managers make proactive decisions regarding species conservation and data collection priorities. A search of the MNHP database (MNHP 2008a) returned no vascular or non-vascular plants currently listed as species of concern known to occupy Township 1 North, Range 12 East or the area within a six mile radius, as of December 2008.

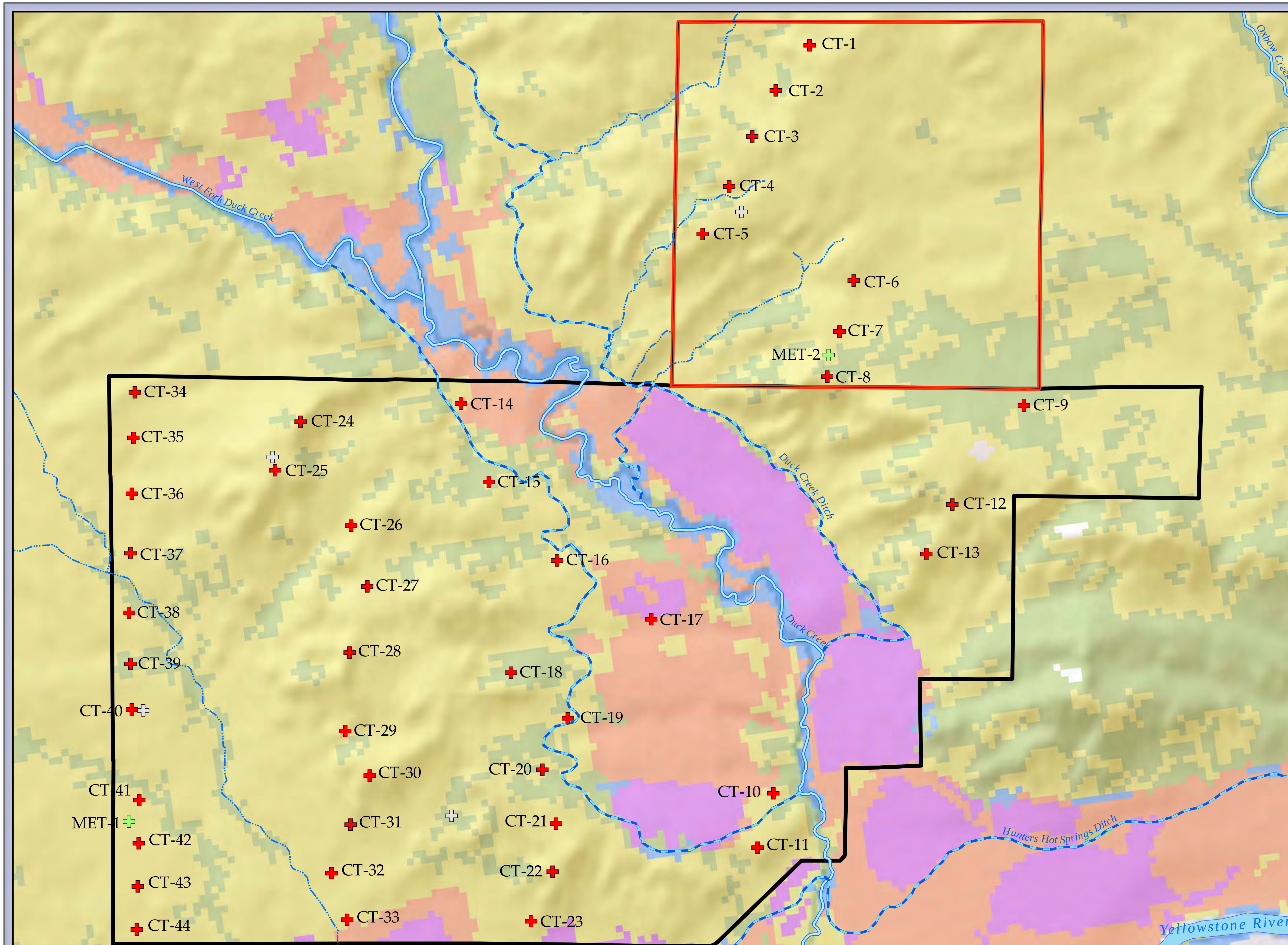
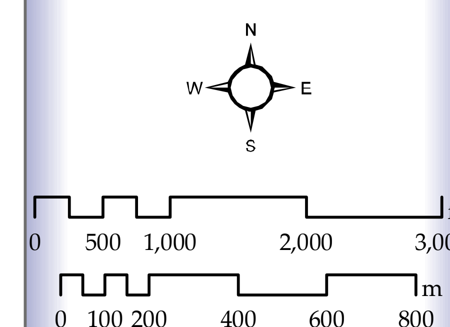


FIGURE 3.7-1.
GENERALIZED LAND COVER IN THE VICINITY OF THE PROPOSED COYOTE WIND PROJECT

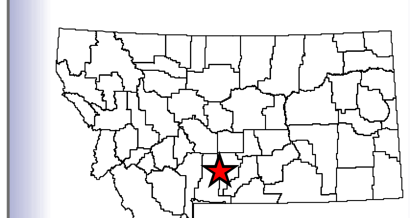
Sweet Grass County, Montana

Map Legend:

- Shrubs
- Herbaceous Vegetation
- Grasses/Legumes
- Cropland
- Riparian/Wetlands
- State Parcel
- Private Parcel
- Proposed Turbine
- Proposed Met Tower
- Existing Met Tower
- Creek
- Ditch
- Intermittent Stream



One Inch is Equal to 1,500 Feet



GANDA

SOURCES:
MONTANA NATURAL RESOURCE INFORMATION SYSTEM (NRIS)
ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE (ESRI)
US GEOLOGICAL SURVEY, NATIONAL LAND COVER DATABASE (USGS-NLCB), 2006

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Nine vascular plant species categorized as species of concern by the MNHP are known to occupy Sweet Grass County as of December 2008; and 28 plant species are documented in Park County (MNHP 2008a). Of these 37 species of concern located in Sweet Grass and Park counties, only three are known to occur in habitats similar to those found on the state parcel based on soil, topographic, and climatic conditions: Mojave brickellbush (*Brickellia oblongifolia)*, linearleaf daisy (*Erigeron linearis)*, and spiny hopsage (*Grayia spinosa).* These species are known to exist in areas of rocky soils or exposed bedrock and south facing slopes often associated with sage or dry shrubland. No rare plant surveys have been done on the state parcel, so it is not known if these species do occur there.

Mojave brickellbush and linearleaf daisy are both rated by the State of Montana as S1- category species of special concern, due to extremely limited and potentially declining numbers and/or habitats and therefore making them highly vulnerable to global extinction or extirpation in the state. Spiny hopsage is listed as S2-category species of special concern, also defined as at risk because of very limited and potentially declining numbers and/or habitat, although not to the same extent as the S1 category.

3.8 Wildlife

This section describes wildlife species known to occur or potentially occurring in the vicinity of the project area and summarizes results of the wildlife studies conducted in support of this EIS. The project area for wildlife is defined as the state parcel, and the project region is defined as the general geographic area up to a four-mile radius of the project area and adjacent private land.

3.8.1 Overview

The project area is located within the Great Plains physiographic province (McNab and Avers 1994). The southeast corner of the project area is approximately 1.6 miles from the Yellowstone River. Duck Creek, a tributary to the Yellowstone River, is located to the southwest and west of the project area and is within one-half mile of the southwest corner (Figure 3.3-1).

The project area elevation ranges from 4,358 feet to approximately 4,600 feet above mean sea level. It is surrounded by private lands used for cattle and sheep grazing and hay production (see Section 3.4, Land Use and Recreation). The western portion is rugged terrain with rocky draws and sandstone ridgelines. The eastern portion is characterized by rolling hills interspersed with low-angle basins.

Primary habitats in the project area are grassland/sagebrush, ephemeral draws, and isolated wetlands. Trees and shrubs include black cottonwood, juniper and willows. For complete vegetation descriptions please refer to Section 3.7, Vegetation. Woody vegetation and trees are scarce, occurring mainly in the ephemeral draws in the western section of the project area.

Based on the habitat types in the project area, the site is expected to provide habitat primarily for species associated with grassland/sagebrush habitat and wetlands. The majority of the habitat is dominated by shrubs and herbaceous vegetation (Figure 3.7-1) of both native and invasive origin; primarily big sagebrush, fringed sage and rubber rabbitbrush. The understory is composed of a mix of grasses and forbs such as bluebunch wheatgrass, Idaho fescue, cheatgrass, needle and thread and purple prairie clover. The sagebrush plant communities are mostly intact in the project area, while surrounding private sections appear to have been treated with herbicides to remove sagebrush for enhanced grass growth for grazing. Small, isolated, remnant linear strips of sagebrush remain on private land. A black-tailed prairie dog (*Cynomys ludoviscianus*) colony is located on the central-eastern portion of the section, and there is reduced grass cover in the immediate area of the colony.

Ephemeral draws exist in several small drainages and are dominated by western serviceberry, snowberry, black cottonwood and Rocky Mountain juniper. The western half of the section has been divided by many ephemeral stream channels that have vegetation characteristics distinct from the surrounding rangeland.

On the state parcel there are four wetlands in two categories: (1) seasonal wetlands that are closed depressions based on geologic structure and low-permeability soil parent material; and (2) perennial wetlands that are proximal to livestock spring developments (see section 3.7). No forest cover or riparian habitats are present on the state parcel. A transmission line crossing the state parcel runs north-south from the substation and parallels the eastern boundary of the project area, providing perching and potentially nesting habitat for raptors.

3.8.2 Inventory Methods

3.8.2.1 Review of Existing Information

A site assessment of the project area was conducted in 2004, and a Potential Impact Index (PII) was completed by Dr. Al Harmata (Wilde 2004; attached as Appendix A). The PII method was developed by FWS to be used during an initial site evaluation to identify physical attributes, species occurrence and status, and the ecological attractiveness of the site (FWS 2003a). The PII is a checklist intended to provide a reconnaissance level ranking of the site in terms of potential of impacts to aerial wildlife. The information in the PII was used to focus field studies.

Data was requested from the MNHP on all known occurrences of species of concern within ten miles of the project area (MNHP 2008a). Species of concern include native Montana animals that are considered to be “at risk” due to declining population trends, threats to their habitats, and/or restricted distribution. Montana Department of Fish, Wildlife and Parks (FWP) was consulted regarding big game distributions and HawkWatch International was consulted for details regarding raptor migrations in southwest and south central Montana.

Field surveys were designed and conducted to evaluate use of the project area and project region by state and federally listed species, big game species, breeding birds including raptors, and bats. In general, surveys were designed considering information from numerous guidance documents including FWS *Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (2003a), American Wind Energy Association *Wind Energy Siting Handbook* (2008), and California Energy Commission and California Department of Fish and Game *California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development* (2007). Field surveys were designed to document species presence or absence and their distribution and use of the project area on a seasonal basis. To do this aerial surveys were used for raptor nests, greater sage grouse (*Centrocercus urophasianus*) leks, and general wildlife habitat; Small Bird Counts (SBCs) for breeding birds; Bird Use Counts (BUC) stations for general bird use; passive acoustical monitoring for bats; and wildlife and wildlife habitat observations while in the project area. Specific methods and goals of these studies are described below. The full technical report is included in Appendix B.

3.8.2.2 Aerial Surveys

Aerial surveys conducted on June 17 and 18, 2008 assessed general wildlife presence and use of the project region with a focus on raptor nests, sage grouse leks, and big game (Figure 3.8-1). The open habitat in the vicinity of the project area is ideal for identifying wildlife from long distances. Raptor nest surveys are typically conducted by air in order to cover a large area and observe nests located high in trees, on river islands, or on cliffs. The aerial vantage point also makes it possible to conduct an assessment of whether a nest is active or not, and to document the number of young in active nests. The surveys for greater sage grouse focused on identifying suitable habitat for breeding and winter range. Follow-up ground surveys were proposed to confirm sage grouse presence or conduct counts if suitable habitat was identified or birds were observed. While in the air, the boundary of the known black-tailed prairie dog colony was sketched onto USGS quadrangle maps.

Total area surveyed was approximately 58,000 acres. A fixed wing Piper PA-18 Super Cub aircraft modified for slow flight and enhanced wildlife observation capabilities was used. One-half mile wide north-south transects at 100 to 300 feet above ground level, at speeds between 60 to 80 mph were flown. The survey transects proceeded from east to west. The weather was clear and mostly sunny, calm, and approximately 50 to 60 degrees Fahrenheit on the survey dates.

3.8.2.3 Small Bird Counts

SBC surveys are designed to document singing male birds indicating they have established breeding territories and are actively courting females to nest with them. The survey design was based on the US Forest Service Northern Region Landbird Monitoring Program protocol (Young et al. 2007), used throughout the western United States, including wind project sites, for long-term breeding bird status monitoring. The SBC technique is recommended for pre-construction surveys of potential wind project sites (CEC and CDFG 2007).

One transect with six point-count stations was located along a proposed turbine string, in habitat representative of the project area (Figure 3.8-2). Point counts were conducted between May 15 and June 20, 2008. Stations were placed approximately 273 yards (250 meters) apart, and surveys began 15 minutes after sunrise and were completed by 10:00 AM. A biologist spent ten minutes at each station and recorded all birds heard or seen within a 137 yard (125 meter) radius. Each transect was surveyed three times during the breeding season. Two other transects were placed on the adjacent private land, also along proposed turbine strings and surveyed using the same methodology.

3.8.2.4 Bird Use Counts

BUC survey methodology was based on that recommended for pre-construction surveys at proposed wind energy projects by the California Energy Commission (CEC and CDFG 2007). These surveys are designed to detect use of the area by larger birds such as raptors, waterfowl, and shorebirds; and to evaluate use in all four seasons. The BUC is a modified point count. An observer records bird detections from a single vantage point for a specified time period. A two-hour sampling period was chosen to maximize observational data at each station. Surveys were conducted at approximately two-week intervals at various times during the day and under various weather conditions in the spring (n=3; May 13 to June 20), summer (n=2; August 26 to August 29), fall (n=4; September 25 to October 23), and winter (n=3; December 17 to January 15) seasons.

The BUC site on the state parcel was located at a vantage point that offered unobstructed views of the surrounding terrain and black-tailed prairie dog colony, and overlooking proposed turbine locations (Figure 3.8-2). The number and species of birds observed within an 875 yard (800 meter) radius, distance from bird to observer, flight height above ground, behavior (e.g. soaring, contour hunting, and flapping flight), and environmental variables (e.g. wind speed, temperature, cloud cover) were recorded. Also conducted were BUCs at two locations on the adjacent private component of the Coyote Wind project.

3.8.2.5 Acoustic Surveys for Bats

Wind energy project impacts to avian species are well documented, however it is only relatively recently that the potential effects to bats have been acknowledged and studied (Drewitt and Langston 2006; Kunz et al 2007; Kuvlesky, Jr. et al 2007; Smallwood 2007). Bats tend to be most affected during migratory periods, and more during fall migrations than spring (Arnett et al. 2007).

There are a number of techniques used to determine bat use of an area proposed for wind development, with the goal of predicting which bat species and in what relative numbers may be affected. Researchers have used radar, infrared cameras, and acoustic monitoring. Each method has its advantages and disadvantages (see Appendix B for a more detailed description). Based on a review of these pros and cons, on the timing of this project, and on the site attributes, a passive acoustic monitoring technique was chosen.

Passive acoustic monitoring is a technique where broadband ultrasonic detectors capable of detecting and recording bat echolocation calls, are deployed at the site. The detectors record the calls in electronic files which can then be downloaded and identified to phonic group (e.g. grouped by frequency measured in kilohertz). Detectors were placed in two locations in the proposed wind project area, one on the state parcel, and one on adjacent private land (Figure 3.8-2). Temporary stationary towers designed for bat detector deployment were erected, and two instruments placed on each tower. One instrument was placed five feet off the ground, and the other placed at about 70 feet, the maximum height possible for the tower. Data were collected during periods of highest bat activity; approximately one hour before dusk to one hour after dawn, every night from August 29 through November 6, 2008 (exceptions were when equipment did not function properly – see Appendix B).

CFCread Software (compact flash card reading software developed by Titley Electronics, Australia specifically to read files recorded by Anabat acoustic bat detectors) was used to convert recorded sounds into computer files stamped with the date and time. A file can be as ‘small’ as a few microseconds of sound to as ‘large’ as 15 seconds of constant noise. Bat echolocation calls are sometimes recognizable to species or, due to similarities among species, reported as phonic groups. Therefore, files from each night were sorted into four groups: (1) 40 kHz phonic group; (2) 25 kHz phonic group; (3) hoary bats (this species has a unique phonic signature), and (4) noise files that did not contain bat calls. Data files were reviewed for calls in the 30 and 50 kHz ranges as well, but none were detected. Noise files were primarily wind, and also a small subset of electronic interference and bird calls.

The state parcel is characterized by fairly steep eroded draws on the western side where the turbines are planned, and more rolling sagebrush and grasslands to the east. The monitoring tower was placed at the largest wetland site because there is a wind turbine planned near that spot, wetlands are an attractant for foraging bats, and the topography is representative of the western side of the state parcel where the wind turbines are planned. Detectors were pointed in an easterly direction to minimize wind noise from the prevailing westerly winds.

3.8.3 Inventory Results

3.8.3.1 Review of Existing Information

The PII ranked the Coyote Wind project area as moderate in terms of potential risk to aerial wildlife (Wilde 2004, Appendix A). This rating is based on species expected to be found in the project area, ecological magnets such as wetlands, and physical characteristics of the site such as topography and meteorological characteristics. The PII did not consider the specific proposed turbine locations, heights, or operational regimes included in the Proposed Action in this EIS; it was a general evaluation of the state parcel.

The MNHP (MNHP 2008a) database query identified seven terrestrial federal and state species of concern within ten miles of the project area; gray wolf (1 record), Canada lynx (1), grizzly bear (1), wolverine (1), bald eagle (7), peregrine falcon (1), and greater sage grouse (2). The MNHP program had no documented sightings of species of concern within the state parcel. Table 3.8-1 lists these species and their status, as well as other species of concern documented during field surveys, or those with suitable habitat in the project area or region. More information on species of concern is included in Section 3.8.3.6 below.

Table 3.8-1. Wildlife Species of Concern Documented During Field Surveys or with Potential to Occur in the Coyote Wind Project Region, Sweet Grass County, MT.

Common Name	**Scientific Name**	**State Rank[1]**	**FWS**	**Habitat Present[2]**	**Documented on state parcel[2]**
Birds					
American white pelican	*Pelecanus erythrorhynchos*	S3B	N/A	Y	Y
Bald eagle	*Haliaeetus leucocephalus*	S3	DM	Y	Y
Brewer's sparrow	*Spizella breweri*	S2B	N/A	Y	Y
Grasshopper sparrow	*Ammodramus savannarum*	S3B	N/A	Y	Y

Table 3.8-1. Wildlife Species of Concern Documented During Field Surveys or with Potential to Occur in the Coyote Wind Project Region, Sweet Grass County, MT.

Common Name	**Scientific Name**	**State Rank**[1]	**FWS**	**Habitat Present**[2]	**Documented on state parcel**[2]
Ferruginous hawk	*Buteo regalis*	S3B	N/A	Y	Y
Long-billed curlew	*Numenius americanus*	S2B	N/A	Y	Y
Peregrine falcon	*Falco peregrinus*	S2B	DM	Y	
Bats					
Fringed myotis	*Myotis thysanodes*	S3S4	N/A	Y	
Hoary bat	*Lasiurus cinereus*	S3S4	N/A	Y	Y
Silver-haired bat	*Lasionycteris noctivagans*	S3S4	N/A	Y	
Spotted bat	*Euderma maculatum*	S2	N/A	Y	
Townsend's Big-eared bat	*Corynorhinus townsendii*	S2	N/A	Y	
Yuma myotis	*Myotis yumanensis*	S3S4	N/A	Y	
Other Mammals			N/A		
Merriam's shrew	*Sorex merriami*	S3	N/A	Y	
Preble's shrew	*Sorex preblei*	S3	N/A	Y	
Black-tailed prairie dog	*Cynomys ludoviscianus*	S3	N/A	Y	Y
Canada lynx	*Lynx Canadensis*	S3	LT		
Gray wolf	*Canis lupus*	S3	E/XN	Y	
Grizzly bear	*Ursus arctos*	S2S3	LT	Y	
Wolverine	*Gulo gulo*	S3	N/A	Y	
Reptiles					
Greater short-horned lizard	*Phrynosoma hernandesi*	S3	N/A	Y	

[1]Definitions for rankings: S = State rank based on status of species in Montana. S2: At risk because of very limited and/or declining numbers, range, and/or habitat, making it vulnerable to global extinction or extirpation in the state. S3: Potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas. S4: Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern. E: Listed endangered; LT: Listed threatened; XN: Non-essential/experimental population; DM: Recovered, delisted and now being monitored. B: breeding population of the species in Montana.
[2]Y = Yes

The project area is located within the Rocky Mountain Flyway, one of four principal north-south bird migration routes in North America. The Rocky Mountain Flyway extends along the spine of mountain ranges from the arctic regions of Alaska and Canada to Central and South America. Within the flyway, certain groups of birds including songbirds, waterfowl and raptors, may travel along narrower migration corridors following topographical features of mountain ranges (Mabee and Cooper 2004; Williams et al. 2001).

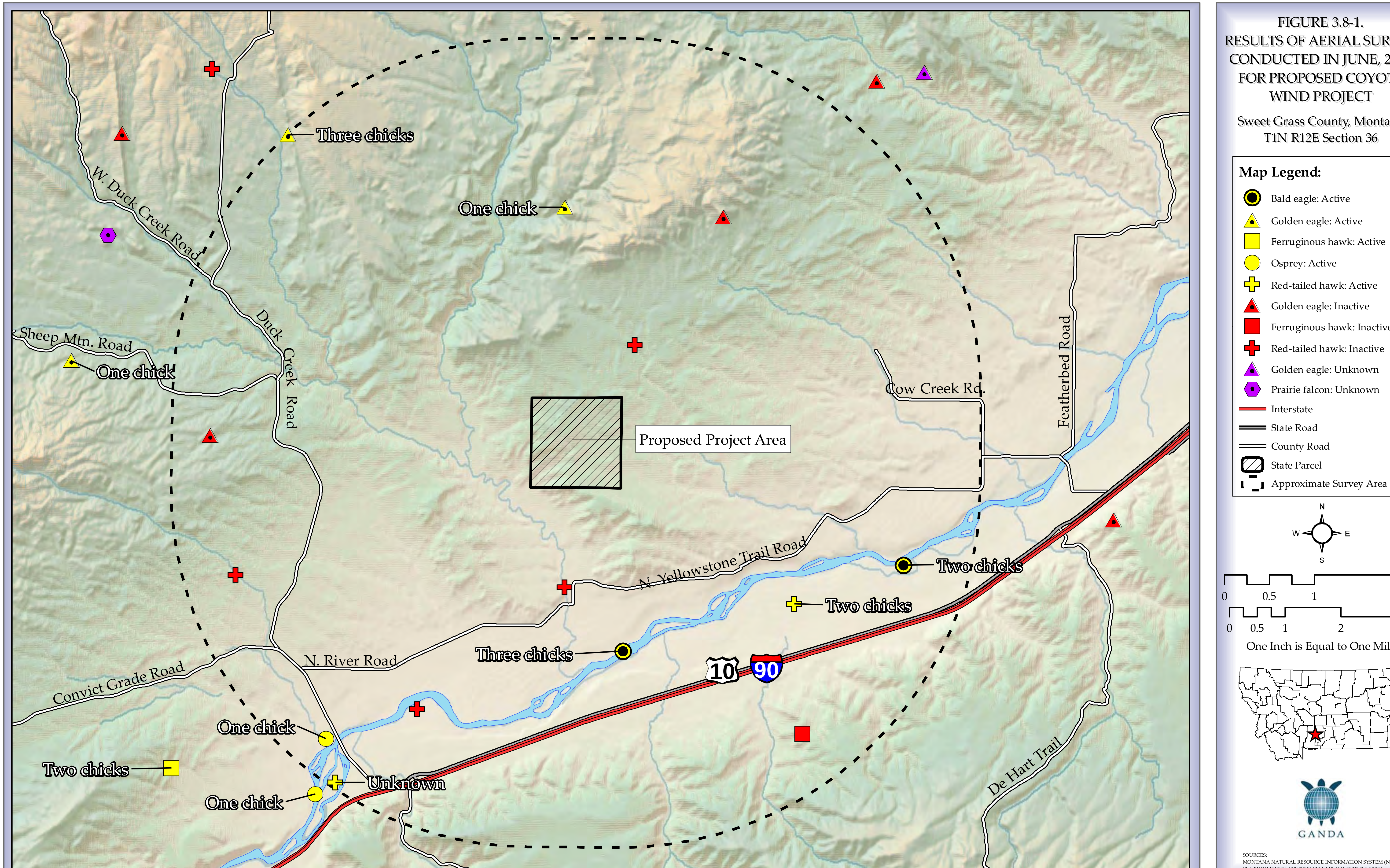

FIGURE 3.8-1.
RESULTS OF AERIAL SURVEY CONDUCTED IN JUNE, 2008 FOR PROPOSED COYOTE WIND PROJECT

Sweet Grass County, Montana
T1N R12E Section 36

SOURCES:
MONTANA NATURAL RESOURCE INFORMATION SYSTEM (NRIS)
ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE (ESRI)

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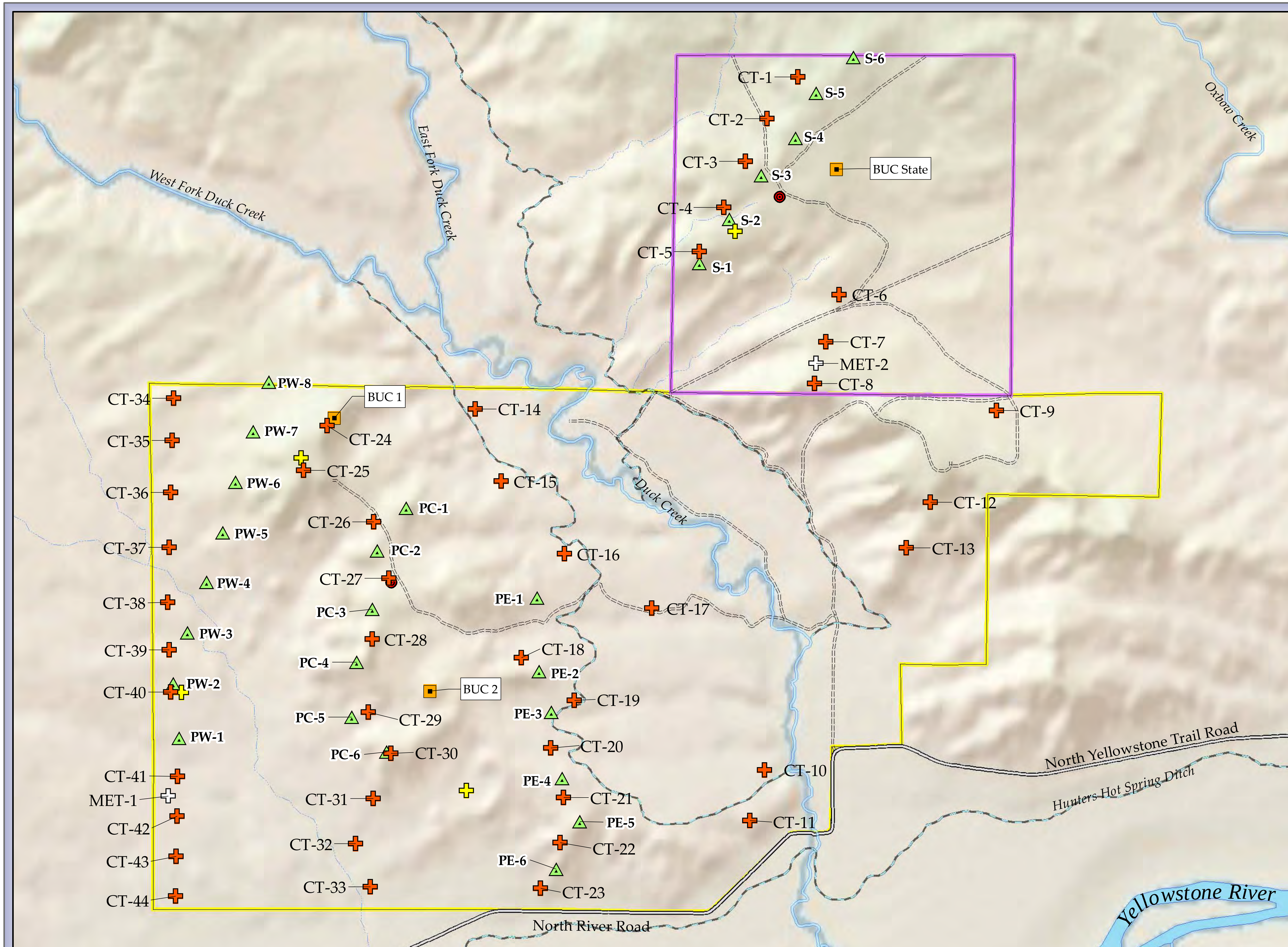
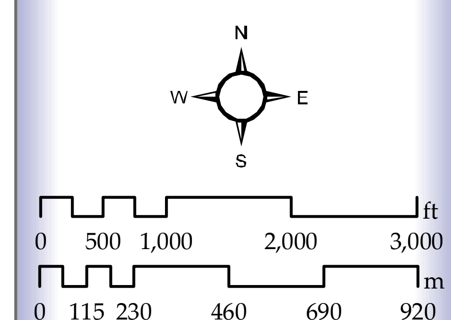


FIGURE 3.8-2.
LOCATION OF SMALL BIRD COUNT AND BIRD USE COUNT STATIONS AND BAT MONITORING TOWERS IN SUPPORT OF THE PROPOSED COYOTE WIND PROJECT

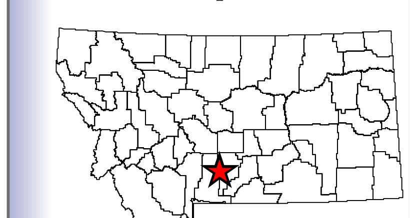
Sweet Grass County, Montana

Map Legend:

- Bird Use Count Location
- Small Bird Count Location
- Bat Monitoring Tower
- Creek
- Ditch
- Intermittent Stream
- Access Road
- County Road
- State Parcel
- Private Parcel
- Proposed Turbine
- Proposed Met Tower
- Existing Met Tower



One Inch is Equal to 1,500 Feet



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SOURCES:
MONTANA NATURAL RESOURCE INFORMATION SYSTEM (NRIS)
ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE (ESRI)

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HawkWatch International has a long-term program for observation of raptors during their fall migration over the Bridger Mountains (approximately 30 miles to the northwest of the project area). These data helped to provide insight into raptor migration use of the project area. When the raptor counts first began in the 1980's, they seemed to indicate that the topographical formation of the Bridger Mountains created consistent updraft patterns and therefore was a desirable migration path. More recent data indicate that in western Montana significant concentrations of migrating eagles and other raptors are not restricted to the Bridger Mountains and may well shift migration routes to nearby mountain ranges, such as the Crazy Mountains north of the project region, with changes in weather conditions (Smith pers. com. 2008).

3.8.3.2 Aerial Surveys

Birds

The state parcel and project region surveyed are dominated by grassland/sagebrush vegetation communities with topography ranging from flat to steeply sloping canyons. Riparian areas and small wetland features occur within this region. Aerial surveys revealed that habitat diversity has been reduced by sagebrush removal and grazing. Sagebrush communities are somewhat intact on the state parcel, but have been largely degraded on the surrounding private lands. Grasses and forbs have been heavily grazed by livestock on both the state parcel and private land decreasing breeding habitat, cover, and forage for grassland birds. Raptor nesting habitat within the project region is limited to widely scattered cliffs and rock outcrops, occasional patches of juniper, and deciduous trees within the Duck Creek and Yellowstone River corridors. No nests were observed on the transmission line towers on the state parcel, and the towers appear unable to support nest structures. Overall the project area is a dry and arid environment with limited raptor nesting substrate.

Twenty-four raptor nests were found within the project region, but no raptor nests were found on the state parcel. Ten nests were active (42%). The active nests were three golden eagle (five young total), two bald eagle (five young total), one red-tailed hawk (*Buteo jamaicensis*; two young), a nest actively defended by a red-tailed hawk on a river island (no count of young due to dense foliage); two osprey nests (*Pandion haliaetus*; two young total); and one ferruginous hawk (two young). The ferruginous hawk nest was approximately five miles west of the state parcel at the base of Sheep Mountain.

Greater sage grouse habitat consists of the sagebrush and upland grassland plant species found in grassland/sagebrush habitat. This bird species is mostly dependent on sagebrush for food and protective cover. In spring and summer they also eat forbs such as dandelion, and may eat alfalfa on farmland in the summer. In winter, greater sage grouse rely completely on sagebrush for forage and shelter. In spring, males gather at leks, or open dancing grounds, some of which have been used by generations for hundreds of years (FWP 2008a). Greater sage-grouse tend to use small habitat patches within larger home ranges. The larger landscapes can be up to a thousand square miles. Sage-grouse may migrate 100 miles in a single direction, flying over unsuitable habitat such as mountains to get to good habitats. The greater sage grouse habitat in the project area is of very low quality. The only contiguous patches of sagebrush that might support greater sage grouse occur on the state parcel, but they are isolated from other patches in the project region, small in acreage, and likely have steeper slopes than those selected by greater sage-grouse. Surrounding private land parcels exhibited patchy and streaked patterns of sagebrush, indicative of herbicide application. Since no suitable habitat was observed during aerial surveys no follow-up ground surveys were conducted.

Big Game and General Wildlife

Big game species were documented during the aerial survey and during ground surveys for other species. The grassland/sagebrush habitat on the state parcel provides mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), and pronghorn antelope (*Antilocapra americana*) seasonal ranges for breeding, shelter, and forage. Most sightings on the state parcel were of individual animals or small groups. Overall densities of ungulates within the project area were low, with somewhat higher densities occurring in the surrounding agricultural areas, likely due to greater habitat diversity. Pronghorn and mule deer were the most consistently observed species in or near the project area. Mule deer and pronghorn pellet groups, indicating habitat use, were observed mainly along exposed ridges and open areas of grass within sagebrush stands.

Seasonal habitat use varied with higher numbers of animals using the project area in spring and fall and fewer during summer and winter, although there is still some use in the winter. Ungulates in the project area may travel between seasonally important habitats in the Yellowstone River corridor to the south and higher elevation summer range in the Crazy Mountains to the north (Paugh pers. com. 2008).

Mule deer populations have been declining in parts of Montana, and studies have shown that winter range is particularly important in maintaining populations. Although mule deer use of the project area in winter appeared low, good winter range habitat is nevertheless present. The sagebrush stands are relatively more intact compared to those on the surrounding private land. These stands occur in breaks and draws on the western edge of the project area. These areas provide protein-rich forage and refugia from human disturbance, both very important for surviving harsh winter temperatures and winds (Paugh pers. com. 2008). Pronghorn will also sometimes use the draws for protection from wind and weather.

No elk (*Cervus elaphus*) were observed in the project area, however one cow elk was seen on the south side of the Yellowstone River in a rugged canyon more than two miles from the state parcel. The nearest known herd is approximately five miles north near Sioux Crossing in the foothills of the Crazy Mountains (Paugh pers. com. 2008). Approximately 200 to 300 elk winter there, and are occasionally hunted by a wolf pack living mainly south of I-90 in the West Boulder River area. This pack has been documented traveling near the project area to access the Sioux Crossing elk winter range (Paugh pers. com. 2008).

The level of hunting pressure on ungulates in the project area is not known (Paugh pers. com. 2008). Hunting is allowed on some of the neighboring private lands.

One coyote (*Canis latrans*) was seen in the project region on the south side of the Yellowstone River, and two were seen during general observations in the project region to the west of the state parcel.

Several snake species are known to occur in the area, such as gopher snakes (*Pituophis catenifer*), western rattlesnakes (*Crotalus viridis*), common garter snakes (*Thamnophis sirtalis*) and the western terrestrial garter snake (*Thamnophis elegans*). Also common in the project area is the racer (*Coluber constrictor*), which was seen on the state parcel during SBCs.

Black-tailed Prairie Dogs

The size of the black-tailed prairie dog colony in the project area has appeared to increase since the last mapping effort (Wilde 2004). The current size within the state parcel is approximately 150 acres; with an additional 300 acres to the east and southeast of the state boundary.

Prairie dog colonies are typically found in open shrub/grasslands with low, relatively sparse vegetation and low slope gradient. The most frequently selected habitat in Montana is dominated by big sagebrush, blue grama, and western wheatgrass (MNHP 2008b). In Montana, Beck and Mitchell (2000) found that prairie dog colonies in their study tended to be associated with areas heavily used by cattle, such as water tanks and long-term supplemental feeding sites such as occur on the state parcel.

Raptors, snakes, coyotes, and red foxes (*Vulpes vulpes*) all prey on prairie dogs, usually at low rates (MNHP 2008b). Historically, predation on prairie dogs was primarily from the black-footed ferret and the badger (Stromberg et al. 1983). Drought and severe winters can cause wide-spread starvation, and old age and other factors contribute to mortality of prairie dogs (MNHP 2008b).

3.8.3.3 Small Bird Counts

Appendix B provides detailed information about all field surveys conducted, with the results for SBCs summarized here. In the project area 62 individual birds of 20 species were documented. The four most frequently observed bird species were western meadowlarks, red-winged blackbirds, horned larks and vesper sparrows. These species comprised 52% of all birds observed.

On all transects (state and private parcels) 281 individuals of 44 species were documented. The four most frequently observed bird species for all transects were western meadowlarks, vesper sparrows, black-billed magpies, and red-winged blackbirds. These species comprised 67% of all birds observed. The diversity of species found on all transects is attributable to the habitat matrix which includes grassland/sagebrush, rangeland, agricultural cropland, Duck Creek corridor, small wetlands and ephemeral creeks, and more rugged coulees and rock outcrops.

3.8.3.4 Bird Use Counts

During BUCs in the project area 47 individuals of 16 species were documented for all four seasons combined. The most frequently observed bird species were golden eagles and common ravens. There were four sightings each of red-tailed hawks, northern harriers, black-billed magpies, and horned larks. Observations of these species comprised 68% of all observations.

For all BUCs (state and private parcels) a total of 147 individuals of 28 species were documented during all four seasons. The four most frequently observed bird species were golden eagles, common ravens, black-billed magpies, and western meadowlarks. Observations of these species comprised 55% of all observations.

Survey methodology for BUCs required each individual sighting to be recorded. This may have resulted in some species, such as golden eagles and red-tailed hawks, being over-represented by repeated, intermittent sightings due to long soaring times. Raptor behavior in the project area was consistent. The ridge along the western portion of the state parcel is perpendicular to prevailing winds thereby creating updrafts. Raptors use those updrafts and thermals from the agricultural fields bordering Duck Creek to soar and hunt.

No consistent pattern in avian flight paths were observed on the portions of the project area with less topographic relief, such as the eastern portion near the black-tailed prairie dog colony. Raptors were observed perching on the transmission line towers (mainly golden eagles and one red-tailed hawk), and landing on the rocky ridge outcroppings interspersed throughout the colony (golden eagles and ferruginous hawks). On the private land the ridgeline running north-south between BUC stations PN and PS (Figure 3.8-2) was frequently used for soaring and hunting by raptors and corvids, primarily golden eagles and common ravens.

Corvids documented were common ravens (*Corvus corax*), American crows (*Corvus brachyrhynchos*), and black-billed magpies (*Pica hudsonia*). Overall numbers of species and individuals of corvids were low, which could be attributed to poor habitat, or frequent moderate to high winds which may have caused smaller species to seek shelter elsewhere or perch. Other species documented at low numbers were sandhill cranes (*Grus canadensis*), long-billed curlews, common nighthawks (*Chordeils minor*), a mallard (*Anas platyrhynchos*) and an American white pelican. Sightings of these species comprised 0.06% of all observations on the state parcel, and 0.07% at all stations on state and private land.

Survey results indicated relatively low avian use of the state and private parcels. BUCs are designed to detect larger birds. If passerines, (perching birds, also known as songbirds) are removed, 37 observations of raptors, corvids and shorebirds were documented on the state parcel, and 110 observations at state and private sites. This equates to 0.5 observations per hour for the project area and 1.5 observations per hour overall.

Higher counts in the spring and fall indicate higher use during migratory seasons. BUCs on the state parcel (one station) ranged in seasonal frequency from nine individuals in spring (May-June), three in summer (August), 11 in fall (September and October), to two in winter (December and January). Counts on private parcels (two stations) ranged in seasonal frequency from nine in spring, four in summer, ten in fall, and 11 in winter. It is difficult to differentiate between resident and migrant raptors without tagging individual birds. Species composition remained consistent throughout the year and none of the migrating raptor species [such as Cooper's hawks (*Accipiter cooperii*), Swainson's hawks (*Buteo swainsoni*) or peregrine falcons (*Falco peregrinus*)] documented at the nearby HawkWatch site in the Bridger Mountains were observed. Although individuals documented during spring and fall surveys may have been migrants, the consistent species list indicates that higher seasonal numbers may have been a result of seasonal fluctuations in the frequency or intensity of resident bird use rather than influxes of migrants. Regardless of the origin of birds observed, use or duration of use increased in the spring and fall seasons compared to summer and winter.

3.8.3.5 Acoustic Surveys for Bats

Four hundred eighty echolocation files were recorded on the state parcel, and 188 on the private land.

Table 3.8-2 lists bat species that were detected by acoustic surveys or that may occur in the project region based on a review of habitat and range (Foresman 2001, MNHP 2008c, Appendix B).

Table 3.8-2. Bat species confirmed to occur, or with potential to occur, in the Coyote Wind Project Region, Montana.

Species	*Scientific name*	Phonic group (kHz)	Detected on acoustic surveys
Townsend's Big-eared Bat	*Corynorhinus townsendii*	Unique call signature	No
Spotted Bat	*Euderma maculatum*	Unique call signature	No
Big Brown Bat	*Eptesicus fuscus*	25	Possible[1]
Silver-haired Bat	*Lasionycteris noctivagans*	25	Yes
Hoary Bat	*Lasiurus cinereus*	25, subset of unique calls	Yes
Long-eared Myotis	*Myotis evotis*	30, subset of unique calls	No
Fringed Myotis	*Myotis thysanodes*	30, subset of unique calls	No
Western Small-footed Myotis	*Myotis ciliolabrum*	40	Possible
Little Brown Myotis	*Myotis lucifugus*	40	Possible
Long-legged Myotis	*Myotis volans*	40	Possible
California Myotis	*Myotis californicus*	50	No
Yuma Myotis	*Myotis yumanensis*	50	No

[1]"Possible" means individuals in the phonic group for that species were detected and confirmed identification to species was not possible.

Species that may potentially occur within the project area, and would not have been detected by the methods used, are the spotted bat and Townsend's big-eared bat. Habitat for the spotted bat ranges from montane forests to deserts. Presence is influenced more by roosting habitats in cliffs and steep canyon walls than by foraging habitats (Adams 2003; Foresman 2001). Cliffs and canyons (draws) exist within the project region, therefore spotted bats may occur. While acoustic surveys may pick up this species, the preferred survey method for the spotted bat is audible detection because it echolocates within the range of human hearing. Foraging habitat for Townsend's big-eared bat in the project region includes Rocky Mountain juniper with big sage and silver sage sagebrush understory. Roosting habitat, found in cold caves and mine shafts, likely does not occur in the project region (Adams 2003, Foresman 2001). Townsend's big-eared bats will sometimes roost in buildings in late summer; buildings do occur in the project region. As with the spotted bat, while acoustic surveys may pick up this species, the preferred survey method for the Townsend's big-eared bat is to search for roost sites because this species echolocates at low intensity and has a limited detection range. Echolocation calls from the fringed myotis and long-eared myotis (30 kHz with a subset of unique calls) are usually recognizable with acoustic monitoring, but were not detected on acoustic surveys for this project.

Many bat species appear to use narrow migration corridors following topographical features of mountain ranges such as river drainages and forested ridges, although there are exceptions to this behavior depending on the specific species (Kunz and Fenton 2005). However, little is known about bat migration routes and timing in Montana (DuBois pers. com. 2008).

3.8.3.6 Species of Concern

Table 3.8-1 in Section 3.8.3.1 identifies all state or federally listed animal species of concern documented, or with potential to occur in the project area. These species are discussed in more detail below.

Federally Listed Species

No federally listed threatened or endangered species have been documented within the project area (MNHP 2008a). No federally designated critical habitat occurs in the project area. Based on the habitat attributes present in the project region and the habitats with which these species are associated, the gray wolf and grizzly bear are the only federally listed species with the potential to occur there.

Gray wolf. An established pack of wolves lives mainly south of the project region, in the West Boulder River area, and occasionally travels through the region to hunt elk wintering north of there near town of Sioux Crossing. Although the pack has been observed passing through (Paugh pers. com. 2008), no denning activity has occurred in or near the project region and it is unlikely wolves would remain in the area due to human presence and active livestock operations.
Gray wolves that occur in the project region are designated as “endangered, non-essential and experimental” and are treated as a species proposed for listing under the Endangered Species Act. The Northern Rocky Mountain population segment of wolves was delisted in March 2008, but a subsequent lawsuit over the number of wolves killed in the recovery area since delisting prompted the US Federal District Court in Missoula, Montana to reinstate the Endangered Species Act protection for wolves in the northern Rocky Mountains. As of February 2009 the federal government is reviewing the delisting decision while maintaining ESA protection for the wolf in the northern Rocky Mountains. Once the wolf is delisted in Montana, FWP will manage the animal under the guidelines of the Montana Gray Wolf Conservation and Management Plan (FWP 2003).

Grizzly bear. The MNHP listed an occurrence for grizzly bears within ten miles of the project region (MNHP 2008a), south of I-90 in the Greater Yellowstone Ecosystem. Grizzly bears have large home ranges and use a variety of habitats on a seasonal basis. It is possible that a grizzly bear could pass through the project region, although no denning or significant foraging habitat exists on either the state or private parcels, and it is unlikely they would remain in the area due to human presence and active livestock operations.

On March 22, 2007, the FWS announced that the Yellowstone Distinct Population Segment of grizzly bears is a recovered population no longer meeting the Endangered Species Act definition of threatened or endangered. This announcement did not affect the status of other grizzly bear populations in the lower 48 states, including any that would occur in the project region. Therefore if grizzly bears occurred in the project region they would retain their threatened status under the act.

Canada lynx. Although no sightings are on record in the project region, Canada lynx exist within ten miles of the region and were last documented by MNHP in 2006 (MNHP 2008a). Relatively continuous habitat for Canada lynx exists in the Gallatin, Absaroka, Beartooth, and Deer Creek mountain ranges. It is possible that a Canada lynx could pass through the project region, although no denning (late successional forests) or significant foraging habitat (early successional forests) exists on either the state or private parcels, and it is unlikely they would remain in the area due to human presence and active livestock operations.

State Species of Concern

The following Montana state species of concern or potential species of concern (animals for which current, often limited, information suggests potential vulnerability or for which additional data are needed before an accurate status assessment can be made) were documented in the project region, or may occur in the project region based on range and habitat descriptions (MNHP 2008a; MNHP 2008d). Designation as a Montana animal species of concern or potential animal species of concern is not a statutory or regulatory classification. Instead, these designations provide a basis for resource managers and decision-makers to make proactive decisions regarding species conservation and data collection priorities.

<u>Birds</u>

Occurrences of five state bird species of concern were documented during SBCs or BUCs for this project. Some were found on the state parcel, some on adjacent private land and some on both (see below).

American white pelican. This species was sighted flying over the state parcel during spring BUC surveys. No summer range exists in the project area. American white pelicans in Montana are common long-distance migrants and move through the project region in spring and fall, usually along the Yellowstone River corridor.

Bald eagle. Bald eagles occur in the project region year-round. Bald eagles were detected during fall and winter BUCs on private land only. The two active bald eagle nests documented during aerial surveys were along the Yellowstone River, and were approximately two and three miles from the project area (Figure 3.8-1).

In Montana the bald eagle is primarily a species of riparian and lacustrine habitats, especially during the breeding season. Important year-round habitats includes wetlands, major water bodies, spring spawning streams, ungulate winter ranges and open water areas. Wintering habitat may include upland sites. Nesting sites are generally located within larger forested areas near large lakes and rivers where nests are usually built in the tallest, oldest, and largest diameter trees. Nesting site selection is dependent on maximum local food availability and minimum disturbance from human activity (Montana Bald Eagle Working Group [MBEWG] 1994). These habitat components exist in the project region.

The bald eagle was delisted by the FWS in 2007, but is still protected under the Migratory Bird Treaty Act of 1918 and the Bald and Golden Eagle Protection Act of 1940, and the FWS (2007) has developed management recommendations for active nests. The Montana Bald Eagle Working Group also developed management guidelines which are followed by state agencies (MBEWG 1994). The project area is within "Zone III" of one bald eagle home range area, as described below. Turbines on private land may also fall into one of the management zones.

Nest management zones for all active bald eagle nests (MBEWG 1994):

- Zone I extends for a ¼ mile radius from the nest. This is considered the nest site area, and management objectives are to eliminate disturbance and maintain or enhance nest site habitat suitability.
- Zone II extends from ¼ to ½ mile from the nest. It is the primary use area, and management objectives are to minimize disturbance, maintain the integrity of the breeding area, and eliminate hazards.
- Zone III includes all suitable foraging habitat within 2.5 miles (4 kilometers) of the nest site. It is the home range area, and management objectives are to maintain suitability of foraging habitat, minimize disturbance within key areas, minimize hazards, and maintain integrity of the breeding area. This zone includes all suitable foraging habitat within 2.5 miles (4 kilometers) of the nest site.

Brewer's sparrow. This species was documented on the private parcels during SBC surveys. They nest in mature sagebrush stands which exist throughout the project region. The project area contains a large expanse of mature sagebrush habitat; therefore it is likely they also occur there.

Grasshopper sparrow. This species was documented on the private parcels during SBC surveys. Grasshopper sparrows prefer open prairies with intermittent brush cover. This habitat also occurs on the state parcel, therefore it is likely they also occur there.

Ferruginous hawk. Aerial surveys confirmed an active nest at the base of Sheep Mountain on the west side of the project region, and BUC documented these hawks hunting near the prairie dog town on the state parcel. Breeding and summer habitat for this species occurs in the project region. This species is entirely migratory (Bechard and Schmutz 1995) and no ferruginous hawks winter in Montana. Fall migration begins in August and continues into early September.

Long-billed curlew. Although this species was documented on private land only, similar habitat exists on the state parcel and it is likely that it nests and forages throughout the project region. Therefore it is likely that the long-billed curlew also occurs in the project area. Breeding and summer habitat for this species exists in the project region. This species is found in prairies and grassy meadows, generally near water. It nests in dry prairies and moist meadows on the ground, usually in flat areas with short grass, sometimes on more irregular terrain, often near a rock or other conspicuous object (NatureServe 2009). In Montana, migration occurs from mid-July to September, with peaks in early August.

Peregrine falcon. This species was federally delisted in 2003 and is being monitored in accordance with the guidance document, Monitoring Plan for American Peregrine Falcons (FWS 2003b). Peregrine falcons remain on the state species of concern list. Peregrine falcons may occur in the project region year-round. Nests are typically situated on cliff ledges under overhangs. Nests are often located with a commanding view of the surrounding valley, and near water sources such as rivers or lakes. In Montana migration usually occurs in early May and mid-September (MNHP 2008e). Both nesting and foraging habitat occur in the project region.

<u>Bats</u>
Fringed myotis. This species was not detected during acoustic surveys. No information on fringed myotis movements in Montana is available (Foresman 2001). The fringed myotis has been observed in Montana only during June to September, indicating it probably migrates out of the state for winter. The fringed myotis is found primarily in desert shrublands, steppe grassland, and woodland habitats (Foresman 2001). Grassland/sagebrush habitat exists in the project area, therefore it may occur there.

Hoary bat. Acoustic monitoring confirmed this species presence on both state and private parcels. During the summer, hoary bats occupy forested areas, and during migration are found throughout the state (Foresman 2001). In North America, breeding occurs from September through November, indicating the bats in the project region were breeding, migrating through, or both. Migration takes place in waves with large numbers of bats passing through an area over the course of a few nights in spring and fall (Layne 1978).

Silver-haired bat. Acoustic monitoring confirmed the unique calls of silver-haired bats on both state and private parcels. The unique calls occur as a subset within the 25 kHz phonic group. Silver-haired bats are one of the more common migrants in Montana and occur throughout the state. Foraging occurs over ponds and waterways, in or near the edge of coniferous forests (Foresman 2001). This species breeds in late September and fertilization is delayed until spring. This species prefers to roost alone in trees under loose bark, and may do so in the Duck Creek corridor or on dispersed trees throughout the study region. The project area has suitable habitat for this species during summer months (NatureServe 2009).

Spotted bat. This species has a unique call signature, and was not found in the project region during acoustic surveys. Year around habitat exists in the project area, therefore this species may occur.. Some spotted bats may migrate south for the winter, but there is no direct evidence of migratory movements. Spotted bats have been encountered or detected most often in open arid habitats dominated by Utah juniper and sagebrush, sometimes intermixed with limber pine or Douglas-fir, or in grassy meadows in ponderosa pine savannah. In other areas, spotted bats have been detected at water sources and in meadow openings, often with large cliffs nearby (Foresman 2001).

Townsend's big-eared bat. This species has a unique call signature, and was not documented by acoustic surveys. Specimen captures are most common in evergreen forests and least common in xeric shrub grasslands (Adams 2003). Little information on movement is available for this species. Townsend's big-eared bats are present year-round in Montana, with summer or winter records from several localities. Habitat use in Montana has not been evaluated in detail, but seems to be similar to other localities in the western United States. This species uses a broad variety of habitats for its annual life history needs. Habitats in the vicinity of roosts (typically caves, mines and buildings) include riparian areas, Douglas-fir and lodgepole pine forests, ponderosa pine savannahs, Utah juniper-sagebrush scrub, sagebrush grasslands, and cottonwood bottomland (Foresman 2001). Several of these habitats exist in or near the project area; therefore this species may occur there.

Yuma myotis. This species was not found in the project region. The Yuma myotis is locally common in Montana, but little is known about its migration behavior. This bat feeds almost exclusively over open water and establishes roost sites nearby. Habitat requirements that exist in the project region include riparian, mixed grassland/herbaceous and sagebrush therefore this species has potential to occur in the project area (NatureServe 2009).

Other mammals

Merriam's shrew. Habitat for this species occurs in the project area and in the project region. Merriam's shrews in Montana have been captured mainly in arid sagebrush-grassland habitats (Foresman 2001), but also in non-native grasses and forbs such as timothy and sweet clover. It has also been taken in poorly developed riparian habitat in shrub and grassland regions. Generally the species is thought to be non-migratory, and apparently only local movements are made.

Preble's shrew. Habitat for this species occurs in the project area and in the project region. Most Preble's shrews in Montana have been captured in arid habitats, often in the immediate or nearby presence of sagebrush (Foresman 2001). Throughout its range, the Preble's shrew occupies a variety of habitats, including arid and semiarid shrub and grassland associations, willow-fringed creeks and marshes, bunchgrass associations and sagebrush-grassland (MNHP 2008f). Little is known about this shrew, but it is probably active all year.

Black-tailed prairie dog. The FWS announced in December 2008 that the black-tailed prairie dog may warrant federal protection as a threatened or endangered species. The FWS will undertake a 90-day finding to determine whether to propose adding it to the federal list of endangered species. Black-tailed prairie dogs are discussed further in section 3.8.3.2.

Wolverine. This species may pass through the project area, but no habitat exists for denning, foraging, or other key needs. It is possible that dispersing individuals could be found far outside of usual habitats. Wolverines tend to select alpine tundra, and boreal and mountain coniferous forest habitats in the west (MNHP 2008g).

Reptiles

Greater short-horned lizard. Habitat for this species exists in the project area and in the project region. The diet of short-horned lizards includes ants and beetles, spiders, snails, and other invertebrates. Habitat use in Montana is poorly described, but includes ridge crests between coulee areas with sparse, short grass and sagebrush with sun-baked soil (MNHP 2008h).

3.9 Cultural Resources

The study area for cultural resources is primarily constrained to the state parcel, but the analysis includes a discussion of a larger geographic area in order to present a cultural context in which to place findings.

Cultural resources are the remains of past human life or activities that are representative of a culture or contain significant information about a culture. Tangible resources are categorized as historic and prehistoric sites, buildings, structures, and objects. Additionally, resources may include properties that play a significant traditional role in a community's historically based beliefs, customs, and practices. A cultural property is defined as an object, structure, or site that is identified as having historic, scientific, artistic, religious, or social significance.

3.9.1 Overview

The DNRC is responsible for establishing rules regarding cultural resources under their jurisdiction, and have written rules for implementing the Montana Antiquities Act (36 CFR 800-Protection of Historic Properties). Under the Montana State Antiquities Act, MEPA, the Unmarked Burial Act, and the Montana Repatriation Act state agencies are required to consult with the State Historic Preservation Office (SHPO) in their efforts to avoid, whenever feasible, actions that substantially alter cultural properties that are located on state lands (SHPO 2000:12). The DNRC rules and procedures generally follow the federal Section 106 process of the National Historic Preservation Act.

3.9.2 Inventory Methods

In September 2005, the DNRC (Trust Land Management Division) established an Area of Potential Effect (APE) for proposed wind energy developments on the state parcel. In general, an APE for cultural resource analysis encompasses those locations within a project area that have the potential to be disturbed by construction and operation of the proposed undertaking (roads, trenching areas, turbine foundation sites, etc.). Although the facilities associated with the Proposed Action are located in the central and western half of the state parcel, the APE established by the DNRC includes the entire 640 contiguous acres of the state parcel. The geographic analysis of the DNRC study was constrained to state land as the State Antiquities Act only applies to state lands (SHPO 2000:12). The full DNRC study is contained in Appendix E of this EIS.

In 2005, the DNRC conducted a Class III level inventory of cultural and paleontological resources within the APE (Rennie 2006; Appendix E to this DEIS). The state parcel was inventoried using parallel pedestrian transects. Some minor subsurface testing was conducted in an attempt to locate associated cultural material that might offer insight into the age, function, or ethnic affiliation of a resource. Other subsurface examinations were conducted in order to examine existing exposures, which included cut bank profiles of ephemeral drainages, and spoil dirt from burrowing mammals. Cultural resources identified in the field were formally recorded on Montana Cultural Resource Information System (CRIS) and Isolated Find forms. Each of the resources was fully documented, and their significance determined utilizing National Register criteria. Smithsonian site numbers were attained for each site, and the site forms are on file with the state's Archaeological Records Department.

Prior to conducting the 2005 fieldwork, the DNRC archaeologist conducted several record and general background information searches, which included a search of the DNRC site database, and a request for the Montana State Historic Preservation Office to conduct a CRIS and a Cultural Resource Annotated Bibliography System (CRABS) search. The CRIS and CRABS searches identify previously recorded cultural resources and locations in the project area that have received prior study. The DNRC site lead files were also searched, as the DNRC maintains a database of identified but unrecorded cultural resources that are located on state lands. Additional background information came from land use records and General Land Office maps. The background research revealed that no previous cultural studies had been conducted in the immediate project area prior to the DNRC's 2005 study.

In addition to the site survey, the history of the area was reviewed to assess whether any pre-historic or historic resources of the larger region would be affected by the Proposed Action. Comments were received during scoping about how the project would affect the Lewis and Clark National Historic Trail. Thus the project's proximity to this, and other historic trails was assessed, along with the significance of the trails as they passed the area near the state parcel.

3.9.3 Inventory Results

The DNRC study resulted in the identification, evaluation, and formal recordation of five cultural resources (see Appendix E for more detail). The significance of the findings were evaluated based on National Register of Historic Places criteria, and were found to be "ineligible" for listing to the National Register. Consequently, no protection measures are required for the five resources should they be affected. Thus the DNRC archaeologist recommended that no additional archaeological work be conducted on the state parcel prior to wind development (Rennie 2006).

The Lewis and Clark Trail and the Bozeman Trail are historically significant trails that are located in the vicinity of the project area. The Lewis and Clark National Historic Trail is a 3,700 mile-long travel corridor from the Midwest to the Pacific Ocean that follows the route of the expedition as closely as possible, and includes both the outbound and return journeys.

In July of 1806 William Clark and his Corps members traveled through the vicinity of the project area on their return journey from the Pacific coast. The location of the trail relevant to this study is a generally defined corridor that runs along the north banks of the Yellowstone River and I-90 (Headwaters Chapter 1987). It is included in a section of the trail from Bozeman, Montana, to Exit 23 on I-94 near Billings, Montana, that is sometimes referred to as the "Pompeys Pillar Corridor" of the Lewis and Clark Trail. The Lewis and Clark National Historic Trail is listed in the National Register of Historic Places.

The Bozeman Trail or Bozeman Road as it was more commonly called, ran from Fort Laramie, Wyoming, to the gold mining towns of Montana, and although it is referred to as a road, it too is considered to be a general travel corridor rather than a specific road. If traveling west in the vicinity of the project area, the corridor runs along the south side of the Yellowstone River until reaching an area near Springdale. At this point, the Yellowstone was crossed in order to reach the north bank of the river. The Bozeman Trail corridor that runs through the vicinity of the project area is also part of a trail mapped by Jim Bridger. While Bridger's Trail crossed the Yellowstone and headed north up the Shields River, Bozeman's Trail crossed the river near Springdale and headed west along the riverbanks and through the rolling hills, before reaching Bozeman Pass (Krigbaum 2006).

The Bozeman Trail Yellowstone River crossing near Springdale served as a significant point of interest for numerous explorers and emigrants during the 1860s. The site was the only place for many miles along the Yellowstone where the terrain allowed wagons to descend to the river, and from 1866 to 1868 an estimated 20,000 emigrants crossed the river at this location. The river crossing site is currently listed in the National Register of Historic Places (Murray 1968).

Although the Lewis and Clark Trail and the Bozeman Road are not considered to be in the immediate study area, visual impacts to these travel corridors have been assessed and the results are discussed in Section 4.10.

3.10 Noise

3.10.1 Overview

The study area for the noise analysis is defined as the geographic area up to a one-mile radius of the state parcel and the private land that would be developed under the No Action and Proposed Action alternatives.

Noise is generally defined as unwanted sound, and can be intermittent or continuous, steady or impulsive, stationary or transient. Noise levels heard by humans and animals are dependent on several variables, including distance between the source and receiver, altitude, temperature, humidity, wind speed, terrain, and vegetation. Human and animal perception of noise is affected by intensity, frequency, pitch and duration, as well as the auditory system and physiology of the animal. Noise can influence humans or animals by interfering with normal activities or diminishing the quality of the environment. Response to noise is subjective, and therefore, the perception of noise can vary from person to person or among animals. Residents, as well as livestock and wildlife that live, forage, and pass through the project area, are the primary noise-sensitive receptors.

Noise levels are quantified using units of decibels (dB). Decibels are logarithmic values, so the combined noise level of two 50 dB noise sources is 53 dB, not 100 dB. The normal human ear can detect sounds that range in frequency from about 20 to 15,000 Hertz (Hz). All sounds in this wide range of frequencies are not heard equally by the human ear, which is most sensitive to frequencies in the 250 to 4,000 Hz range. Weighting curves have been developed to correspond to the sensitivity and perception of different types of sound. A-weighting, or A-weighted decibels (dBA), accounts for frequency dependence by adjusting the very high and very low frequencies (below 500 Hz and above 10,000 Hz) to approximate the human ear's lower sensitivities to these frequencies.

Some common noise sources are shown for reference in Table 3.10-1, and although a "subjective evaluation" is provided for a range of noise levels, the perception of noise can vary widely from person to person, and the subjective evaluation is provided only for general information.

Table 3.10-1. Common Noise Sources

Noise Level (dBA)	Noise Source	Subjective Evaluation
120	• Hard rock concert	Deafening
110	• Motorcycle accelerating a few feet away	
100	• Automobile horn 10 feet away	Very Loud
	• Gas lawnmower 3 feet away	
90	• Diesel truck 50 feet away	
	• Inside a computer equipment room	
80	• Garbage disposal 3 feet away	Loud
	• Very loud speech 3 feet away	
70	• Vacuum cleaner 10 feet away	
	• Outdoors in a commercial area	
60	• Normal speech 3 feet away	Moderate
50	• Typical office activities	
	• Background noise in a conference room	
40	• Library background noise	Faint
	• Quiet suburban environment at night	
	• Typical background noise in a residence	
30	• Whisper 3 feet away	
	• Quiet rural environment at night	
20	• Concert hall background noise	Very Faint
10	• Human breathing	
0	• Threshold of hearing or audibility	

Sources: Egan 1988, Cavanaugh 1998, and Burge 2002.

Many different metrics, or parameters can be used to describe and quantify noise levels. The equivalent noise levels, L_{eq}, during a certain time period uses a single number, similar to an average, to describe the constantly fluctuating instantaneous ambient noise levels at a receptor location during a period of time. The L_{eq} accounts for all of the noises and quiet periods that occur during that time period.

The 90th percentile-exceeded noise level, L_{90}, is a metric that indicates the single noise level that is exceeded during 90% of a measurement period, although the actual instantaneous noise levels fluctuate continuously. The L_{90} noise level is typically considered the ambient noise level, and is often near the low end of the instantaneous noise levels during a measurement period. It typically does not include the influence of discrete noises of short duration, such as car doors closing, bird chirps, dog barks, car horns, wind gusts, etc. For example, if a continuously operating piece of equipment is audible at a measurement location, typically it is the noise created by the equipment that determines the L_{90} of a measurement period even though other noise sources may be briefly audible and occasionally louder than the equipment during the same measurement period.

3.10.2 Noise Guidelines

No state, county or federal noise regulations exist to govern environmental noise levels or noise generated by the project. The US Environmental Protection Agency has developed noise level guidelines with the intent to protect public health and welfare, from urban, transportation and industrial sources, but it is more appropriate to evaluate wind turbines using different criteria (Pedersen and Waye 2004). Although the noise from wind turbines can be covered up by the sound created by surface wind blowing across grass, through trees and against buildings;

relatively calm and stable atmospheric conditions near the ground can occur while wind at the turbine hub height is sufficient enough to generate power, particularly at night (van den Berg 2004). Locations in valleys can be sheltered from the wind, resulting in low ambient noise while strong wind exists at the turbine hub [Swedish Environmental Protection Agency (SEPA) 2003].

The noise impact criteria listed in Table 3.10-2 for the project are based on noise level criteria specifically for wind turbines, and were developed as limits to identify potential annoyance at residences due to the wind turbine generators [ETSU 1996, Kamperman and James 2008, South Australia Environmental Protection Agency (SAEPA) 2007]. Since the noise produced by a turbine and the ambient noise at a receptor location will vary with wind speed, the criteria presented in Table 3.10-2 are based on the L_{eq} noise level produced by the turbines and the ambient noise level (L_{90}) related to wind speed.

Table 3.10-2. Wind turbine noise level criteria at residences.

Turbine noise level:	L_{eq} 35 dBA
Turbine noise vs. ambient noise:	$L_{eq} < L_{90} + 5$ (dBA)

3.10.3 Existing Noise Levels

The ambient noise at a receptor location in a given environment is the all-encompassing sound associated with that environment, and is due to the combination of noise sources from many directions, near and far, including the noise source of interest. When traveling from a noise source to a receptor in an outdoor environment, noise levels decrease as the distance increases between the source and receptor. Noise levels typically decrease by approximately 6 dBA every time the distance between the source and receptor is doubled (Figure 3.10-1), depending on the characteristics of the source and the conditions over the path that the noise travels. The reduction in noise levels can be increased if a solid barrier or natural topography is located between the source and receptor.

The project is located in a sparsely populated rural residential area, with ranching and agricultural uses. Existing noise sources in the area include wind-generated noise through grass and trees, farm equipment, wildlife and insects, aircraft flying overhead, water flowing in the Yellowstone River and nearby creeks, traffic on local roads and I-90, and trains on the tracks south of the Yellowstone River. However, not all the existing noise sources were audible during the noise level measurements (BSA 2009, see below).

Ambient noise level measurements were conducted in November 2008 at three representative locations within approximately 0.5 miles of the proposed wind project (Figure 3.10-2). The L_{eq} and L_{90} noise levels were measured at each location (BSA 2009). Table 3.10-3 summarizes the measured ambient noise levels. The measured daytime and nighttime L_{90} dBA levels are typical for sparsely-populated, rural locations (Harris 1998).

Table 3.10-3. Ambient noise level measurements, Coyote Wind Project Sweet Grass County, MT.

Location	Date and Time (hours)	Measured L_{90} (dBA)	Noise Sources
1	11/10/08 1546-1601	31	Wind in the trees, and a pick-up driving by near the residence.
	11/11/08 0024-0039	26	Intermittent dog barks and howling coyotes in the distance, and flowing water in creek.
2	11/10/08 1651-1706	38	Wind in the trees and traffic on I-90.
	11/10-11/08 2357-0012	32	Traffic on I-90, water in small creek, geese honking briefly, and airplane in distance.
3	11/10/08 2332-2347	25	Traffic on I-90.

Ambient noise levels in a rural setting are often related to wind speed. Common sources of wind-generated noise include the interaction between wind and trees, grasses and buildings. As the wind speed increases, the ambient noise will also increase.

The power output and noise levels generated by a wind turbine are also related to wind speed. As the wind speed increases, the noise created by the turbine will also increase. Wind speeds tend to increase with increasing elevation, and the operating characteristics of turbines are typically referenced to a height of 32 feet (10 meters) above the ground. Wind turbines typically begin to turn, or "cut-in", when the wind is blowing approximately 8.9 miles per hour (mph) (4 meters per second [m/s]), and reach a maximum sound level at about 17.9 mph (8 m/s). Once wind speeds reach 17.9 mph, the turbine noise level does not typically increase even though the wind speed increases. Therefore, a noise analysis of a wind project typically compares the ambient noise level at a receptor location and the turbine noise, to a range of wind speeds at 32 feet above ground level.

As shown in Table 3.10-4, the ambient noise levels versus wind speeds at 32 feet above ground level were estimated based on data for typical rural areas (ETSU 1996). The measured A-weighted ambient (L_{90}) noise levels (Table 3.10-3) were compared to wind data at 32 feet above ground level (Enerfin 2008) recorded at an existing meteorological tower located on Section 36.

Table 3.10-4. Estimated existing ambient noise levels at ground level vs. wind speed at 32 feet above ground level, Coyote Wind Project, Sweet Grass County, MT.

Wind Speed at 32 feet:	**8.9 mph (4 m/s)**	**13.4 mph (6 m/s)**	**17.9 mph (8 m/s)**	**22.4 mph (10 m/s)**	**26.8 mph (12 m/s)**
Ambient (L_{90}) Noise Level (dBA):	26	32	38	44	48

Source: BSA 2009 (included as Appendix G).

3.11 Visual Resources

3.11.1 Overview

This section describes the existing visual resources within the study area. For the visual analysis, the study area was defined as the entire viewshed from the I-90 corridor to the state parcel.

3.11.2 Inventory Methods

There are no formal guidelines for managing visual resources on private, state, or county-owned lands found within the vicinity of the study area. However, because the key areas where the wind turbines would be viewed by the public are from the I-90 corridor, and from the North River Road; viewshed analyses were conducted from these locations.

Visual simulations were conducted by combining photographs taken at the site with technical renderings of the proposed turbine locations. Simulations were completed for day and night. The night simulation included FAA required turbine lighting.

3.11.3 Inventory Results: Regional Setting and Landscape Character Type

Overall, the study area contains visual resources such as rolling foothills and the Crazy Mountains in prominent view north of I-90. The area is rural in character, and the buildings are limited to the small community of Springdale, and scattered ranch buildings and homes. The railroad parallels I-90 to the north and the tracks are visible from I-90. The Yellowstone River is also visible; I-90 follows the river corridor as it passes by the project area.

3.12 Airfields

The primary aviation safety consideration in the development of the Coyote Wind Project is the physical obstruction of the towers themselves, which could pose a hazard to aircraft arriving or departing at a nearby airfield as well as to military training and other low-flying aircraft. Thus, the geographic area of analysis for airfields includes the state parcel, plus a fifteen mile radius. This radius was used to insure the inclusion of approach and departure slopes of any nearby airfields with the potential to support commercial or military operations in addition to public and private airfields supporting single engine general aviation and agricultural flight operations.

3.12.1 Inventory Methods

Topographic maps (DeLorme 1994) and aerial photographs (Google Earth 2008) were reviewed to indentify locations of airfields within 15 miles of the Project. Airfield statistics were provided by AirNav (2008). FAA regulations were reviewed (FAA 2007, 2008a and b).

3.12.2 Inventory Results

There are two airfields located within 15 miles of the Project; the Big Timber Airport 9.5 miles to the east-southeast, and Park County’s Mission Field Airport 14.7 miles to the west-southwest. In addition, there are eleven publicly owned and six privately owned airstrips within a 75 mile radius of the Project. The geographic position of the Proposed Action alternative is in alignment with three FAA designated routes.

There are 13 aircraft based on the Big Timber Airport field, all single engine planes. The airfield averages 20 flights per day, of which, 66% are local general aviation, 24% are transient general aviation, and 10% are air taxi operations. There is no reported military use of the field.

Park County’s Mission Field Airport is five miles east of Livingston, and 14.7 miles west-southwest of the Project. There are 25 aircraft based on the field: 19 single engine planes, three multi-engine planes, two jet airplanes, and one ultralight. The airfield averages 113 flights a week, of which 59% are local general aviation, 34% are transient general aviation, and 7% air taxi operations. Current military use of the airfield is less than one percent of all operations.

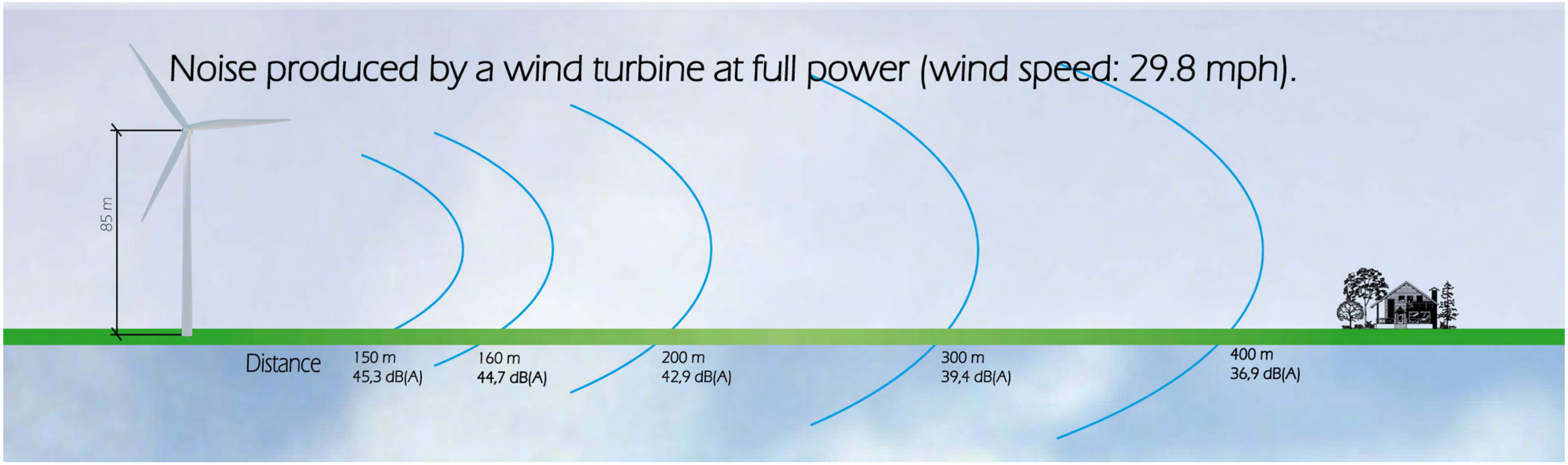
Larger publicly owned airfields in an east-west alignment to the project include the Columbus Airport in Columbus, Billings Logan International Airport in Billings, and Gallatin Field in Belgrade.

Agricultural aircraft operations proximal to the project include the spraying of cropland, pasture and range lands, and to a lesser extant, seeding (Morgan pers. com. 2009). Seeding activities typically occur only after a major fire event, when applicators seed grasses and other cover crops to stabilize burn areas and reduce erosion (Morgan pers. com. 2009). It is rare that crops are seeded by air.

The FAA defines approach surfaces to promote air safety and the efficient use of the navigable airspace (FAA 2008a). These approach surfaces extend for a horizontal distance of:

- 5,000 feet at a slope of 20:1 for all utility and visual runways such as the smaller airfields in the area;
- 10,000 feet at a slope of 34:1 for all non-precision instrument runways other than utility for the larger commercial airfields; and,
- 10,000 feet at a slope of 50:1 with an additional 40,000 feet at a slope of 40:1 for all precision instrument runways, such as those found at Gallatin Field in Bozeman, and Billings Logan International Airport in Billings.

FAA rules require lights that flash white during the day and twilight and red at night be mounted as high as possible on wind turbine nacelles. Lights should flash simultaneously and be placed so they are visible from 360 degrees. The FAA's Obstruction Marking and Recommendations on marking and/or lighting structures to facilitate aircraft safety can vary depending on the terrain, number and layout of turbines, weather patterns, and geographic location. Lighting recommendations recognize that not all of the turbines within an installation would require illumination. Instead, the Advisory Circular specifies the importance of defining the periphery of the turbine array, and that within the array no unlighted gap greater than one-half statute mile should be present (FAA 2007).



GANDA

FIGURE 3.10-1 TYPICAL RELATIONSHIP BETWEEN DISTANCE FROM SOURCE AND NOISE LEVEL AT A RECEPTOR.

SOURCE:
ENERFIN ENERGY COMPANY

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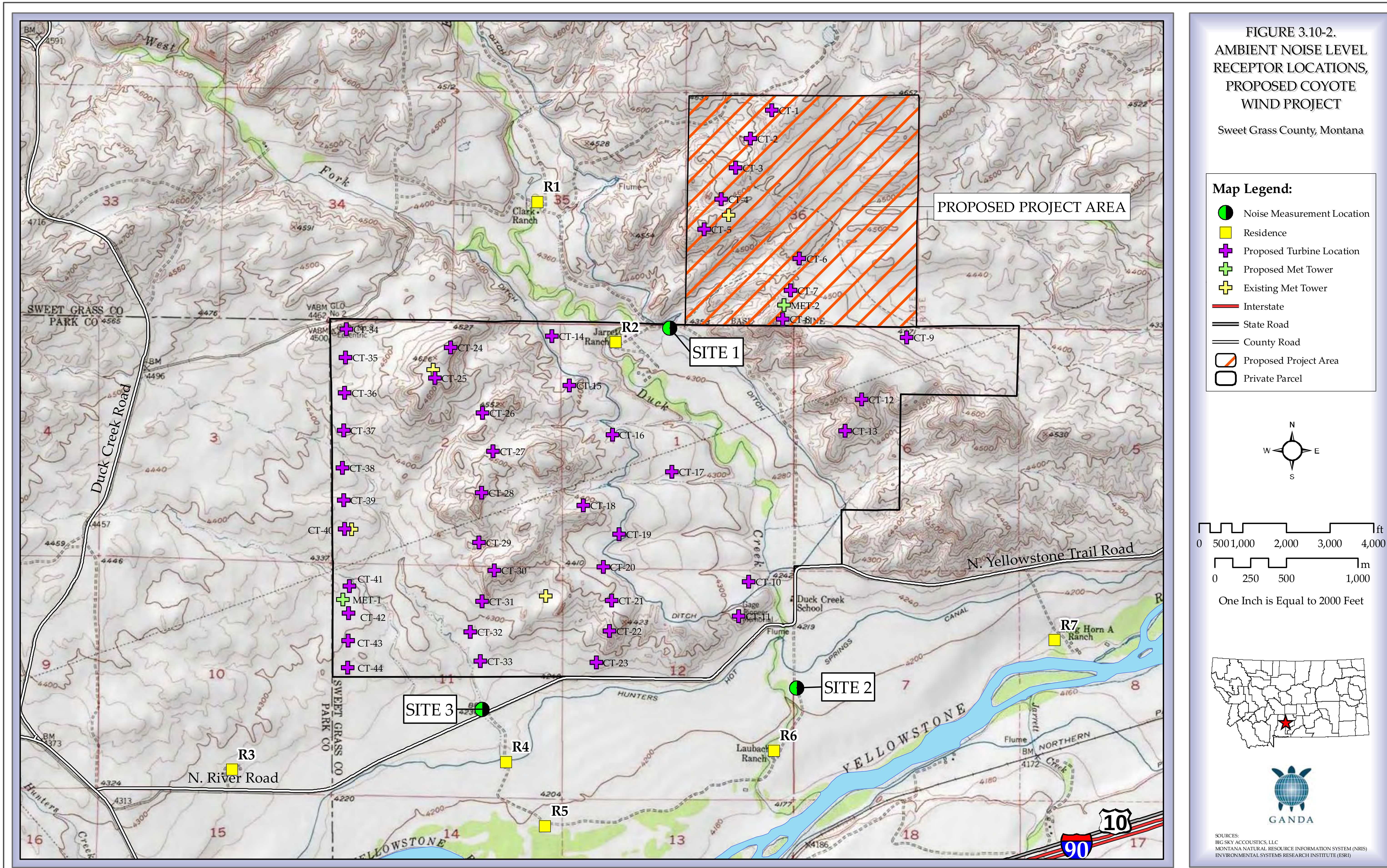

FIGURE 3.10-2.
AMBIENT NOISE LEVEL RECEPTOR LOCATIONS, PROPOSED COYOTE WIND PROJECT

Sweet Grass County, Montana

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Chapter 4: Alternatives Analysis

4.1 Introduction

Chapter 4 describes potential impacts to the existing environment that could occur due to the No Action and the Proposed Action alternatives described in Chapter 2 (i.e., the alternatives carried forward for detailed analysis). Chapter 4 serves three purposes: (1) it provides an analysis and comparison of alternatives and their impacts; (2) it ensures a clear understanding of the potential impacts, both positive and negative, of all alternatives under consideration; and (3) it provides the public with information to evaluate the Proposed Action. Impacts are assessed for the same environmental components discussed in Chapter 3, including geology, soils, water, land use, recreation, socioeconomics, vegetation, wildlife, cultural resources, and aesthetics. Impact analysis for each resource is limited to the affected environment and study area of analysis described for that resource in Chapter 3.

In most EISs the No Action Alternative means continuation of the management or development status quo. However, in this EIS the No Action Alternative means DNRC takes no action to lease the state parcel to Coyote Wind, but wind development on the adjacent private land still moves forward. Therefore, Chapter 4 discusses impacts from wind project development on the adjacent private land under the No Action Alternative, and wind development on both the private land and state parcel under the Proposed Action Alternative.

MEPA defines three levels of potential impacts: direct, secondary, and cumulative. Direct impacts are defined as those impacts that have a direct cause and effect relationship with a specific action, i.e., they occur at the same time and place as the action that causes the impact. Secondary impacts are indirectly related to the agency action, i.e., they are induced by a direct impact but occur at a later time or at a distance from the triggering action. Cumulative impacts are the collective impacts on the human environment of the No Action or Proposed Action alternatives when considered in conjunction with other past, present, and future actions. These actions are related by location or generic type to Proposed Action. In order to avoid undue speculation about possible future events, related future actions need only be considered if they are undergoing concurrent evaluation by any agency (e.g. a permit application has been submitted). As stated in Chapter 2, the only future action being considered in the cumulative effects analysis is the wind project development on the adjacent private land.

In some instances, impacts can be minimized or avoided altogether by making changes to an alternative or to how an alternative is implemented. These changes are called “mitigation.” Under the No Action Alternative, DNRC has no authority to require mitigation. Any mitigation measures implemented would be on a voluntary basis at the discretion of Coyote Wind (Coyote Wind has stated they would implement reasonable measures). The three levels of impacts and potential mitigation are examined for each resource area below.

4.2 Geology and Soils

Table 4.2-1 summarizes the potential impacts on geology and soils for both the No Action and Proposed Action alternatives.

Table 4.2-1. Potential impacts to geology and soil resources from the Coyote Wind Project, Sweet Grass County, MT.

Potential Impact	No Action Alternative	Proposed Action Alternative
Geology	Minimal impacts.	Minimal impacts.
Soil Quality	Net effects minimal. Possible soil compaction during construction and maintenance. Potential increase for point-source pollution near roads and in heavy equipment work areas.	Similar to No Action. Slightly, but not significantly, greater due to additional area of disturbance.
Soil Erosion	Possible soil erosion in localized areas. Potential for noxious weeds to colonize disturbed soil areas would increase risk of soil erosion.	Similar to No Action. Slightly, but not significantly, greater due to additional area of disturbance.

4.2.1 No Action Alternative

4.2.1.1 Direct Impacts

Under the No Action Alternative, measurable direct impacts to local geology would be minimal. Extremely localized changes to geologic structure are possible in areas of road cuts. There would be no direct impacts to geology on the state parcel from the No Action Alternative.

Direct impacts to soil resources under the No Action Alternative would be primarily associated with ground disturbance, soil erosion, and soil quality related to on-site road construction and improvements. Permanent ground disturbance would occur due to road building, excavating trenches, and turbine foundation and other facility construction. Soil erosion and soil compaction could occur if there is heavy equipment travel across roadless areas or adjacent to construction sites.

Most on-site roads would consist of a 20-foot wide compacted graveled surface, and up to a 34-foot wide leveled surface in other areas to support the large equipment used to erect the wind turbines. Precipitation falling on the compacted gravel roads would likely flow toward the adjacent soil areas, which are likely shallow soils over a restrictive bedrock layer close to the surface. A rapid increase in water on these shallow soil areas could cause a greater-than-normal discharge along these roadways, damaging soil and vegetation resources. The effects of these events would likely be minimal and extremely localized provided that roadways are engineered in such a manner as to mitigate for these situations.

Wherever practical, existing on-site road corridors would be used to minimize new ground disturbance. However, during the course of construction, soil materials would be dislodged and relocated, removing the terrestrial vegetation in the process and possibly increasing the potential for erosion by wind and water. While re-vegetation procedures are mandated by state law, time is required for new vegetation to establish, and during the interim the dislocated soil would be particularly susceptible to erosion along cut and fill areas associated with roads and turbines. BMPs typically required as conditions of the MPDES permit would likely mitigate these impacts.

Soil materials that are cut or filled in excess of their normal angle of repose are much more susceptible to erosion, particularly by water. While the angle of repose is highly variable based on soil structure and content, this typically ranges from 30-55 degrees in slope. In the areas of steeper grades, a cut-and-fill design would be implemented to keep grades below 15% in order to help prevent potential erosion issues associated with the roadways themselves. However, the potential for increased erosion associated with grading away from roadways, even with required mitigation factors in place, would likely remain, especially during the time required for vegetation to firmly re-establish.

4.2.1.2 Secondary Impacts

Secondary impacts from the No Action Alternative may include erosion after the conclusion of the construction period. Potential for noxious weeds to colonize disturbed soil areas would increase risk of soil erosion (see section 4.7, vegetation). Again, if BMPs and revegetation plans are properly adhered to, this effect is likely to be minimal.

4.2.1.3 Cumulative Impacts

Under the No Action Alternative, ranching activities on private land would continue in addition to the wind development. Therefore any erosion or soil compaction, or spread of noxious weeds, from ranching practices would continue and would be in addition erosion exacerbated by the wind development.

There is a potential for increased soil erosion on the state parcel under the No Action Alternative if current grazing management practices are continued. In general, the site is experiencing a decrease of native plant species, combined with increasing non-native vegetation and infestations of noxious weeds and invasive species. These plants, while very competitive, are not as ideally suited for the site as native plant communities, and do not restrict soil erosion by wind and water to the same degree as native vegetation. Evidence of head-cutting is apparent throughout the parcel on steeper slopes, especially in and around the ephemeral gullies and stream channels, and while this head-cutting cannot be attributed solely to the degradation of native plant communities, it is probably a contributing factor to the net soil loss. This trend is likely to continue under the current land usage, and there is a high potential for increased soil erosion if measures are not enacted to reduce the current spread of noxious weeds and other invasive species throughout the parcel.

In addition, soil resources on the state parcel could be negatively affected by ongoing livestock grazing if the No Action Alternative is followed. Most domestic livestock grazing is taking place in focused areas near water resources, rather than evenly distributed across the parcel. The availability of water combined with deeper, more developed soils allows for increased plant growth and vigor, enticing livestock and wildlife to concentrate in these isolated areas. With no internal fencing currently being used, damage is occurring to soil resources in these concentrated areas as a result of overgrazing. Overgrazing in turn results in removal of vegetation and soil compaction. This process further increases the potential for soil erosion, and the trend would likely continue if measures are not initiated to reduce or re-distribute domestic livestock from concentrating around water resources.

4.2.1.4 Mitigation

If the BMPs typically required as a condition of an MPDES permit are strictly adhered to, erosion resulting from wind project construction and operation would be minimal. Strict adherence to revegetation plans and compliance with county weed control requirements would also minimize erosion and spread of noxious weeds.

The grazing lease holder or DNRC could fence water sources on the state parcel to control livestock use. This measure would minimize erosion impacts from concentrated grazing in these areas. Implementation of such a measure would be separate from the consideration of the alternatives discussed and would be based on a review of the conditions of the parcel by the DNRC. The DNRC can add conditions when the grazing lease is renewed or at the time that it is converted to a License.

4.2.2 Proposed Action Alternative

The Proposed Action Alternative includes all impacts discussed under the No Action Alternative. In addition there would be impacts associated with wind development on the state parcel.

4.2.2.1 Direct Impacts

Similar to the No Action Alternative, measurable direct impacts to local geology from the Proposed Action would be minimal. The direct impacts discussed under the No Action Alternative may occur on the state parcel in addition to the private land, but these impacts to the local geology would likely be immeasurable.

Direct impacts to soil resources under the Proposed Action Alternative would also be similar to those discussed under the No Action Alternative, and again BMPs typically required as conditions of the MPDES permit would likely mitigate these impacts. Under the Proposed Action Alternative, there is currently no plan to alter the grazing regime on the state parcel. Therefore, the grazing induced soil erosion would continue under the Proposed Action to the same degree as under the No Action Alternative. Development and implementation of an adequate noxious weed control plan would minimize the impacts associated with the current spread of noxious weeds and other invasive species throughout the parcel.

4.2.2.2 Secondary Impacts

The secondary impacts described under the No Action Alternative would occur on the state parcel in addition to the private land under the Proposed Action.

4.2.2.3 Cumulative Impacts

Cumulative impacts under the Proposed Action would be similar to the direct and secondary impacts described. Over time and in the absence of mitigation, spread of noxious weeds and erosion would continue and be exacerbated.

4.2.2.4 Mitigation

Recommended mitigation under the Proposed Action is the same as described under the No Action Alternative.

4.3 Hydrology and Water Quality

Wind farms by their nature produce relatively few potential impacts to hydrology and water quality. As described in Chapter 3, the state parcel contains no continuously flowing streams or rivers, nor any significant standing water, only ephemeral drainages and wetlands. The Duck Creek drainage is located on the private land that is part of the No Action Alternative. The most likely impact to water quality would come from construction-related erosion. Due to MPDES permitting and BMPs required for these activities, any impacts to water quality would be minimal, but they are further described below.

4.3.1 No Action Alternative

4.3.1.1 Direct Impacts

A possible, although unlikely, direct impact of the No Action Alternative, would be accidental leaks or spills into water bodies of any toxic materials used or stored on site during construction and operation of the wind project. During project construction there would be a designated place for storage of fuel and any other toxic materials used during construction (e.g., paint). During project operation, there would be a fuel deposit area in the substation to store oil that could spill from the transformer. There are not expected to be any other direct impacts to water quality from the No Action Alternative.

4.3.1.2 Secondary Impacts

It is likely that building the wind turbines on the private lands would require the Duck Creek road crossing be improved. This improvement would make the road passable for large heavy trucks carrying wind turbine parts and other heavy construction materials. Improvement of the Duck Creek crossing may involve installing culverts for the stream to flow under the road. This stream crossing would be part of the project construction requiring a MPDES permit.

Other permits needed may fall under: 1) the Montana Natural Streambed and Land Preservation Act (310 permit); 2) the Short-Term Water Quality Standard for Turbidity (318 Authorization); 3) the Montana Flood Plain and Floodway Management Act (Floodplain Development Permit) or 4) the Montana Stream Protection Act (SPA 124). These permits and associated plans would require the use of BMPs to reduce any impacts to Duck Creek from the construction. BMPs can take many forms to control erosion and sediment, but would typically involve installation and maintenance of silt fences to prevent sediment from wind farm construction from reaching the creek. Thus, while it is possible that erosion from road construction could affect water quality in Duck Creek, BMPs should prevent significant impacts to water quality from the construction.

Under the No Action Alternative there is a potential for continued or increased soil erosion on the state parcel if current grazing management practices are continued (see section 4.2, Geology and Soils). This soil erosion could contribute to impairment of Duck Creek for beneficial uses.

4.3.1.3 Cumulative Impacts

Cumulative impacts to water quality from the No Action Alternative could occur with continued grazing practices on the state parcel (as described above).

4.3.1.4 Mitigation

The BMPs required by MPDES or other permits should mitigate for any impacts to water quality associated with wind farm construction on private land.

4.3.2 Proposed Action Alternative

4.3.2.1 Direct Impacts

The direct impacts from the Proposed Action Alternative would be similar to those described under the No Action Alternative.

4.3.2.2 Secondary Impacts

Secondary impacts to water quality from the Proposed Action Alternative are similar to those described under the No Action. Because the Proposed Action involves construction of 8 more wind turbines and approximately 2 more miles of roads, the potential for water quality to be degraded by project-related erosion is slightly greater. However, as stated above, BMPs would likely render this impact minor.

4.3.2.3 Cumulative Impacts

Cumulative impacts from the Proposed Action would be similar to those described under the No Action Alternative.

4.3.2.4 Mitigation

In addition to implementing the BMPs required by MPDES or other permits, the grazing intensity on the state parcel could be altered, and if it were, could minimize any potential run-off from over grazing.

4.4 Land Use and Recreation

As noted in Chapter 3, the focus of impact analysis for land use and recreation is on the state parcel and lands immediately adjacent to, or surrounding, this parcel out to a distance of 2 miles. The potential for land use and recreation impacts centers on the same three issues describing the affected environment in Chapter 3:

- Land ownership (i.e. changes in ownership or ownership patterns in the project area)
- Existing land use and recreation (i.e. potential changes to or constraints placed on current uses within the state parcel or on surrounding lands), and
- Relevant Land Use Plans and Regulations (i.e. consistency with local, state or federal plans and land use regulations governing the State site and surrounding lands)

4.4.1 No Action Alternative

4.4.1.1 Direct Impacts

Land Ownership

The No Action Alternative would have no impact on land ownership, either on, or surrounding the state parcel. The state parcel would remain within the State's Trust land inventory, and would continue to be surrounded by private land holdings.

Existing Land Use and Recreation

The No Action Alternative would have no direct impact on current uses of the state parcel. All existing leases (grazing and oil and gas) and rights-of-way (transmission line, pipeline, and communications line) would remain in force, subject to the terms and conditions applicable to each. Any informal, incidental recreational use of the site (e.g. hunting) would continue to be at the discretion of the Crazy Mountain Cattle Company (CMCC) which both owns the land through which the only access road to the site passes and also holds the grazing lease on the state parcel (Bollman pers. com. 2008a). Other adjoining landowners could also grant access across their properties to access the Trust land.

The No Action Alternative would not have any direct impacts on other existing land uses in the surrounding area.

Relevant Land Use Plans and Regulations

As noted in Chapters 1 and 3, DNRC has conducted studies specifically aimed at identifying and pursuing opportunities on the most promising locations for wind power development, and has adopted a REMP aimed at increasing revenues from State Trust lands on behalf of the Trust Beneficiaries. Through this overall planning process, involving the Montana Wind Energy Working Group, the DEQ, and DNRC, the state parcel has been identified as a high potential location for wind power development. This work resulted in the DNRC RFP process through which the Proposed Action was defined.

From the standpoint of the Sweet Grass County Growth Policy, the No Action Alternative would represent no significant inconsistencies with relevant goals, objectives and policy/action statements. The state parcel would continue to be part of the regional Open & Resource Lands inventory, in a primarily undeveloped area; it would continue to be used for grazing activities, consistent with surrounding private ranching and farming activities. There would be no change to the natural resource values of the site. The No Action Alternative may provide local employment on a short and long-term basis.

4.4.1.2 Secondary Impacts

The No Action Alternative would have no secondary land use or recreation impacts on either the state parcel or surrounding private lands.

4.4.1.3 Cumulative Impacts

The No Action Alternative would have no cumulative land use or recreation impacts on either the state parcel or surrounding private lands.

4.4.1.4 Mitigation

The only impact of the No Action Alternative on land use or recreation is inconsistency with State planning for the site. This impact is not subject to mitigation. No other mitigation considerations are relevant for land use and recreation.

4.4.2 Proposed Action Alternative

4.4.2.1 Direct Impacts

Land Ownership

The Proposed Action Alternative would involve no impacts on land ownership, either on or surrounding the state parcel. The project site would remain within the State's Trust land inventory, and would continue to be surrounded by private land holdings.

Existing Land Use and Recreation

The implementation of a lease agreement between the State and Coyote Wind would not represent a significant direct impact on existing uses of or use rights granted for the site. Grazing is expected to continue in the long term (i.e. after potential restrictions during wind farm facility construction) with CMCC, however the existing lease would be converted to a Land Use License (Bollman pers. com. 2008a). There are currently no plans or proposals by the oil and gas lessee (Pacer Energy LLC) to pursue exploration or production on the site; if such action is pursued in the future, it is unlikely that the presence of the proposed wind turbines and related facilities would represent a significant constraint or conflict. Coyote Wind has entered into discussions with Pacer Energy LLC to avoid any potential conflict, and would follow Pacer Energy's specifications in the construction phase.

The proposed wind farm development may affect existing or potential uses of the ROWs (electric transmission, communication, and pipeline) granted on the site. Heavy equipment crossing the buried pipeline ROW could cause compression damage. However, Coyote Wind would follow the standard practice of having any utility owner locate their underground lines (e.g. communication or pipeline) prior to disturbance. In the unlikely event compression damage occurred, it would be repaired at no cost to the utility. Damage to overhead electrical lines (or their support structures) may occur during construction within or adjacent to the existing ROWs. There may be requirements to relocate sections of overhead electrical lines to accommodate project construction and operation or requirements to cross existing ROWs with windfarm-related electric lines or access roads. Coyote Wind is also entering into agreements with all ROW utilities to avoid or minimize any such conflicts.

Regarding recreation, DNRC Administrative Rule 36.25.150 provides that Trust lands with commercial leases, including wind energy leases, are closed to recreational use. The rules do provide for the DNRC Area Manager to consider opening the property to recreational use if petitioned. The Area Manager makes the determination with the potential that the decision could be appealed to the Director of DNRC.

Related to surrounding lands, the Proposed Action Alternative would be compatible with existing uses. For lands to the north and east of the state parcel, development of the proposed wind farm facilities would not significantly impact existing rangeland and open space uses.

Relevant Land Use Plans and Regulations

The Proposed Action Alternative would be fully consistent with State plans for the site. Development of wind farm facilities on this land would represent the intended culmination of the State's planning and RFP processes. In addition, it would be consistent with the statewide REMP that aims to increase revenue to the Trust Beneficiaries through development of appropriate residential, commercial, industrial and conservation opportunities.

The Proposed Action Alternative would be consistent with relevant goals, objectives and policy/action statements in the Sweet Grass County Growth Policy that are applicable to adjacent private lands. The following review of consistency with relevant goals, objectives, policies and actions stated in the County's Growth Policy (as listed in Chapter 3) validates this conclusion.

Land Use:

- The Proposed Action would both [1] allow existing ranching/agricultural uses on and surrounding the site to continue, consistent with the County's emphasis on supporting and protecting the agricultural base, and [2] take advantage of the natural resource characteristics of the site (i.e. wind power potential).
- Development of wind farm facilities on the state parcel would be compatible with planned uses of surrounding lands.[1]
- Overall, the site would remain largely open space, consistent with current conditions. The visual impacts of the Proposed Action from the standpoint of maintaining a "pleasant environment" and seeking to have development "enhance the beauty of the area" are discussed in section 4.11, aesthetics, but must be considered in context of adjacent wind farm development (i.e. the Proposed Action would represent one increment of the larger development in the area). Maintenance of a 'pleasant environment' should not be significantly affected by implementing the Proposed Action.

Environment and Natural Resources:

- The site of the Proposed Action does not contain "areas of environmental significance such as wetlands, floodplains and critical wildlife habitat" or historic resources. While there are wetlands present on the state parcel (see section 4.7) they are small, isolated, and not likely to be jurisdictional.
- As described in Chapter 2, the Proposed Action includes preparation and implementation of a plan to address any noxious weed concerns that may be associated with the Proposed Action. This plan would be consistent with the Montana County Noxious Weed Management Act, and would be submitted to the County weed board for approval.

Economic Development:

- The Proposed Action would represent local employment opportunities, both short and long term (see section 4.6).

[1] Planned uses are defined as either specified in the County Growth Policy or the subject of active, formal application to the County for land use changes.

4.4.2.2 Secondary Impacts

The Proposed Action Alternative would have no secondary land use impacts to the surrounding private lands but would close the state parcel to recreational use.

4.4.2.3 Cumulative Impacts

The Proposed Action Alternative would have no cumulative land use impacts to the surrounding private lands but would close the state parcel to recreational use.

4.4.2.4 Mitigation

Potential for conflicts with or damage to existing transmission, communication, and/or pipeline facilities on the site could be mitigated by proper coordination between Coyote Wind and the respective ROW holders. Coyote Wind is working directly with all ROW holders to reach agreement on how project construction and operation would be carried out to avoid service disruption or facility damage, to relocate existing facilities if necessary, and apply for new easements, or to provide appropriate compensation in the event that disruption or damage is unavoidable. The following guidelines are being considered (Ostwald pers. com. 2009).

- Wind project plans would be reviewed with the owner of the existing facility or rights-of-way to determine what measures would be necessary to ensure continued safe operation of and access to the facility.
- Any encroachments on, over, or through the existing rights-of-way should be designed according to mutually agreed-upon guidelines, formalized in an encroachment agreement executed between the existing facility owner/operator and Coyote Wind. Such agreements should be executed prior to any encroachment and should address both the specifics of construction and operation and financial responsibility for implementation.
- In the specific case of the petroleum pipeline, it may be necessary to vacuum excavate/pothole the pipeline at various locations of proposed wind farm operations to determine the exact pipeline depth. This procedure would help ensure proper/acceptable design of any road crossings, underground power lines and location of wind farm structures. Any such exploratory activity should be preceded by proper notification of and coordination with the pipeline owner/operator.

No other mitigation related to land use or recreation activities would be needed.

4.5 Transportation

The focus of impact analysis for transportation is on the routes that would be used by workers traveling to and from the wind development site, and that would be used to transport necessary construction materials and equipment. At this time, no decisions have been made regarding which of two routes to the project site (described in Chapter 3) would be used. In fact, both routes may be used in some manner during project development. Thus, potential for impact is assessed for both routes, as well as the involved segment of I-90.

Upon completion of the environmental review (MEPA process) and the securing of a lease with the DNRC, Coyote Wind would hire a construction firm to construct the wind farm. The contractor would be responsible for reviewing the existing roads and determining the improvements that would be necessary to accommodate the truck traffic that would be transporting the wind turbine blades, nacelles and tower sections to the wind farm. The contractor would be required to coordinate with the Park and Sweet Grass County Road Departments, as well as the Montana Department of Transportation and include these entities in the review of the proposed route and any upgrades that may be necessary to accommodate the project traffic. Any improvements, road maintenance during construction or any post-construction repairs to the existing roads would require approval from the appropriate County or State agency. The cost for these improvements or repairs would be assumed solely by Coyote Wind. Coyote Wind would ensure roads were maintained in conditions equal to or exceeding pre-project conditions.

The potential for transportation impacts centers on the following topics:

- Travel routes and roadway alignments (short-term or long-term changes in roadway route configuration, including the need for new roads or major changes in alignment of existing roads)
- Traffic volumes (short-term or long-term impact on levels of roadway use and potential for congestion)
- Roadway engineering and maintenance (concerns related to bearing capacity of roadbeds, bridges, culvert crossings, etc., and/or increases in maintenance/repair costs)
- Public safety (concerns related to transport of heavy or over-sized loads and traffic controls during any necessary roadway improvements)

4.5.1 No Action Alternative

4.5.1.1 Direct Impacts

Travel Routes and Roadway Alignments

It is unknown at this time whether any substantial road section realignments would be necessary for transport of large equipment using the two available routes to the area that could be developed under the No Action Alternative (see Roadway Engineering and Maintenance, below).

Traffic Volumes

Traffic associated with the No Action Alternative would occur primarily during the construction period and would include the required personal transport for approximately 400 workers (average per day), transport to and from the site, approximately 75 construction vehicles including heavy equipment, and an undetermined number of truck trips delivering construction materials and the wind farm equipment itself. During operation of the No Action Alternative, only four vehicles per day would be on site. The short-term level of traffic volume during construction and the small increase in traffic volume during operation does not represent a significant impact on the local or regional roadway system capacity.

Roadway Engineering and Maintenance

Wind farm construction would involve transport of heavy construction equipment and potentially over-sized loads (e.g. turbine components) to the development site. Key roadway engineering and maintenance concerns would include:

- Turning radii/movements for construction vehicles (e.g. at intersections)
- Width of vehicles relative to highway travel lanes and rural road cross-sections
- Capacity of the roads, bridges, culvert crossings, etc. to carry the weight of required vehicles without failure
- Potential for damage to roads and related structures, requiring repair work
- Dust suppression on gravel roads during construction

It is unknown if any improvements (temporary or permanent) would be required to I-90 facilities (e.g. off ramps) to address these concerns. As described above, Coyote Wind would be required to consult with and meet the permitting requirements of the State Department of Transportation, Motor Carrier Service Division for any changes to I-90. Applicable state standards that must be followed are specified in the 2006 Montana Commercial Vehicle Size and Weight and Safety Trucker Handbook (MDT 2006).

Improvements would be necessary to the county roads leading to the development site. The exact location, nature and extent of these improvements have not been defined. Consultation with the county road departments and County Commissioners would be required, specifically to obtain permits for any road construction or modification (Hillman pers. com. 2008, Wordell pers. com. 2008). In addition, the project proponent has committed to restoring roads to their original condition, as required by the counties, after completion of project construction.

Public Safety

Transport of heavy and/or oversized loads and construction necessary for road improvements also involves public traffic safety concerns. Examples include wide loads travelling slowly on highways and delays or detours during road improvements/construction. These concerns would be addressed during required consultations with MDT and the county road departments. Public notification of road delays and detours would be conducted consistent with the policies of the road departments.

4.5.1.2 Secondary Impacts

There are no anticipated secondary impacts from the No Action Alternative to transportation resources.

4.5.1.3 Cumulative Impacts

There are no cumulative impacts associated with the No Action Alternative.

4.5.1.4 Mitigation

Mitigation for damage to county or state roadways would be handled under agreements between Coyote Wind and the relevant county or state highway departments. Coyote Wind has committed to restoring all roadways to their original condition or better after project construction, and to continue to maintain roads during project operation.

4.5.2 Proposed Action Alternative

4.5.2.1 Direct Impacts

The Proposed Action Alternative would use primarily the same travel routes and roadways that would be used for the No Action Alternative. Therefore direct impacts to transportation resources from the Proposed Action would not be significantly different than that described for the No Action. Development on the state parcel would add low levels of additional vehicular traffic.

Travel Routes and Roadway Alignments

Impact to travel routes and roadway alignments would be the same as described under the No Action Alternative.

Traffic Volumes

Traffic associated with the Proposed Action would occur primarily during the construction period and would be similar to that described for the No Action Alternative, but would include traffic and construction vehicles on the state parcel (see Table 2.3-1, Chapter 2). Similar to the No Action Alternative, this short-term level of traffic volume should not represent a significant impact on local or regional roadway system capacity.

Roadway Engineering and Maintenance

Impacts to roadway engineering and maintenance are the same as described under the No Action Alternative.

Public Safety

Impacts to public safety are the same as described under the No Action Alternative.

4.5.2.2 Secondary Impacts

The Proposed Action Alternative would have no secondary transportation impacts.

4.5.2.3 Cumulative Impacts

The Proposed Action would not have cumulative impacts on transportation.

4.5.2.4 Mitigation

Mitigation for the Proposed Action Alternative is the same as that described for the No Action Alternative.

4.6 Socioeconomics

The main factors considered in the evaluation of the impacts from project alternatives to socioeconomics are employment, income, property values, and revenues generated from the state parcel. In general, direct impacts are the initial, immediate economic activities (jobs and income) generated by a project or development. Direct impacts associated with the development coincide with the first round of spending in the economy. Secondary impacts are the production, employment and income changes occurring in other businesses or industries that occur as a result of the project; spending and other activities of employees who are working for the project; or the impact of the project activities on other resources. All tax changes are considered secondary impacts.

4.6.1 No Action Alternative

Under the No Action Alternative approximately 36 wind turbines would be located on 2,400 acres of private lands, but no wind facilities would be located on the state parcel.

4.6.1.1 Direct Impacts

Employment

Table 2.3-1 (Chapter 2) shows that approximately 400 new jobs would be created during the construction phase of the No Action Alternative, but in the long term, the project would operate with approximately four personnel on site. The exact number of local residents that would be employed is not known, however, it is Enerfin's policy to hire locally to the extent practicable (deVicente pers. com. 2009). The four long-term employees would most likely live locally.

Income

The wages and salary paid to construction workers and engineers that would work on the project are unknown at present. However, at the time of construction it is likely that they would be consistent with prevailing labor market conditions in the area. A recent publication indicates that prevailing wages in 2007 for individuals employed in the construction industry were approximately $31,000 per year (Montana Department of Labor and Industry 2007) in Montana. Because there is no information on the number of workers that would be hired locally, the direct impacts of the No Action Alternative on local income levels cannot be evaluated.

Revenue from Sales Receipts

Purchase of construction materials or other materials from local businesses during project construction or operation would increase sales for the local economies. There is no information to address the direct impact on sales receipts because it is unclear exactly what and how many materials would be purchased locally. However, Enerfin's policy is to maximize local engagement in projects, and Coyote Wind will be no exception (Martin pers. com. 2009).

Revenue Generated from State Parcel

There are no direct impacts to income generated from the state parcel under the No Action Alternative. Annual revenues would still be collected for grazing and oil and gas leases. In 2008 this revenue was $1,994.06 (Bollman pers com. 2008b).

4.6.1.2 Secondary Impacts

The secondary impacts of the No Action Alternative include the broader effects of project spending and employment on the economies of Sweet Grass and Park counties.

Employment

Significant increases in long term employment opportunities in Park and Sweet Grass counties (after the initial construction phase) are not expected as a result of the project. The operation of the No Action Alternative is expected to employ four people and this would not significantly change the local employment outlook.

Income

There are not expected to be significant effects on income as a result of project operation. The four permanent staff would likely be paid prevailing wages.

Revenue from Sales Receipts

Sales of goods and services within Park and Sweet Grass counties would increase during the construction phase of the project as a result of additional construction workers relocating to the area. The total number of new temporary workers that would relocate to the area is unknown. It is reasonable to assume a positive relationship between worker relocation and sales receipts, i.e. as more workers relocate temporarily to the area there is a greater positive impact on sales receipts. This relocation would have a positive effect on other businesses in the area during construction, but is not likely to be maintained by the four permanent staff employed when the project is in operation.

Property Values

The impacts of wind energy projects on property values are dependent on many site-specific factors such as the viewshed for adjacent properties, the primary use of adjacent properties, and their current value. There are very few studies available that examine the impacts on property values of siting a wind farm nearby. The studies and reports that are available and their results suggest that the impacts of wind turbines on property values can be positive, negative or negligible depending on the particular property and regional characteristics. The sites for the No Action Alternative are not high density residential or of high recreation amenity value; they are primarily used for grazing and as such the majority of value expressed in property prices relates to the agricultural production value of the land. The existence of wind turbines would not have any impact on the production values of adjacent agricultural lands. The nature of the predominant existing land use, production agriculture, suggests that the impacts on property values would be negligible in a downward direction.

Sterzinger et al. (2003) collected 25,000 records of property sales within the viewshed of wind developments and examined the impact of wind development on property values. They found that for the majority of projects, the property values rose more quickly in the viewshed than in comparable communities. Twenty-six of 30 analyses showed that the property values in the affected viewshed performed better than those outside. Unfortunately, however, these authors conducted a rudimentary statistical analysis and the robustness of their work could be questioned.

Hoen (2006) analyzed 280 arm's-length[2] single-family residential sales using a hedonic regression model[3]. The sales took place from 1996 to 2005 and are within 5 miles of a 20 turbine, 30 megawatt (MW) wind farm in Madison County, New York. The analysis did not reveal any statistically significant relationship between either proximity to, or visibility of, the wind farm and the sale price of homes. Additionally, even when concentrating on homes within a

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[2] An 'arm's length' transaction is one in which buyers and sellers act independently and have no relationship to one another, i.e. both parties are self-interested.

[3] In economics, hedonic regression, also hedonic demand theory, is a method of estimating demand or value. It decomposes the item being researched into its constituent characteristics, and obtains estimates of the contributory value of each characteristic.

mile of the turbines, or homes that sold immediately following the announcement and construction of the wind farm, there was nothing to support an impact on property values. The study suggests that in the area analyzed, a view of the wind farm does not significantly affect property values in either an upward or downward direction.

Residential property values could also be affected by the addition of new residents to the surrounding area during the construction phase of the project. Table 2.3-1 (Chapter 2) indicates that approximately 400 workers would be on site daily during the construction period in 2010. The Livingston Chamber of Commerce reported 600 beds available at hotels in Livingston, but did not have information on rates of occupancy (Livingston Chamber of Commerce 2009); numbers of available beds and occupancy rates were not available from the Sweet Grass County Chamber of Commerce (Sweet Grass Chamber of Commerce 2009). It is not clear how many workers would be recruited from outside of the project area and require housing, versus those that could be recruited from existing residents and therefore not require additional housing. As such it is difficult to say whether the construction period would create a shortage of accommodation within the area. The short-term nature of the construction phase and the limited alternative employment opportunities, suggests that the presence of outside construction workers in the area would be temporary. It is unlikely that additional expansion of the housing stock, or significant sales of existing houses would result as a consequence of the No Action Alternative. If there is no significant change in housing demand, there would be little change in housing prices in Sweet Grass and Park counties as a result of the No Action Alternative.

Property Tax Revenue

All property within Montana is taxed, unless provided otherwise (15-6-101; MCA 2007b). If construction of the Coyote Wind Project is undertaken using prevailing wages, the property is taxed as a Class 14 property (Hofland pers. com. 2009; SB 115) and the tax rate is 3% of market value (15-6-157 MCA 2007b). Most increases in the appraised value of property are as a result of locating buildings and other improvements on the land parcel. The tax obligation is calculated by multiplying the taxable value by the mill levy rate as shown below:

Taxable value = Market value of property * tax rate (1)

Tax obligation = taxable value*mill levy (2)

The average mill levy in District 29 (where the project would be located) was 366.4 mills in 2008 (Hofland pers. com. 2009). The actual market value of the property cannot be established until the project is in operation. Therefore, the value of the turbines proposed to be located on the property was used as an estimate of the market value. Approximately 66.8MW of generation is proposed for the private land at a cost of between $1.3 and $1.7 million/MW (Matalucci pers. com. 2009). Based on these figures, the total value of the property is between $86.84 and $113.56 million.

Based on these estimates of market value, the taxable value of the property would be between $2.6 and $3.4 million, and the tax obligation [without factoring in any tax incentive programs and there are tax incentive and tax reduction programs in Montana, e.g. MCA 15-24-3111 and MCA 15-24-3001(2007b)] would be between $0.95 and $1.25 million annually.

Wind Generation Facility Impact Fee for Local Governmental Units and School Districts

The project could also be subject to a local governmental and local school impact fee for the first 3 years after construction of the wind generation facility begins. The impact fee may not exceed 0.5% of the total cost of constructing the wind generation facility (15-24-3004 MCA 2007b). If imposed, this would be a significant increase in taxation for Sweet Grass County over the period the tax is levied.

Revenue from Bed Tax

There is a 7% state-wide bed tax within the State of Montana. Any additional room rentals that occur as a result of the No Action Alternative would supply the state with additional revenue from the bed tax. There is a linear relationship between numbers of rooms occupied and bed taxes accruing to the state. For example, if an additional 100 hotel nights are occupied and the rate is $100/night, the total tax accruing to the state from the bed-tax is $700. If an additional 200 hotel rooms were occupied as a result of the proposed alternative, the revenue received by the state would equal an additional $200 and so on.

Electrical Energy License and Wholesale Energy Transaction Taxes

The State of Montana levies a tax of $0.0002 on each Kwh of electricity generated from a power facility [Montana Department of Revenue 2007; Broussard 2009; MCA 15-51-101 (2007b)]. In the event that power is sold across transmission lines there is also a wholesale energy transaction tax levied at 0.015 cents on each Kwh sold with a 5% reduction for transmission losses if power is sold out of state [Montana Department of Revenue 2008, Broussard 2009; MCA 15-72-104 (2007b)].

The relationship between Kwh production and tax revenues is linear, i.e. the greater number of Kwh produced the larger the tax revenues accruing to the State.

Corporation Taxes

Corporate profits are also taxed by the State of Montana. Different tax codes apply depending on the specific structure of each corporation. Greater profits lead to greater tax revenues for the State.

4.6.1.3 Cumulative Impacts

All anticipated impacts associated with the No Action Alternative are described under direct and secondary impacts. There are no cumulative impacts.

4.6.1.4 Mitigation

The expected socioeconomic effects on Sweet Grass County as a result of the No Action Alternative would be positive when the increase in property tax revenue over the longer term in taken into account. Effects on Park County would be neutral to slightly positive. Therefore no mitigation of these effects would be required.

4.6.2 Proposed Action Alternative

Under the Proposed Action Alternative approximately 8 wind turbines would be located on 640 acres of state lands adjacent to the private lands within the No Action Alternative. Impacts of the Proposed Action Alternative discussed below, are in addition to the impacts already discussed above for the No Action Alternative. All impacts described under the No Action Alternative would still occur if the Proposed Action were implemented.

4.6.2.1 Direct Impacts

Employment

The Proposed Action Alternative would not create any additional construction or permanent jobs as a result of siting turbines on the state parcel. Construction staff and permanent employees would simply work at all sites.

Income

Similar to the No Action Alternative, the wages and salary paid to construction workers and engineers that work on the project are unknown at present and the direct impacts of the Proposed Action Alternative on local income levels cannot be evaluated. Although the Proposed Action would not hire more staff, presumably the construction staff would work for a longer period of time and thus would have slightly more income as a result of the Proposed Action.

Revenues from Sales Receipts

The direct impact on sales receipts from the Proposed Action is unclear because it is not known what materials would be purchased locally.

Revenue Generated from the State Parcel

In 2008, the state parcel generated $1,034 of income under a state grazing lease that charges $6.94 per Animal Unit Month (AUM) for 149 AUMs on the state parcel (Bollman pers. com. 2008b)[4]. Bollman (pers. com. 2008b) states that there are current examples of instances where cattle have continued to graze parcels upon which turbines have been placed and as such the state can continue to generate revenue from existing grazing leases. Construction of 8 turbines and access roads could reduce the number of AUMs available for lease and thus reduce the lease revenue from the state parcel. Any reduction in lease value would depend on the reduction in AUMs on the parcel. For example; a 10% reduction in the number of AUMs would also reduce the income generated from the grazing lease by 10% (approximately $103 at 2008 lease rates per AUM). Because only 6.38 acres (approximately 1.5 AUMs) would permanently be lost from production, it is unlikely there would be a significant reduction in grazing lease revenue.

The Proposed Action Alternative would result in the following changes in income generated from the state parcel. A Land Use License charged at $1.50/acre currently generates $960/year. At commencement of operations Coyote Wind would cease paying this license fee and instead would pay a one time installation fee of $1,000/MW of installed capacity[5] (Bollman pers. com. 2009). Additional annual fees would be calculated as 3% of gross annual revenues, or $1,500/year for each MW of installed capacity, whichever is greater (Bollman pers. com. 2009). The approximate capacity of wind turbines proposed for the state parcel is 14.4 MW (Table 2-3). Bollman (pers. com. 2009) indicated there would be no change to revenue from the current oil

[4] Grazing lease rates per AUM vary from year to year. The lease rate for 2009 is $6.97/AUM (Bollman pers. com. 2009), slightly higher than the rate in 2008.
[5] Calculated as the nameplate capacity of the wind turbine as calculated by the manufacturer of the turbine.

and gas lease providing it does not interfere with the existing surface use of the wind farm[6]. The estimated minimum dollar amount accruing to the state from the Proposed Action Alternative is shown in Table 4-6.1. The minimum income in Year 1 is estimated to be $36,000 and the minimum increase in subsequent years is estimated to be $21,600/year in nominal dollars (nominal dollars are dollar values that are not adjusted for inflation over time).

Table 4-6.1. Estimated minimum income from the state parcel under the Proposed Action Alternative.

Activity	**Minimum Income (nominal $)**	**Calculation**
Installation Fee (Year 1 only)	$ 14,400	(14.4MW * $1,000/MW)
Annual Fees (minimum)	$ 21,600	14.4MW*$1,500/MW
Minimum Total Income Year 1	$ ***36,000***	$14,400+$21,600
Minimum Total Income after Year 1	$ ***21,600***	14.4MW*$1,500/MW

4.6.2.2 Secondary Impacts

Employment

The Proposed Action Alternative would have the same secondary impacts on employment patterns as the No Action Alternative.

Income

The Proposed Action Alternative would have the same secondary impacts on income as the No Action Alternative.

Revenue from Sales Tax

Revenue streams from the sale of goods and services could be slightly increased by the Proposed Action Alternative during construction. In the long term there is no expected impact on sale of goods and services.

Property Values

The production agriculture use of adjacent land, and the presence of existing turbines in close proximity on the landscape suggest that property value impacts would be negligible from the addition of 8 turbines on the state parcel.

Property Tax Revenues

State lands are generally exempt from property taxes (Hofland pers. com. 2009). However any personal property located on the state parcel by the lessee could be taxed using the formulas presented in section 4.5.1.2. Using the same valuation figures of $1.3 to $1.7 million per MW, and assuming there would be 14.4MW capacity on the state parcel, the estimated market value of improvements and personal property on the state parcel would be between $18.72 and $24.48 million (in addition to the value on private property discussed in section 4.5.1.2). The potential tax obligation (assuming no tax deductions) would be between $0.21 million and $0.28 million. This would a significant positive increase in property tax revenue.

[6] The lease was issued in September 2008 and covers the entire state parcel (640 acres). The lease rate is $1.50/acre in years 1-5; $2.75/acre in year 6 and $4.00/acre in years 7-10 (Bollman pers. com. 2009).

Wind Generation Facility Impact Fee for Local Governmental Units and School Districts

Similar to the turbines placed on private lands under the No Action Alternative, construction on the state parcel could also be subject to a local governmental and local school impact fee. If imposed this would be a significant positive increase in tax revenue for Sweet Grass County over the period the tax is levied.

Revenue from Bed Tax

Any additional room rentals that occur as a result of the Proposed Action Alternative would supply the state with additional revenue from bed tax. Similar to the No Action Alternative, there is a linear relationship between the numbers of additional rooms occupied and bed taxes accruing to the state. The exact increase in room occupancy as a result of the Proposed Action Alternative cannot be calculated without estimates of the number of additional workers that require accommodation. Any increase in bed-tax is likely to be temporary because of the limited duration of project construction.

Electrical Energy License and Wholesale Energy Transaction Taxes

The additional 14.4 MW generated from the turbines located on state lands would generate additional tax revenue to the State of Montana as described under the No Action Alternative.

Corporation Taxes

Since the additional 14.4 MW generated from the state parcel is likely to add to corporate profits, this additional corporate revenue would also increase tax revenues for the state.

4.6.2.3 Cumulative Impacts

All anticipated impacts associated with the Proposed Action Alternative are described under direct and secondary impacts. There are no cumulative impacts.

4.6.2.4 Mitigation

As described for the No Action Alternative, the expected socioeconomic effects on Sweet Grass County of the Proposed Action would be positive when the increase in property tax revenue over the longer term in taken into account. Effects on Park County would be neutral to slightly positive. Therefore no mitigation of these effects would be required.

4.7 Terrestrial Vegetation and Habitats

Impacts to vegetation from the No Action and the Proposed Action are similar. The Proposed Action would result in an increase of 6.38 acres of permanent ground disturbance in addition to the 37.26 acres under the No Action Alternative. With proper adherence to erosion and vegetation management plans, impacts to vegetation for either alternative are expected to be minimal. Table 4.7-1 summarizes the potential impacts to vegetation for both the No Action and Proposed Action alternatives.

Table 4.7-1. Potential impacts to vegetation resources from the Coyote Wind Project, Sweet Grass County, MT.

Potential Impact	No Action Alternative	Proposed Action Alternative
Permanent loss of vegetation	Approximately 37 acres – 1.6 % of wind resource area	Additional 6.4 acres Approximately 1.0 % of state parcel and 1.4% of wind resource area
Habitat fragmentation	Minimal – temporary to permanent fragmentation of native habitats would occur near roadways.	Minimal - temporary to permanent fragmentation of native habitats would occur near roadways.
Noxious weeds	Potential for increase	Potential for increase
Effects to species of special concern	Minimal or no effect	Minimal or no effect

4.7.1 No Action Alternative

4.7.1.1 Direct Impacts

The No Action Alternative would result in the permanent loss of approximately 1 acre of habitat to the footprint of the turbine foundations, 36 acres to roads, and <0.25 acres for the operation and maintenance facility. The permanent loss of this vegetation represents 1.6% of the land used for the No Action Alternative. During construction there would be a temporary loss of approximately 8.4 acres of vegetation in areas where trenching would occur, 7.2 acres for turbine foundations, and possibly less than one acre for equipment staging. The specific location of all of these areas has not yet been determined.

Fragmentation of plant communities would occur near roadways and around the tower sites. While disconnected or fragmented habitats can cause disturbance to native wildlife usage of the plant communities for shelter and forage, minimal disturbance is predicted due to relatively small affected acreages associated with the road construction and improvements.

Removal of vegetation during the construction process would expose bare soil in isolated areas of cut and fill, or where vegetation is disturbed in heavy equipment work areas. Mitigation factors are required for the re-establishment of vegetation, including a plan that would comply with the Montana County Noxious Weed Management Act and the Sweet Grass County Weed Board that addresses reseeding, fertilization, recommended native plant species, use of weed-free seed, and a weed management plan. However, during this interim period the dislocated soil would be particularly susceptible to colonization by non-native plant species, which include noxious weeds. These plants, while very competitive, are not as ideally suited for the site as native plant communities, and do not restrict soil erosion by wind and water to the same degree as native vegetation. Degradation of native plant species could increase under the No Action Alternative if measures are not initiated to control the spread of invasive species immediately after the initial soil disturbance.

There would be no direct impacts to the vegetation on the state parcel as a result of the No Action Alternative since no activities would take place there.

4.7.1.2 Secondary Impacts

With increased traffic by heavy machinery there is a potential for increased noxious weed spread if these vehicles have previously operated in infested areas. Some seeds from invasive species are known to be viable after 20 years of dormancy, and if mud and debris from previous work sites is contaminated by these seeds it can effectively spread them into the project area by the typical operation of this type of machinery.

With implementation of the No Action Alternative, there is a possibility for plant resource damage in isolated areas due to increased erosion potential adjacent to roadways, particularly on high-slope areas and in high runoff events associated with precipitation or snow melt. The effects of these events would likely be minimal and extremely localized provided that roadways are engineered in such a manner as to mitigate for these situations.

4.7.1.3 Cumulative Impacts

There is potential for cumulative impacts on vegetation resources associated with the No Action Alternative. If weed management procedures are not adhered to during construction of the project, there could be an increase in invasive species on both the private and state parcel due to the increased traffic from the wind project and the ability of invasive species to spread rapidly.

Impacts to vegetation from the No Action Alternative would be combined with any ongoing impacts from current ranching operations. These impacts were not specifically evaluated but may include overgrazing, or concentration of grazing in certain areas, and related effects.

4.7.1.4 Mitigation

Close adherence to BMPs and all conditions of the weed control plan, and prompt seeding with native plant species, would minimize impacts from the No Action Alternative.

4.7.2 Proposed Action Alternative

4.7.2.1 Direct Impacts

The direct impacts of the Proposed Action Alternative are similar to those described under the No Action Alternative. The Proposed Action would result in approximately 0.2 acres of permanent habitat loss due to turbine foundations and 6.2 acres of habitat loss due to roads in addition to that described under the No Action Alternative. This acreage is primarily in grass and sage habitat types and constitutes approximately 1% of the acreage of the state parcel. There would be approximately 2.9 additional acres of temporary habitat loss due to trenching for the electrical collection cables and for turbine foundation construction on the state parcel.

4.7.2.2 Secondary Impacts

Secondary impacts from the Proposed Action Alternative would be similar to those described under the No Action Alternative, but to a somewhat larger degree. There are no species of special concern known to currently occupy the state parcel (MNHP 2008a), and because there is minimal habitat available in the project region, the potential secondary impacts on these plant species is likely negligible.

4.7.2.3 Cumulative Impacts

Cumulative impacts associated with the Proposed Action are similar to those described under the No Action Alternative, but to a somewhat larger degree.

4.7.2.4 Mitigation

The same mitigation measures described under the No Action Alternative should be applied under the Proposed Action and would minimize impacts to vegetation.

4.8 Wildlife Resources

Continued research and monitoring efforts have increased our understanding of how wildlife is affected by wind energy facility infrastructure. However, differences in methodology and analyses between studies often make comparisons difficult however (Erickson et al. 2001; Kunz et al. 2007; Kuvlesky Jr. et al. 2007; Smallwood 2007). Site-specific variation such as differences in species present on a seasonal basis, habitat composition, topography, wildlife behavior, and weather, also make comparisons challenging. Current research is focusing on how to define mortality causes, wind project site characteristics and components, carcass search methodology, and mitigation. Table 4.8-1 describes potential impacts for the No Action and Proposed Action Alternatives. Construction and operation phases of the proposed project are described for each Alternative.

Table 4.8-1. Potential impacts of the No Action and Proposed Action Alternatives, Coyote Wind Project, Sweet Grass County, MT.

Potential Impact	No Action Alternative	Proposed Action Alternative
Construction		
	36 turbines, approximately 11 miles of roads, and approximately 52 acres of ground disturbance.	Additional 8 turbines, 2 miles of roads, and 9 acres of ground disturbance.
Birds	Injury or mortality from collision (with vehicles, cranes, turbines, meteorological towers, guy wires) or when machinery disturbs ground vegetation.	Similar to No Action, but mortality may also occur on state land.
Bats	No impacts are expected.	Similar to No Action
Big Game and General Wildlife	Possible direct mortality of small mammals, reptiles, amphibians, and ground-dwelling birds.	Similar to No Action, but mortality may also occur on state land
Species of Concern	Impacts similar to those discussed in the above sections.	Similar to No Action
Operation		
	Permanent loss of approximately 37 acres	Additional permanent loss of approximately 6 acres
Birds	Potential for fatalities from collisions with turbines. Reduced reproduction	Similar to No Action, but potential for nominal increased impacts, and

Table 4.8-1. Potential impacts of the No Action and Proposed Action Alternatives, Coyote Wind Project, Sweet Grass County, MT.

Potential Impact	No Action Alternative	Proposed Action Alternative
	or recruitment from displacement, habitat loss or fragmentation.	occurrences on state land.
Bats	Potential for fatalities due to collisions with blades and effects of barotraumas. Possible reduced reproduction or recruitment from changes in migration and foraging behavior.	Similar to No Action, but potential for nominal increased impacts, and occurrences on state land.
Big Game and General Wildlife	Mortality of small mammals, reptiles, amphibians, and ground-dwelling birds could result from collisions with maintenance vehicles. Possible reduced reproduction or recruitment from habitat loss or fragmentation.	Similar to No Action, but impacts may also occur on state land.
Species of Concern	Impacts similar to those discussed in the above sections.	Similar to No Action.

4.8.1 No Action Alternative

4.8.1.1 Direct Impacts

Direct impacts are discussed for construction and operational phases of the project. Construction activity which may cause direct impacts to wildlife include road construction; site clearing and grading for towers and buildings; digging and construction of footings and building pads or foundations; trenching for utilities; and vehicle travel. The No Action Alternative would result in approximately 52 acres of temporary habitat disturbance, and 37 acres of permanent habitat lost (approximately 1.6% of the wind resource area) due to turbine platforms and roads. The design and placement of the support buildings had not been determined at the time this report was written, and thus the footprint is not known.

Operation activities that may have direct impacts to wildlife include vehicle travel and the turbine activity.

Birds

Impacts to birds during construction may include mortality or injury from collisions during the erection of wind turbines, installation of nacelles and blades; meteorological towers or guy wires; and construction vehicles. Direct impacts from operations may include collisions with installed infrastructure and maintenance vehicles. Birds could be killed when machinery disturbs ground vegetation, and mortality is likely to be higher if construction occurs in spring during nesting season.

Drewitt and Langston (2006) found that collision risks are influenced by variables such as the layout design of the wind farm, specific characteristics of turbines, weather conditions, topography, and the specific bird species and numbers of birds using the site. For example, topographic features are often used for lift, especially by large birds, and could direct birds into the path of turbine blades. Other studies have speculated that possible factors influencing avian mortality also include the number of turbines, the location of turbines within the string (turbines at end of rows have higher collision rates), tower height and blade length (rotor sweep area relative to ground height), proximity to migration corridors or attractants such as wetlands and prey sources, and proximity to rim edges (Johnson et al. 2002; NWCC 2003).

Another variable in evaluating potential avian impacts is that resident bird populations may be affected differently than migratory populations, due to their familiarity with the wind towers relative to wind conditions, habitats and food sources. Post-construction studies at the Judith Gap Wind Energy Center in central Montana (JGWEC; TRC 2008) found that 97% of all bird mortalities occurred during fall migration. This project is similar to Coyote Wind in that it is located in grassland although much of the acreage is cropland rather than rangeland. Young Jr. et al. (2003), however, found casualties spread fairly evenly amongst migratory and non-migratory populations at the Foote Creek Rim wind resource area, also similar in habitat to Coyote Wind and located in south-central Wyoming. Conflicting research results suggest that seasonal mortality may be more site-specific based on topography, species, seasonal abundance, and weather events.

Post-construction monitoring results from wind facilities in the same region and with similar habitats as Coyote Wind indicate variable mortality rates. The JGWEC monitored 20 turbines (out of 90) to record carcass data (TRC 2008). Annual mortality rates averaged 4.5 birds/turbine (small birds = 3.8 birds/turbine/year; large birds = 0.7 birds/turbine/year). Horned larks had the highest fatalities of all bird species (27%), followed by smaller numbers of eared grebes (*Podiceps nigricollis*), Wilson's warblers (*Wilsonia pusilla*), and American coots (*Fulica americana*). The only identified raptor (one fatality) was a short-eared owl. In the Coyote Wind project region horned larks were the third most frequently observed species, and only one short-eared owl was documented. No grebes, Wilson's warblers or coots were observed.

Monitoring programs at the Foote Creek Rim project sampled 34 out of 69 turbines. Annual mortality rates at that site averaged 1.5 birds/turbine/year (Young Jr. et al. 2003). Ninety-two percent of fatalities were passerines, while very few raptor carcasses were found. The most common passerine found was the horned lark, followed by vesper sparrow and Brewer's sparrow. All three species were documented in the Coyote Wind project region. Observed raptor use at Foote Creek Rim did not reflect fatalities; golden eagles were the most frequently observed (40% of use) yet no carcasses were found. American kestrels had a low frequency of use (5%), yet accounted for 60% of the carcasses found. Both of these species were observed in the Coyote Wind project region, with golden eagles comprising 22% of BUC survey species and American kestrels comprising 3% of BUC survey species observed.

The mortality rate for the Coyote Wind Project No Action Alternative is not known. However, if the mortality rates from the JGWEC and Foote Creek Rim are applied to the Coyote Wind Project No Action Alternative, there would be an annual range of 54 to 162 bird fatalities per year. It is important to note however that differences in bird densities, behavior, and habitat may lead to higher or lower mortality rates. Differences in bird densities, behavior, and habitat, as well as differences in number of turbines may lead to higher or lower mortality rates than at other projects.

Bats

Little or no bat mortality is expected during the construction phase of the No Action Alternative. Bats would likely be able to avoid non-moving objects such as cranes, towers or guy wires. Mortality from collisions with vehicles is possible, though not likely to be significant. Bat mortality from project operations would occur mainly from collisions with blades and effects of barotrauma. Barotrauma occurs when bats fly too close to turbine blades and suffer traumatic lung damage from the sudden drop in air pressure (Baerwald et al. 2008).

Direct mortality to bats from wind energy facilities has been documented at several wind energy facility sites, but little is known about how to estimate those impacts prior to post-construction mortality studies (DuBois pers. com. 2008). The JGWEC discovered 97% of their carcasses in late summer when bats are beginning to migrate (TRC 2008). Many bat species appear to use narrow migration corridors following topographical features of mountain ranges such as river drainages and forested ridges (Baerwald and Barclay 2008). However, very little is known about bat migration routes and timing in Montana (DuBois pers. com. 2008).

As more research is conducted, seasonal patterns are emerging and indicate that mortality is most significant for migratory tree-dwelling species (Kuvlesky Jr. et al. 2007). The bat species most likely to be affected at the Coyote Wind Project site are those feeding at blade height, including big brown bats, hoary bats, little brown myotis, sliver-haired bats, spotted bats and Townsend’s big-eared bats (foraging behavior and heights from Adams 2003). Sixty-seven percent of mortality found at JGWEC was of hoary and silver-haired bats, both of which were documented in the Coyote Wind Project region.

Research to date indicates that impacts to bats may be greater than to bird species in some regions of the country, although it is important to note that differences in bat species, densities, behavior, and habitat use may lead to higher or lower mortality rates at any given project (Kuvlesky Jr. et al. 2007). Arnett et al. (2007) reviewed published mortality estimate data from wind facilities across the country and found widely varying mortality rates by region. The eastern US had the highest mean bat fatalities/turbine/year ranging from 20.8 to 69.6 with an average of 37.0 (n=7). Wind facilities in the Midwestern US had lower bat fatalities/turbine/year and ranged from 0.1 to 7.8 with an average of 3.26 (n=5). Wind facilities in the Pacific Northwest documented bat fatalities/turbine/year ranging from 0.7 to 3.4 with an average of 1.92 (n=5). In Alberta, Canada wind facilities estimated bat fatalities/turbine/year ranging from 0.5 (n=2) to 18.5 (n=1) with an average of 6.5 (n=3). In the Rocky Mountains, one facility was evaluated with bat fatalities/turbine/year of 1.3 (n=1). The closest facility to Coyote Wind is the JGWEC where bat fatalities/turbine/year were estimated at 13.4 (TRC 2008). These comparisons show that estimates of bat fatalities were highest at wind facilities in the eastern US located on forested ridges and lowest in the Rocky Mountain and Pacific Northwest regions in grasslands and more open habitats. The mortality rate for the Coyote Wind Project No Action Alternative is not known.

Big Game and General Wildlife

Little or no direct mortality to mule deer, white-tailed deer, pronghorn, or elk is expected during the construction phase. Newborn fawns or elk calves could be susceptible to vehicle collision if encountered hiding in sagebrush within the first few weeks of life in the spring, but young and adults are highly mobile and would avoid contact with construction and operation sites and activities. The long sight distances in the project region and likelihood that vehicles would be traveling at low speeds also minimizes collision risk.

Direct mortality of wildlife species with limited mobility such as small mammals, reptiles, amphibians, ground-dwelling birds and burrowing animals could result from ground disturbing activities or collisions with vehicles or equipment during both construction and operation phases. Construction activities may disturb transient individuals in the project region, but operations are not expected to generate more disturbances over the life of the project than general ranching operations.

Species of Concern

Federally listed species

The No Action Alternative is not likely to result in direct impacts to any federally listed species. No sightings or denning activity of gray wolves, grizzly bears or Canada lynx have occurred in or near the project region (Paugh pers. com. 2008). All three species are highly mobile animals and usually actively avoid human interaction. Construction activities may disturb transient individuals in the project region, but operations are not expected to generate more disturbances over the life of the project than general ranching operations. Mortality by construction equipment or vehicles is possible, though highly unlikely.

State listed species

Direct impacts to state listed species of concern are addressed above under their general taxonomic groups (e.g., birds). Of the six bird species of concern documented during surveys, the Brewer’s sparrow, grasshopper sparrow and long-billed curlew may be most vulnerable to direct impacts because nesting and foraging habitat may exist within the tower or road footprints. Breeding habitat for ferruginous hawks exists in the area, and may occur within the tower or road footprints.

4.8.1.2 Secondary Impacts

Secondary impacts affect wildlife in less direct ways than direct mortality, and can be more difficult to quantify and document. These types of impacts may include habitat degradation and fragmentation, displacement from important habitats, changes in behavior, and reduction in fitness and reproductive capabilities due to increased stress. Active turbines and human activity related to facility construction and operations can cause these types of impacts.

Birds

Secondary impacts to birds from disturbance or loss of habitat can result in changes in flight behavior, breeding bird density or distribution. Construction noise and activity could temporarily disturb or displace individual birds and interfere with breeding, foraging and nesting behavior, especially if construction occurs in the spring breeding season. Although limited to the initial construction phase, this disturbance could result in short-term reduced survival and reproductive success. Disturbance from wind project maintenance operations (vehicles, human noise and movement) would be minimal and likely no greater than the current level of disturbance from vehicles.

Long-term disturbance over the life of the project from turbine motion, noise or vibration could affect habitat use by birds. Chick mortality could result from adults abandoning active nests due to these disturbances. Few long-term studies of the disturbance effects of wind projects have been completed in the United States although several are in progress. Preliminary results from ongoing studies in North and South Dakota have indicated there are variable responses among species (Johnson et al. 2002, 2003). Western meadowlarks did not appear to avoid turbines, however grasshopper sparrows moved as far as 650 feet away from turbines (Johnson pers. com. 2009). Both of these species were documented in the Coyote Wind project region. Kuvlesky Jr. et al. (2007) report that European studies found habitat loss associated with wind facility development had a greater negative impact on bird populations than direct mortality. Studies on farmland birds in England documented increased or stable populations after wind facility construction (Devereux et al. 2008), but other studies specific to grasslands demonstrated the opposite response from avian species. Leddy et al. (1999) demonstrated that grassland bird densities on Conservation Reserve Program lands in southwestern Minnesota were higher either where there were no wind turbines or ≥ 162 feet from them. Osborn et al. (2000) found similar results for birds and other species at the Buffalo Ridge Resource Area in Minnesota.

Drewitt and Langston (2006) discuss differences in avoidance distance between species such as waterfowl (greater distance) and grassland birds (lesser distance) at several wind energy facilities in Europe. They hypothesized that grassland birds (passerines) may not show immediate displacement due to longer lifespan and high site fidelity, and that true impacts cannot be measured until new recruits have replaced current breeders. Determining how displacement affects avian productivity and survival would help identify whether or not this disturbance has an effect at a population level. It is likely the No Action Alternative would cause some bird displacement, but how much is not known.

Bats

Secondary impacts to bats from the No Action Alternative and from wind projects in general, are not clear. Secondary impacts to bats would likely be manifested through potential changes in migration and foraging behavior. Kuvlesky Jr. et al. (2007) propose that although high mortality rates have been documented at wind farms in the eastern US, they may not be sufficient enough to cause population declines. Bats have low reproductive rates, and therefore slow population growth rates. If bats suffer significant mortality from wind turbines over a long period of time, that level of mortality should then lead to measurable decreases in carcasses recorded during wind farm monitoring, perhaps indicating population declines over time. A four-year study at the Buffalo Ridge wind facility in Minnesota failed to find evidence for this; high mortalities did not decline over the study period of four years (Johnson et al. 2003). Conclusions cannot be made until long-term research has been conducted on a variety of wind projects that adequately represent the variations in topography, habitat and weather conditions found in wind resource areas.

Big Game and General Wildlife

Wind energy facilities differ from other types of energy production such as oil and gas drilling, surface mineral mining or coal- or gas-fired power plants, in that each tower has a relatively small footprint, yet are often spread over a large expanse of open and otherwise undeveloped landscape. Large landscapes often include sensitive habitats for big game species that are used for breeding, birthing young, foraging, security cover, or travel between habitats. Secondary impacts may include habitat fragmentation or loss through visual and audible impacts affecting a large area. A study in southwestern Oklahoma, however, found that elk did not change home range size or exhibit any stress indicators after turbine construction (Walter et al. 2006).

Road systems associated with turbine strings can impact behavior of both ungulates and their predators. For prey species, greater road density and altered seasonal access created by snow removal may create greater access for people and predators (Forman et al. 2003). Response to these secondary impacts may result in displacement and lower use of the private land by big game species, especially if roads or infrastructure maintenance disturbs the draws and coulees that serve as refugia. However, the increased road use due to project operations would be slight and likely would have a minimal effect.

Secondary impacts for small mammals, reptiles and amphibians could include displacement or habitat loss or fragmentation which may affect breeding success, survival and genetic isolation over time. Small mammal species such as rodents are less mobile and are more greatly impacted by habitat fragmentation and loss caused by roads and pad development. A compacted road surface limits subterranean movements, and creates a large expanse of open terrain that has no cover from predators. Conrey and Mills (2001) found that roads can serve as barriers to movements of small mammals. Gerlach and Musolf (2000) found that when roads fragmented habitats to the point where movement of bank voles (*Clethrionomys glareolus*) was reduced, genetic isolation occurred. Roads have been found to affect the behavior of garter snakes (*Thamnophis sirtalis parietalis*) by changing travel habits to avoid the hard surfaces, and making trail-following of conspecifics difficult (Shine et al. 2000). Mate-searching male snakes were less able to follow substrate-deposited pheromonal trails left by females if those trails crossed a road than if the trails were entirely within the surrounding grassland.

Numerous studies have been conducted documenting the effects of noise on wildlife. Animal response to noise is a function of many other variables besides noise, including the characteristics of the noise and its duration, life history characteristics of the species, habitat type, season and current activity of the animal, sex, age, previous noise exposure, and other physical stressors such as drought (CST 1996). General animal responses to human-made noise relevant to project operation are summarized in the following list (CST 1996, EPA 1971, Bowles 1995).

- The sight and actions of noise sources can cause greater impact than the noise itself.
- Most animals habituate to sounds (e.g., truck and equipment noise) disassociated with other threatening stimuli.
- Steady sounds are less prone to startle animals than sudden onset noise.
- Herding or flocking animals are often as sensitive as the most sensitive individual in the group. However, animals rarely respond with uncontrolled panic.

- Motivation to find food make can make animals tolerant of noise.
- Animal aversion is measured in avoidance responses and can be lessened if animals can control or predict exposures.

Species of Concern

Federally listed species
No secondary impacts are anticipated to any federally listed species.

State listed species
Secondary impacts to state listed species of concern are addressed above under their taxonomic groups. No secondary impacts specific to species of concern are anticipated.

4.8.1.3 Cumulative Impacts

Historical land uses would continue and impacts from them to wildlife would remain the same. These impacts would include vehicle and farm machinery use on existing roads, continued sheep and cattle ranching, dryland and irrigated farming, periodic clearing of vegetation for road and ditch maintenance, predator control, application of herbicides and pesticides, and the unintended introduction of non-native plant species. Hunting for game species and varmints would likely continue on private land. These cumulative impacts are not expected to reduce or threaten the viability of wildlife populations in the project region.

There are no other reasonably foreseeable future actions to consider under cumulative impacts.

4.8.1.4 Mitigation

Under MEPA, mitigation reduces or prevents the undesirable impacts of an action by limiting the degree or magnitude of an action and its implementation, or rectifying an impact by repairing, rehabilitating or restoring the affected environment.

The Coyote Wind Project has incorporated a number of measures into the project design that would minimize impacts to wildlife. The following measures would be implemented under the No Action Alternative:

- use of tubular, rather than less-expensive lattice, turbine towers;
- use of perch-free smooth nacelles;
- underground placement of power collection and communication cables;
- use of tall towers and slowly rotating turbine blades ;
- turbines locations would be set back from the rim edge approximately 50 meters to avoid raptor use of uplifting air currents created at rim edges;
- use of large capacity wind turbines would be used to reduce the number of turbines and increase the spacing between turbines and rows of turbines

In addition, the following measures are suggested to minimize impacts to wildlife:

- Rocks should not be piled up near turbines since they create rodent cover habitat which may attract raptors. Any straw waddles or bales used for erosion control should be completely removed after construction activities are completed to avoid attracting rodents.

- Implement appropriate storm water management practices that do not create attractions for birds.
- Reduce availability of carrion by practicing responsible animal husbandry such as removing carcasses to avoid attracting Golden Eagles and other raptors.
- 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.
- Mitigation measures for big game species could include revegetation of construction sites and road corridors to reduce habitat fragmentation and encourage native plant species and reduce infestation by invasive species.
- Slow speed limits and strict rules for staying on road and pad surfaces to avoid vegetation and refugia would help to mitigate vehicle and equipment impacts.
- Foundations should be constructed to discourage under-burrowing by small mammals.

4.8.2 Proposed Action Alternative

Impacts to wildlife associated with the Proposed Action Alternative are similar to those described under the No Action Alternative. Impacts associated with the Proposed Action Alternative would be somewhat greater due to the addition of 8 turbines and associated roads on the state parcel.

4.8.2.1 Direct Impacts

The Proposed Action Alternative would result in approximately 6.4 acres (approximately 1% of the state parcel) of habitat lost (in addition to that lost under the No Action Alternative) due to turbine platforms and roads.

Birds

The Proposed Action Alternative has several features that attract a variety of avian species. The western edge of the state parcel features rim edges formed by the draws and steep inclines associated with Duck Creek. Raptors such as golden eagles, red-tailed hawks, American kestrels, and common ravens were observed using updrafts along these rims to soar and hunt. Based on these patterns of use the proposed turbine arrangement along the western ridge of the state parcel may pose a collision risk for raptors soaring along the ridgeline or utilizing thermals. A wetland feature near the meteorological tower attracts species such as long-billed curlews, sandhill cranes, Wilson's snipes and red-winged blackbirds.

Golden eagles and ferruginous hawks were observed hunting near the black-tailed prairie dog town on the east side of the state parcel during BUC surveys. Hunting raptors often approach from the east to maximize lift from the prevailing westerly winds. No turbines are planned for the eastern side of the state parcel, thereby minimizing potential collisions with hunting raptors.

If the mortality rates reported at the JGWEC (TRC 2008) are applied to the Proposed Action Alternative, the turbines on the state parcel may cause a range of 5.6 to 13 bird fatalities per year in addition to those under the No Action Alternative. However differences in bird densities, behavior, and habitat may lead to higher or lower mortality rates for the Proposed Action Alternative.

Bats

Passive acoustic surveys documented relatively high bat activity near the wetland feature on the state parcel, and turbines placed nearby would likely cause mortality to bats hunting near the wetland area. Roosting habitat may exist in the mature cottonwood galleries along the Duck Creek drainage or nearby ranch buildings, and bats flying between those roosts and the wetland area to forage may suffer mortalities from encountering turbines located along the western ridges of the state parcel.

Big Game and General Wildlife

Big game hunting and shooting of black-tailed prairie dogs is allowed on the state parcel, and access through private land has been allowed (Jarrett pers. com. 2008). However, the signing of the wind lease would automatically close the state parcel to all recreational use, so the shooting of big game or prairie dogs would not be permitted unless the section is opened by the DNRC Southern Land Office Area Manager (see section 4.3).

Species of Concern

As with the No Action Alternative, the Proposed Action Alternative is not likely to result in direct impacts to any federally listed species of concern and direct impacts to state listed species of concern are addressed above under their general taxonomic groups (e.g., birds) and in the No Action Alternative.

The current size of the black-tailed prairie dog colony within the state parcel is approximately 150 acres, with an additional 300 acres to the east and southeast of the state boundary. There are no turbines or additional roads planned in the vicinity of the prairie dog colony and thus direct impacts are expected to be minimal.

4.8.2.2 Secondary Impacts

Secondary impacts from the Proposed Action Alternative would be similar to those of the No Action Alternative, although potentially slightly greater due to the higher number of turbines. Habitat is similar between the No Action and the Proposed Action Alternatives, with the addition of a wetland located on the state parcel and more contiguous sagebrush habitat. Both of these habitats provide additional foraging opportunities for several bird and bat species, so impacts to these species may be slightly greater under the Proposed Action Alternative.

The private lands associated with the No Action Alternative have more forage availability and water features than the state parcel and offer additional resources for big game and other wildlife. Therefore the Proposed Action may have relatively fewer impacts on these species groups.

4.8.2.3 Cumulative Impacts

Under the Proposed Action Alternative development would occur on both state and private lands. Approximately 44 acres of land would be permanently lost for turbine platforms, roads, and support buildings for wind project development on private and state land. Cumulative impacts would include the direct and secondary impacts described in Section 4.2. In addition, the cumulative impacts described for the No Action Alternative apply to the Proposed Action Alternative.

4.8.2.4 Mitigation

Mitigation of impacts for the Proposed Action Alternative includes those discussed in section 4.8.1.4. In addition, as a stipulation of a lease agreement under the Proposed Action Alternative, DNRC would require post-construction monitoring of bird and bat fatalities for a minimum of two years, with less intensive monitoring for the life of the project (see Appendix F for more details). Post-construction monitoring on the private land would be at the discretion of Coyote Wind.

Because wetland habitats tend to attract waterfowl and shorebirds and provide important feeding sites for bats, turbine setbacks from the wetland boundary should be considered to avoid altering resource availability for wildlife in the project area. The one small wetland, near a proposed tower is small, and reasonable setbacks should avoid direct impacts to wildlife and runoff into the wetland. Construction of turbine foundations, siting of roads and utility ditches should all take into consideration the groundwater-sensitive habitats and wildlife species using the wetlands. A setback of several hundred yards from the wetland for roads and turbines would reduce potential for bird and bat collisions with turbines. This recommendation is consistent with the planned layout for the Proposed Action.

The black-tailed prairie dog colony on the east side of the state parcel provides foraging opportunities for raptors. Most raptors would approach from the east to use updraft and westerly winds, therefore no towers should be placed within or east of the colony boundaries. A setback of several hundred yards from the prairie dog colony for roads and turbines would reduce potential for raptor collisions with turbines, and again, is consistent with the current layout.

4.9 Cultural Resources

Impacts to cultural resources can occur as a result of ground disturbances, changes to a resource’s setting, or changes to the status of a resource. This section evaluates the potential or likelihood of affecting cultural resources due to changes in status (e.g. eligibility for the National Register of Historic Places - NRHP) and as a result of ground disturbances.

4.9.1 No Action Alternative

Cultural resource inventories are not required on private lands. At this time there is no information available regarding cultural resources located on the private lands that would be developed as part of the No Action Alternative.

4.9.1.1 Direct Impacts

It is possible the No Action Alternative may affect previously unknown cultural resources in the footprint of disturbance areas on private land, but because no surveys have been conducted, the extent of any impacts is not known.

The No Action Alternative would not pose any direct or secondary impacts to previously documented or unknown (i.e. sub-surface) cultural resources on the state parcel. The project area would not be developed as an electric energy generating facility powered by wind, and status quo activities would be maintained on the state administered parcel.

4.9.1.2 Secondary Impacts

A temporary increase in human use of the land due to project development may increase opportunities for human disturbance to any unknown cultural resources. A minor increase in human disturbance to cultural resources may also occur over a long-term period, due to daily operations and maintenance of the project. Additional secondary impacts may occur due to project upgrades in the future, or by ground disturbances due to future decommissioning of the project. However, as stated, it is not known if any impacts may occur due to lack of survey data.

Secondary impacts to the Lewis and Clark National Trail along the Yellowstone River corridor may occur on some days to due faint noise from wind turbines (see section 4.10). In addition, turbines may be visible in the distance from some points along the trail (section 4.11).

No significant impacts to Native American religious concerns, sacred sites, or traditional cultural properties have been identified, but no tribal consultation is known to have taken place to date.

4.9.1.3 Cumulative Impacts

The private lands associated with the No Action Alternative have had ground disturbances over time, due to grazing, road and trail building and use, and general ranching activities. These activities would continue, in addition to the wind development. Because no survey has been conducted, cumulative effects on cultural resources from the No Action Alternative are not known.

4.9.1.4 Mitigation

The activities that would be likely to cause impacts to any unknown cultural resources involve ground disturbance activities such as earth moving or widening of roads. Mitigation that would reduce potential negative impacts to unknown resources from the No Action Alternative would include minimizing areas of construction impact by limiting the surface area disturbance to immediate development areas and avoid clearing entire sites. Plans for the No Action Alternative already include minimizing disturbance of new ground.

Coyote Wind has committed to having an archaeologist on call should cultural or historic resources be discovered during construction activities. The archaeologist would verify the finding and notify the Montana State Historic Preservation Office, secure the site, and avoid disturbance until it could be properly assessed. The State Archaeologist can be reached at (406) 444-7719.

4.9.2 Proposed Action Alternative

Because there is no information about the cultural resources on the private lands that would be developed under both the No Action and Proposed Action alternatives, this discussion focuses on the state parcel.

Direct and secondary impacts to cultural resources may result from the construction, operation, and maintenance of the Proposed Action or from decommissioning activities that physically disturb a cultural resource. Assuming there are unknown (i.e. sub-surface) cultural resources located within a project area, certain activities associated with wind projects have a greater potential for adversely affecting resources than others. These ground-disturbing activities include excavation, trenching, and grading, and present the potential to encounter sub-surface archaeological deposits during project construction. Additionally, everyday operation and maintenance, future upgrades, or decommissioning of the project would require a long-term increase in human traffic and activity on the land, creating the potential to cause secondary impacts to cultural resources.

4.9.2.1 Direct Impacts

The Proposed Action Alternative may pose minor direct impacts to one previously documented cultural resource. The turbine location labeled CT3 appears to be in close proximity to site #24SW495, and although the turbine location and access road would not directly impact the site, it is unknown what activities associated with building CT3 may cause direct impacts because the size of the site is not known. However, avoidance of the site as well as having an archaeologist on call would reduce the chances of impact. Site #24SW495 does not meet NRHP criteria and is not necessarily afforded a means of protection. However, its age, function, and cultural association has not been determined, and it is unknown whether sub-surface archaeological resources associated with the site may exist in the site area. In some cases, discovery of such sub-surface resources may change the eligibility of the site for the NRHP (e.g. associated finds provide more information to make the eligibility determination).

Based on the location of the additional sites and isolated finds in relation to the proposed tower and access road locations on state land, the Proposed Action Alternative is not expected to cause direct impacts to any of the other previously recorded resources.

The state parcel was originally part of the Crow Reservation established in 1851 under the Fort Laramie Treaty, and a majority of the reservation, including the land in the immediate project area, was ceded in 1868 to the Territory of Montana. No tribal consultation has taken place for this project, but there are no regulations in place at this time that require tribal consultation for wind energy developments on the state parcel (Murdo pers. com. 2008). Based on the information available, there are no expected direct impacts to any tribal members' ability to fully exercise their current treaty rights within the project area.

4.9.2.2 Secondary Impacts

Secondary impacts from the Proposed Action Alternative are the same as for the No Action Alternative.

4.9.2.3 Cumulative Impacts

Based on the results of the Class III cultural study, and based on previous land use patterns in the area, which include ground disturbing activities like grazing and road building, cumulative impacts to cultural resources are likely to be minimal. Additionally, there are no foreseeable future actions that would result in any major increase in development or a major increase in human use of the area beyond what is described above, and therefore no major changes are anticipated in the way the land is to be used.

4.9.2.4 Mitigation

Previously identified cultural resources were determined to be ineligible for listing to the NRHP and therefore, no mitigation measures would be necessary for the Proposed Action to proceed. However, because the age, function and cultural association of resources found could not be determined, and because it is unknown whether sub-surface archaeological resources may exist in these areas, Coyote Wind has committed to avoiding the previously identified sites and isolated find areas during construction activities. Avoidance of these sites would limit the potential to encounter associated subsurface resources.

For the Proposed Action Alternative, Coyote Wind would implement the same mitigation as described for the No Action Alternative. In addition, the DNRC Archaeologist would be consulted if there are any discoveries on the state parcel.

4.10 Noise

Noise would be produced from various sources during the construction, operation and maintenance phases of the project. During the construction phase, standard construction equipment would be used to construct the roads, turbine foundations, turbines and electric system. The primary operation and maintenance noise sources include the wind turbines at various wind speeds, and light truck traffic on the access roads (BSA 2009) (Appendix G).

The primary noise sensitive receptors are the nearby human and animal populations that live, forage and pass through the project area. One rural residence is located within approximately 0.6 miles of the state parcel, and people frequently use the Yellowstone River and adjacent Lewis and Clark National Historic Trail, located approximately 1.5 miles southeast of the parcel, for recreational purposes (Figure 4.10-1). Livestock and numerous wildlife species (sections 3.8 and 4.8) live or frequent the area.

4.10.1 No Action Alternative

A total of 36 wind turbines would be constructed for the No Action Alternative. Seven rural residences are located within approximately 1 mile of the area that would be developed under the No Action Alternative. For the purposes of the quantitative analysis conducted, receptors are defined as the residences mapped on Figure 4.10-1.

4.10.1.1 Direct Impacts

Construction Noise

Construction activities would likely be audible at some or all of the receptors at any given time, and the sound would most often consist of diesel-powered heavy equipment. Noise levels at a listener location would vary depending on the type of equipment used, the number of pieces of equipment used simultaneously, the mode of operation for each piece of equipment, the length of time a piece of equipment is used, the distance between the equipment and a listener, and whether a direct line of sight is available between the equipment and a listener. Quantifying the noise associated with construction is difficult because the operations and equipment would move around the project site as the wind farm is built.

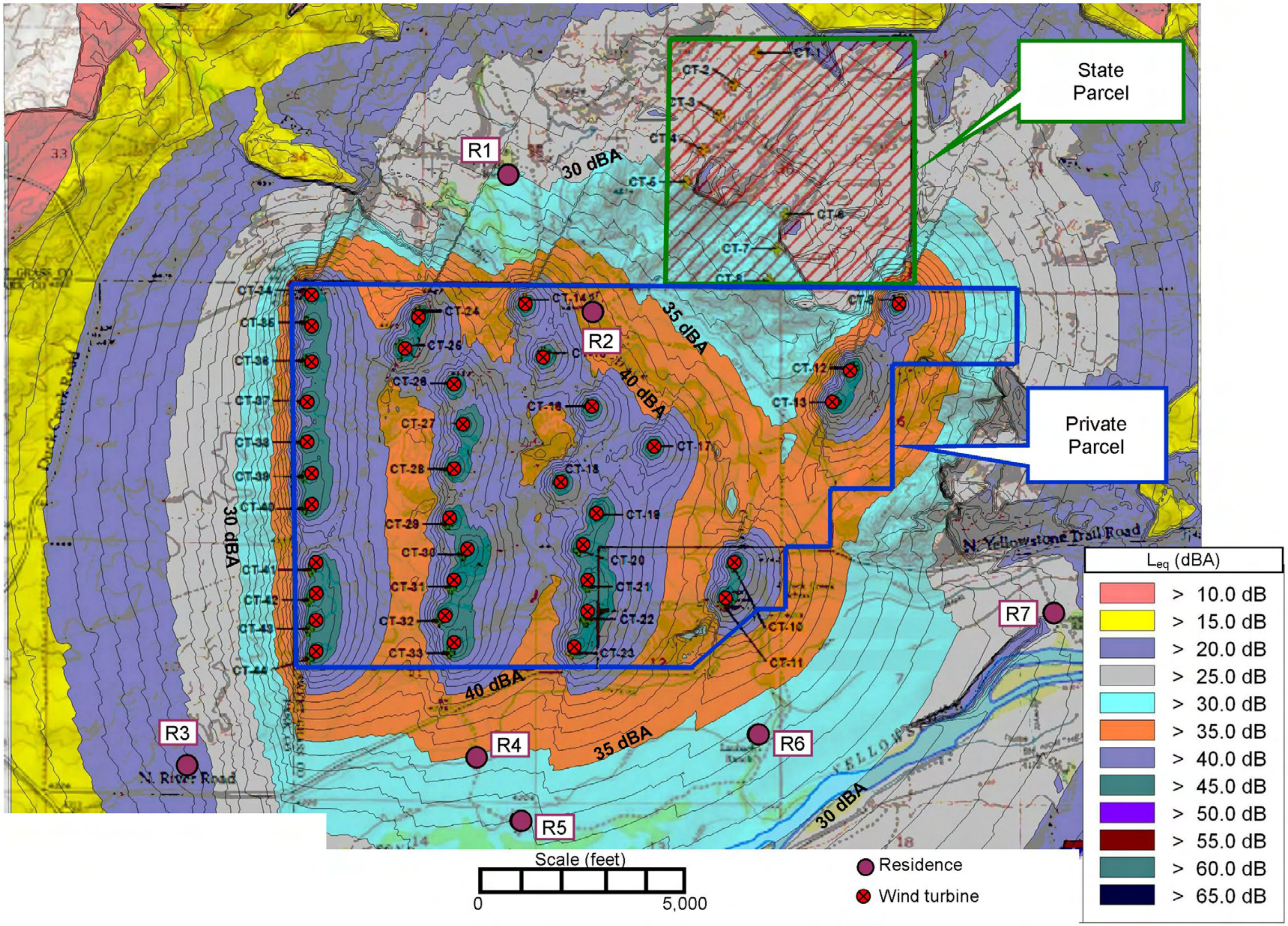

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FIGURE 4.10-1 PREDICTED NOISE CONTOURS - NO ACTION ALTRENATIVE (WIND SPEED 8.9 MPH), COYOTE WIND PROJECT, SWEET GRASS COUNTY, MT.

SOURCE:
BIG SKY ACOUSTICS, LLC

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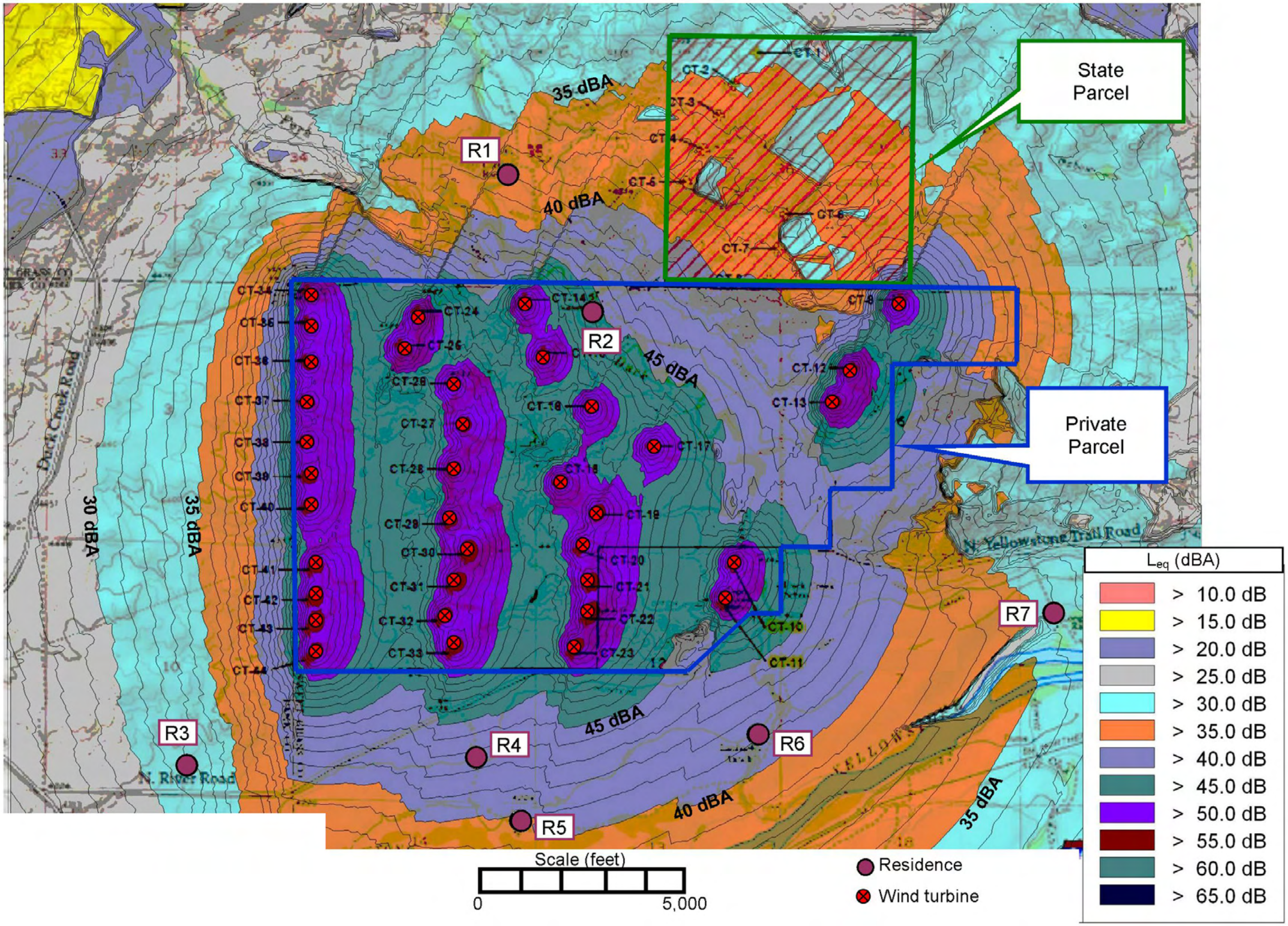

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FIGURE 4.10-2 PREDICTED NOISE CONTOURS - NO ACTION ALTRENATIVE (WIND SPEED 17.9 MPH), COYOTE WIND PROJECT, SWEET GRASS COUNTY, MT.

SOURCE:
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Table 4.10-1 lists the construction equipment and anticipated noise levels for the individual pieces of equipment assuming that a direct line of sight between the equipment and a listener is available. If the line of sight is blocked, then lower noise levels should be expected at the same distances. Comparing the construction equipment noise levels in Table 4.10-1 and the estimated existing ambient noise levels (L_{90} dBA) shown in Table 3.10-4, construction noise may still be audible but faint at locations up to one mile from the equipment.

Table 4.10-1. Construction Equipment Noise Levels, Coyote Wind Project, Sweet Grass County, MT.

Type of equipment	**Reference Noise Level at 50 ft. from Equipment (dBA)**	**Estimated Noise Level at 1,000 ft. from Equipment (dBA)**	**Estimated Noise Level at 0.5 mile from Equipment (dBA)**	**Estimated Noise Level at 1 mile from Equipment (dBA)**
Cranes (500 ton and 350 ton)	88	62	49	38
Support crane	88	62	49	38
Backhoes	80	54	41	30
Vehicles (4x4 light truck)	70	44	31	20
Trenchers	85	59	46	35
Dumper trucks	88	62	49	38
Concrete portable plant	85	59	46	35
Trucks (material & equipment transport)	88	62	49	38

Sources: FTA 1995, FHWA 1998.

Operation Noise

Noise level contours were developed using the Cadna-A Version 3.7 noise prediction software from DataKustik. Cadna-A uses algorithms from the International Organization for Standardization (ISO) Standard 9613-2, *Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation* (ISO 1996). This standard specifies the calculations to determine the reduction in noise levels due to the distance between the noise source and the receiver, the effect of the ground on the propagation of sound, and the effectiveness of natural barriers due to grade or man-made barriers, such as walls. The Cadna-A noise model used for the analysis of the Coyote Wind Farm also included adjustments for wind speed, wind direction and atmospheric stability, as defined by the Conservation of Clean Air and Water in Europe (CONCAWE 1981), as well as data and assumptions for the proposed wind farm equipment (BSA 2009) (Appendix G). Since atmospheric conditions can vary dramatically at large distances between a noise source and a receptor, the estimated levels should be assumed to be average noise levels, and temporary significant positive and negative deviations from the averages can occur (Harris 1998).

The results for the No Action Alternative are summarized on Figures 4.10-1 and 4.10-2, and in Table 4.10-2. The noise contours shown on the figures, which accounts for topography, indicates the predicted L_{eq} noise levels of the wind turbines at two wind speeds, 8.9 mph – the “cut in” speed where the wind turbine begins to rotate, and 17.9 mph – generally the maximum noise output of a wind turbine. The sound of a wind turbine is typically described as a “swishing” (van den Berg, Frits 2008, Pedersen and Waye 2004).

Table 4.10-2 summarizes the predicted No Action Alternative L_{eq} noise levels at the nearby residences. At lower wind speeds 32 feet above ground level (agl), the turbine noise is predicted to exceed the L_{eq} 35 dBA noise level criteria (Table 3.10-2) at five of the seven residences (Figure 4.10-2) at ground level. Therefore, the wind turbines may be heard at lower wind speeds at residences located within 0.75 miles downwind or crosswind (i.e., north, east and south) from the turbines.

Table 4.10-2 also compares the predicted No Action wind turbine L_{eq} noise levels to the predicted ambient (L_{90}) noise levels at the residences, per the noise level criteria listed in Table 3.10-2. The ambient L_{90} noise level helps quantify the acoustical character of an environment, such as "rural area," "urban area," or "noisy neighborhood" because it represents the residual noise between individual noise events, such as a vehicle pass-by or aircraft over flight. The more noise events that occur close together, the higher the L_{90} would be. The L_{eq} represents the noise level of a noise source. If a person was listening to one continuously operating noise source, such as a wind turbine, the L_{eq} and L_{90} noise levels at that location would be approximately equal. If the L_{eq} noise level of a proposed wind farm is greater than the existing ambient L_{90} noise level by 5 dBA or more, then the turbine noise would be clearly audible (Table 3.10-2) (Harris 1998).

The difference between the existing L_{90} and the L_{eq} of a proposed noise source in an area also helps determine if the new noise source would be audible. The higher the L_{eq} is above the L_{90}, the more clearly audible the new noise source would be. In general, a L_{eq} due to a continuous noise source that is less than the L_{90} would not be heard (Table 4.10-2).

As shown in Table 4.10-2, the No Action wind turbine L_{eq} noise levels are predicted to exceed the existing L_{90} noise level by +5 dBA or more (Table 3.10-2) at wind speeds of 8.9 mph (Figure 4.10-1) and 13.4 mph at five of the seven nearby residences, and at 17.9 mph at two residences (Figure 4.10-2). The largest differences between the wind turbine noise and the existing ambient noise occur at relatively low wind speeds and in these cases, the wind turbine noise is predicted to be heard at the nearby residences. The turbines would be operating at these lower wind speeds approximately 32% of the time (Martin pers. com. 2009). The turbines would be operating at higher wind speeds (>17.9 mph) approximately 68% of the time, and therefore, it is unlikely that the wind turbines would be audible at the nearby residences due to the ambient noise on the ground created by higher wind speeds.

Table 4.10-2. Predicted Noise Levels – No Action Alternative, Coyote Wind Project, Sweet Grass County, MT.

Residential Receptor	Receptor Distance to Nearest No Action Turbine	Wind Speed at 32 feet agl (mph)	Ground Level Ambient (L_{90}) Noise Level (dBA) Table 3.10-4	Ground Level Predicted No Action Turbine L_{eq} (dBA)	Ground Level No Action Turbine L_{eq} minus Ambient L_{90} (dBA)
		8.9	26	31	+5
		13.4	32	38	+6
R1	0.53 miles	17.9	38	38	0
		22.4	44	39	-5
		26.8	48	39	-9
R2	1,500 feet	8.9	26	38	+12
		13.4	32	46	+14
		17.9	38	46	+8
		22.4	44	47	+3

Residential Receptor	Receptor Distance to Nearest No Action Turbine	Wind Speed at 32 feet agl (mph)	Ground Level Ambient (L_{90}) Noise Level (dBA) Table 3.10-4	Ground Level Predicted No Action Turbine L_{eq} (dBA)	Ground Level No Action Turbine L_{eq} minus Ambient L_{90} (dBA)
		26.8	48	47	-1
		8.9	26	24	-2
		13.4	32	32	0
R3	0.7 miles	17.9	38	32	-6
		22.4	44	32	-12
		26.8	48	32	-16
		8.9	26	35	+9
		13.4	32	43	+11
R4	0.47 miles	17.9	38	43	+5
		22.4	44	43	-1
		26.8	48	43	-5
		8.9	26	33	+7
		13.4	32	40	+8
R5	0.75 miles	17.9	38	40	+2
		22.4	44	41	-3
		26.8	48	41	-7
		8.9	26	34	+8
		13.4	32	42	+10
R6	0.57 miles	17.9	38	42	+4
		22.4	44	42	-2
		26.8	48	42	-6
		8.9	26	26	0
		13.4	32	34	+2
R7	1.2 miles	17.9	38	34	-4
		22.4	44	34	-10
		26.8	48	34	-14

Shading: Noise level equals or exceeds noise impact criteria in **Table 3.10-2**.

Ambient noise along the Yellowstone River depends on the water flow rate and the surface turbulence of the moving water, as well as traffic on I-90 and other existing sources. At its closest point, the Yellowstone River is approximately 0.7 miles south of the project between residential receptors R3 and R5. Therefore, the noise levels of the No Action wind turbines would be slightly lower than at these residences. As shown on Figures 4.10-1 and 4.10-2, the wind turbine L_{eq} noise levels along the river are predicted to be approximately 20 to 40 dBA for the No Action Alternative. Therefore, the wind turbines may be audible if a listener is along calm water stretches of the river south of the project during low wind speeds. Either increased water turbulence, increased wind speed, or other area noise sources (e.g., I-90 traffic) would likely create enough noise to mask the sound of the turbines much of the time.

Maintenance Noise

For project maintenance activities, it is anticipated that four people would work on site using two vehicles (4x4 light trucks). At 25 mph, the maximum noise level of a typical light truck as it passes by a listener location is approximately 70 dBA (FHWA 1998). The closest residence to a county road is R3 (approximately 500 feet north), and R2 is the closest residence to a project (No Action) access road (approximately 1,400 feet east) (Figure 4.10-1). As shown in Table 4.10-3, a predicted light truck noise level of 31 dBA occurs at approximately 0.5 miles from a road. Therefore, up to 0.5 mile from a road, the maintenance trucks would be briefly audible as the truck passes by a receptor and inaudible at distances greater than 0.5 mile. This is equivalent to existing vehicle noise generated by residents.

Table 4.10-3: Maximum Noise Level for a Maintenance Vehicle Pass-By at 25 mph, Coyote Wind Project, Sweet Grass County, MT.

Type of equipment	Reference Noise Level at 50 ft. from Road (dBA)	Estimated Noise Level at 1,000 ft. from Road (dBA)	Estimated Noise Level at 0.5 mile from Road (dBA)	Estimated Noise Level at 1 mile from Road (dBA)
Vehicles (4x4 light truck)	70	44	31	20

Source: FHWA 1998.

4.10.1.2 Secondary Impacts

Wind turbine noise greater than 45 dBA may cause sleep disturbances or increased stress for some individuals, but otherwise, noise created by wind turbines does not cause health problems (van den Berg, Frits 2008). For the No Action Alternative, noise levels above L_{eq} 45 dBA are only predicted at residential receptor R2 (Figures 4.10-1 and 4.10-2) (Table 4.10-2) at lower wind speeds.

The effects of wind turbine noise on humans tends to be related to visibility of the wind turbines, economic benefit for a landowner related to the turbines, and a person's attitude toward wind turbines in general (van den Berg, Frits 2008, Pedersen and Waye 2004). When wind turbines are visible, residents are far more likely to be bothered by turbine noise. Benefiting economically from a wind farm decreases the level of irritation by residents due to noise.

Potential effects of noise on wildlife are documented in section 4.8.1.2.

4.10.1.3 Cumulative Impacts

Existing noise sources include wind-generated noise through grass and trees, farm equipment, vehicles traveling on county and private roads, wildlife and insects, aircraft flying overhead, water flowing in the Yellowstone River and nearby creeks, traffic on I-90, and trains on the tracks south of the Yellowstone River. The cumulative impact would be the combination of the existing noise sources plus the wind turbine noise.

4.10.1.4 Mitigation

Noise mitigation measures were considered for the construction, operation and maintenance phases of the wind farm project.

Construction and Maintenance

Construction and maintenance project noise could be reduced by implementing the following possible noise mitigation measures:

- Restrict the construction and maintenance operations to daytime hours (7:00 am to 7:00pm).
- Combine noisy operations to occur for short durations during the same time periods.
- Use new equipment rather than older equipment.

- On all diesel-powered construction equipment, replace standard back-up alarms with approved manually adjustable, ambient-sensitive, directional sound technology, or strobe light alarms. Adjustable and ambient-sensitive alarms typically limit the alarm noise to 5 to 10 dBA above the background noise, which would still typically be audible behind the equipment.
- Install high-grade mufflers on all diesel-powered equipment.
- Implement a regular maintenance schedule to ensure that all construction and maintenance equipment, as well as the wind turbine motors, blades, etc. are operating properly.

Operation Noise

The effects of operational noise from the project could be reduced by relocating those wind turbines expected to be most audible at residences. However, Enerfin has reached agreements about turbine placement with the private landowners whose land would be used for the project, so this should not be necessary (deVicente pers. com. 2009). The proposed Vestas wind turbines are currently the best available technology with regard to noise abatement.

4.10.2 Proposed Action Alternative

Eight wind turbines are planned for the Proposed Action Alternative. The predicted noise levels for the Proposed Action Alternative discussed below include the noise levels for the No Action Alternative in addition to the eight turbines proposed to be located on the state parcel.

4.10.2.1 Direct Impacts

The noise of the Proposed Action Alternative is summarized in Table 4.10-4 and on Figures 4.10-3 and 4.10-4, (the combination of noise due to the 36 turbines considered in the No Action Alternative plus 8 turbines proposed for the state parcel). The Proposed Action Alternative noise impacts are predicted to be at the same receptors as those described for the Operation Noise portion of the No Action Alternative (Section 4.10.1.1). The additional turbines of the Proposed Action Alternative would provide an incremental increase in noise, but are not predicted to change the turbine noise levels at the residences compared to the No Action Alternative.

Table 4.10-4. Predicted Noise Levels – Proposed Action Alternative, Coyote Wind Project, Sweet Grass County, MT.

Residential Receptor	Receptor Distance to Nearest No Action Turbine	Wind Speed at 32 feet agl (mph)	Ground Level Ambient (L_{90}) Noise Level (dBA) Table 3.10-4	Ground Level Predicted Cumulative Turbine L_{eq} (dBA)	Ground Level Cumulative Turbine L_{eq} minus Ambient L_{90} (dBA)
R1	0.53 miles	8.9	26	31	+5
		13.4	32	39	+7
		17.9	38	39	+1
		22.4	44	39	-5
		26.8	48	39	-9
R2	1,500 feet	8.9	26	39	+13
		13.4	32	46	+14
		17.9	38	46	+8
		22.4	44	47	+3
		26.8	48	47	-1
R3	0.7 miles	8.9	26	24	-2

Residential Receptor	Receptor Distance to Nearest No Action Turbine	Wind Speed at 32 feet agl (mph)	Ground Level Ambient (L_{90}) Noise Level (dBA) Table 3.10-4	Ground Level Predicted Cumulative Turbine L_{eq} (dBA)	Ground Level Cumulative Turbine L_{eq} minus Ambient L_{90} (dBA)
		13.4	32	32	0
		17.9	38	32	-6
		22.4	44	32	-12
		26.8	48	32	-16
R4	0.47 miles	8.9	26	35	+9
		13.4	32	43	+11
		17.9	38	43	+5
		22.4	44	43	-1
		26.8	48	43	-5
R5	0.75 miles	8.9	26	33	+7
		13.4	32	40	+8
		17.9	38	40	+2
		22.4	44	41	-3
		26.8	48	41	-7
R6	0.57 miles	8.9	26	34	+8
		13.4	32	42	+10
		17.9	38	42	+4
		22.4	44	42	-2
		26.8	48	42	-6
R7	1.2 miles	8.9	26	26	0
		13.4	32	34	+2
		17.9	38	34	-4
		22.4	44	34	-10
		26.8	48	34	-14

Shading: Noise level equals or exceeds noise impact criteria in **Table 3.10-2**.

4.10.2.2 Secondary Impacts

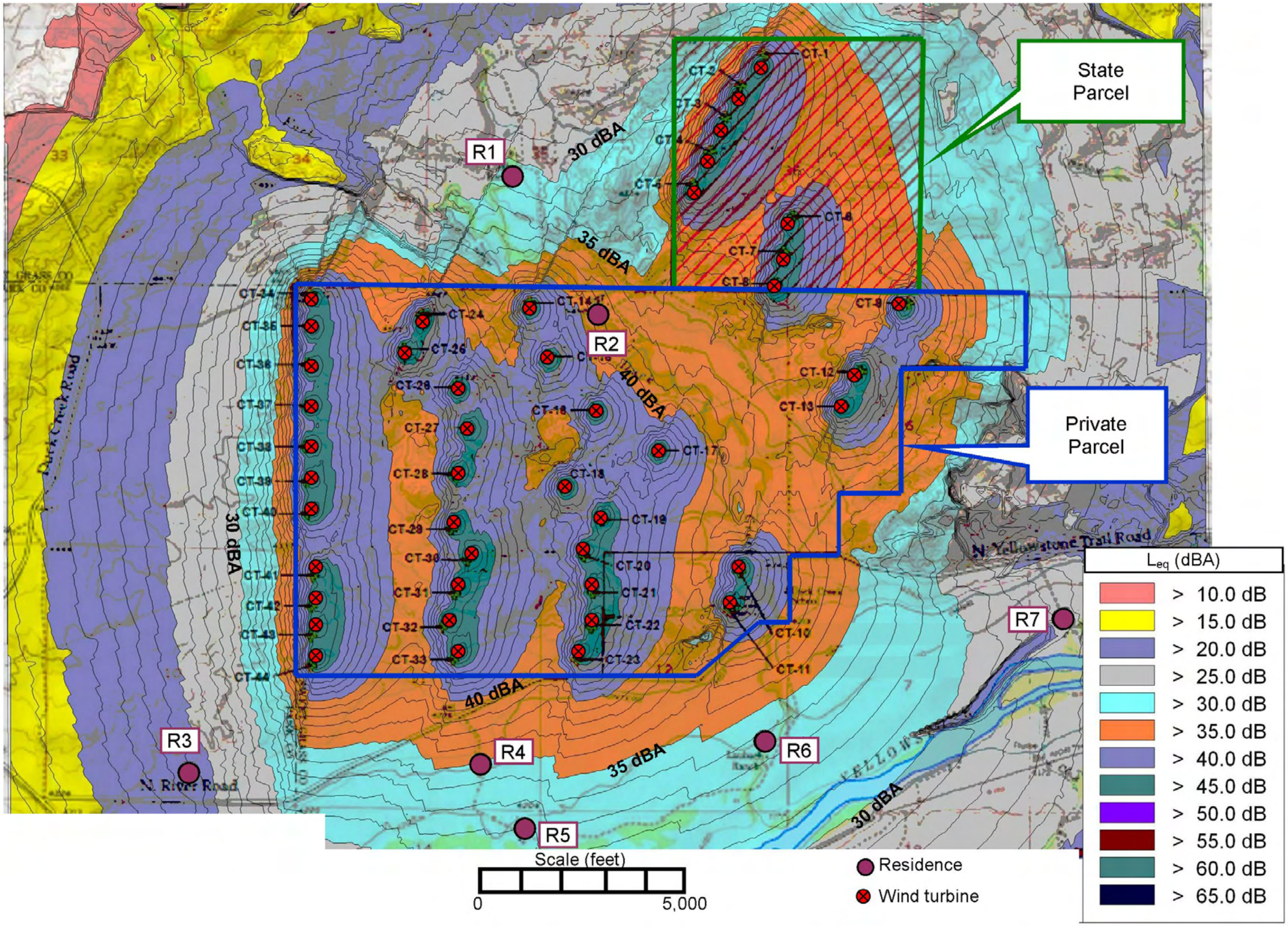
The secondary impacts to noise levels from the Proposed Action Alternative are the same as described for the No Action Alternative.

4.10.2.3 Cumulative Impacts

The cumulative impacts to noise levels from the Proposed Action Alternative are the same as described for the No Action Alternative.

4.10.2.4 Mitigation

Suggested mitigation measures for the Proposed Action Alternative are the same as the No Action Alternative mitigation discussed in Section 4.10.1.4.



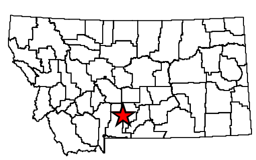


FIGURE 4.10-3 PREDICTED NOISE CONTOURS - PROPOSED ACTION ALTRENATIVE (WIND SPEED 8.9 MPH), COYOTE WIND PROJECT, SWEET GRASS COUNTY, MT.

SOURCE:
BIG SKY ACOUSTICS, LLC

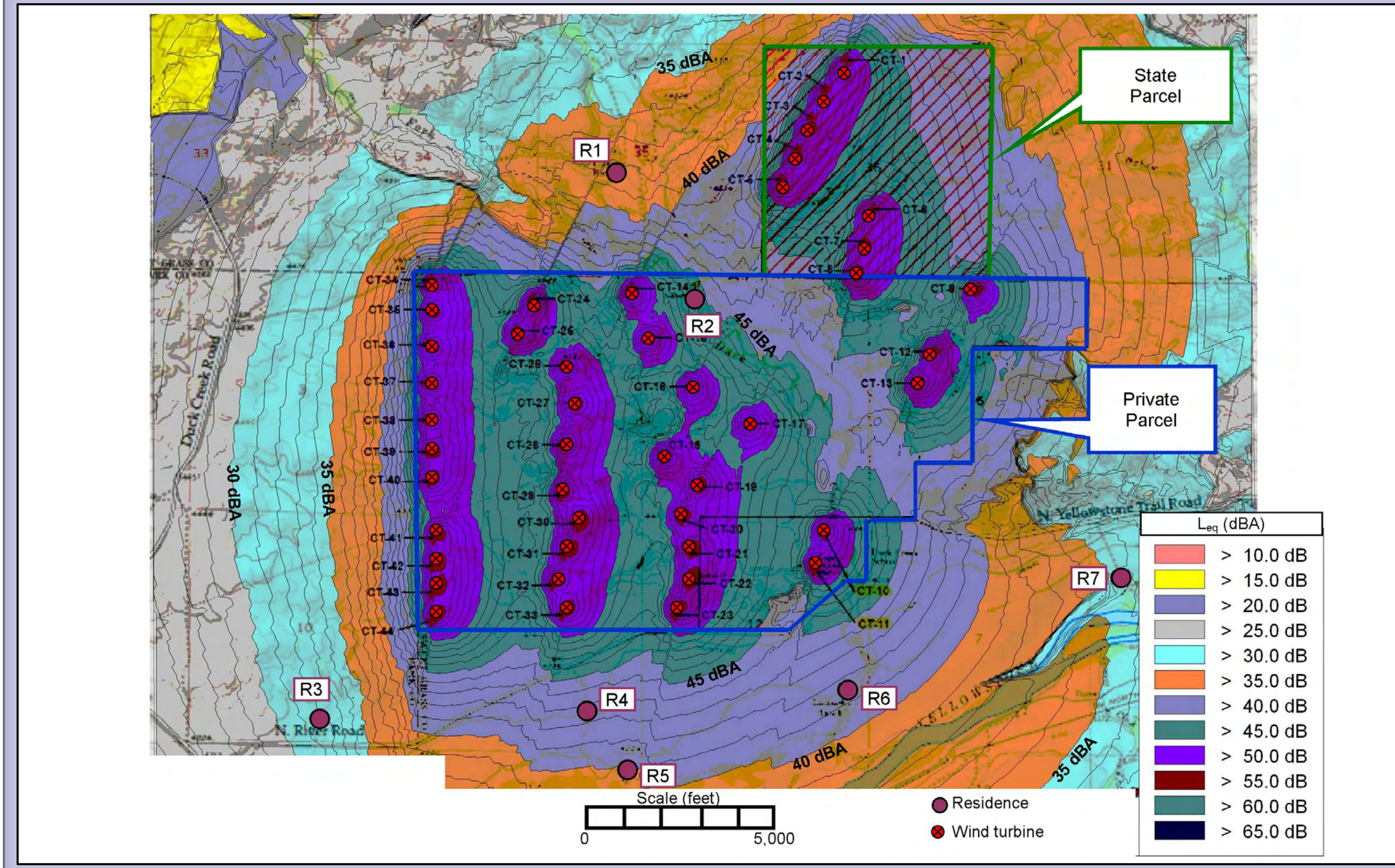


FIGURE 4.10-4 PREDICTED NOISE CONTOURS - PROPOSED ACTION ALTRENATIVE (WIND SPEED 17.9 MPH), COYOTE WIND PROJECT, SWEET GRASS COUNTY, MT.

SOURCE:
BIG SKY ACOUSTICS, LLC

4.11 Visual Resources

4.11.1 No Action Alternative

All of the visual impacts are direct.

Construction activities would be visible from the North River Road and I-90 depending on the phase of construction and the vantage point viewed from. These impacts would be short term and would include views of construction cranes and other heavy equipment, increased traffic in the area, and potentially increased dust from roadways. Equipment laydown areas would be visible from some vantage points along public roadways.

Figures 4.11-1 and 4.11-2 are photographic simulations of the wind project once fully constructed under the No Action and Proposed Action alternatives. Figure 4.11-1 is a simulation of the wind turbines as viewed from the North River Road, just north of the Duck Creek School. Approximately three of the 36 turbines are visible. Figure 4.11-2 shows the view of the turbines associated with the No Action Alternative from I-90 near the Sweet Grass/Park County line, looking northeast towards the project. Most of the turbines are visible, some more prominently than others.

Figures 4.11-3 and 4.11-5 are nighttime simulations under the No Action Alternative at the same locations as the daytime simulations. Because the nighttime photographs are very dark, enhanced images are also depicted for viewer orientation. These simulations show very little visibility of turbines at night, even with the FAA required lighting. Figure 4.11-7 shows which turbines would have the FAA required lighting (for both alternatives).

In general, public perception of viewing turbines associated with the wind project is highly subjective. Some people are positively affected by the sight of turbines, and others prefer a landscape without them.

4.11.2 Proposed Action Alternative

The visual impacts from construction activities associated with the Proposed Action are similar to those of the No Action Alternative. The location of the state parcel, further away from more heavily traveled areas, would mitigate the visual effect from construction in that area. As with the No Action Alternative, construction impacts would be short term in nature.

Figures 4.11-1 and 4.11-2 also show photographic simulations of the wind project once fully constructed under the Proposed Action Alternative. All additional eight turbines would be visible from North River Road. From I-90 at the Springdale exit, most of the visible turbines would be associated with the No Action Alternative. The turbines on the state parcel would not be prominent in the viewshed.

Figures 4.11-4 and 4.11-6 are the nighttime simulations with enhanced images, under the Proposed Action Alternative, also at the same locations as the daytime simulations. Similar to the No Action Alternative simulations, the Proposed Action visibility of turbines at night is very minimal.

4.12 Airfields

4.12.1 No Action Alternative

4.12.1.1 Direct Impacts

Under the No Action Alternative, the Project would be far enough removed from the nearest airfield so as not to cause an infringement on required aircraft approach slopes, but structures would be tall enough to require FAA notification and Obstruction Evaluation/Airport Airspace Analysis. Coyote Wind would comply with all FAA requirements regarding notification and lighting.

The project site is approximately 9.5 miles west/northwest of the Big Timber Airport's paved runway. The prohibition on obstacle height at this distance is 2,508 feet, well above the 393 to 410-foot height of the turbines. Due to the relatively small area affected by the wind farm and distance from the nearest airport, no direct impacts to general aviation would likely be associated with the No Action Alternative.

The No Action Alternative would result in the presence of additional structures for aircraft to avoid. The impact on commercial, recreational, and general aviation would be minimal, as current FAA Regulations require all aircraft to fly, at a minimum, 500 feet above ground level in open country, and 1000 feet above any inhabited structure when within one-half mile of said structure. Regulations for agricultural operations differ, and such operations may be directly affected if aerial application of agricultural chemicals occurs on properties adjacent to the Project.

4.12.1.2 Secondary Impacts

There would be no secondary impacts from the No Action Alternative on aviation.

4.12.1.3 Cumulative Impacts

Construction of the wind farm would result in the presence of additional structures for aircraft to avoid for the life of the project, but these impacts would be minimal.

4.12.1.4 Mitigation

As long as all lighting measures required by the FAA are implemented, no mitigation would be required.

4.12.2 Proposed Action Alternative

The direct, indirect, and cumulative impacts and mitigation under the Proposed Action would be the same as described for the No Action Alternative.

No Action - North River Road View

Proposed Action - North River Road View

Technical Design

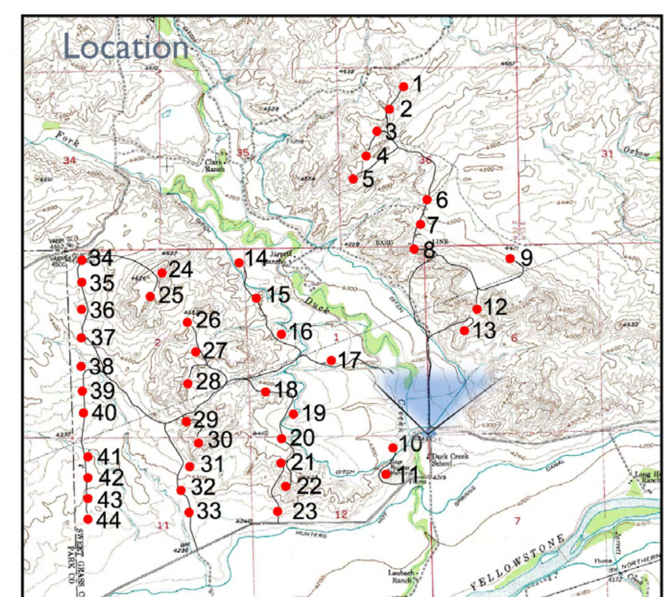
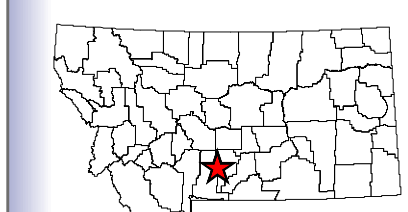


FIGURE 4.11-1.
VISUAL SIMULATION
OF LANDSCAPE UNDER
NO ACTION AND
PROPOSED ACTION
ALTERNATIVES VIEWED
FROM NORTH RIVER ROAD,
SWEET GRASS COUNTY, MT.



GANDA

SOURCE:
ENERFIN ENERGY COMPANY

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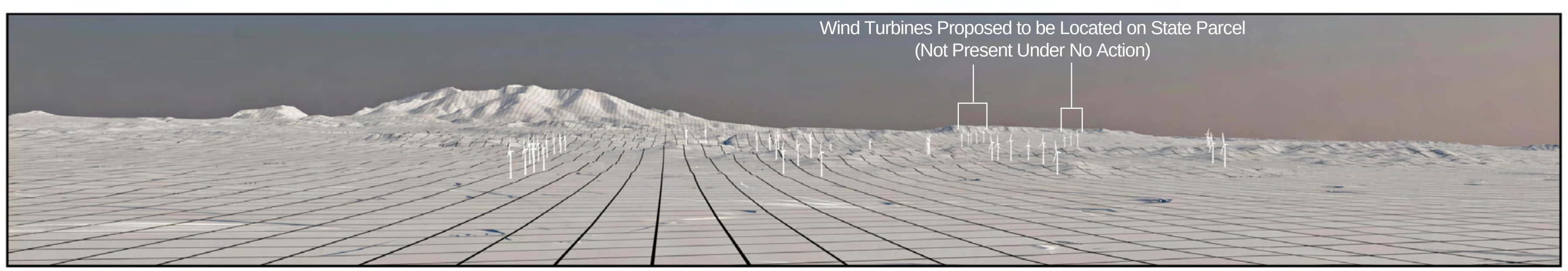
No Action - I-90 View

Proposed Action - I-90 View



Technical Design

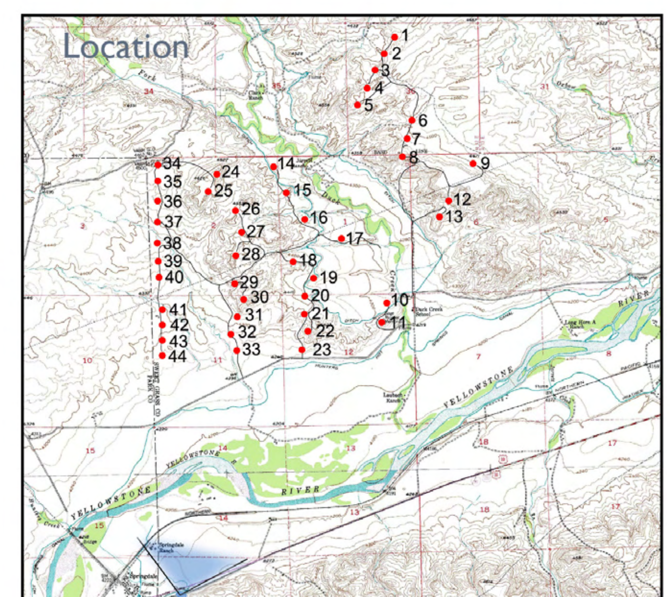
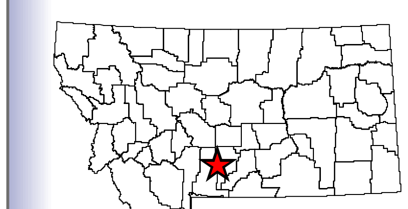


FIGURE 4.11-2.
VISUAL SIMULATION OF LANDSCAPE UNDER NO ACTION AND PROPOSED ACTION ALTERNATIVES VIEWED FROM THE SPRINGDALE EXIT, I-90, SWEET GRASS COUNTY, MT.



GANDA

SOURCE:
ENERFIN ENERGY COMPANY

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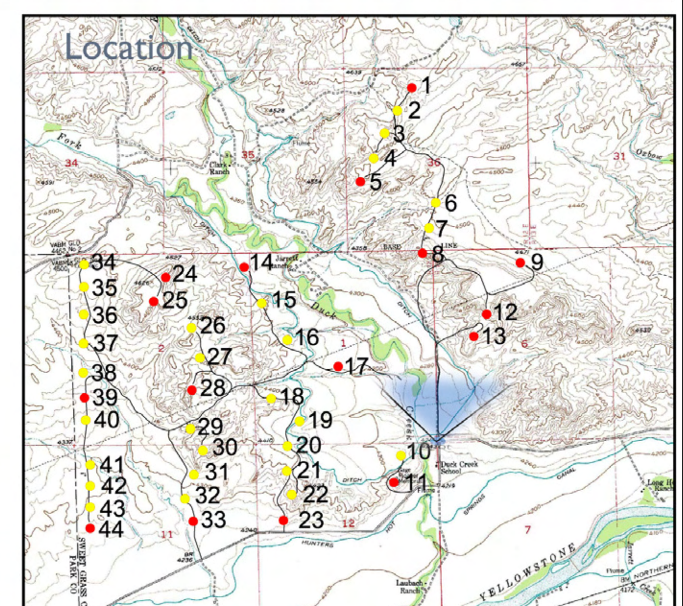
No Action - North River Road Night Simulation View

No Action - North River Road Night Simulation View (Photo Enhanced for Orientation)

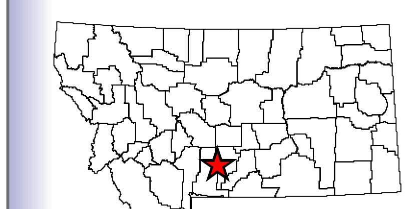
Turbines With Lights

Turbines Without Lights



Technical Design

FIGURE 4.11-3.
VISUAL SIMULATION
OF LANDSCAPE AT NIGHT
UNDER THE
NO ACTION
ALTERNATIVE VIEWED
FROM NORTH RIVER ROAD,
SWEET GRASS COUNTY, MT.



GANDA

SOURCE:
ENERFIN ENERGY COMPANY

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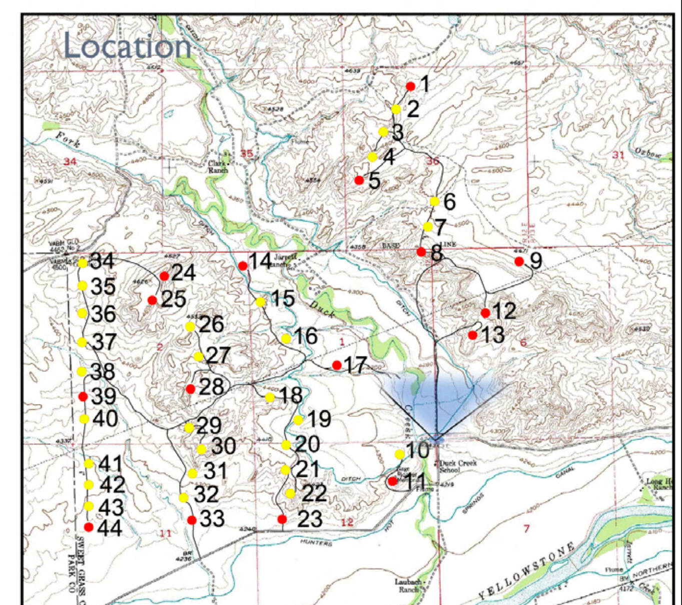
FIGURE 4.11-4.
VISUAL SIMULATION
OF LANDSCAPE AT NIGHT
UNDER THE
PROPOSED ACTION
ALTERNATIVE VIEWED
FROM NORTH RIVER ROAD,
SWEET GRASS COUNTY, MT.

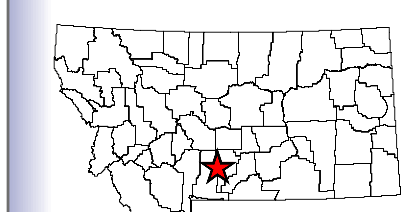
Proposed Action - North River Road Night Simulation View

Proposed Action - North River Road Night Simulation View (Photo Enhanced for Orientation)

Technical Design

Turbines With Lights
Turbines Without Lights





GANDA

SOURCE:
ENERFIN ENERGY COMPANY

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FIGURE 4.11-5.
VISUAL SIMULATION
OF LANDSCAPE AT NIGHT
UNDER THE
NO ACTION
ALTERNATIVE VIEWED
FROM THE
SPRINGDALE EXIT, I-90,
SWEET GRASS COUNTY, MT.

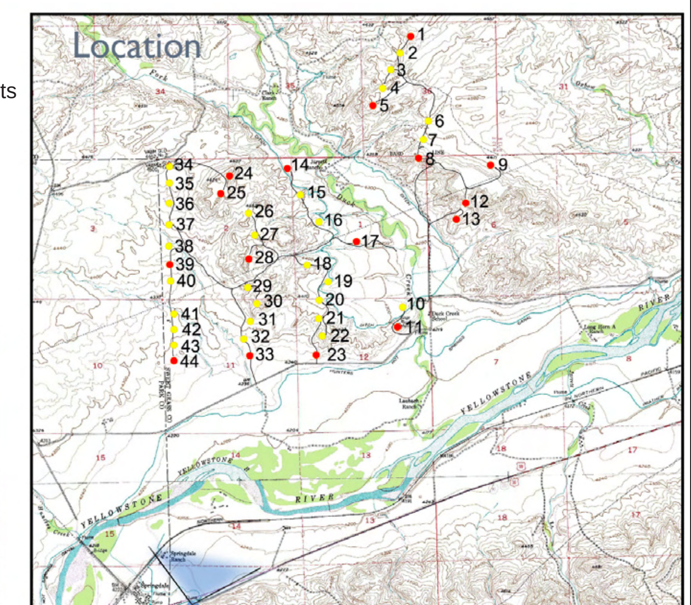
No Action - I-90 Night Simulation View

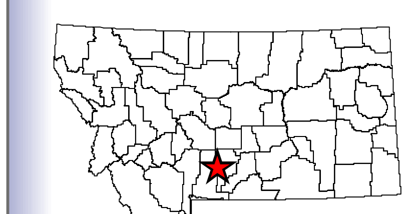
No Action - I-90 Night Simulation View (Photo Enhanced for Orientation)

Technical Design

Turbines With Lights

Turbines Without Lights





GANDA

SOURCE:
ENERFIN ENERGY COMPANY

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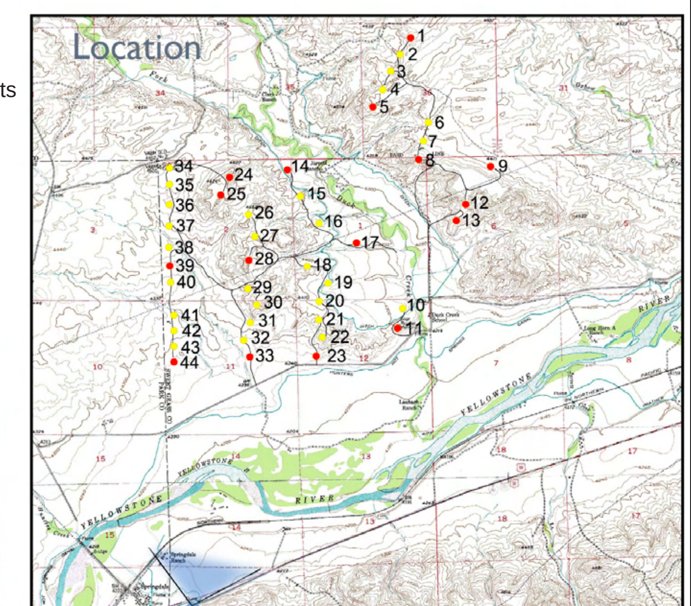
Proposed Action - I-90 Night Simulation View

Proposed Action - I-90 Night Simulation View (Photo Enhanced for Orientation)

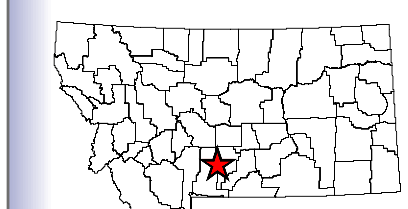
Turbines With Lights

Turbines Without Lights



Technical Design

FIGURE 4.11-6.
VISUAL SIMULATION OF LANDSCAPE AT NIGHT UNDER THE PROPOSED ACTION ALTERNATIVE VIEWED FROM THE SPRINGDALE EXIT, I-90, SWEET GRASS COUNTY, MT.



GANDA

SOURCE:
ENERFIN ENERGY COMPANY

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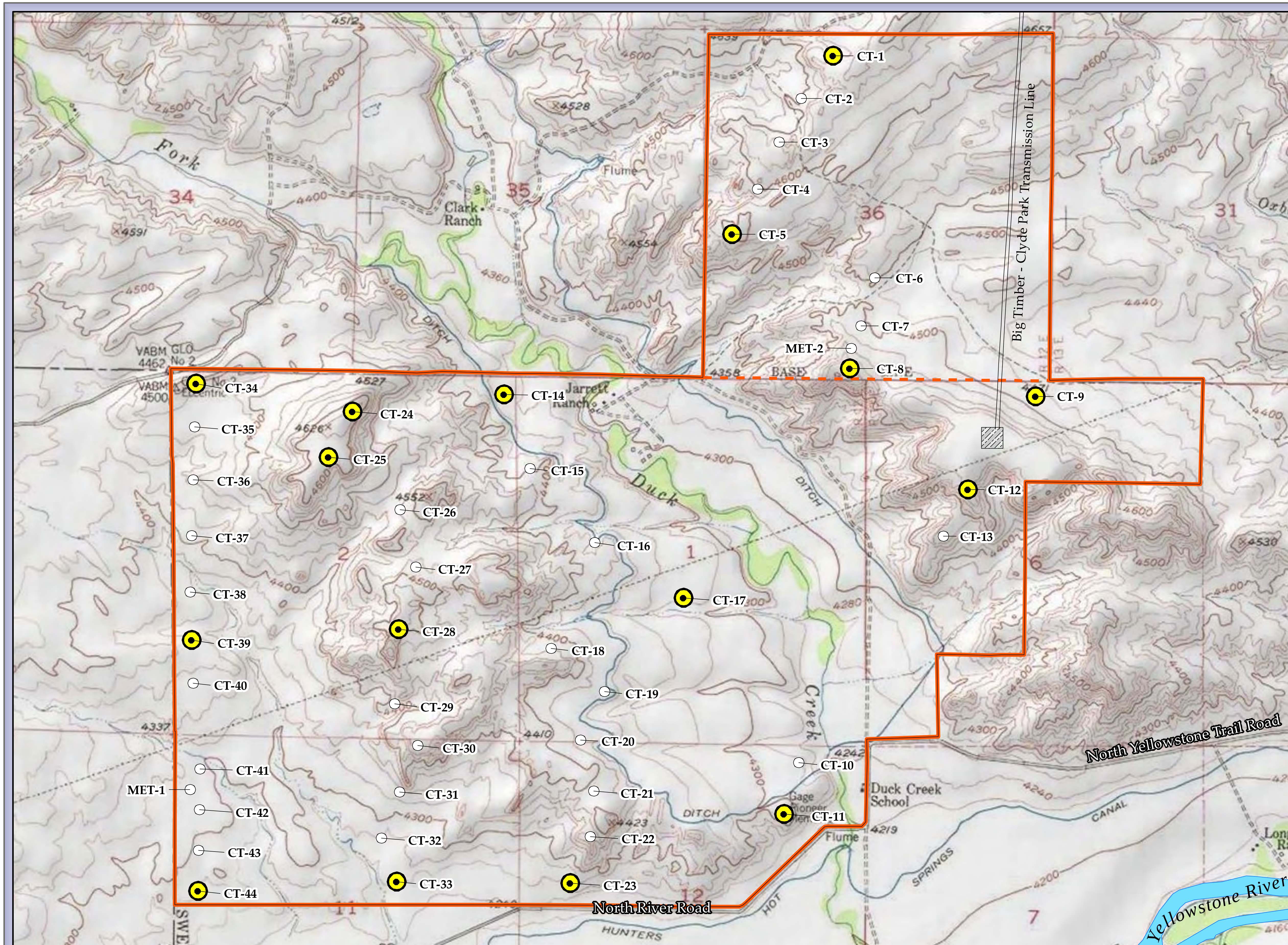
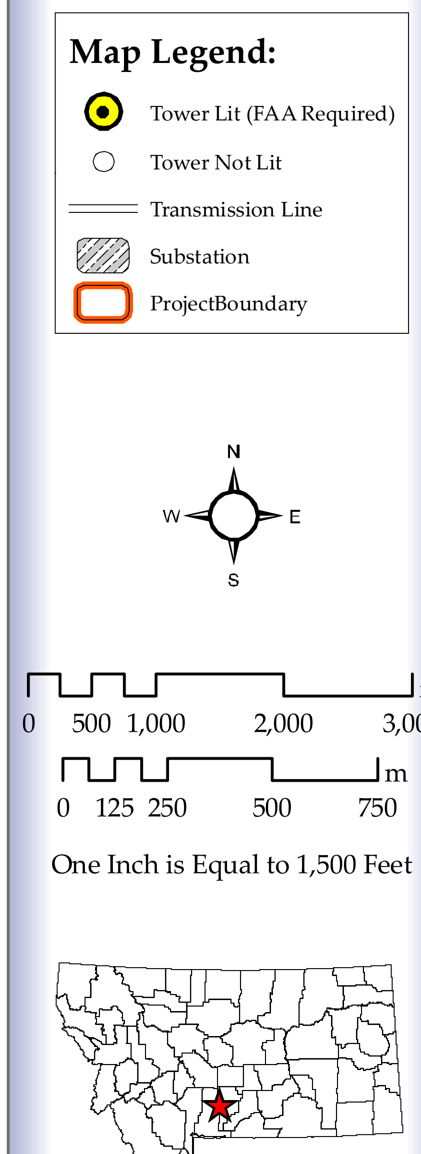
FIGURE 4.11-7.
TURBINES WITH FAA REQUIRED LIGHTING UNDER THE NO ACTION AND PROPOSED ACTION ALTERNATIVES
COYOTE WIND PROJECT

Sweet Grass County, Montana





GANDA

SOURCES:
MONTANA NATURAL RESOURCE INFORMATION SYSTEM (NRIS)
ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE (ESRI)
USDA-FSA ORTHO PHOTO FLIGHT: AUGUST 25, 2005

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Chapter 5: Consultation and Coordination

5.1 Geology and Soils

None

5.2 Hydrology and Water Quality

Contact Name	Title	Agency	Date of Contact
Wease Bollman	Chief Biologist	Rhithron Associates, Inc	February 2, 2009
Michael Pipp	Data Management Program Manager	Montana Department of Environmental Quality – TMDL Program	February 2, 2009

5.3 Land Use and Recreation

Contact Name	Title	Agency	Date of Contact
Jeff Bollman	Area Planner	Montana Department of Natural Resources and Conservation, Southern Land Office	November 20, 2008, December 16, 2008
Richard Moore	Area Manager	Montana Department of Natural Resources and Conservation Southern Land Office	June 15, 2009
Larry P. Ostwald	Advisor	Conoco Philips, Inc.	March 5, 2009

5.4 Transportation

Contact Name	Title	Agency	Date of Contact
Jim Skinner	Manager	Montana Department of Transportation, Program and Policy Analysis Division	November 16, 2008, November 26, 2008
Randy Wordell	Supervisor	Sweet Grass County Road Department	December 10, 2008
Ed Hillman	Supervisor	Park County Montana Road and Bridge Department	December 12, 2008

5.5 Socioeconomics

Contact Name	Title	Agency	Date of Contact
Jeff Bollman	Area Planner	Montana Department of Natural Resources and Conservation, Southern Land Office	December 15, 2008, March 2, 2009
Gonzalo Martin	Engineer	Enerfin Energy Company	May 7, 2009
Kory Hofland	Unit Manager	Montana Department of Revenue, Business Tax and Valuation Bureau	January 7, 2009, July 1, 2009
Keith Broussard	Corporate Auditor	Montana Department of Revenue	January 26, 2009
Ben Hoen	Author/former graduate student		March 1, 2009 March 2, 2009
Grace Gilmore		Montana Department of Revenue	Dec, 23 2008

Contact Name	Title	Agency	Date of Contact
			January 6, 2009
Livingstone Area Chamber of Commerce (did not identify their name in their email)		Livingstone Area Chamber of Commerce	January 21, 2009
H. Jarrett	Chamber Executive	Sweet Grass County Chamber of Commerce	January 22, 2009
Anne Marie Matalucci	Sales Director	Vestas Americas Inc.	July 1, 2009

5.6 Terrestrial Vegetation and Habitats

None

5.7 Wildlife

Contact Name	Title	Agency	Date of Contact
Jeff P. Smith	Conservation Science Director	HawkWatch International	November 18, 2008
Justin I. Paugh	Wildlife Biologist	Montana Fish Wildlife and Parks, Region 3	December 18, 2008
Kristi DuBois	Native Species Biologist and Bat Working Group Coordinator	Montana Fish Wildlife and Parks, Region 2	April 29, 2008
Doug Johnson	Wildlife Biologist	United States Geological Survey	February 27, 2009
Rick Jarrett	Owner	Crazy Mountain Cattle Company	May 5, 2008
Ed B. Arnett	Co-Director of Programs & Conservation Scientist	Bat Conservation International	April 8, 2008
Allison Begley	Native Species Biologist, Wildlife Division	Montana Fish Wildlife and Parks, Billings	July 1, 2009
Lou Hanebury	Wildlife Biologist	US Fish and Wildlife Service, Billings suboffice	April 2008

5.8 Cultural Resources

Contact Name	Title	Agency	Date of Contact
Damon Murdo	Cultural Records Manager	Montana Historical Society	November 13, 2008, December 10, 2008

5.9 Noise

None

5.10 Aesthetics

None

5.11 Aviation

Contact Name	Title	Agency	Date of Contact
Boyd Morgan	President	Association of Montana Aerial Applicators	March 13, 2009
Richard Roehm	Board Chair	Gallatin Field Airport	March 12, 2009

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Chapter 6: List of Preparers

Preparer	Area of Expertise	Education
Enerfin Sociedad de Energia (Enerfin)		
Juan Pablo de Vicente	Technical Manager	B.S. Physicist, University Autonoma, Madrid. Alternative energy sources specialist. Wind Energy development operation and maintenance specialist. PV Solar technical management.
Sara Diaz Martí	Manager Business Development USA & Canada	Forest Engineering, Universidad Politecnica, Madrid
Daniel Abelson	Project manager USA	B.A. *(with Honors)* History, University of Michigan, Ann Arbor. B.S. *(with Honors)* Renewable Energy Engineering Oregon Institute of Technology. Portland
Montse Talavera	Environmental Department	B.S. Geology, University Complutense, Madrid.
Gonzalo Martin	Civil Engineer	Civil Engineering, University Alfonso X el sabio, Madrid.
Garcia and Associates		
Pam Spinelli	Terrestrial Ecology; Wildlife Biology	M.S. Wildland Resource Science, University of California, Berkeley B.A. Environmental Studies/Natural History, University of California, Santa Cruz B.A. Economics, University of California, Santa Cruz
Wendy Roberts	Aquatic ecology	Ph.D. Zoology, University of California, Berkeley A.B. Biology *(cum laude)*, Mt. Holyoke College
Graham Neale	Wildlife Biology	M.S. Wildlife Biology, University of Montana, Missoula B.A. Intercultural Studies and Economics, Warren Wilson College, NC
Josh Robino	Terrestrial Ecology	B.S. *(with honors)* Earth Sciences, Geography
Jeanne Knox	Fisheries; Aquatic Resources	B.S. Fish and Wildlife Management, Montana State University
Heather Johnson	Wildlife Biology, Bat Ecology	M.S. Biological Conservation, California State University, Sacramento B.S. Biological Sciences, California State University, Sacramento, 1991
Dagny Krigbaum	Cultural-Heritage Resources	M.A. Museum Education (Specialization in American Civilization & Historic Preservation), George Washington University B.A. Anthropology, (Specialization in North American Archaeology) University of Colorado

Preparer	Area of Expertise	Education
Sian Mooney, Associate Professor, Dept. of Economics, Boise State University		
Sian Mooney	Socioeconomics	Ph.D. Resource and Environmental Economics, Oregon State University M.S. Agricultural Economics and Farm Management, University of Manitoba B.S.(Hons) 1987 Agricultural Economics University College of Wales – Aberystwyth
John Petrovsky		
John Petrovsky	Land use; Recreation	M.L.A. California State Polytechnic University, Pomona B.A. (Honors) University of California, Los Angeles
Big Sky Acoustics, LLC		
Sean Connolly, P.E.	Acoustical Engineering	M.S. Mechanical Engineering, North Carolina State University B.S. Mechanical Engineering, North Carolina State University
Cossitt Consulting		
Anne Cossitt	Facilitator services	MA - Public Affairs, Univ. of Minnesota, H.H. Humphrey Institute of Public Affairs BA - Art History, University of California, Santa Barbara

Chapter 7: Response to Public Comments

To be completed in Final EIS after public comment period.

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Bollman, J. 2009. Area Planner, Southern Land Office, Department of Natural Resources and Conservation, Trust Land Management Division, Billings, MT. Personal communication. March 2, 2009.

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Appendices

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Appendix A - Background Information about Enerfin Energy Company

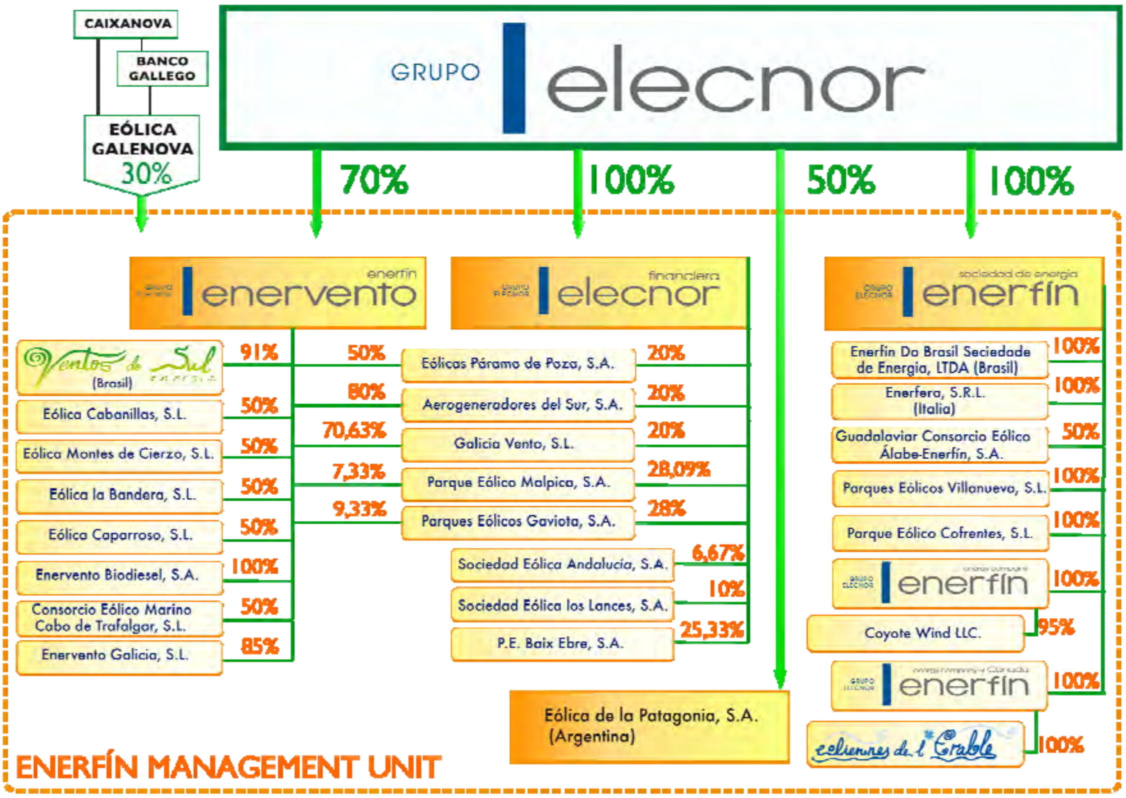
ENERFIN SOCIEDAD DE ENERGÍA

Owned 100% by Elecnor Group, this company was set up on January 20, 2005 as a consequence of the reorganization of the corporate structure of the former Enerfin, S.A, that also belonged to Elecnor.

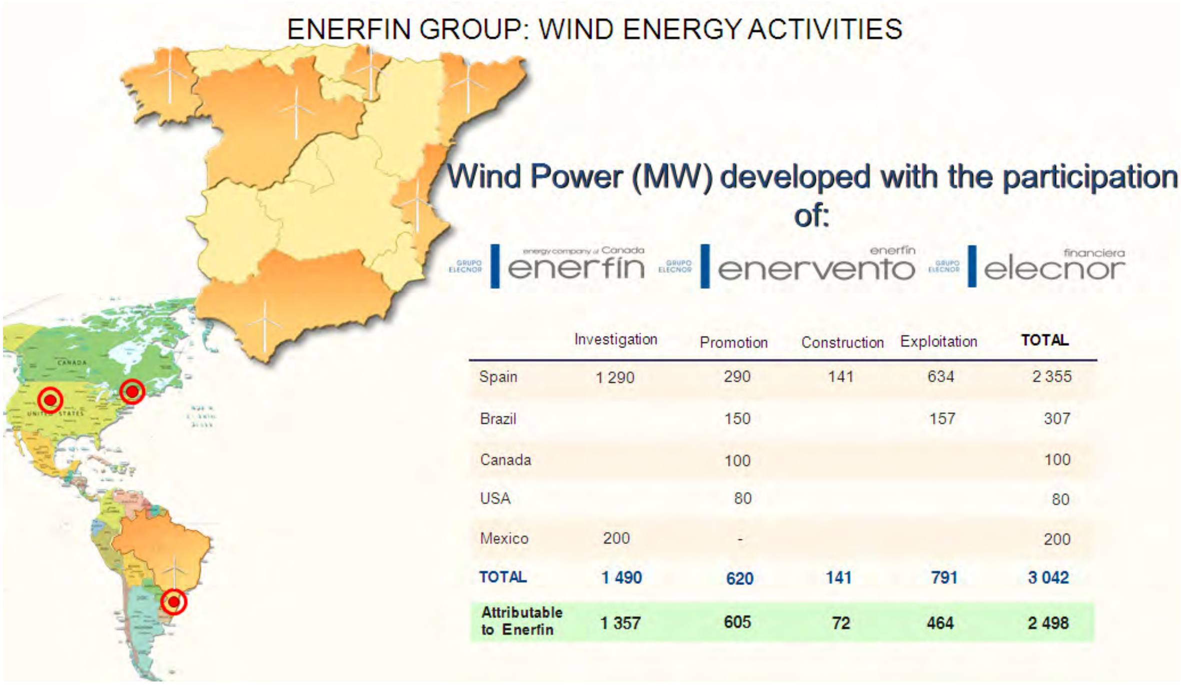
ENERFIN has been developing and operating wind farms since 1997.

Today, ENERFIN not only handles its own project portfolio of wind farm projects, but also renders supervision and technical, financial, administrative and accounting operational management for the wind power subsidiaries of the Elecnor Group: Enerfin-Enervento, S.A., Elecnor Financiera, S.L., Eólica de la Patagonia, S.A. and their respective investing companies.

These companies, which are managed on a unified basis, hold the different interests in the wind projects currently in operation.



Through its different subsidiaries, ENERFIN currently has developed almost 800 MWs; also it is starting the operation of new 66.7 MW and a pipeline of 2000 additional MW, in Spain, South America and North America. From the 800 MW developed, Enerfin directly owns and operate more than 460 MW.



	Investigation	Promotion	Construction	Exploitation	TOTAL
Spain	1 290	290	141	634	2 355
Brazil		150		157	307
Canada		100			100
USA		80			80
Mexico	200	-			200
TOTAL	**1 490**	**620**	**141**	**791**	**3 042**
Attributable to Enerfin	**1 357**	**605**	**72**	**464**	**2 498**

For ENERFIN, 2006 was the year of the consolidation as a full-service manager of projects abroad. The year big landmark in that area was the commissioning of the biggest wind power project in all of Latin America, spanning three wind farms providing a total of 150 MW.

The wind farms located in the state of Río Grande do Sul, Brazil, were developed by Enerfín Enervento, S.A. (ENERFIN's affiliate) through its brazilian subsidiary Ventos do Sul.

This project was registered with the U.N. as a Clean Development Mechanism. Enerfin leaded the process of the financing, receiving the 2005 Euromoney award to finance renewable energy sources in Latin America.

Among others, the services carried out by ENERFIN for its projects are the following:

- Technical studies:
- Wind potential evaluation
- Energy production study
- Environmental impact assessment
- Basic projects
- Comparative analysis and evaluation of technologies
- Economic-financial studies:
- Feasibility plan
- Financing development

- Administrative procedure of projects
- Permits and approvals management
- Construction and assembly on “turn-key” basis.
- Operation management
- Maintenance

In the following tables are showed the main projects developed by different affiliates of Enerfin, and built by ELECNOR.

ENERFÍN-ENERVENTO’s wind farms in Navarra (150 MW)

	Serralta Wind Farm	**San Gregorio** Wind Farm	**Montes de Cierzo** Wind Farm	**La Bandera** Wind Farm	**Caparroso** Wind Farm
Location	Cabanillas, (Navarra, Spain)	Cabanillas, (Navarra, Spain)	Cabanillas, (Navarra, Spain)	Cabanillas, (Navarra, Spain)	Cabanillas, (Navarra, Spain)
Installed Capacity	15 MW	15 MW	59,5 MW	30 MW	30 MW
WTG Model	Ecotecnia 44/600 kW	Ecotecnia 44/600 kW	Ecotecnia 44/600 kW	Ecotecnia 44/600 kW	Ecotecnia 44/600 kW
Client/Distributor	Iberdrola Distribución Eléctrica, S.A.	Iberdrola Distribución Eléctrica, S.A.	Iberdrola Distribución Eléctrica, S.A.	Iberdrola Distribución Eléctrica, S.A.	Iberdrola Distribución Eléctrica, S.A.
Planned/Actual commencement dates	June 1998/ August 1998	June 1998/ August 1998	March 2000/ June 2000	December 2000/ December 2000	April 2001/ April 2001

Ownership

Serralta Wind Farm: EÓLICA CABANILLAS, S.L. (constituted by EBRO ENERGÍA, S.L. and ENERFIN ENERVENTO, S.A. (ENERFIN’s affiliate))
San Gregorio Wind Farm: EÓLICA CABANILLAS, S.L. (constituted by EBRO ENERGÍA, S.L. and ENERFIN ENERVENTO, S.A. (ENERFIN’s affiliate))
Montes de Cierzo W. F. (Phase I and II): EÓLICAS MONTE DE CIERZO S.L. (constituted by EBRO ENERGÍA, S.L. and ENERFIN ENERVENTO, S.A. (ENERFIN’s affiliate))
La Bandera Wind Farm: EÓLICA LA BANDERA, S.L. (constituted by EBRO ENERGÍA, S.L. and ENERFIN ENERVENTO, S.A. (ENERFIN’s affiliate))
Caparroso Wind Farm: EÓLICA CAPARROSO, S.L. (constituted by EBRO ENERGÍA, S.L. and ENERFIN ENERVENTO, S.A. (ENERFIN’s affiliate))

Role of the Bidder or Bidder’s affiliates

- Design and engineering development were undertaken by ENERFIN.
- Construction (“Turn-Key”), testing and placement into service were carried out by ELECNOR S.A. and ECOTECNIA. Supervision was done by ENERFIN.

PARAMO DE POZA Wind Farm, Phase I and II (99.75 MW)

	Paramo de Poza Wind Farm (Phase I)	**Paramo de Poza** Wind Farm (Phase II)
Location	Municipality of Poza de la Sal (Burgos, Spain)	Municipality of Poza de la Sal (Burgos, Spain)
Installed Capacity	49.5 MW	50.25 MW
WTG Model	Ecotecnia 48/750 kW	Ecotecnia 48/750 kW
Client/Distributor	Iberdrola Distribución Eléctrica, S.A.	Iberdrola Distribución Eléctrica, S.A.
Planned/Actual Start up dates	June 2002 / June 2002	September 2002 / September 2002

Ownership
EÓLICAS PÁRAMO DE POZA, S.A., constituted by: ENERFIN ENERVENTO S.A. (ENERFIN's affiliate) ELECNOR FINANCIERA, S.L. (ELECNOR Group) and UNIÓN DE GENERADORES DE ENERGÍA S.L.

Role of the Bidder or Bidder's affiliates
- Design and engineering development were undertaken by ENERFIN SOCIEDAD DE ENERGIA S.A.
- Construction ("Turn-Key"), testing and placement into service were carried out by ELECNOR S.A. and ECOTECNIA. Supervision was done by ENERFIN.

"LA HERRERIA" and "PASADA DE TEJEDA" Wind farms (54.4 MW)

	La Herreria Wind Farm	**Pasada de Tejeda** Wind Farm
Location	Tarifa (Cadiz, Spain)	Tarifa (Cadiz, Spain)
Installed Capacity	44.8 MW	9.6 MW
WTG Model	Ecotecnia 74/1600 kW	Ecotecnia 74/1600 kW
Client/Distributor	Endesa Distribución Eléctrica, S.L.	Endesa Distribución Eléctrica, S.L.
Planned/Actual start up dates	June 2004 / January 2005	March 2004 / January 2005

Ownership
AEROGENERADORES DEL SUR, S.A., constituted by: ENERFIN ENERVENTO, S.A. (ENERFIN's affiliate) and ELECNOR FINANCIERA, S.L. (ELECNOR Group)

Role of the Bidder or Bidder's affiliates

- Design and engineering development were undertaken by ENERFIN.
- Construction ("Turn-Key"), testing and placement into service were carried out by ELECNOR S.A. and ECOTECNIA. Supervision was done by ENERFIN.

SERRA FARO-FARELO Wind Farms (128 MW)

	Penas Grandes Wind Farm	**Chantada** Wind Farm	**Monte Cabeza** Wind Farm	**Farelo** Wind Farm
Location	Lugo, Pontevedra (Galicia,Spain)	Lugo, Pontevedra (Galicia,Spain)	Lugo, Pontevedra (Galicia,Spain)	Lugo, Pontevedra (Galicia,Spain)
Installed Capacity	14.4 MW	48 MW	36.8 MW	28.8 MW
WTG Model	Ecotecnia 74/1600 kW	Ecotecnia 74/1600 kW	Ecotecnia 74/1600 kW	Ecotecnia 74/1600 kW
Client/Distributor	Union Fenosa	Union Fenosa	Union Fenosa	Union Fenosa
Planned/Actual start up dates	September 2004/ April 2005	November 2004/ June 2005	December 2004/ September 2005	February 2005/ September 2005

Ownership
GALICIA VENTO, S.L. constituted by ENERFIN ENERVENTO S.A. (ENERFIN's affiliate), ELECNOR FINANCIERA, S.L. (ELECNOR Group) y MINICENTRALES BOUZA VELLA, S.L.

Role of the Bidder or Bidder's affiliates

- Design and engineering development were undertaken by ENERFIN.
- Construction ("Turn-Key"), testing and placement into service were carried out by ELECNOR S.A. and ECOTECNIA. Supervision was done by ENERFIN.

OSORIO Wind Farms (150 MW)

	Osorio Wind Farm	**Sangradouro** Wind Farm	**Dos Indios** Wind Farm
Location	Osorio, (Rio Grande do Sul, Brasil)	Osorio, (Rio Grande do Sul, Brasil)	Osorio, (Rio Grande do Sul, Brasil)
Installed Capacity	50 MW	50 MW	50 MW
WTG Model	Enercon E-70 2000 kW	Enercon E-70 2000 kW	Enercon E-70 2000 kW
Client/Distributor	ELETROBRAS	ELETROBRAS	ELETROBRAS
Planned/Actual start up dates	July 2006/July 2006	September 2006/ September 2006	December 2006/ December 2006

Ownership
VENTOS DO SUL ENERGÍA S.A. constituted by ENERFIN ENERVENTO S.A. (ELECNOR Group) y WOBBEN WINDPOWER (ENERCON).

Role of the Bidder or Bidder's affiliates

- Design and engineering development were undertaken by ENERFIN
- Construction ("Turn-Key"), testing and placement into service were carried out by ELECNOR DO BRASIL, S.A. and WOBBEN (ENERCON). Supervision was done by ENERFIN DO BRASIL Sociedade de Energía S.A. (100% owned by ENERFIN.)

Villanueva I and II Wind Farms (66,7 MW)

	Villanueva I	**Villanueva II**
Location	Jarafuel (Valencia)	Jarafuel (Valencia)
Installed Capacity	48.3 MW	18.4 MW
WTG Model	Enercon E-70 2300 kW	Enercon E-70 2300 kW
Client/Distributor	Iberdrola Distribución Eléctrica, S.A.	Iberdrola Distribución Eléctrica, S.A.

Planned/Actual start up dates	Under construction	January 2009/ January 2009

Ownership

Parques Eólicos Villanueva, S.L. company belonging 100% to Enerfín Sociedad de Energía, S.A.

Role of the Bidder or Bidder's affiliates

- Design and engineering development were undertaken by ENERFIN
- Turn-Key construction will be done by ELECNOR while ENERCON will undertake the Operation and Maintenance works under the supervision of Enerfin.

ENERFIN PHILOSOPHY ON ENVIRONMENTAL ASPECTS

All the projects developed by Enerfín are known for using the most advanced and environmentally-friendly technologies, always putting in service the cooperation of the local manpower and institutions. This philosophy, based on the respect for the citizens and the region, turns Enerfin into a well-considered corporative citizen among the places we have installed energy producing infrastructures.

Enerfin's philosophy can be summarized in the following ideas:

- Taking advantage of a natural, clean and sustainable resource, and transforming it into a useful good for the everyday life.
- Looking for the beauty in innovation and using it to put in advantage the region´s environmental, historic and cultural values, making our projects the expression of the most noble man´s intervention in nature.
- Obtaining the best integration of our activities, to protect the environment and to respect its inhabitants.
- Putting our experience in sustainable development, always learning from the region´s inhabitant´s experience.
- Full commitment in the community heart where we develop our projects, with the desire to become an active citizen.

It is important to underline that the contents of this policy will be applied throughout all of the conditioning, exploitation and dismantling stages required for the designed wind farm. Aware of the importance of considering the environmental issues from the design stage of the projects for minimizing the impact during the following stages, ENERFIN has an environmental management system for its promotion activities and those related to the exploitation management for energy and environment projects.

This system is certified by AENOR meeting the norm ISO-14001, that states that ENERFIN develops all its activities taking the maximum care to the environment and with a permanent improvement engagement. The functioning of a system is supervised by AENOR with annual auditing for all of its wind farms (see appendix A).

Appendix B - Results of biological field studies conducted in support of the Coyote Wind Project, Sweet Grass County, Montana

Results of Biological Field Studies
Conducted in Support of the Coyote Wind Project
Sweet Grass County, Montana

Prepared by:
Garcia and Associates
1716 W. Main St.; Ste. 8-F
Bozeman, MT 59715

Prepared for:
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28020 Madrid Spain

June 2009

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1.0 Introduction

The Montana Department of Natural Resources and Conservation (DNRC) is evaluating whether to lease 640 acres of school trust land in Sweet Grass County (Section 36, Township 1 North, Range 12 East) to Coyote Wind, LLC (Coyote Wind) for the placement of eight wind turbines to generate electricity (Figure 1-1). The Proposed Action is being evaluated under the Montana Environmental Policy Act (MEPA) via an Environmental Impact Statement (EIS). The action would be implemented as early as 2010 and would continue annually for at least 20 years based on the final terms of the lease between the State of Montana and Coyote Wind. The Coyote Wind Project (project) includes wind development on adjacent private land (36 wind turbines) which is considered under the No Action Alternative in the EIS (this development would occur with or without the state land lease being evaluated under MEPA).

Garcia and Associates (GANDA) conducted wildlife studies on the state parcel and relevant surrounding areas to provide baseline information on wildlife use (primarily birds and bats) and to evaluate potential project impacts. This report documents the methods and results of these studies. The project area is defined as the state parcel, and the project region is defined as the general geographic area up to a four-mile radius (based on distances moved by wildlife) of the project area and adjacent private land.

Project area description

The project area is located within the Great Plains physiographic province (McNab and Avers 1996). The southeast corner of the project area is approximately 1.6 miles from the Yellowstone River. Duck Creek, a tributary to the Yellowstone River, is located to the southwest and west of the project area and is within one half mile of the southwest corner (Figure 1-1).

The project area elevation ranges from 4,358 feet to approximately 4,600 feet above mean sea level. It is surrounded by private lands used for cattle and sheep grazing and hay production. The western portion is rugged terrain with rocky draws and sandstone ridgelines. The eastern portion is characterized by rolling hills interspersed with low-angle basins. Primary habitats in the project area are grassland/sagebrush, ephemeral draws, and isolated wetlands. Trees and shrubs include black cottonwood, juniper and willows. Woody vegetation and trees are scarce, occurring mainly in the western section of the project area. Based on the habitat types in the project area, the site is expected to provide habitat primarily for species associated with sagebrush, grassland, and wetlands.

Ephemeral draws exist in several small drainages and the western half of the section has been divided by many seasonal stream channels that have vegetation characteristics distinct from the surrounding rangeland. These areas contain most of the woody vegetation found at the site and many of the plants found on the rangeland. The soil in many places is denuded of vegetation due to a combination of overgrazing by livestock and seasonal geomorphic processes. Weedy species are common. On the state parcel there are four wetlands in two categories: (1) seasonal wetlands that are closed depressions based on geologic structure and low-permeability soil parent material; and (2) perennial wetlands that are proximal to livestock spring developments. No forest cover or riparian habitats are present in the project area. An electric transmission line crossing the state parcel runs north-south from the substation and parallels the eastern boundary of the project area, providing perching and potentially nesting habitat for raptors.

Survey design

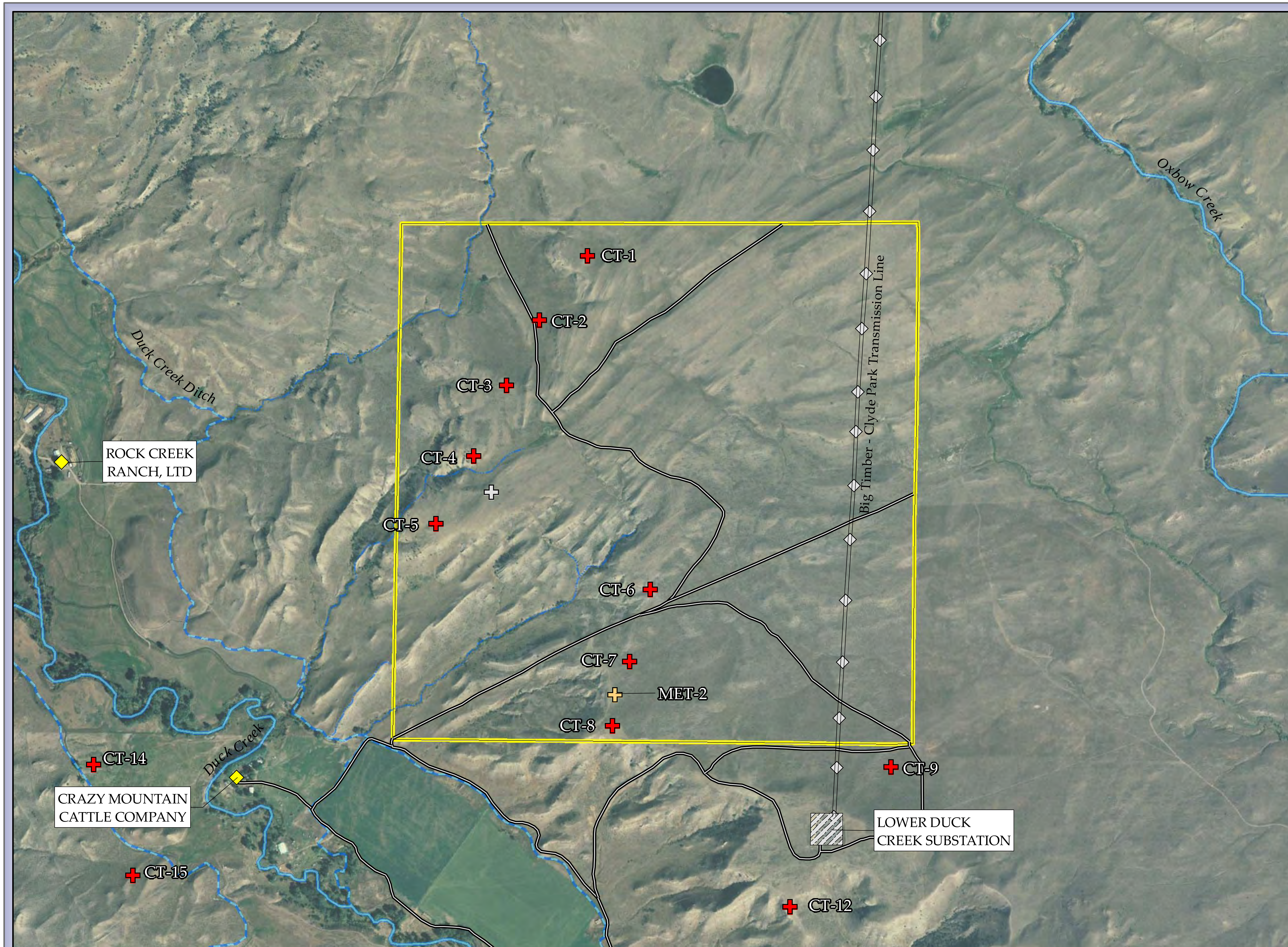
Field surveys were designed to evaluate relative abundance and spatial and temporal use of the project region by birds and bats. We also assessed habitat and general use of the area by state and federally listed species and big game. We conducted aerial surveys to detect raptor nests and look for greater sage grouse (*Centrocercus urophasianus*) leks, and describe general wildlife habitat. We used Small Bird Counts (SBCs) to detect breeding birds; Bird Use Counts (BUCs) to assess general bird use with a focus on larger species; and passive acoustical monitoring for bats. We noted wildlife and habitat observations while in the project region.

A wide variety of survey methods for birds and bats are being tested at wind resource areas throughout the country. These range from lower effort and cost-per-unit of data gathered such as point counts for birds and acoustical monitoring for bats, to techniques such as radar and infrared imaging. For the Coyote Wind project, survey design and station placement were intended to provide robust baseline data to inform the EIS process and to allow for post-construction studies to build upon them if deemed necessary. Methods were selected to account for project size and scope, topography and regional location, species likely to occur, and to capture seasonal variation. The ultimate goals were to collect data in an accepted scientific manner, to maximize sample sizes in a relatively short amount of time, and to work effectively within budgetary constraints.

Information from numerous guidance documents was used, including the US Fish and Wildlife Service (FWS) *Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (2003a), American Wind Energy Association *Wind Energy Siting Handbook* (2008), and California Energy Commission (CEC) and California Department of Fish and Game (CDFG) *California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development* (2007). Research and monitoring results and environmental impact assessment documents from nearby wind facilities were reviewed. Several authors have reviewed a wide variety of wind energy projects for impacts to birds and bats and provide excellent background for the state of ongoing wind energy facility research efforts (Kunz et al 2007; Kuvlesky Jr. et al 2007; Erickson et al 2001).

FIGURE 1-1.
STATE PARCEL PROPOSED TO BE LEASED FOR THE COYOTE WIND PROJECT

Sweet Grass County, Montana
T1N R12E Section 36



Map Legend:

- Proposed Project Area
- Proposed Turbine Location
- Proposed Met Tower
- Existing Met Tower
- Access Road
- Creek
- Ditch
- Intermittent Stream
- T-Line
- Substation
- T-Line Towers
- Residence

N
W E
S

0 250 500 1,000 1,500 2,000 ft

0 100 200 400 600 m

One Inch is Equal to 1,000 Feet

GANDA

SOURCES:
MONTANA NATURAL RESOURCE INFORMATION SYSTEM (NRIS)
ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE (ESRI)
USDA-FSA ORTHO PHOTO FLIGHT: AUGUST 25, 2005

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Information sources
Information on wildlife species, their habitats and ranges came from the FWS online database for threatened and endangered species (http://www.fws.gov/endangered/), from Montana Fish, Wildlife and Parks (FWP) website (http://fwp.mt.gov/default.html), the Montana Natural Heritage Program (MNHP) website (http://mtnhp.org/), Foresman (2001), and NatureServe (2009; http://www.natureserve.org/) as well as research papers cited in this report. Other sources for birds included HawkWatch International (www.hawkwatch.org), Floyd (2008), Wells (2007), Sibley (2000), and the AOU check-list of North American birds (www.aou.org/checklist/); and Adams (2003) for bats.

Potential Impact Index results
The Potential Impact Index (PII), completed as part of a site assessment of the project area conducted in 2004, was used to focus field studies (Wilde 2004 and appended to the Coyote Wind EIS). The PII method was developed by FWS for initial site evaluations to identify physical attributes, species occurrence and status, and the ecological attractiveness of the site (FWS 2003a). The PII ranked the Coyote Wind project area as moderate in terms of potential risk to wildlife. This rating is based on species expected to be found in the project area; ecological magnets such as wetlands; and physical characteristics of the site such as topography and meteorological characteristics.

2.0 Field Study Methods

Since the first large-scale wind farms were constructed at Altamont Pass, CA in the 1980s concerns about impacts to wildlife have centered mainly on bird species. Subsequent research efforts on avian species have looked at direct impacts such as mortality from collisions with infrastructure; indirect impacts such as habitat fragmentation and displacement; differences between avian groups such as resident or migratory, songbirds, waterfowl or raptors; and level of effect such as local or population (Kunz et al. 2007; Kuvlesky et al. 2007; Smallwood 2007; Morrison 2006).

Research efforts may be further divided into pre- and post-construction investigations. Pre-construction studies require data for species' temporal and spatial use of the project area prior to disturbance. One popular research approach is the 'before-after/control-impact', or BACI design which may or may not include reference sites. The BACI design without reference sites is limited to the site that will be developed and provides a comparison of data from before and after construction of the project. This is the approach chosen for the Coyote Wind project.

2.1 Avian species surveys

Three methods were employed to survey for avian species in the project region. These were the SBCs, BUCs, and aerial survey and are described below. SBCs are essentially BUCs conducted at a greater density of smaller-radii point count circles. BUCs estimate the spatial and temporal use of the site by all birds, including large birds such as raptors, vultures, corvids, and waterfowl. Raptor nest counts identify species, ratio of active and inactive nests, productivity metrics (i.e., number of young per occupied site), and the spatial location of nests relative to the potential turbine sites.

2.1.1 Small Bird Counts

SBCs were used to assess breeding bird presence and relative abundance. Survey methodology was based on the Northern Region [US Forest Service] Landbird Monitoring Program protocols (Young Jr. et al. 2007). Transects were placed along proposed turbine strings (one on the state parcel and three on private land; Figure 1-2). The proposed turbine strings were predominantly within homogenous habitat (grassland/sagebrush) therefore no sampling stratification was necessary. A small perennial wetland associated with stock tanks (<1 acre) exists on the state parcel but this feature was small enough that an additional transect was not warranted.

Transects consisted of 6-8 stations each. Stations were located 250 m apart and centered approximately between proposed turbine sites. This design allowed for repetition of surveys for post-construction monitoring if necessary. We conducted SBCs between May 13 and June 20, 2008 with three visits to each transect. Stations were geo-referenced using a GPS unit. A biologist spent 10 minutes at each station identifying all birds within 125 m of each station center point, and basing identification on visual or audio (calls) cues. We used a digital rangefinder to estimate distances for visual observations. We began surveys 15 minutes after sunrise and completed them by 10AM each day. We recorded date, transect identification, station number, observer, time, species observed/detected, distance from observer, and abundance.

2.1.2 Bird Use Counts

We based the BUC survey methodology on that described by the California Energy Commission (CEC and CDFG 2007) for pre-construction surveys at proposed wind farms. These surveys are designed to detect larger birds such as raptors, waterfowl, and shorebirds, and to evaluate seasonal avian use. The BUC is a modified point count for which an observer records bird detections from a single vantage point for a specified time period. We chose a 2-hour sampling period to maximize observational data at each station, and made observations with binoculars and spotting scopes. We used a digital rangefinder to estimate distances. Survey stations were located at high vantage points overlooking proposed turbine strings at a density of approximately 1 per square mile (Figure 1-2). We conducted surveys at approximately 2-week intervals at various times during the day and under various weather conditions in the spring (n=3; May 13 to June 20, 2008); summer (n=2; August 26 to August 29, 2008); fall (n=4; September 25 to October 23, 2008); and winter (n=3; December 17, 2008 to January 15, 2009). The two stations on private land had a small area of overlap (<10%) due to topographical limitations.

The BUC site on the state parcel offered unobstructed views of the surrounding terrain and black-tailed prairie dog colony. Data recorded included date, station identification, observer, time, number and species of birds observed within an 800 m radius, distance from bird to observer, flight height above ground, and behavior (soaring, hunting and flyovers).

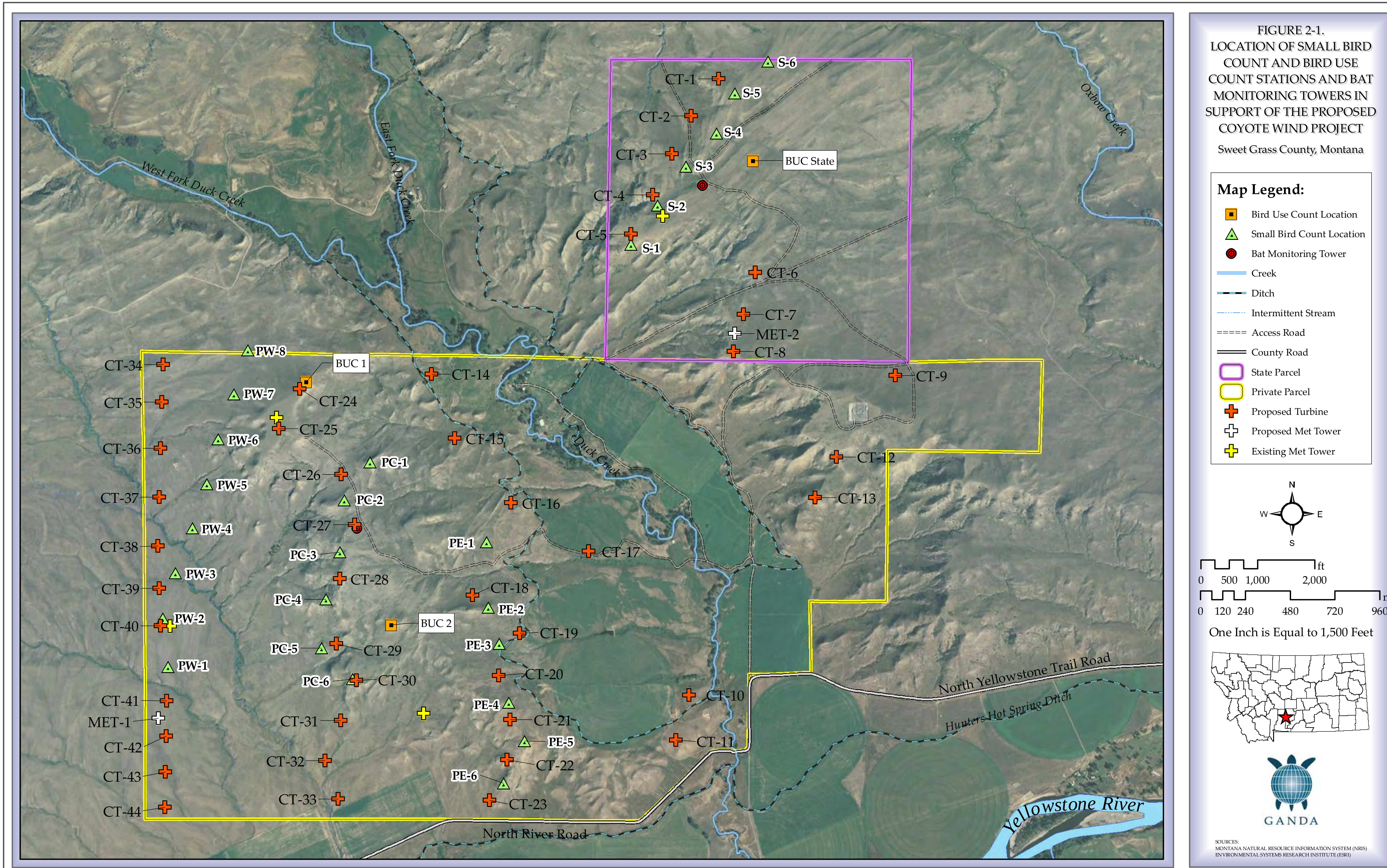

FIGURE 2-1.
LOCATION OF SMALL BIRD COUNT AND BIRD USE COUNT STATIONS AND BAT MONITORING TOWERS IN SUPPORT OF THE PROPOSED COYOTE WIND PROJECT
Sweet Grass County, Montana
Map Legend:
Bird Use Count Location
Small Bird Count Location
Bat Monitoring Tower
Creek
Ditch
Intermittent Stream
Access Road
County Road
State Parcel
Private Parcel
Proposed Turbine
Proposed Met Tower
Existing Met Tower
N
W
E
S
ft
0 500 1,000 2,000
m
0 120 240 480 720 960
One Inch is Equal to 1,500 Feet
GANDA
SOURCES:
MONTANA NATURAL RESOURCE INFORMATION SYSTEM (NRIS)
ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE (ESRI)
West Fork Duck Creek
East Fork Duck Creek
Duck Creek
Oxbow Creek
North Yellowstone Trail Road
Hunters Hot Spring Ditch
Yellowstone River
North River Road
BUC State
BUC 1
BUC 2
S-1
S-2
S-3
S-4
S-5
S-6
CT-1
CT-2
CT-3
CT-4
CT-5
CT-6
CT-7
MET-2
CT-8
CT-9
CT-10
CT-11
CT-12
CT-13
CT-14
CT-15
CT-16
CT-17
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CT-34
CT-35
CT-36
CT-37
CT-38
CT-39
CT-40
CT-41
MET-1
CT-42
CT-43
CT-44
PW-1
PW-2
PW-3
PW-4
PW-5
PW-6
PW-7
PW-8
PC-1
PC-2
PC-3
PC-4
PC-5
PC-6
PE-1
PE-2
PE-3
PE-4
PE-5
PE-6

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2.1.3 Aerial surveys

We conducted aerial surveys to assess general wildlife presence and use of the project region with a focus on raptor nests, greater sage grouse leks, and big game. Raptor nest surveys are typically conducted by air in order to cover a large area and observe nests located high in trees, on river islands, or on cliffs. The aerial vantage point makes it possible to assess nest activity status and document the number of young in active nests. The open habitat in the vicinity of the project area was ideal for identifying wildlife from long distances. For greater sage grouse we focused on identifying suitable habitat for breeding and winter range.

We surveyed the area on June 17 and 18, 2008 and covered approximately 23,500 hectares (Figure 1-3). We used a fixed wing Piper PA-18 Super Cub aircraft modified for slow flight and enhanced wildlife observation capabilities. We flew one-half mile north-south transects at 30 to 90 m above ground level at between 60 to 80 mph, surveying east to west.

2.2 Passive acoustic monitoring for bats

Wind farm impacts to avian species are well documented; however, it is only recently that the potential effects to bats have been acknowledged and studied (Arnett et al. 2007; Drewitt and Langston 2006; Kunz et al. 2007; Kuvlesky, Jr. et al. 2007; Smallwood 2007). Bats tend to be most affected during migratory periods, and during fall migrations more so than spring (Baerwald et al 2008). Other causal factors are beginning to become apparent, and a review of wind farm monitoring studies found that most bats were killed on nights with low wind speed and that fatalities increased immediately before and after passage of weather fronts (Arnett et al. 2007).

Researchers are testing a number of techniques such as radar, infrared cameras, and acoustic monitoring to determine bat use of proposed wind energy development areas with the purpose of predicting which bat species, and in what relative numbers, may be affected. Each method has its advantages and disadvantages. We selected passive acoustic monitoring as the most effective technique for the Coyote Wind Project because we could collect the most data over an extended period of time and evaluate the following parameters of interest:

1. Bat activity over the study period (August 29-November 6, 2008)
2. Bat activity within each night (measured by hours after sunset)
3. Relationship between bat activity and wind speed
4. Relationship between bat activity and temperature
5. Bat activity at each of the instrument heights.

Passive acoustic monitoring is a technique where broadband ultrasonic detectors capable of detecting and electronically recording bat echolocation calls are deployed at a site that can collect large amounts of data for relatively low cost and field effort. Two or more echolocation calls are recorded as computer files stamped with the date and time of their detection. Software is used to view the echolocation calls in each file as sonograms relative to frequency and time scales; each file is sorted into a phonic group based on the characteristic frequency (in kilohertz-kHz) of the sonograms.

2.3 Bat data analyses methods

Numbers of bat files per phonic group per unit time (i.e., bat activity) was used as the response variable for all analyses of bat data. In order to assess bat activity over the study period (parameter number 1 above), we divided total bat files observed by the number of operating instruments on that night. Because data for each night was collected over two calendar days, we standardized this by labeling the date as the date the instrument was turned on. For example, August 29, 2008 overnight included data collected from one hour before sunset on August 29 through one hour after sunrise on August 30. For parameter 2, bat activity within each night, we calculated hours after sunset in one hour blocks for each day data was collected. Any data collected between sunset and 60 minutes after sunset was considered one hour after sunset; data collected between 61 minutes and 120 minutes after was considered two hours after sunset, etc.

We used data from the project meteorological (MET) towers for data on wind speed and temperature. We used data from the MET tower closest to each bat tower site. MET tower 1 was used to obtain wind speed (m/s) and air temperature (C) associated with bat files recorded on State land. The heights at which our acoustic instruments were placed were not the same as the anemometer heights on the MET towers. Therefore we used a linear regression equation between wind speed and anemometer height (9.9m, 24.5m, 49.4m, and 49.6m) to estimate the wind speed at our instrument heights (1.5m and 20m). The wind speed prediction at 20m is considered interpolation because the 20m height is within the range of heights used to calculate the linear regression equation. The wind speed prediction at 1.5m is considered extrapolation and may not produce as accurate predictions.

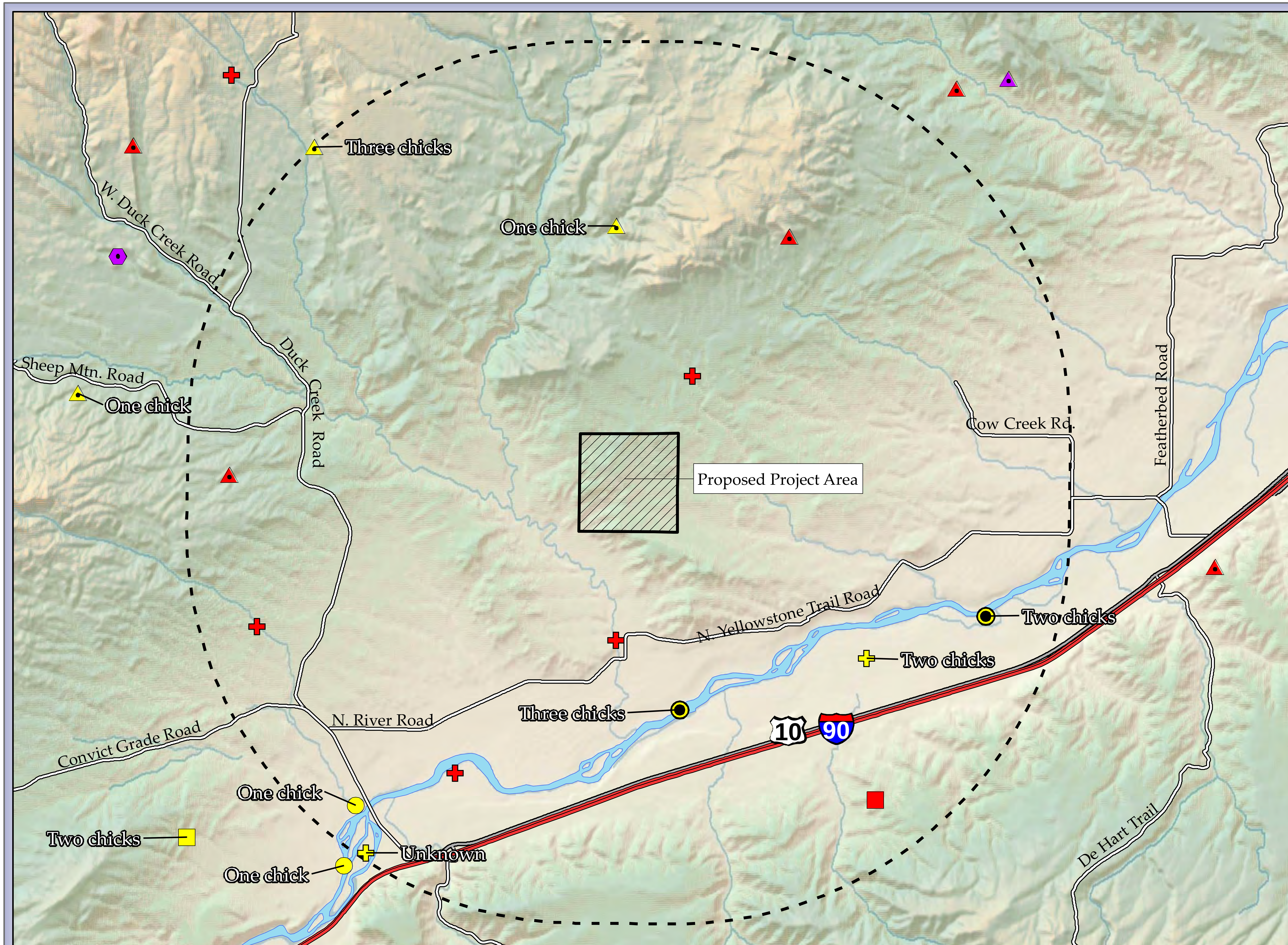
The bat tower on private land was located between MET towers 2, 5 and 6. We analyzed data from both MET towers 2 and 6, because these were considered to be most similar to our bat towers. The anemometer heights on MET tower 6 were 40m, 50m, and 60m; and as described above, these data were used to predict the wind speed at the bat instrument heights of 1.5m and 20m. In this case the wind speed predictions at both bat instrument heights were extrapolated. The anemometer heights on MET tower 2 were 11m, 23m, 45m and 61m. Wind speed at the 20m high bat instrument was interpolated, and at the 1.5m height was extrapolated.

Air temperature on all MET towers was measured at one location, 3m. We used the average temperature for each 10 minute period.

We used the chi-square test to determine if there was an association between bat tower height (High vs. Low) and bat activity by phonic group (25 kHz, 40 kHz, and hoary bats). We conducted this analysis to assess whether certain phonic groups might be more susceptible to blade strikes or barotrauma based on their flight patterns. The chi-square test compares the percent distribution of bat files in each phonic group for high versus low bat tower heights. If the percent distribution of a phonic group was similar at the high and low heights, then the test will not show significance. If the percent distribution was not similar at the high and low heights, then the test will show significance.

FIGURE 2-2.
RESULTS OF AERIAL SURVEY CONDUCTED IN JUNE, 2008 FOR PROPOSED COYOTE WIND PROJECT

Sweet Grass County, Montana
T1N R12E Section 36



Map Legend:

- Bald eagle: Active
- Golden eagle: Active
- Ferruginous hawk: Active
- Osprey: Active
- Red-tailed hawk: Active
- Golden eagle: Inactive
- Ferruginous hawk: Inactive
- Red-tailed hawk: Inactive
- Golden eagle: Unknown
- Prairie falcon: Unknown
- Interstate
- State Road
- County Road
- State Parcel
- Approximate Survey Area

N E S W

0 0.5 1 2 mi

0 0.5 1 2 3 km

One Inch is Equal to One Mile

GANDA

SOURCES:
MONTANA NATURAL RESOURCE INFORMATION SYSTEM (NRIS)
ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE (ESRI)

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We mounted detectors on portable aluminum towers in two locations in the proposed wind farm area, one on the state parcel and one on adjacent private land (Figure 1-2). The equipment array was based on designs tested by Bat Conservation International (BCI) research projects utilizing components from several manufacturers (Arnett pers. comm. 2008). BCI is currently testing a variety of data collection methods and does not recommend any specific equipment or systems.

Habitat on the state parcel where the proposed turbine strings are located is characterized by moderately steep eroded draws on the western side and more rolling sagebrush and grasslands to the east. The monitoring tower was placed at the largest wetland site because there is a wind turbine planned near that spot and wetlands are an attractant for foraging bats. The overall topography is representative of the western side of the state parcel where the wind turbines are planned. Habitat on the private land is rolling hills with sagebrush and grassland vegetation with no nearby water features. Detectors at both sites were pointed in an easterly direction to minimize wind noise from the prevailing westerly winds.

We used Anabat passive acoustic detectors. We mounted one Anabat microphone to record data at each of two heights; 1.5 m and 20 m above ground level. While the 20 m height is below the rotor swept area, this was the maximum height possible for the tower. We programmed all units to turn on to collect data during periods of highest bat activity; approximately one hour before dusk to one hour after dawn every night from August 29 through November 6, 2008. We exchanged data cards and checked battery charge and equipment function on a weekly basis.

We used CFCRead software (Corben 2008) to convert recorded sounds into computer files stamped with the date and time. A file can be as ‘small’ as a few microseconds of sound to as ‘large’ as 15 seconds of constant noise. Bat echolocation calls are sometimes recognizable as specific species or, due to similarities among species, reported as phonic groups. Therefore, files from each night were sorted into four groups: (1) 40 kHz phonic group; (2) 25 kHz phonic group; (3) hoary bats (this species has a very unique phonic signature), and (4) noise files that did not contain bat calls. We reviewed the data files for calls in the 30 and 50 kHz ranges as well, but none were detected. Noise files were primarily wind, and also a small subset of electronic interference and bird calls.

3.0 Field Study Results

3.1 Avian species

Full results of SBC and BUC surveys are presented in appendices A and B.

3.1.1 Small Bird Counts

In the project region 281 individuals of 44 bird species were documented on all four transects (Table 3-1; Appendix A).

Table 3-1. Number of individual birds observed on all SBC surveys by transect in 2008, Coyote Wind Project, Sweet Grass County, Montana.

Species*	State (S)	Private West (PW)	Private Central (PC)	Private East (PE)	Total
AMCR		2	1		3
AMGO				1	1
AMKE	2	5	1	1	9
AMRO	1	1			2
BASW		3			3
BBMA	4	9	10	3	26
BHCO	2	3	1	2	8
BRBL		3		2	5
BRSP		2		2	4
CCSP				1	1
CHSP	2	1	3	2	8
CLSW			1	1	2
CONI		1			1
CORA	1		2		3
EAKI		1	1	1	3
EUST		2		1	3
GBHE	1				1
GOEA			2		2
GRPA	3				3
GRSP			1	1	2
HOLA	5	1			6
KILL	4		1	1	6
LASP		3	2	1	6
LBCU	1	3			4
MOBL				1	1
MODO	1	1			2
NOFL		2	2	1	5
NOHA	1	1			2
NRWS		2			2
OSPR			1		1
PRFA			1		1
ROPI		1	2	2	5
RWBL	7	5		1	13
SACR	2	2		2	6
SAVS		1		1	2
SOSP	1	4	5	1	11
SPSA	1				1
TRES			1		1
TUVU				2	2
VESP	5	8	7	16	36
WEME	15	23	16	18	72
WETA		1			1
WISN	3			1	4
YEWA		1			1
Total	**62**	**92**	**61**	**66**	**281**

* Species acronyms follow USGS bird banding conventions. Available online: http://www.pwrc.usgs.gov/bbl/manual/sname.htm. Additional bird codes: GRPA – Gray partridge (*Perdix perdix*); NOFL

aka FLIN or Flicker integrade (*Colaptes auratus*); ROPI – Rock pigeon (*Columba livia*); WISN – Wilson's snipe (*Gallinago delicata*); YEWA aka YWAR - Yellow warbler (*Dendroica petechia*).

In the project region, the four most frequently observed bird species were western meadowlarks (*Sturnella neglecta*), vesper sparrows (*Pooecetes gramineus*), black-billed magpies (*Pica hudsonia*), and red-winged blackbirds (*Agelaius phoeniceus*). The frequency of occurrence (proportion of points where present) and relative abundance (number seen per point) for these species in the project region are described in Table 3-2. These species comprised 67% of all birds observed.

Table 3-2. Species, number of stations where observed, frequency of occurrence, and relative abundance of the four most frequently observed bird species in the Coyote Wind Project region, Sweet Grass County, Montana, 2008.

Species	Number of Stations	Frequency	Relative Abundance
Western meadowlarks	26	1.0	2.77
Vesper sparrows	20	0.77	1.4
Black-billed magpies	18	0.70	1.0
Red-winged blackbirds	8	0.30	0.5
			5.67

On the State parcel a total of 62 individual birds of 20 species were documented. The four most frequently observed bird species were western meadowlarks, red-winged blackbirds, horned larks (*Eremophila alpestris*) and vesper sparrows. The frequency and relative abundance for these species on the state parcel are described in Table 3-3. These species comprised 52% of all birds observed.

Table 3-3. Species, number of points, frequency of occurrence, and relative abundance of the top four most frequently observed bird species on project area SBC transects May and June 2008

Species	Number of Stations	Frequency	Relative Abundance
Western meadowlarks	6	1.0	2.5
Red-winged blackbirds	5	0.83	1.16
Horned larks	3	0.5	0.83
Vesper sparrows	3	0.5	0.83
			5.32

3.1.2 Bird Use Counts

In the project region a total of 147 individuals of 28 species were documented during all four seasons (Table 3-4; Appendix B). The four most frequently observed bird species were golden eagles (*Aquila chrysaetos*), common ravens (*Corvus corax*), black-billed magpies, and western meadowlarks. Observations of these species comprised 55% of all observations.

In the project area (i.e., the State parcel) a total of 47 individuals of 16 species were documented for all four seasons combined. The most frequently observed bird species were golden eagles and common ravens. There were four sightings each of red-tailed hawks (*Buteo jamaicensis*), northern harriers (*Circus cyaneus*), black-billed magpies, and horned larks. Observations of these most frequently observed species comprised 68% of all observations.

Table 3-4. Number of individual birds observed on all BUC surveys by station in 2008-2009, Coyote Wind Project, Sweet Grass County, Montana.

Species*	State BUC station	Private North BUC station	Private South BUC station	Total
AMCR		1		**1**
AMKE	2	1	2	**5**
AMRO	1	1		**2**
AWPE	1			**1**
BAEA			2	**2**
BASW		1		**1**
BBMA	4	2	9	**15**
BRBL	1	2	2	**5**
CORA	5	9	10	**24**
EUST			1	**1**
FEHA	3		1	**4**
GOEA	11	7	15	**33**
HOLA	4	1	2	**7**
LBCU		1	1	**2**
MALL	1			**1**
MODO			1	**1**
CONI			1	**1**
NOHA	4			**4**
NRWS	1			**1**
PRFA	1			**1**
RLHA		1	2	**3**
ROPI		1	7	**8**
RTHA	4		1	**5**
RWBL			1	**1**
SACR	1	1	4	**6**
TUVU			2	**2**
VESP			1	**1**
WEME	3	3	3	**9**
Total	**47**	**32**	**68**	**147**

* Species acronyms follow USGS bird banding conventions. Available online: http://www.pwrc.usgs.gov/bbl/manual/sname.htm.

Each individual sighting was recorded, and may have resulted in some species, such as golden eagles and red-tailed hawks, being over-represented by repeated, intermittent sightings due to long soaring times as they moved along ridgelines riding thermals and hunting. Raptor behavior in the project area was relatively consistent. The ridge along the western portion is perpendicular to prevailing winds thereby creating updrafts. Raptors used those updrafts and thermals from the agricultural fields bordering Duck Creek to soar and hunt. No consistent pattern in avian flight paths was observed on the portions of the project area with less topographic relief, such as the eastern portion near the black-tailed prairie dog colony. Raptors were observed perching on the transmission line towers (mainly golden eagles and one red-tailed hawk), and landing on the rocky ridge outcroppings interspersed throughout the colony (golden eagles and ferruginous hawks).

Other species documented at low numbers were common ravens, American crows (*Corvus brachyrhynchos*), black-billed magpies, sandhill cranes (*Grus canadensis*), long-billed curlews (*Numenius americanus*), common nighthawks (*Chordeils minor*), a mallard (*Anas platyrhynchos*) and an American white pelican (*Pelecanus erythrorhychos*). Sightings of these species comprised 6% of all observations on the state parcel, and 7% at all stations on state and private land combined.

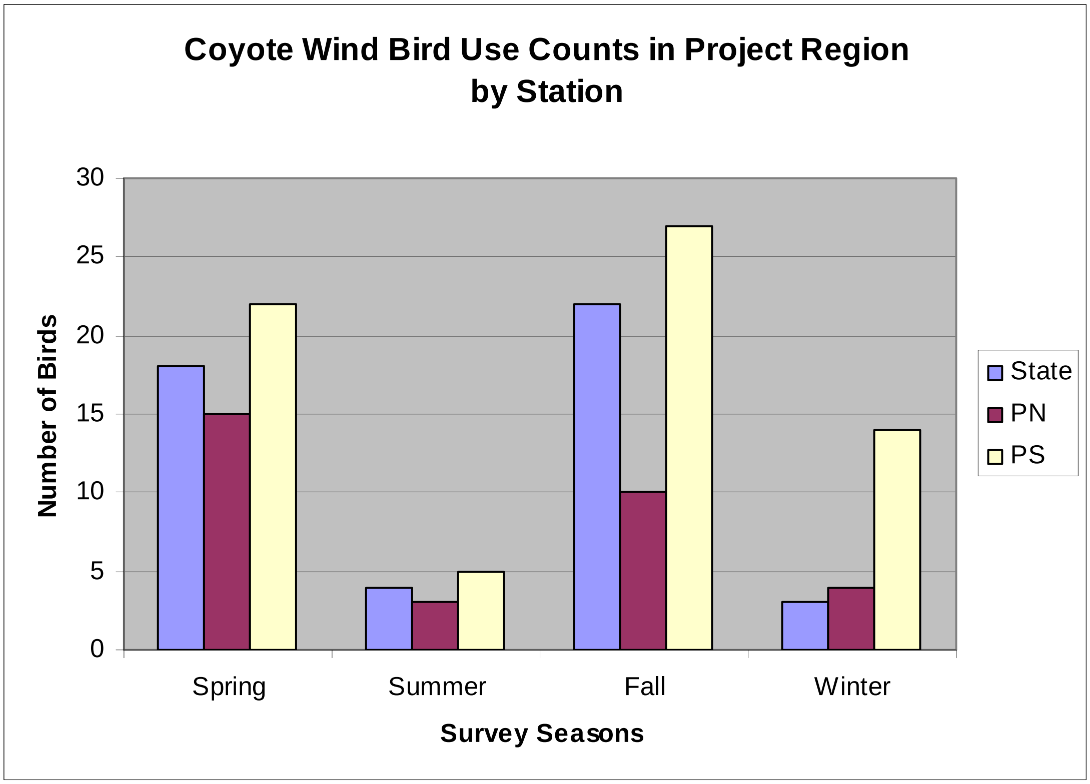
Survey results indicated relatively low avian use of the state and private parcels. Since BUCs are designed to detect larger birds and if passerines are removed from totals, then 37 observations of raptors, corvids and shorebirds were documented on the state parcel, and 110 observations at state and private sites. This equates to 0.5 observations per hour for the project area and 1.5 observations per hour overall.

Impacts to migratory birds

The relative difference in susceptibility of resident or migratory bird populations to collisions is an important variable to consider when evaluating potential avian impacts. Some studies indicated resident birds may suffer fewer fatalities than migratory populations due to their familiarity with the wind towers relative to wind conditions, topography and food sources (TRC 2008), while other studies found casualties spread fairly evenly between migratory and non-migratory populations (Young Jr. et al. 2003). Conflicting research results suggest that seasonal mortality may be influenced by site-specific conditions based on topography, species, seasonal abundance, and weather events.

Higher BUC counts in the spring and fall in the Coyote Wind project region indicate greater use during migratory seasons (Figure 3-1). The results from the BUC on the state parcel (one station) ranged in seasonal frequency from nine individuals in spring (May-June), three in summer (August), 11 in fall (September and October), and two in winter (December and January). It is difficult to differentiate between resident and migrant raptors, or seasonal use patterns of residents, without tracking individual birds. Species composition remained consistent throughout the year and none of the more typical migrating raptor species - such as Cooper's hawks (*Accipiter cooperii*), Swainson's hawks (*Buteo swainsoni*) or peregrine falcons (*Falco peregrinus*) - documented at the nearby HawkWatch site in the Bridger Mountains were observed (HawkWatch 2009).

Figure 3-1. Total number of birds found on BUC surveys by season, 2008-2009, Coyote Wind Project, Sweet Grass County, Montana.



BUC observations within the Rotor Swept Area (RSA)
Birds are most at risk of direct mortality in wind farm areas when they are flying through the airspace swept by the rotor blades. To further explore potential risk to birds in the project region, we separated all data collected during BUC counts into a subset of observations occurring only within the rotor swept area (RSA). This distinction may represent a more accurate estimate of risk to birds. In the state parcel, eight out of 47 sightings (17%) were in the RSA. Those sightings were comprised of five species: common raven (3); golden eagle (2); red-tailed hawk (1); and prairie falcon (1). Seasonal activity was comprised of four sightings in spring, two in summer, two in fall and none in winter. Two of those sightings were flyovers, while the remainder (75%) stayed longer in the RSA hunting or soaring.

3.1.3 Aerial surveys

Weather conditions during raptor nesting surveys were ideal with mostly sunny skies, calm, and approximately 50-60 degrees Fahrenheit. The state parcel and project region surveyed were dominated by sagebrush and grassland vegetation communities with topography ranging from flat to steeply sloping canyons. Riparian areas and small wetland features occur within this region. Aerial surveys revealed that habitat diversity has been reduced by sagebrush removal and grazing. Sagebrush communities are somewhat intact within the project area, but have been largely degraded on the surrounding private lands. Grasses and forbs have been heavily grazed by livestock on both the state parcel and private land decreasing breeding habitat, cover, and forage for grassland birds. Raptor nesting habitat is limited to widely scattered cliffs and rock outcrops, occasional patches of juniper, and deciduous trees within the Duck Creek and Yellowstone River corridors. No nests were observed on the transmission line towers on the state parcel, and they appear unsuitable to support large nest structures. Overall the project area is a dry and arid environment with limited raptor nesting habitat.

Twenty-four raptor nests were found within the project region search area (58,161 acres), but no raptor nests occurred on the state parcel (Figure 2-2). Ten nests were active (42%). The active nests were three golden eagle (five young total), two bald eagle (five young total), one red-tailed hawk (two young), a nest actively defended by a red-tailed hawk on a river island (no count of young due to dense foliage); two osprey nests (*Pandion haliaetus*; two young total); and one ferruginous hawk (two young).

The greater sage grouse habitat in the project area is of very low quality. The only contiguous patches of sagebrush that might support greater sage grouse occur on the state parcel, but they are isolated from other patches in the project region, small in acreage and likely have steeper slopes than those selected by greater sage grouse. Surrounding private land parcels exhibited patchy and streaked patterns of sagebrush, indicative of herbicide application. Since no suitable habitat was observed during aerial surveys no follow-up ground surveys were conducted.

3.2 Passive Bat surveys

The bat species reported by phonic group in Table 3-5 either potentially occur within the project region (based on habitat and range) (Foresman 2001, MNHP 2009), or were detected during our surveys.

Table 3-5. Bat species, phonic group, detection status and detection location, Coyote Wind Project region, Sweet Grass County, MT.

Species	*Scientific name*	Phonic group (kHz)	Documented/Location
Townsend's Big-eared Bat	*Corynorhinus townsendii*	Unique call signature	No
Spotted Bat	*Euderma maculatum*	Unique call signature	No
Big Brown Bat	*Eptesicus fuscus*	25	Possible/state and private
Silver-haired Bat	*Lasionycteris noctivagans*	25	Yes/state and private
Hoary Bat	*Lasiurus cinereus*	25, subset of unique calls	Yes/state and private
Long-eared Myotis	*Myotis evotis*	30, subset of unique calls	No
Fringed Myotis	*Myotis thysanodes*	30, subset of unique calls	No
Western Small-footed Myotis	*Myotis ciliolabrum*	40	Possible /state and private
Little Brown Myotis	*Myotis lucifugus*	40	Possible /state and private
Long-legged Myotis	*Myotis volans*	40	Possible /state and private
California Myotis	*Myotis californicus*	50	No
Yuma Myotis	*Myotis yumanensis*	50	No

A total of 480 echolocation files were recorded on the state parcel and 188 on the private land (Table 3-6). Three phonic groups were detected: 40 kHz (270 files state parcel/98 private), 25 kHz (97 files state parcel/61 private) and hoary bats which have a unique phonic signature (113 state parcel/29 private). No 30 or 50 kHz species were documented.

Table 3-6. Bat calls identified on state and private parcels, Coyote Wind Project region, Sweet Grass County, MT. 2008

	40 kHz	**25 kHz**	**Hoary**	**Total**
State High	90	53	65	**208**
State Low	180	44	48	**272**
Total	**270**	**97**	**113**	**480**
Private High	83	51	28	162
Private Low	15	10	1	26
Total	**98**	**61**	**29**	**188**
Grand Total	**368**	**158**	**142**	**668**

Roosting and foraging in the project region

Roosting habitat for tree-roosting species (e.g. hoary bats or silver-haired bats – species that were detected on surveys) may occur throughout the project region, especially in cottonwood galleries in the riparian zones along Duck Creek and the Yellowstone River. Daily and seasonal flight patterns can vary tremendously depending on weather, insect emergence and wind speeds. Flight patterns and spatial use of roosting and foresting areas within the project region or project area are not known.

Species that may potentially occur within the project area, and might not be detected by our methodology, are the spotted bat and Townsend's big-eared bat. Habitat for the spotted bat ranges from montane forests to deserts, and presence is influenced more by roosting habitats in cliffs and steep canyon walls than by foraging habitats (Adams 2003; Foresman 2001). Cliffs and canyons exist within the project region, therefore spotted bats may occur there. While acoustic surveys may detect this species, the preferred survey method for the spotted bat is audible detection because it echolocates within the range of human hearing. Foraging habitat for Townsend's big-eared bat in the project region includes Rocky Mountain juniper with big sage and silver sage understory. Roosting habitat, found in cold caves and mine shafts, likely does not occur in the project region (Adams 2003; Foresman 2001). As with the spotted bat, while acoustic surveys may detect this species, the preferred survey method for the Townsend's big-eared bat is to search for roost sites because this species echolocates at low intensity and has a limited detection range. Spotted bats and Townsend's big-eared bats are not among the species most commonly found on fatality studies for wind projects however. Echolocation calls from the fringed myotis and long-eared myotis (30 kHz with a subset of unique calls) are usually recognizable with acoustic monitoring, but were not detected by acoustic surveys for this project.

Migration behavior and timing

Many bat species appear to use narrow migration corridors following topographical features of mountain ranges such as river drainages and forested ridges (Baerwald et al. 2008). However, very little is known about bat migration routes and timing in Montana (DuBois, pers. com. 2008).

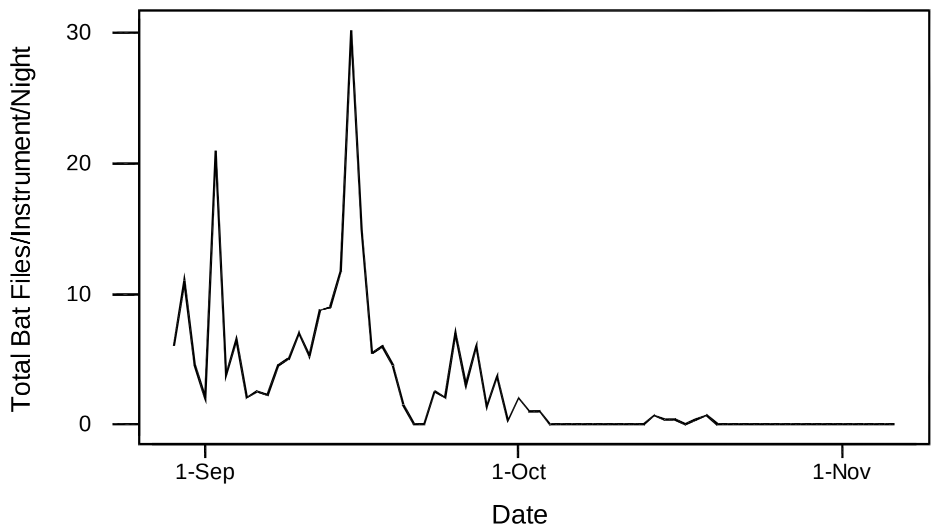
3.3 Bat data analyses results

All input files used for the analyses below are provided in Appendix C.

Bat activity over the study period

Bat activity was monitored August 29 to November 6, and was highest between August 29 and October 1, 2008, with a peak in mid-September (Figure 3-2). After early October, activity more or less ceased.

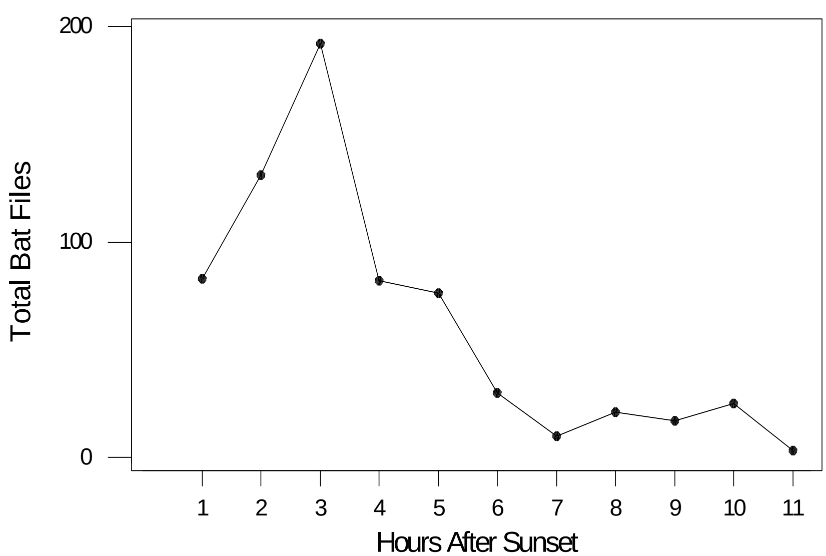
Figure 3-2. Total number of bat files/instrument/night by date in 2008, Coyote Wind Project, Sweet Grass County, Montana.



Bat activity within each night

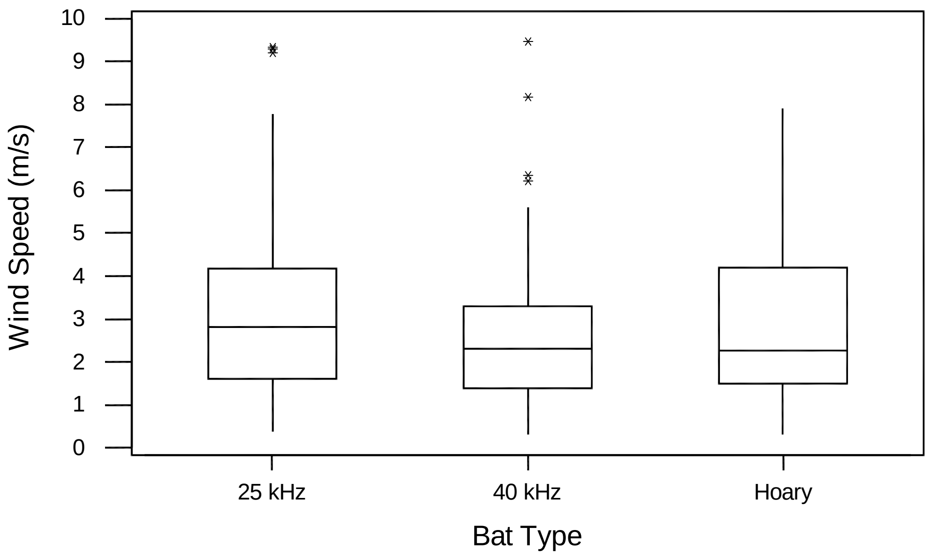
Within each night, activity was highest within the first 3 hours after sunset, and then steadily dropped off over the course of the night (Figure 3-3). The time of sunset within our study period ranged from 20:02 in August to 16:53 in November (FWP 2008b).

Figure 3-3. Total bat files by hours after sunset, Coyote Wind Project, Sweet Grass County, Montana.



Relationship between bat activity and wind speed

Figure 3-4. Wind speed (rounded to the nearest m/s) vs. bat phonic group; August 29-November 6, 2008, MET towers 1 and 6, Coyote Wind Project, Sweet Grass County, MT.



Figures 3-4 and 3-6 display side-by-side boxplots of wind speed (m/s) versus bat phonic group for all bat files, and wind data from MET towers 1 and 6, and towers 1 and 2 respectively. The vertical line from the bottom of the box extends to the minimum wind speed, the horizontal lines forming the bottom and top of the box are the first and third quartiles (25% of wind speeds are below the first quartile and 75% of wind speeds are below the third quartile), the horizontal line inside the box is the median (50% of wind speeds are below the median), and the vertical line from the top of the box extends to the maximum wind speed. Asterisk symbols are wind speeds considered to be potential outliers. Figures 3-5 and 3-7 display these data graphically by phonic group and for all bat files combined.

Figure 3-5. Number of bat files vs. wind speed (rounded to the nearest m/s) for MET towers 1 and 6, August 29-November 6, 2008; Coyote Wind Project, Sweet Grass County, Montana.

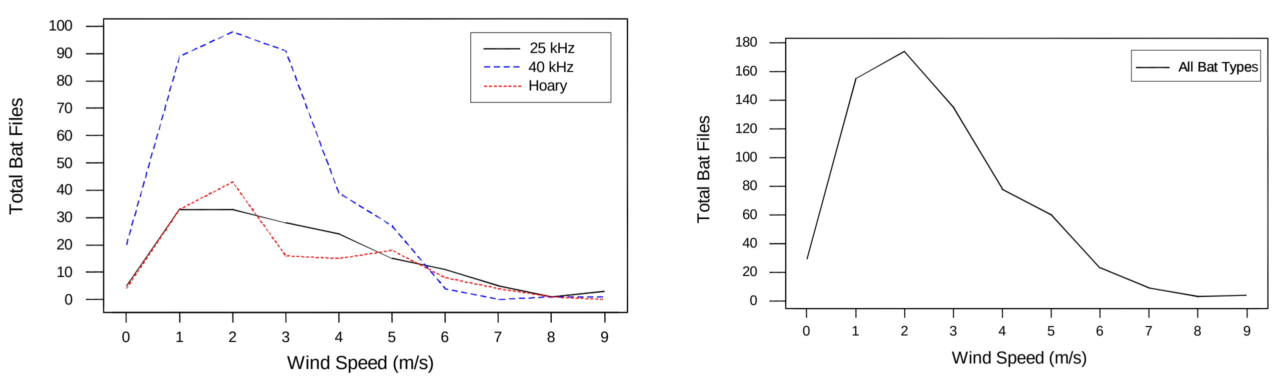


Figure 3-6. Wind speed (rounded to the nearest m/s) vs. bat phonic group; August 29-November 6, 2008, MET towers 1 and 2, Coyote Wind Project, Sweet Grass County, MT.

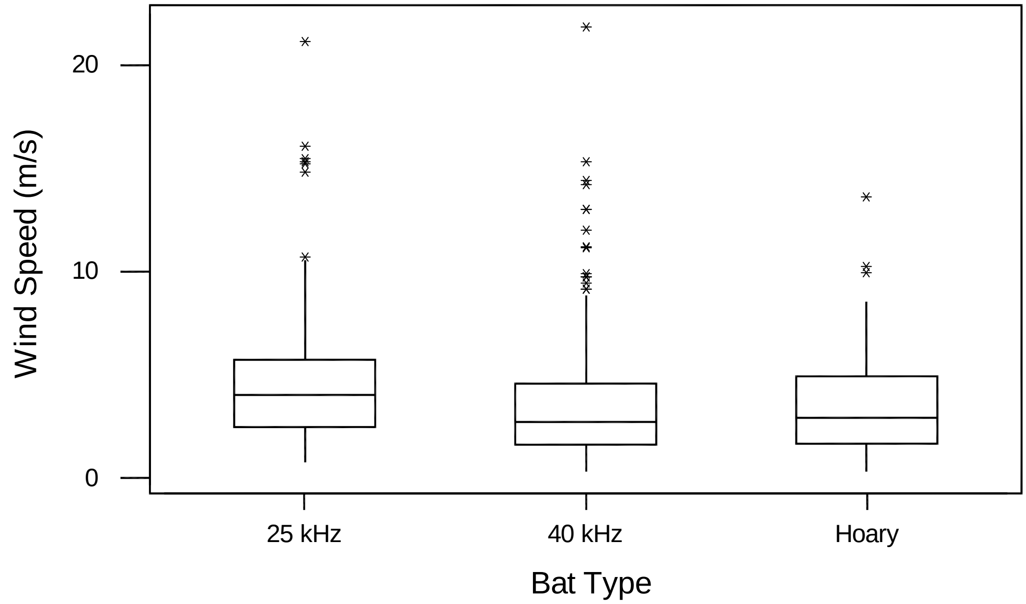
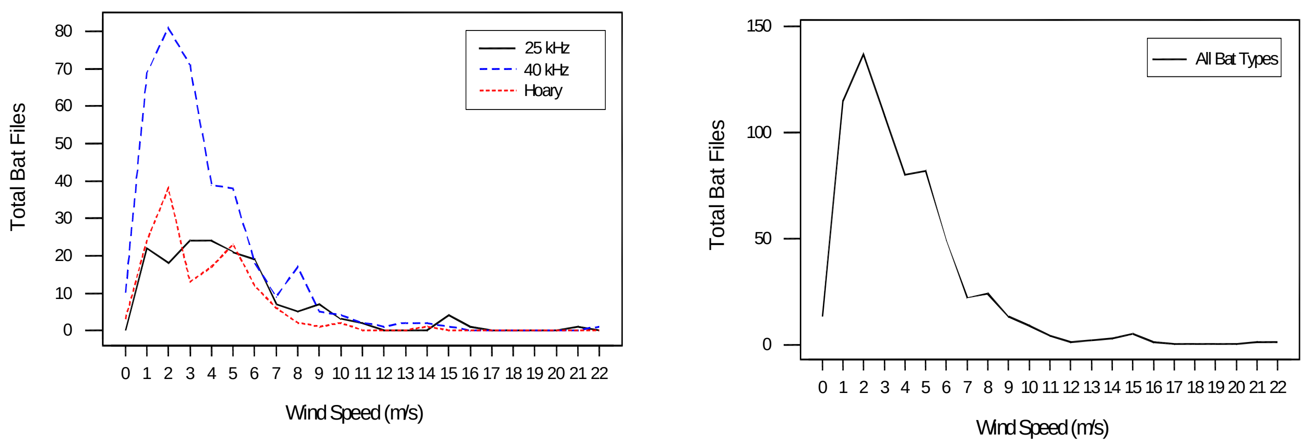


Figure 3-7. Number of bat files vs. wind speed (rounded to the nearest m/s) for MET towers 1 and 2, August 29-November 6, 2008; Coyote Wind Project, Sweet Grass County, Montana.



In general, bat activity peaked at wind speeds of 2-3 m/s, then dropped off at increasing wind speeds to about 7-8 m/s. There was very little activity at wind speeds greater than 8 m/s. All phonic groups behaved similarly in this regard.

Relationship between bat activity and temperature

Figures 3-8 and 3-10 are boxplots of temperature versus bat phonic group for all bat files and wind data from MET towers 1 and 6, and 1 and 2 respectively. The interpretation of boxplots is described above. Figures 3-9 and 3-11 display these data graphically by phonic group and for all bat files combined.

Figure 3-8. Temperature (roundest to nearest whole number in degrees C) vs. bat phonic group using data from MET towers 1 and 6; August 29-November 6, 2008; Coyote Wind Project, Sweet Grass County, Montana.

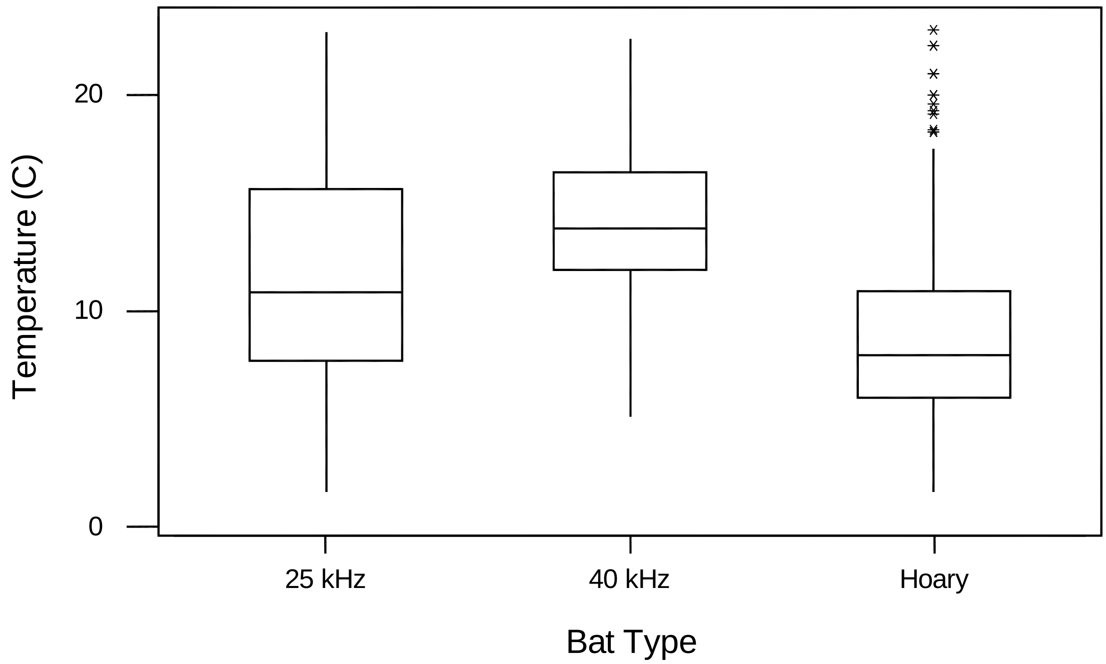


Figure 3-9. Number of bat files vs. temperature (rounded to the nearest whole number in degrees C) from MET towers 1 and 6, August 29-November 6, 2008, Coyote Wind Project, Sweet Grass County, Montana.

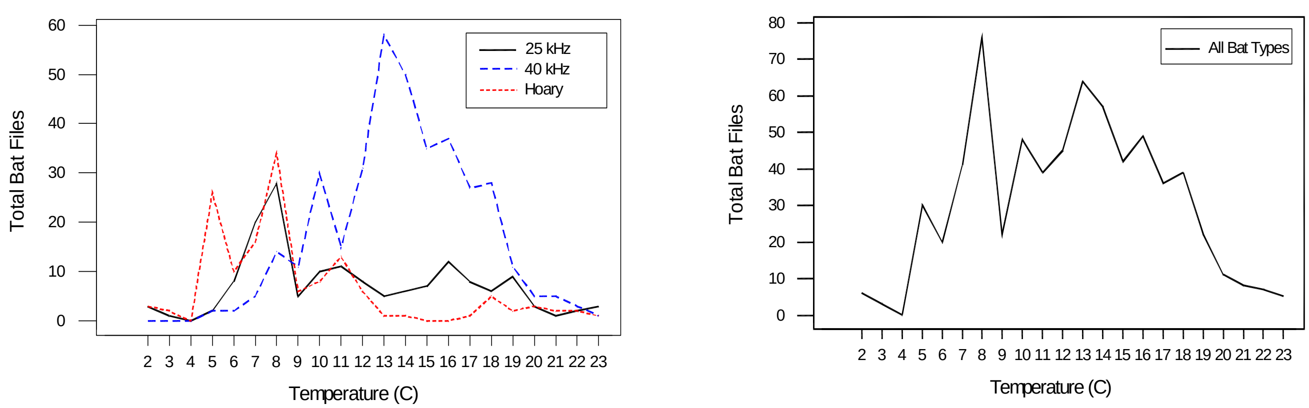


Figure 3-10. Temperature (rounded to nearest whole number in degrees C) vs. bat phonic group using data from MET towers 1 and 2; August 29-November 6, 2008; Coyote Wind Project, Sweet Grass County, Montana.

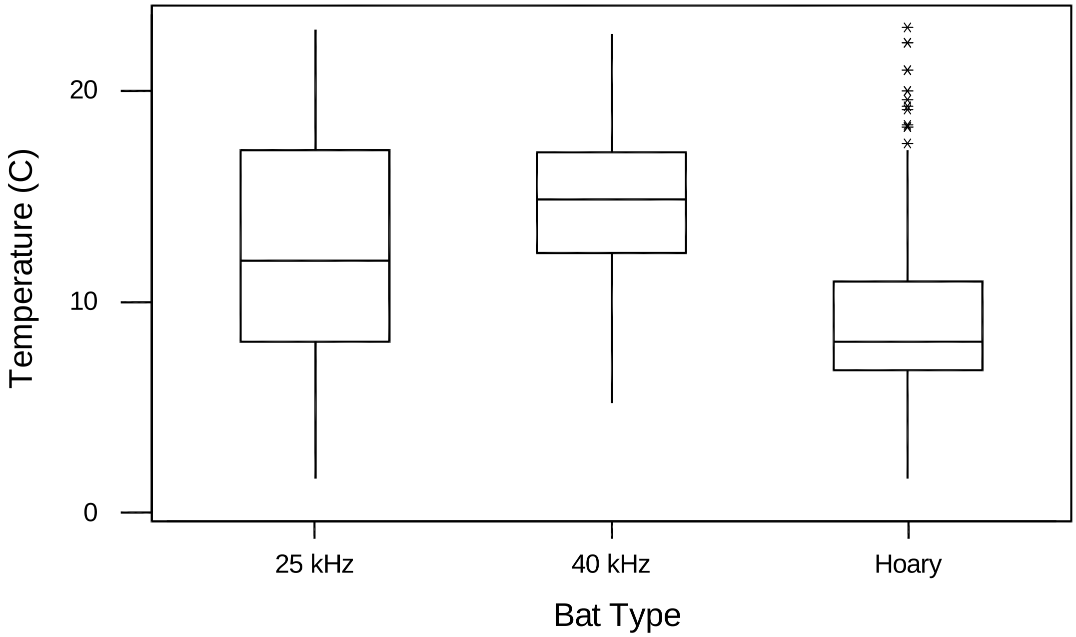
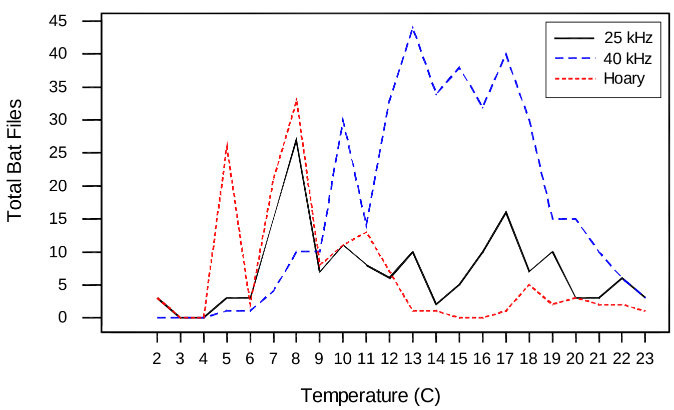
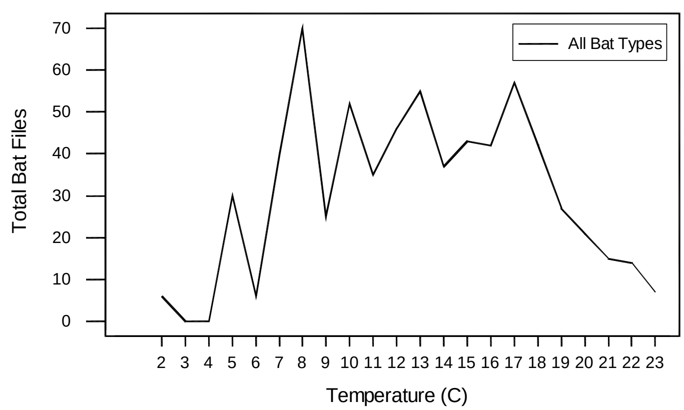


Figure 3-11. Number of bat files vs. temperature (rounded to the nearest whole number in degrees C) from MET towers 1 and 2, August 29-November 6, 2008, Coyote Wind Project, Sweet Grass County, Montana.





Bats were most active at temperatures ranging from 5-20 degrees C (Figures 3-8 to 3-11). Temperatures recorded at the MET towers from August 29-November 6, 2008 ranged from -6.5 to 35.8 C. It appears that bats in the 40 KHz phonic group were more active at warmer temperatures than those in the 25 kHz group or hoary bats.

Bat activity at each of the instrument heights.

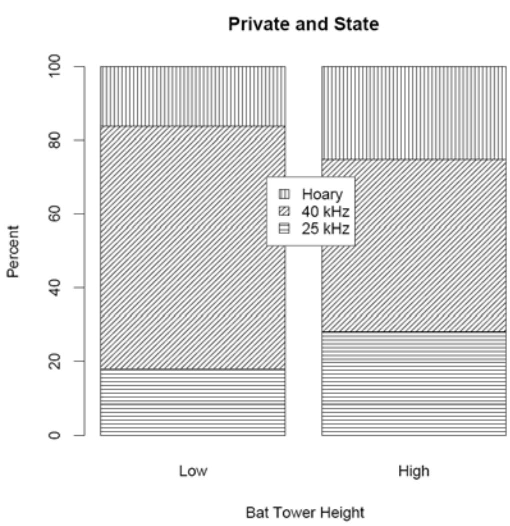
Table 3-7 shows the results of chi-square analysis of bat occurrence and tower height. The relationship between bat activity at each instrument height vs. bat phonic group can be seen in Figure 3-12. The segmented bar chart on the left displays the row percentages and the segmented bar chart on the right displays the column percentages. In a segmented bar chart, one can visually see if the percent distribution (or segmentation) of one variable is the same for each category of the other variable. For example, in the segmented bar chart on the right one can see that the 25 kHz and hoary bats are similar in regards to their preference to fly at the higher bat tower, whereas 40 kHz bats are different (i.e. mostly flying at the low bat tower height).

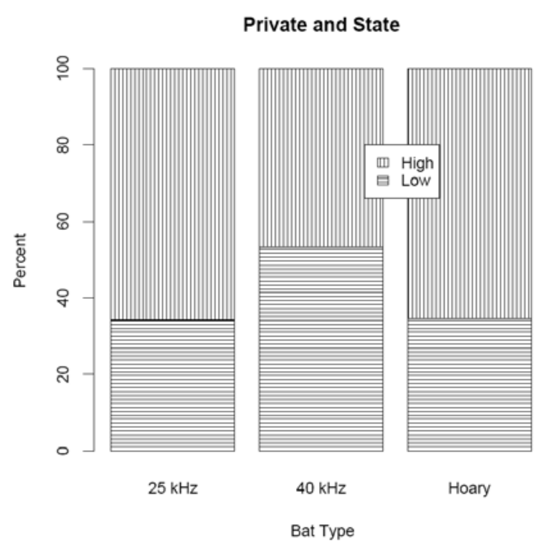
Table 3-7. Chi-Square Test: PS-25 kHz, PS-40 kHz, PS-Hoary (PRIVATE AND STATE)

	Counts	**PS-25 kH**	**PS-40 kH**	**PS-Hoary**	**Total**
High	Expected	104	173	93	370
	Observed	87.25	204.33	78.42	
Low	Expected	54	197	49	300
	Observed	70.75	165.67	63.58	
	Total	158	370	142	670
	Chi-Sq	3.214 +	4.803 +	2.712 +	
		3.964 +	5.924 +	3.344 +	= 23.961
DF = 2	**P-Value= 0.000**				

		25 kHz	**40 kHz**	**Hoary**
	Count:	104	173	93
High	Row %:	28.1%	46.8%	25.1%
	Column %:	65.8%	46.8%	65.5%
	Count:	54	197	49
Low	Row %:	18.0%	65.7%	16.3%
	Column %:	34.2%	53.2%	34.5%

Figure 3-12. Percent distribution of bats vs. tower height, August 29-November 6, 2009; Coyote Wind Project, Sweet Grass County, MT.





The chi-square test shows that there is a significant association (P-value<0.0005) between bat instrument height and bat phonic group. Over 50% of the 40 kHz bats were observed flying at the low bat tower height, whereas nearly 65% of the 25 kHz and hoary bats were observed flying at the high bat tower height.

The results of these analyses can be used to focus post-construction surveys, and can perhaps guide mitigation if fatalities are high. While data was collected for several months, it is important to recognize that these data only represent one year and results may vary between years. In addition, data collection began August 29. Researchers at Judith Gap recently reported August and September as months of high bat activity (TRC 2008). Therefore future research should include the month of August.

Results of this research are generally consistent with those found by Arnett et al. (2006) in Pennsylvania, and in a review by Arnett et al. (2007) of bat fatalities at wind energy facilities in North America. These studies correlated bat activity with weather and other environmental variables. Similar to the Coyote Wind study, these authors found greatest activity immediately after sunset and declining through the night; and that high frequency bat (>35 kHz) activity was greater than low frequency bat activity (<35 kHz) at lower heights (1.5 m). Arnett et al. (2006) found bat activity increased with temperature. They did not observe the decline in activity after about 20 degrees C that we saw. Similar to our results, they did find bat activity decreased after wind speeds of about 6-8 m/s (Arnett et al. 2007).

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Appendices

Appendix A: Results of Small Bird Counts (SBC)

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Results of Small Bird Counts Conducted by Garcia and Associates in support of the Coyote Wind Project

Date YYMMDD	**Transect Name** Private west (PW), Private center (PC), Private east (PE), State (S1)	**Stop (= Point Count #)** Point #	**Time** Four digit military time	**Wind** 0 to 5 Beaufort Scale	**Sky** 0 to 6 (clear to heavy rain scale)	**Temp** in °F	**Noise (Stream or other)** Stream Noise Codes	**Species** Appropriate 4-letter AOU code	**Distance** in meters	**Sex** Male (M), Female (F), Pair (P), Unknown/Flock (U)	**Abundance** # detected	**A** Song (S), Drum (D), Call - C	**V** Yes or blank
05/13/08	PW	1	0720	1	0	37	1	WEME	100	M	2		V
05/13/08	PW	1	0720	1	0	37	1	VESP	23	M	1		V
05/13/08	PW	1	0720	2	0	37	2	AMCR	45	M	1		V
05/13/08	PW	1	0720	2	0	37	2	VESP	25	M	1	S	
05/13/08	PW	2	0745	2	0	37	2	WEME	100	M	1		V
05/13/08	PW	2	0745	2	0	37	2	VESP	23	M	1	S	
05/13/08	PW	2	0745	2	0	37	2	AMCR	45	U	1		V
05/13/08	PW	3	0800	2	0	37	2	WEME	40	M	1		V
05/13/08	PW	3	0800	2	0	37	2	RWBL	90	M	1		V
05/13/08	PW	3	0800	2	0	37	2	VESP	125	M	1	S	
05/13/08	PW	3	0800	2	0	37	2	MALL	225	M	1		V
05/13/08	PW	4	0816	2	0	37	2	RWBL	120	M	2		V
05/13/08	PW	4	0816	2	0	37	2	VESP	30	M	1		V
05/13/08	PW	4	0816	2	0	37	2	WEME	100	M	2		V
05/13/08	PW	4	0816	2	0	37	2	LASP	20	M	1	S	
05/13/08	PW	4	0816	2	0	37	2	AMKE	80	M	1		V
05/13/08	PW	5	0841	2	0	39	2	SOSP	55	M	1	S	

05/13/08	PW	5	0841	2	0	39	2	AMKE	60	M	1		V
05/13/08	PW	5	0841	2	0	39	2	RWBL	150	M	1		V
05/13/08	PW	5	0841	2	0	39	2	WEME	70	M	1		V
05/13/08	PW	5	0841	2	0	39	2	BBMA	85	U	1		V
05/13/08	PW	5	0841	2	0	39	2	EUST	100	U	1	C	
05/13/08	PW	6	0854	2	0	39	2	AMKE	200	M	1		V
05/13/08	PW	6	0854	2	0	39	2	WEME	200	M	2		V
05/13/08	PW	6	0854	2	0	39	2	SOSP	120	M	1	C	
05/13/08	PW	6	0854	2	0	39	2	BBMA	120	U	1		V
05/13/08	PW	6	0854	2	0	39	2	LBCU	250	U	1		V
05/13/08	PW	7	0905	2	0	40	2	WEME	120	M	2		V
05/13/08	PW	7	0905	2	0	40	2	LBCU	200	U	1		V
05/13/08	PW	8	0920	2	0	40	2	WEME	120	M	1	C	
05/13/08	PW	8	0920	2	0	40	2	SOSP	70	M	1		V
05/13/08	PW	8	0920	2	0	40	2	AMKE	150	M	1		V
05/13/08	PW	8	0920	2	0	40	2	LBCU	75	U	1		V
05/13/08	PW	8	0920	2	0	40	2	BBMA	200	U	1		V
05/13/08	PW	8	0920	2	0	40	2	EUST	250	U	1		V
05/13/08	PC	1	0941	3	0	42	2	SOSP	100	M	2	C	
05/13/08	PC	1	0941	3	0	42	2	WEME	110	M	1	C	
05/13/08	PC	1	0941	3	0	42	2	BBMA	150	U	1		V
05/13/08	PC	2	1000	3	0	42	2	CORA	200	U	2		V
05/13/08	PC	2	1000	3	0	42	2	WEME	150	M	1	C	
05/13/08	PC	3	1018	2	0	45	2	WEME	50	M,F	2		V
05/13/08	PC	3	1018	2	0	45	2	SOSP	100	M	1	C	
05/13/08	PC	3	1018	2	0	45	2	BBMA	75	U	1		V
05/13/08	PC	4	1034	2	1	45	2	WEME	70	M	1	C	
05/13/08	PC	4	1034	2	1	45	2	VESP	80	U	5		V
05/13/08	PC	5	1051	2	1	45	2	LASP	50	M,F	15		V
05/13/08	PC	5	1051	2	1	45	2	WEME	120	M	1		V
05/13/08	PC	5	1051	2	1	45	2	ROPI	10	U	1		V
05/13/08	PC	5	1051	2	1	45	2	GOEA	200	U	1		V
05/13/08	PC	6	1112	2	1	45	2	ROPI	250	U	1		V
05/13/08	PC	6	1112	2	1	45	2	GOEA	300	U	1		V
05/13/08	PC	6	1112	2	1	45	2	OSPR	70	U	1		V

05/15/08	PE	1	0630	0	2	46	2	WEME	70	M	1	C	
05/15/08	PE	1	0630	0	2	46	2	COSN	100	M	1	C	
05/15/08	PE	1	0630	0	2	46	2	SOSP	40	M	3	C	
05/15/08	PE	1	0630	0	2	46	2	SACR	150	U	2	C	
05/15/08	PE	1	0630	0	2	46	2	RWBL	70	M	1	C	
05/15/08	PE	1	0630	0	2	46	2	VESP	50	M	3	C	
05/15/08	PE	1	0630	0	2	46	2	ROPI	10	U	5		V
05/15/08	PE	2	0654	0	2	46	2	RWBL	280	M	2		V
05/15/08	PE	2	0654	0	2	46	2	SOSP	75	M	3	C	
05/15/08	PE	2	0654	0	2	46	2	WEME	100	M	2	C	
05/15/08	PE	2	0654	0	2	46	2	COSN	270	M	1	C	
05/15/08	PE	2	0654	0	2	46	2	LISP	200	M	1	C	
05/15/08	PE	2	0654	0	2	46	2	VESP	25	M	1	C	
05/15/08	PE	2	0654	0	2	46	2	AMRO	200	M	1	C	
05/15/08	PE	2	0654	0	2	46	2	SACR	100	U	2		V
05/15/08	PE	3	713	1	2	45	2	SACR	200	U	2		V
05/15/08	PE	3	713	1	2	45	2	COSN	150	M	1	C	
05/15/08	PE	3	713	1	2	45	2	WEME	70	M	1		V
05/15/08	PE	3	713	1	2	45	2	SOSP	40	M	1	C	
05/15/08	PE	3	713	1	2	45	2	VESP	40	M	1		V
05/15/08	PE	3	713	1	2	45	2	CAGO	200	U	5	C	
05/15/08	PE	3	713	1	2	45	2	BRSP	70	M	1	C	
05/15/08	PE	3	713	1	2	45	2	CHSP	10	M	2		V
05/15/08	PE	4	0738	2	2	44	2	WEME	30	M	1		V
05/15/08	PE	4	0738	2	2	44	2	BRSP	50	M	2	C	
05/15/08	PE	4	0738	2	2	44	2	CHSP	40	M	1		V
05/15/08	PE	4	0738	2	2	44	2	VESP	10	M	1		V
05/15/08	PE	4	0738	2	2	44	2	BHCO	15	U	2		V
05/15/08	PE	5	0755	1	2	45	2	VESP	50	M	1	C	
05/15/08	PE	5	0755	1	2	45	2	BRSP	70	M	2	C	
05/15/08	PE	5	0755	1	2	45	2	WEME	80	M	2	C	
05/15/08	PE	5	0755	1	2	45	2	CHSP	75	M	1	C	
05/15/08	PE	6	0808	2	2	45	2	BRSP	75	M	2	C	
05/15/08	PE	6	0808	2	2	45	2	WEME	50	M	1	C	
05/15/08	PE	6	0808	2	2	45	2	VESP	5	M	1		V

05/15/08	PE	6	0808	2	2	45	2	COGR	150	U	2		V
05/15/08	S1	1	0926	3	3	52	2	WEME	75	M	1	C	
05/15/08	S1	1	0926	3	3	52	2	CHSP	150	M	1	C	
05/15/08	S1	1	0926	3	3	52	2	BBMA	80	U	1		V
05/15/08	S1	1	0926	3	3	52	2	AMRO	100	U	1	C	
05/15/08	S1	2	0941	3	3	52	2	GRPA	10	u	1		V
05/15/08	S1	2	0941	3	3	52	2	WEME	200	M	1	C	
05/15/08	S1	2	0941	3	3	52	2	AMCR	150	U	2		V
05/15/08	S1	2	0941	3	3	52	2	VESP	20	U	1		V
05/15/08	S1	2	0941	3	3	52	2	BRSP	50	M	2	C	
05/15/08	S1	2	0941	3	3	52	2	CHSP	150	M	1	C	
05/15/08	S1	3	0958	2	3	52	2	RWBL	10	M,F	6		V
05/15/08	S1	3	0958	2	3	52	2	NOHA	10	F	1		V
05/15/08	S1	3	0958	2	3	52	2	BHCO	50	U	15		V
05/15/08	S1	3	0958	2	3	52	2	SOSP	30	U	1		V
05/15/08	S1	4	1013	2	3	52	2	WEME	75	M	1	C	
05/15/08	S1	4	1013	2	3	52	2	CORA	150	U	1		V
05/15/08	S1	4	1013	2	3	52	2	BRSP	90	M	1	C	
05/15/08	S1	5	1028	2	3	60	2	AMKE	30	F	1		V
05/15/08	S1	5	1028	2	3	60	2	HOLA	40	M	1		V
05/15/08	S1	5	1028	2	3	60	2	WEME	75	M	2	C	
05/15/08	S1	5	1028	2	3	60	2	RWBL	120	F	1		V
05/15/08	S1	5	1028	2	3	60	2	CHSP	50	M	1	C	
05/15/08	S1	5	1028	2	3	60	2	VESP	80	M	1	C	
05/15/08	S1	6	1042	1	2	69	2	WEME	40	M	1	C	
05/15/08	S1	6	1042	1	2	69	2	CHSP	60	M	1	C	
05/15/08	S1	6	1042	1	2	69	2	BBMA	90	U	1	C	
05/15/08	S1	6	1042	1	2	69	2	AMKE	100	M	1		V
05/15/08	S1	6	1042	1	2	69	2	HOLA	150	M	1		V
05/15/08	S1	6	1042	1	2	69	2	AMCR	250	U	1		V
05/29/08	PC	6	0625	0	2	49	1	GOEA	100	U	1		V
05/29/08	PC	6	0625	0	2	49	1	WEME	100	M	1	C	
05/29/08	PC	6	0625	0	2	49	1	BBMA	20	U	1		V
05/29/08	PC	6	0625	0	2	49	1	SACR	200	U	2	C	
05/29/08	PC	6	0625	0	2	49	1	CAGO	200	U	3	C	

05/29/08	PC	6	0625	0	2	49	1	EAKI	10	M	1		V
05/29/08	PC	6	0625	0	2	49	1	BRSP	30	M	1	C	
05/29/08	PC	6	0625	0	2	49	1	AMCR	150	U	1	C	
05/29/08	PC	6	0625	0	2	49	1	CORA	25	U	2		V
05/29/08	PC	6	0625	0	2	49	1	CCLO	55	M	1	C	
05/29/08	PC	5	0642	0	2	49	1	WEME	45	M	1	C	
05/29/08	PC	5	0642	0	2	49	1	BBMA	50	U	1		V
05/29/08	PC	5	0642	0	2	49	1	BRSP	75	M	1	C	
05/29/08	PC	5	0642	0	2	49	1	BHCO	30	U	1		V
05/29/08	PC	5	0642	0	2	49	1	CORA	150	U	2		V
05/29/08	PC	5	0642	0	2	49	1	VESP	75	M	1	C	
05/29/08	PC	5	0642	0	2	49	1	GRSP	25	M	1		V
05/29/08	PC	4	0702	1	2	50	2	SOSP	50	M	1	C	
05/29/08	PC	4	0702	1	2	50	2	WEME	70	M	1	C	
05/29/08	PC	4	0702	1	2	50	2	SACR	200	U	1	C	
05/29/08	PC	4	0702	1	2	50	2	BBMA	135	U	2		V
05/29/08	PC	4	0702	1	2	50	2	AMCR	200	U	1	C	
05/29/08	PC	3	0717	1	2	50	2	WEME	30	M	1	C	
05/29/08	PC	3	0717	1	2	50	2	BBMA	75	U	2	C	
05/29/08	PC	3	0717	1	2	50	2	CORA	150	U	1		V
05/29/08	PC	3	0717	1	2	50	2	VESP	75	M	1	C	
05/29/08	PC	3	0717	1	2	50	2	BRSP	55	M	1	C	
05/29/08	PC	2	0733	1	2	50	2	WEME	125	M	1	C	
05/29/08	PC	2	0733	1	2	50	2	BBMA	200	U	1	C	
05/29/08	PC	2	0733	1	2	50	2	CAGO	250	U	2	C	
05/29/08	PC	2	0733	1	2	50	2	VESP	75	M	1	C	
05/29/08	PC	2	0733	1	2	50	2	AMCR	55	U	2		V
05/29/08	PC	1	0746	1	2	50	2	WEME	30	M	2	C	
05/29/08	PC	1	0746	1	2	50	2	SOSP	40	M	1	C	
05/29/08	PC	1	0746	1	2	50	2	BBMA	70	U	2		V
05/29/08	PC	1	0746	1	2	50	2	TRES	45	U	1		V
05/29/08	PC	1	0746	1	2	50	2	PRFA	200	M	1		V
05/29/08	PW	8	0813	2	2	55	2	WEME	30	M	2	C	
05/29/08	PW	8	0813	2	2	55	2	EAKI	45	M	1		V
05/29/08	PW	8	0813	2	2	55	2	NOHA	75	M	1		V

05/29/08	PW	8	0813	2	2	55	2	ROPI	50	U	2		V
05/29/08	PW	8	0813	2	2	55	2	CONI	20	U	1		V
05/29/08	PW	8	0813	2	2	55	2	LBCU	150	U	1	C	
05/29/08	PW	8	0813	2	2	55	2	BRBL	200	U	1		V
05/29/08	PW	8	0813	2	2	55	2	NRWS	95	U	1		V
05/29/08	PW	7	0836	2	2	55	2	LBCU	70	U	2	C	
05/29/08	PW	7	0836	2	2	55	2	WEME	50	M	1	C	
05/29/08	PW	7	0836	2	2	55	2	BRBL	70	U	1	C	
05/29/08	PW	7	0836	2	2	55	2	TRES	150	U	2		V
05/29/08	PW	7	0836	2	2	55	2	AMKE	100	F	1		V
05/29/08	PW	7	0836	2	2	55	2	NRWS	130	U	2		V
05/29/08	PW	6	0849	2	2	59	2	WEME	60	M	2	C	
05/29/08	PW	6	0849	2	2	59	2	VESP	30	M	1	C	
05/29/08	PW	6	0849	2	2	59	2	GOEA	250	U	1		V
05/29/08	PW	6	0849	2	2	59	2	SACR	125	U	2		V
05/29/08	PW	6	0849	2	2	59	2	LBCU	180	U	1	C	
05/29/08	PW	5	0902	2	2	60	2	WEME	50	M	1	C	
05/29/08	PW	5	0902	2	2	60	2	LBCU	150	U	1	C	
05/29/08	PW	5	0902	2	2	60	2	HOLA	70	U	1		V
05/29/08	PW	5	0902	2	2	60	2	BRSP	90	M	1	C	
05/29/08	PW	5	0902	2	2	60	2	BBMA	60	U	1		V
05/29/08	PW	5	0902	2	2	60	2	VESP	80	M	1	C	
05/29/08	PW	5	0902	2	2	60	2	BASW	150	U	1		V
05/29/08	PW	4	0915	2	2	60	2	WEME	30	M	1	C	
05/29/08	PW	4	0915	2	2	60	2	BRSP	80	M	1	C	
05/29/08	PW	4	0915	2	2	60	2	NRWS	90	U	1		V
05/29/08	PW	4	0915	2	2	60	2	BASW	45	U	1		V
05/29/08	PW	4	0915	2	2	60	2	AMRO	40	U	1	C	
05/29/08	PW	4	0915	2	2	60	2	RWBL	210	M	1	C	
05/29/08	PW	3	0930	2	2	60	2	WEME	30	M	1	C	
05/29/08	PW	3	0930	2	2	60	2	RWBL	20	M,F	2		V
05/29/08	PW	3	0930	2	2	60	2	GRSP	55	M	2	C	
05/29/08	PW	3	0930	2	2	60	2	BASW	30	U	1		V
05/29/08	PW	3	0930	2	2	60	2	BBMA	150	U	1		V
05/29/08	PW	3	0930	2	2	60	2	NOFL	180	U	1	C	

05/29/08	PW	3	0930	2	2	60	2	EUST	50	U	1		V
05/29/08	PW	2	0947	2	2	62	2	AMKE	20	M	1		V
05/29/08	PW	2	0947	2	2	62	2	WEME	60	M	1	C	
05/29/08	PW	2	0947	2	2	62	2	SAVS	40	M	1	C	
05/29/08	PW	2	0947	2	2	65	2	AWPE	200	U	4		V
05/29/08	PW	1	1000	2	2	65	2	WEME	30	M	3	C	
05/29/08	PW	1	1000	2	2	65	2	AMKE	40	M	1		V
05/29/08	PW	1	1000	2	2	65	2	BHCO	180	U	3		V
05/29/08	PW	1	1000	2	2	65	2	BASW	20	U	1		V
05/29/08	PW	1	1000	2	2	65	2	SOSP	45	M	1	C	
5/30/08	S1	1	0640	2	2	50	2	WEME	40	M	1	C	
5/30/08	S1	1	0640	2	2	50	2	CORA	50	U	1	C	
5/30/08	S1	2	0653	2	2	50	2	WEME	30	M,F	2		V
5/30/08	S1	2	0653	2	2	50	2	GRPA	25	M,F	2		V
5/30/08	S1	3	0706	2	2	50	2	SACR	10	M,F	2		V
5/30/08	S1	3	0706	2	2	50	2	RWBL	25	M,F	6		V
5/30/08	S1	3	0706	2	2	50	2	KILL	25	U	2		V
5/30/08	S1	3	0706	2	2	50	2	WEME	10	M	1	C	
5/30/08	S1	4	0720	2	2	50	2	HOLA	10	U	2		V
5/30/08	S1	4	0720	2	2	50	2	SACR	210	M,F	2		V
5/30/08	S1	4	0720	2	2	50	2	WEME	180	M	1	C	
5/30/08	S1	4	0720	2	2	50	2	BHCO	50	U	2	C	
5/30/08	S1	5	0734	2	2	50	2	HOLA	20	M	1		V
5/30/08	S1	5	0734	2	2	50	2	WEME	40	M	2	C	
5/30/08	S1	6	0747	2	2	50	2	WEME	10	M	1		V
5/30/08	S1	6	0747	2	2	50	2	HOLA	25	M	1		V
5/30/08	S1	6	0747	2	2	50	2	LBCU	125	U	1		V
5/30/08	PE	1	0852	2	2	50	2	WEME	30	m	2		v
5/30/08	PE	1	0852	2	2	50	2	EUST	90	U	2		V
5/30/08	PE	1	0852	2	2	50	2	VESP	30	M	2		V
5/30/08	PE	1	0852	2	2	50	2	MODO	150	U	1	C	
5/30/08	PE	2	0908	2	2	50	2	WEME	45	M	3	C	
5/30/08	PE	2	0908	2	2	50	2	VESP	40	M	1		V
5/30/08	PE	2	0908	2	2	50	2	KILL	70	U	1	C	
5/30/08	PE	2	0908	2	2	50	2	BRSP	150	M	1	C	

5/30/08	PE	2	0908	2	2	50	2	BRBL	200	U	1	C	
5/30/08	PE	2	0908	2	2	50	2	GRSP	220	M	1	C	
5/30/08	PE	3	0921	2	2	50	2	WEME	50	M	1	C	
5/30/08	PE	3	0921	2	2	50	2	RWBL	200	M	2	C	
5/30/08	PE	3	0921	2	2	50	2	BRSP	40	M	1	C	
5/30/08	PE	3	0921	2	2	50	2	GRSP	75	M	1	C	
5/30/08	PE	3	0921	2	2	50	2	EAKI	25	M	2		V
5/30/08	PE	3	0921	2	2	56	2	MOBL	40	f	1		v
5/30/08	PE	4	0934	2	2	56	2	WEME	30	M	1	C	
5/30/08	PE	4	0934	2	2	56	2	KILL	200	U	2	C	
5/30/08	PE	4	0934	2	2	56	2	BRSP	60	M	1	C	
5/30/08	PE	4	0934	2	2	56	2	EAKI	200	M	1		V
5/30/08	PE	4	0934	2	2	56	2	RWBL	250	M	1	C	
5/30/08	PE	4	0934	2	2	56	2	VESP	20	M	1		V
5/30/08	PE	5	0947	2	2	56	2	WEME	75	M	1	C	
5/30/08	PE	5	0947	2	2	56	2	TUVU	30	U	1		V
5/30/08	PE	5	0947	2	2	56	2	BHCO	45	U	4	C	
5/30/08	PE	5	0947	2	2	56	2	BRBL	200	U	2		V
5/30/08	PE	5	0947	2	2	56	2	AMCR	250	U	1	C	
5/30/08	PE	5	0947	2	2	56	2	SACR	200	U	1	C	
5/30/08	PE	6	1000	2	2	60	2	AMKE	50	M,F	2		V
5/30/08	PE	6	1000	2	2	60	2	WEME	30	M	1	C	
5/30/08	PE	6	1000	2	2	60	2	TUVU	100	U	1		V
5/30/08	PE	6	1000	2	2	60	2	BRBL	150	U	1	C	
5/30/08	PE	6	1000	2	2	60	2	GRSP	70	M	1	C	
5/30/08	PE	6	1000	2	2	60	2	BRSP	80	M	1	C	
6/19/08	PW	1	0620	0	1	57	1	WEME	10	M	2	C	
6/19/08	PW	1	0620	0	1	57	1	BBMA	40	U	1	C	
6/19/08	PW	1	0620	0	1	57	1	SACR	75	U	3	C	
6/19/08	PW	1	0620	0	1	57	1	LASP	100	M	1	C	
6/19/08	PW	1	0620	0	1	57	1	VESP	65	M	1	C	
6/19/08	PW	2	0635	0	1	57	1	WEME	22	M	2	C	
6/19/08	PW	2	0635	0	1	57	1	BHCO	50	M	1		V
6/19/08	PW	2	0635	0	1	57	1	MODO	125	U	1	C	
6/19/08	PW	2	0635	0	1	57	1	BRBL	80	U	1		V

6/19/08	PW	2	0635	0	1	57	1	SACR	200	U	2	C	
6/19/08	PW	2	0635	0	1	57	1	BBMA	50	U	1	C	
6/19/08	PW	2	0635	0	1	57	1	CORA	130	U	2	C	
6/19/08	PW	3	0651	0	1	57	1	WEME	20	M	1		V
6/19/08	PW	3	0651	0	1	57	1	RWBL	80	M	2		V
6/19/08	PW	3	0651	0	1	57	1	SACR	175	U	1	C	
6/19/08	PW	3	0651	0	1	57	1	YEWA	100	M	1		V
6/19/08	PW	3	0651	0	1	57	1	LASP	80	M	1	C	
6/19/08	PW	3	0651	0	1	57	1	WETA	30	M	1		V
6/19/08	PW	3	0651	0	1	57	1	BHCO	30	M,F	5		V
6/19/08	PW	4	0710	0	1	60	1	NOFL	65	U	1	C	
6/19/08	PW	4	0710	0	1	60	1	BBMA	80	U	2	C	
6/19/08	PW	4	0710	0	1	60	1	WEME	30	M	1		V
6/19/08	PW	4	0710	0	1	60	1	RWBL	55	M	3		V
6/19/08	PW	4	0710	0	1	60	1	SAVS	150	U	1		V
6/19/08	PW	4	0710	0	1	60	1	CORA	200	U	1	C	
6/19/08	PW	4	0710	0	1	60	1	MODO	200	U	1	C	
6/19/08	PW	4	0710	0	1	60	1	BRBL	120	M,F	5		V
6/19/08	PW	5	0723	1	1	60	2	WEME	30	M	1	C	
6/19/08	PW	5	0723	1	1	60	2	BBMA	50	U	2	C	
6/19/08	PW	5	0723	1	1	60	2	NOFL	120	U	1	C	
6/19/08	PW	5	0723	1	1	60	2	CHSP	135	M	1	C	
6/19/08	PW	5	0723	1	1	60	2	BHCO	75	M	1		V
6/19/08	PW	5	0723	1	1	60	2	CORA	250	U	1	C	
6/19/08	PW	6	0735	1	1	60	2	WEME	35	M	2		V
6/19/08	PW	6	0735	1	1	60	2	CORA	200	U	1	C	
6/19/08	PW	6	0735	1	1	60	2	VESP	170	M	1	C	
6/19/08	PW	6	0735	1	1	60	2	BBMA	75	U	1		V
6/19/08	PW	6	0735	1	1	60	2	CHSP	70	M	1	C	
6/19/08	PW	6	0735	1	1	60	2	LBCU	80	U	1	C	
6/19/08	PW	7	0747	1	1	60	2	WEME	35	M	2		V
6/19/08	PW	7	0747	1	1	60	2	BBMA	120	U	1		V
6/19/08	PW	7	0747	1	1	60	2	WISN	200	M	1		C
6/19/08	PW	7	0747	1	1	60	2	CORA	175	U	1	C	
6/19/08	PW	8	0758	1	1	60	2	WEME	30	M	3		V

6/19/08	PC	1	0822	2	2	62	2	BBMA	75	U	1	C	
6/19/08	PC	1	0822	2	2	62	2	WEME	50	M	1	C	
6/19/08	PC	1	0822	2	2	62	2	CORA	150	U	2		V
6/19/08	PC	1	0822	2	2	62	2	KILL	70	U	1		V
6/19/08	PC	1	0822	2	2	62	2	CLSW	30	U	1		V
6/19/08	PC	2	0834	2	2	62	2	WEME	40	M	1	C	
6/19/08	PC	2	0834	2	2	62	2	NOFL	75	U	1	C	
6/19/08	PC	2	0834	2	2	62	2	BBMA	90	U	1	C	
6/19/08	PC	2	0834	2	2	62	2	LASP	85	M	1	C	
6/19/08	PC	2	0834	2	2	62	2	CHSP	45	M	2	C	
6/19/08	PC	3	0848	2	2	62	2	BBMA	30	U	1	C	
6/19/08	PC	3	0848	2	2	62	2	WEME	25	M	2	C	
6/19/08	PC	3	0848	2	2	62	2	NOFL	100	U	1	C	
6/19/08	PC	3	0848	2	2	62	2	SOSP	35	U	1		V
6/19/08	PC	3	0848	2	2	62	2	VESP	20	U	2		V
6/19/08	PC	3	0848	2	2	62	2	ROPI	15	U	1		V
6/19/08	PC	3	0848	2	2	62	2	CHSP	40	U	1	C	
6/19/08	PC	3	0848	2	2	62	2	AMKE	35	M	1		V
6/19/08	PC	4	0901	2	2	62	2	WEME	20	M	1	C	
6/19/08	PC	4	0901	2	2	62	2	BBMA	100	U	1	C	
6/19/08	PC	4	0901	2	2	62	2	SACR	200	U	1	C	
6/19/08	PC	4	0901	2	2	62	2	CHSP	35	U	2	C	
6/19/08	PC	4	0901	2	2	62	2	NOFL	175	U	1	C	
6/19/08	PC	5	0914	2	2	65	2	WEME	35	M	1	C	
6/19/08	PC	5	0914	2	2	65	2	BBMA	100	U	2	C	
6/19/08	PC	5	0914	2	2	65	2	VESP	45	M	2	C	
6/19/08	PC	5	0914	2	2	65	2	GOEA	75	U	1		V
6/19/08	PC	6	0927	2	2	65	2	WEME	45	M	1	C	
6/19/08	PC	6	0927	2	2	65	2	VESP	55	M	2	C	
6/19/08	PC	6	0927	2	2	65	2	SACR	200	U	3	C	
6/19/08	PC	6	0927	2	2	65	2	CORA	125	U	1		V
6/19/08	PC	6	0927	2	2	65	2	PRFA	20	U	1		V
6/20/08	S1	1	0627	0	0	46	1	WEME	20	M	1	C	
6/20/08	S1	1	0627	0	0	46	1	VESP	15	M	1	C	
6/20/08	S1	1	0627	0	0	46	1	WISN	50	M	1	C	

6/20/08	S1	1	0627	0	0	46	1	RWBL	25	M	3		V
6/20/08	S1	1	0627	0	0	46	1	AMRO	200	M	1	C	
6/20/08	S1	2	0640	0	0	46	1	BBMA	48	U	1		V
6/20/08	S1	2	0640	0	0	46	1	WEME	125	M	1	C	
6/20/08	S1	2	0640	0	0	46	1	VESP	150	M	2	C	
6/20/08	S1	2	0640	0	0	46	1	RWBL	70	M	2	C	
6/20/08	S1	2	0640	0	0	46	1	GRPA	5	U	1		V
6/20/08	S1	2	0640	0	0	46	1	KILL	80	U	2	C	
6/20/08	S1	2	0640	0	0	46	1	MODO	200	U	1	C	
6/20/08	S1	3	0653	0	0	46	1	WEME	20	M	1		V
6/20/08	S1	3	0653	0	0	46	1	RWBL	80	M	7		V
6/20/08	S1	3	0653	0	0	46	1	KILL	10	U	6		V
6/20/08	S1	3	0653	0	0	46	1	MODO	10	U	2		V
6/20/08	S1	3	0653	0	0	46	1	SPSA	15	U	1		V
6/20/08	S1	3	0653	0	0	46	1	WISN	30	M	1	C	
6/20/08	S1	4	0709	0	0	46	1	GBHE	15	U	1		V
6/20/08	S1	4	0709	0	0	46	1	WEME	20	M	3	C	
6/20/08	S1	4	0709	0	0	46	1	KILL	15	U	5	C	
6/20/08	S1	4	0709	0	0	46	1	RWBL	120	M	2	C	
6/20/08	S1	4	0709	0	0	46	1	WISN	75	M	1	C	
6/20/08	S1	4	0709	0	0	46	1	MODO	200	U	1	C	
6/20/08	S1	4	0709	0	0	46	1	AMKE	200	MF	2		V
6/20/08	S1	4	0709	0	0	46	1	BBMA	140	U	1	C	
6/20/08	S1	4	0709	0	0	46	1	PRFA	300	F	1		V
6/20/08	S1	5	0723	0	0	46	1	WEME	75	M	3	C	
6/20/08	S1	5	0723	0	0	46	1	WISN	300	M	1	C	
6/20/08	S1	5	0723	0	0	46	1	RWBL	300	M	2	C	
6/20/08	S1	5	0723	0	0	46	1	BBMA	250	U	3	C	
6/20/08	S1	5	0723	0	0	46	1	SACR	300	U	2	C	
6/20/08	S1	5	0723	0	0	46	1	HOLA	45	M	1		V
6/20/08	S1	6	0735	0	0	46	1	WEME	20	M	1		V
6/20/08	S1	6	0735	0	0	46	1	BBMA	45	U	1	C	
6/20/08	PE	1	0822	0	0	55	1	WEME	25	M	3	C	
6/20/08	PE	1	0822	0	0	55	1	BBMA	125	U	1	C	
6/20/08	PE	1	0822	0	0	55	1	NOFL	49	U	1		V

6/20/08	PE	1	0822	0	0	55	1	AMGO	25	M	1		V
6/20/08	PE	1	0822	0	0	55	1	SASP	75	M	1	C	
6/20/08	PE	1	0822	0	0	55	1	VESP	120	M	2	C	
6/20/08	PE	1	0822	0	0	55	1	BRSP	35	M	1		V
6/20/08	PE	2	0822	0	0	55	1	WEME	25	M	1	C	
6/20/08	PE	2	0838	0	0	55	1	BBMA	125	U	1	C	
6/20/08	PE	2	0838	0	0	55	1	CCSP	10	U	1		V
6/20/08	PE	2	0838	0	0	55	1	BRBL	300	U	30		V
6/20/08	PE	3	0850	0	0	55	1	WEME	125	M	1	C	
6/20/08	PE	3	0850	0	0	55	1	CCSP	100	M	1	C	
6/20/08	PE	3	0850	0	0	55	1	BBMA	75	U	1	C	
6/20/08	PE	3	0850	0	0	55	1	BASW	100	U	1		V
6/20/08	PE	3	0850	0	0	55	1	RWBL	150	U	5		V
6/20/08	PE	3	0850	0	0	55	1	BRSP	30	M	1		V
6/20/08	PE	3	0850	0	0	55	1	SACR	300	U	1	C	
6/20/08	PE	3	0850	0	0	55	1	SASP	20	M	1		V
6/20/08	PE	4	0904	1	0	55	1	WEME	35	M	1	C	
6/20/08	PE	4	0904	1	0	55	1	SASP	10	M	1		V
6/20/08	PE	4	0904	1	0	55	1	SACR	250	U	1	C	
6/20/08	PE	4	0904	1	0	55	1	LASP	70	M	1		V
6/20/08	PE	4	0904	1	0	55	1	CCSP	65	U	3	C	
6/20/08	PE	4	0904	1	0	55	1	BRBL	25	U	10		V
6/20/08	PE	5	0919	2	0	55	1	WEME	32	M	1	C	
6/20/08	PE	5	0919	2	0	55	1	BRBL	80	U	1		V
6/20/08	PE	5	0919	2	0	55	1	SACR	250	U	1	C	
6/20/08	PE	6	0932	2	0	55	1	SACR	105	U	2		V
6/20/08	PE	6	0932	2	0	55	1	WEME	75	M	1	C	
6/20/08	PE	6	0932	2	0	55	1	RWBL	150	M	2	C	
6/20/08	PE	6	0932	2	0	55	1	CLSW	5	U	2		V
6/20/08	PE	6	0932	2	0	55	1	VESP	100	M	1	C	

Appendix B: Results of Bird Use Counts (BUC)

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Date	Time	Station (PN-private north; PS-private south; Spdog-State	Species (common name)	Latin name	Height (meters)	Distance (meters)	Behavior	Weather
Spring Surveys								
5/13/2008	1230	PN	Western meadowlark	*Sturnella neglecta*	5	25	Foraging and shelter	Steady wind, westerly, clear
5/13/2008	1230	PN	American crow	*Corvus brachyrhynchos*	30	150	Flyover	Steady wind, westerly, clear
5/13/2008	1230	PN	Golden eagle	*Aquila chrysaetos*	20	230	Flyover	Steady wind, westerly, clear
5/15/2008	1138	Spdog	Western meadowlark	*Sturnella neglecta*	30	340	Flyover	
5/15/2008	1138	Spdog	Black-billed magpie	*Pica hudsonia*	5	400	Flyover	Windy, southwesterly, clear, 69F
5/15/2008	1138	Spdog	Common raven	*Corvus corax*	10	300	Flyover	Windy, southwesterly, clear, 69F
5/15/2008	1138	Spdog	Brewer's blackbird	*Euphagus cyanocephalus*	10	350	Flyover	Windy, southwesterly, clear, 69F
5/15/2008	1138	Spdog	Northern rough-winged swallow	*Stelgidopteryx serripennis*	10	50	Flyover	Windy, southwesterly, clear, 69F
5/15/2008	1138	Spdog	Northern harrier (male)	*Circus cyaneus*	10	500	Hunting, hovering	Windy, southwesterly, clear, 69F
5/15/2008	1138	Spdog	American kestrel (male)	*Falco sparverius*	10	700	Hunting, hovering	Windy, southwesterly, clear, 69F
5/15/2008	1138	Spdog	Red-tailed hawk	*Buteo jamaicensis*	20	250	Flyover	Windy, southwesterly, clear, 69F

5/15/2008	1138	Spdog	Northern harrier	*Circus cyaneus*	15	150	Sparring, tail chasing	Windy, southwesterly, clear, 69F
5/15/2008	1138	Spdog	Redtail hawk	*Buteo jamaicensis*	15	150	Sparring, tail chasing	Windy, southwesterly, clear, 69F
5/29/2008	1311	PS	Black-billed magpie	*Pica hudsonia*	gnd level	350	Flyover	Moderate winds, partly cloudy, 61F
5/29/2008	1311	PS	Common raven	*Corvus corax*	gnd level	400	Flyover	Moderate winds, partly cloudy, 61F
5/29/2008	1311	PS	American kestrel (male)	*Falco sparverius*	40	450	Hunting, hovering	Moderate winds, partly cloudy, 61F
5/29/2008	1311	PS	Western meadowlark	*Sturnella neglecta*	gnd level	80	Foraging and shelter	Moderate winds, partly cloudy, 61F
5/29/2008	1311	PS	Black-billed magpie	*Pica hudsonia*	10	250	Flyover	Moderate winds, partly cloudy, 61F
5/29/2008	1311	PS	Golden eagle	*Aquila chrysaetos*	30	100	Hunting, gliding	Moderate winds, partly cloudy, 61F
5/29/2008	1311	PS	Sandhill crane	*Grus canadensis*	35	800	Flyover	Moderate winds, partly cloudy, 61F
5/30/2008	1050	PN	Western meadowlark	*Sturnella neglecta*	gnd level	15	Cover	Moderate winds, partly cloudy, 64F
5/30/2008	1050	PN	Long-billed curlew	*Numenius americanus*	gnd level	10	Foraging	Moderate winds, partly cloudy, 64F
5/30/2008	1050	PN	Brewer's blackbird	*Euphagus cyanocephalus*	gnd level	5	Flyover	Moderate winds, partly cloudy, 64F
5/30/2008	1050	PN	Common raven	*Corvus corax*	10	45	Flyover	Moderate winds, partly cloudy, 64F
5/30/2008	1050	PN	Sandhill crane	*Grus canadensis*	30	30	Flyover	Moderate winds, partly cloudy, 64F
5/30/2008	1050	PN	Golden eagle	*Aquila chrysaetos*	30	30	Hunting, gliding	Moderate winds, partly cloudy, 64F
6/18/2008	1100	PS	Common nighthawk	*Chordeils minor*	8	30	Foraging	Calm, mostly clear, 75F

6/18/2008	1100	PS	Red-winged blackbird	*Agelaius phoeniceus*	30	50	Flyover	Calm, mostly clear, 75F
6/18/2008	1100	PS	Black-billed magpie	*Pica hudsonia*	10	125	Perched on powerline	Calm, mostly clear, 75F
6/18/2008	1100	PS	Black-billed magpie	*Pica hudsonia*	gnd level	500	Flyover	Calm, mostly clear, 75F
6/18/2008	1100	PS	Sandhill crane	*Grus canadensis*	gnd level	450	Foraging	Calm, mostly clear, 75F
6/18/2008	1100	PS	Golden eagle	*Aquila chrysaetos*	200	750	Soaring	Calm, mostly clear, 75F
6/18/2008	1100	PS	Brewer's blackbird	*Euphagus cyanocephalus*	10	20	Flyover	Calm, mostly clear, 75F
6/18/2008	1100	PS	Turkey vulture	*Cathartes aura*	150	800	Flyover	Calm, mostly clear, 75F
6/18/2008	1100	PS	Ferruginous hawk	*Buteo regalis*	50	75	Flyover	Calm, mostly clear, 75F
6/18/2008	1308	PN	Common raven	*Corvus corax*	30	200	Soaring	Calm, mostly clear, 75F
6/18/2008	1308	PN	Barn swallow	*Hirundo rustica*	5	5	Foraging	Calm, mostly clear, 75F
6/18/2008	1308	PN	Common raven	*Corvus corax*	5	5	Soaring	Calm, mostly clear, 75F
6/18/2008	1308	PN	Common raven	*Corvus corax*	40	75	Soaring	Calm, mostly clear, 75F
6/18/2008	1308	PN	Common raven	*Corvus corax*	5	75	Flyover	Moderate wind, clear, 75F
6/18/2008	1308	PN	American kestrel	*Falco sparverius*	50	75	Hunting, hovering	Moderate wind, clear, 75F
6/18/2008	1530	Spdog	Red-tailed hawk	*Buteo jamaicensis*	100	350	Soaring	Calm, mostly sunny, 77F
6/18/2008	1530	Spdog	Prairie falcon	*Falco mexicanus*	50	100	Hunting prairie dog town, soaring	Calm, mostly sunny, 77F
6/18/2008	1530	Spdog	American white pelican	*Pelecanus erythrorhychos*	175	200	Flyover	Calm, mostly sunny, 77F
6/18/2008	1530	Spdog	Ferruginous hawk	*Buteo regalis*	200	200	Hunting prairie dog town, soaring	Calm, mostly sunny, 77F

6/18/2008	1530	Spdog	Mallard	*Anas platyrhynchos*	gnd level	450	Small pond south of prairie dog town	Calm, mostly sunny, 77F
6/20/2008	1003	PS	Western meadowlark	*Sturnella neglecta*	gnd level	45	Foraging, cover	Calm, clear, 66F
6/20/2008	1003	PS	Vesper sparrow (male)	*Pooecetes gramineus*	gnd level	100	Foraging, cover	Calm, clear, 66F
6/20/2008	1003	PS	Long-billed curlew	*Numenius americanus*	20	150	Flyover	Calm, clear, 66F
6/20/2008	1003	PS	Common raven	*Corvus corax*	30	75	Foraging	Calm, clear, 66F
6/20/2008	1003	PS	Sandhill crane	*Grus canadensis*	gnd level	400	Foraging	Calm, clear, 66F
6/20/2008	1003	PS	Turkey vulture	*Cathartes aura*	30	125	Soaring, foraging	Calm, clear, 66F
6/20/2008	1230	Spdog	Golden eagle	*Aquila chrysaetos*	10	175	Perched on power pole in prairie dog town	Calm, clear, 68F
6/20/2008	1230	Spdog	Common raven	*Corvus corax*	100	100	Soaring	Calm, clear, 68F
6/20/2008	1230	Spdog	Black-billed magpie	*Pica hudsonia*	75	50	Flew to ground	Calm, clear, 68F
Summer Surveys								
8/26/2008	1330	PS	Common raven	*Corvus corax*	30	125	Flyover	Very windy, partly cloudy, 79F
8/27/2008	1000	PN	Golden eagle	*Aquila chrysaetos*	50	100	Hunting, soaring	Windy (25mph), mostly cloudy, 66F
8/27/2008	1000	PN	Common raven	*Corvus corax*	20	60	Flyover	Windy (25mph), mostly cloudy, 66F
8/27/2008	1000	PN	Black-billed magpie	*Pica hudsonia*	40	35	Foraging	Windy (25mph), mostly cloudy, 66F

8/27/2008	1234	Spdog	None observed					Very windy (25-40 mph gusts, mostly cloudy, some light rain, 58F
8/29/2008	858	Spdog	Great blue heron	*Ardea herodias*	low, gnd level	50	Flew to ground	Light wind, clear, 66F
8/29/2008	858	Spdog	Golden eagle	*Aquila chrysaetos*	50	100	Hunting, circling prairie dog town	Light wind, clear, 66F
8/29/2008	858	Spdog	Common raven	*Corvus corax*	35	275	Flyover	Light wind, clear, 66F
8/29/2008	1110	PN	None observed					
8/29/2008	1320	PS	Golden eagle	*Aquila chrysaetos*	15	200	Hunting, circling	Moderate to high wind, clear, 75F
8/29/2008	1320	PS	Sandhill crane	*Grus canadensis*	20	175	Flyover	Moderate to high wind, clear, 75F
8/29/2008	1320	PS	Red-tailed hawk	*Buteo jamaicensis*	30	270	Hunting, circling	Moderate to high wind, clear, 75F
8/29/2008	1320	PS	American kestrel	*Falco sparverius*	15	130	Hunting, hovering	Moderate to high wind, clear, 75F
Fall Surveys								
9/25/2008	1017	PN	Western meadowlark	*Sturnella neglecta*	20	50	Flyover	Calm, overcast, 60F
9/25/2008	1017	PN	Common raven	*Corvus corax*	50	10	Flyover	Calm, overcast, 60F
9/25/2008	1246	PS	Golden eagle	*Aquila chrysaetos*	100	800	Circling	Calm, overcast, 60F
9/25/2008	1246	PS	Golden eagle	*Aquila chrysaetos*	150	650	Circling	Calm, overcast, 60F
9/25/2008	1246	PS	Golden eagle	*Aquila chrysaetos*	150	650	Circling	Calm, overcast, 60F

9/25/2008	1246	PS	Golden eagle	*Aquila chrysaetos*	300	750	Circling	Calm, overcast, 60F
9/25/2008	1246	PS	Golden eagle	*Aquila chrysaetos*	100	250	Circling	Calm, overcast, 60F
9/25/2008	1246	PS	Rock pigeon	*Columba livia*	30	75	Flyover	Calm, overcast, 60F
9/25/2008	1246	PS	Rock pigeon	*Columba livia*	30	75	Flyover	Calm, overcast, 60F
10/3/2008	1015	Spdog	Golden eagle	*Aquila chrysaetos*	5	400	Hunting	Winds 10-15 mph, overcast, 60F, scattered showers
10/3/2008	1015	Spdog	Golden eagle	*Aquila chrysaetos*	150	800	Circling	Winds 10-15 mph, overcast, 60F, scattered showers
10/3/2008	1015	Spdog	Black-billed magpie	*Pica hudsonia*	10	450	Flyover	Winds 10-15 mph, overcast, 60F, scattered showers
10/3/2008	1015	Spdog	American robin	*Turdus migratorius*	10	100	Flyover	Winds 10-15 mph, overcast, 60F, scattered showers
10/3/2008	1015	Spdog	Western meadowlark	*Sturnella neglecta*	10	50	Flyover	Winds 10-15 mph, overcast, 60F, scattered showers
10/3/2008	1015	Spdog	Western meadowlark	*Sturnella neglecta*	5	100	Ground to Flyover	Winds 10-15 mph, overcast, 60F, scattered showers
10/3/2008	1240	PS	Golden eagle	*Aquila chrysaetos*	5	150	Hunting	Wind 10 mph, partly cloudy, 65F
10/3/2008	1240	PS	Western meadowlark	*Sturnella neglecta*	10	300	Flyover	Wind 10 mph, partly cloudy, 65F
10/3/2008	1240	PS	Black-billed magpie	*Pica hudsonia*	0	250	Ground	Wind 10 mph, partly cloudy, 65F
10/6/2008	928	PN	Golden eagle	*Aquila chrysaetos*	150	500	Flyover/Play	Wind 10-15 mph, mostly clear, 53F

10/6/2008	928	PN	Golden eagle	*Aquila chrysaetos*	150	500	Flyover/Play	Wind 10-15 mph, mostly clear, 53F
10/6/2008	928	PN	Brewer's blackbird	*Euphagus cyanocephalus*	10	30	Flyover	Wind 10-15 mph, mostly clear, 53F
10/6/2008	928	PN	American robin	*Turdus migratorius*	5	5	Flyover	Wind 10-15 mph, mostly clear, 53F
10/8/2008	1140	Spdog	Golden eagle	*Aquila chrysaetos*	5	175	Hunting	Winds 10-20 mph, clear, 60F
10/8/2008	1140	Spdog	Golden eagle	*Aquila chrysaetos*	5	250	Hunting	Winds 10-20 mph, clear, 60F
10/8/2008	1140	Spdog	Golden eagle	*Aquila chrysaetos*	450	700	Flyover	Winds 10-20 mph, clear, 60F
10/8/2008	1140	Spdog	Golden eagle	*Aquila chrysaetos*	150	800	Hunting	Winds 10-20 mph, clear, 60F
10/8/2008	1415	PS	Common raven	*Corvus corax*	5	75	Soaring	Winds 15-25, clear, 65F
10/8/2008	1415	PS	Common raven	*Corvus corax*	100	200	Soaring	Winds 15-25, clear, 65F
10/8/2008	1415	PS	Black-billed magpie	*Pica hudsonia*	5	125	Flyover	Winds 15-25, clear, 65F
10/8/2008	1415	PS	Common raven	*Corvus corax*	25	175	Play	Winds 15-25, clear, 65F
10/8/2008	1415	PS	Rock pigeon	*Columba livia*	20	75	Flyover	Winds 15-25, clear, 65F
10/8/2008	1415	PS	Rock pigeon	*Columba livia*	20	75	Flyover	Winds 15-25, clear, 65F
10/8/2008	1415	PS	Common raven	*Corvus corax*	5	225	Flyover	Winds 15-25, clear, 65F
10/8/2008	1415	PS	Black-billed magpie	*Pica hudsonia*	1	70	Ground	Winds 15-25, clear, 65F
10/8/2008	1415	PS	Golden eagle	*Aquila chrysaetos*	150	800	Soaring	Winds 15-25, clear, 65F
10/8/2008	1415	PS	Rock pigeon	*Columba livia*	50	100	Flyover	Winds 15-25, clear, 65F
10/8/2008	1415	PS	Rock pigeon	*Columba livia*	75	100	Flyover	Winds 15-25, clear, 65F

10/22/2008	938	PN	Black-billed magpie	*Pica hudsonia*	5	375	Flyover	Winds 15-20, clear, upper 40's
10/22/2008	1148	PS	Common raven	*Corvus corax*	100	500	Soaring	Winds 15-20, clear, upper 40's
10/22/2008	1148	PS	Common raven	*Corvus corax*	30	375	Flyover	Winds 15-20, clear, upper 40's
10/22/2008	1148	PS	Snow bunting	*Plectrophenax nivalis*	40	125	Flyover	Winds 15-20, clear, upper 40's
10/22/2008	1148	PS	Bald eagle	*Haliaeetus leucocephalus*	50	700	Flyover	Winds 15-20, clear, upper 40's
10/22/2008	1148	PS	European starling	*Sturnus vulgaris*	5	5	Flyover	Winds 15-20, clear, upper 40's
10/22/2008	1148	PS	Brewer's blackbird	*Euphagus cyanocephalus*	15	30	Flyover	Winds 15-20, clear, upper 40's
10/22/2008	1442	Spdog	Golden eagle	*Aquila chrysaetos*	40	70	Hunting	Winds 10-15, clear, mid 50's
10/22/2008	1442	Spdog	Horned lark	*Eremophila alpestris*	5	30	Flyover	Winds 10-15, clear, mid 50's
10/22/2008	1442	Spdog	Common raven	*Corvus corax*	45	375	Flyover	Winds 10-15, clear, mid 50's
10/23/2008	920	PN	Common raven	*Corvus corax*	15	100	Soaring	Winds 15-20, mostly clear, upper 40's
10/23/2008	920	PN	Common raven	*Corvus corax*	5	125	Soaring	Winds 15-20, mostly clear, upper 40's
10/23/2008	920	PN	Horned lark	*Eremophila alpestris*	0	170	Ground	Winds 15-20, mostly clear, upper 40's
10/23/2008	1145	Spdog	Ferruginous hawk	*Buteo regalis*	5	150	Hunting	Winds 10-15, mostly clear, mid 50's
10/23/2008	1145	Spdog	Horned lark	*Eremophila alpestris*	0	125	Ground	Winds 10-15, mostly clear, mid 50's

10/23/2008	1145	Spdog	Golden eagle	*Aquila chrysaetos*	10	200	Hunting	Winds 10-15, mostly clear, mid 50's
10/23/2008	1145	Spdog	Golden eagle	*Aquila chrysaetos*	20	225	Hunting	Winds 10-15, mostly clear, mid 50's
10/23/2008	1145	Spdog	Horned lark	*Eremophila alpestris*	5	75	Flyover	Winds 10-15, mostly clear, mid 50's
10/23/2008	1145	Spdog	Common raven	*Corvus corax*	5	200	Flyover	Winds 10-15, mostly clear, mid 50's
10/23/2008	1145	Spdog	Common raven	*Corvus corax*	0	350	Ground	Winds 10-15, mostly clear, mid 50's
10/23/2008	1145	Spdog	Black-billed magpie	*Pica hudsonia*	15	225	Flyover	Winds 10-15, mostly clear, mid 50's
10/23/2008	1145	Spdog	Ferruginous hawk	*Buteo regalis*	5	250	Hunting	Winds 10-15, mostly clear, mid 50's
Winter Surveys								
12/17/2008	1038	Spdog	None seen					Winds 10-20, high clouds, 26F
12/17/2008	1300	PN	None seen					Winds 25-35, mostly cloudy, 27F
1/6/2009	930	PS	Golden eagle	*Aquila chrysaetos*	50	700	Soaring	Winds 15-25, overcast, 30F
1/6/2009	930	PS	Mourning dove	*Zenaida macroura*	30	10	Flyover	Winds 15-25, overcast, 30F
1/6/2009	930	PS	Horned lark	*Eremophila alpestris*	10	10	Flyover	Winds 15-25, overcast, 30F
1/6/2009	1155	Spdog	Northern harrier	*Circus cyaneus*	30	800	Soaring	Winds 10-20, overcast, 36F
1/6/2009	1155	Spdog	Northern harrier	*Circus cyaneus*	5	650	Hunting	Winds 10-20, overcast, 36F
1/14/2009	930	PN	Rock pidgeon	*Columba livia*	10	100	Flyover	Winds 10-15, overcast,

								36F
1/14/2009	1145	PS	Rough-legged hawk	*Buteo lagopus*	25	650	Hunting	Winds 5-10, mostly cloudy, 36F
1/14/2009	1145	PS	Black-billed magpie	*Pica hudsonia*	20	500	Flyby	Winds 5-10, mostly cloudy, 36F
1/14/2009	1410	Spdog	Horned lark	*Eremophila alpestris*	5	100	Flush	Winds 5-10, mostly cloudy, 37F
1/15/2009	950	PS	Golden eagle	*Aquila chrysaetos*	50	700	Soaring	Winds 5-10, mostly clear, 45F
1/15/2009	950	PS	Golden eagle	*Aquila chrysaetos*	20	400	Soaring	Winds 5-10, mostly clear, 45F
1/15/2009	950	PS	Rough-legged hawk	*Buteo lagopus*	50	375	Soaring	Winds 5-10, mostly clear, 45F
1/15/2009	950	PS	Black-billed magpie	*Pica hudsonia*	5	475	Flyby	Winds 5-10, mostly clear, 45F
1/15/2009	950	PS	Golden eagle	*Aquila chrysaetos*	200	700	Soaring	Winds 5-10, mostly clear, 45F
1/15/2009	950	PS	Bald eagle	*Haliaeetus leucocephalus*	100	675	Soaring	Winds 5-10, mostly clear, 45F
1/15/2009	950	PS	Rock pidgeon	*Columba livia*	45	250	Flyby	Winds 5-10, mostly clear, 45F
1/15/2009	950	PS	Golden eagle	*Aquila chrysaetos*	100	500	Soaring	Winds 5-10, mostly clear, 45F
1/15/2009	950	PS	Common raven	*Corvus corax*	250	800	Flyby	Winds 5-10, mostly clear, 45F
1/15/2009	1207	PN	Rough-legged hawk	*Buteo lagopus*	45	450	Hunting	Winds 15-20, clear, 45F
1/15/2009	1207	PN	Golden eagle	*Aquila chrysaetos*	75	600	Soaring	Winds 15-20, clear, 45F
1/15/2009	1207	PN	Golden eagle	*Aquila chrysaetos*	10	75	Soaring	Winds 15-20, clear, 45F

Appendix C: Bat Data Associated with Figures in Document

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Table 1. Total number of bat files/instrument/night by date – used for Figure 3-2.

August	Total Bat Files per Instrument	September	Total Bat Files per Instrument	October	Total Bat Files per Instrument	November	Total Bat Files per Instrument
29/08/2008	6.00	01/09/2008	2.00	01/10/2008	2.00	01/11/2008	0.00
30/08/2008	11.00	02/09/2008	21.00	02/10/2008	1.00	02/11/2008	0.00
31/08/2008	4.50	03/09/2008	3.75	03/10/2008	1.00	03/11/2008	0.00
		04/09/2008	6.50	04/10/2008	0.00	04/11/2008	0.00
		05/09/2008	2.00	05/10/2008	0.00	05/11/2008	0.00
		06/09/2008	2.50	06/10/2008	0.00	06/11/2008	0.00
		07/09/2008	2.25	07/10/2008	0.00		
		08/09/2008	4.50	08/10/2008	0.00		
		09/09/2008	5.00	09/10/2008	0.00		
		10/09/2008	7.00	10/10/2008	0.00		
		11/09/2008	5.25	11/10/2008	0.00		
		12/09/2008	8.75	12/10/2008	0.00		
		13/09/2008	9.00	13/10/2008	0.00		
		14/09/2008	11.75	14/10/2008	0.67		
		15/09/2008	30.25	15/10/2008	0.33		
		16/09/2008	15.00	16/10/2008	0.33		
		17/09/2008	5.50	17/10/2008	0.00		
		18/09/2008	6.00	18/10/2008	0.33		
		19/09/2008	4.50	19/10/2008	0.67		
		20/09/2008	1.50	20/10/2008	0.00		
		21/09/2008	0.00	21/10/2008	0.00		
		22/09/2008	0.00	22/10/2008	0.00		
		23/09/2008	2.50	23/10/2008	0.00		
		24/09/2008	2.00	24/10/2008	0.00		
		25/09/2008	7.00	25/10/2008	0.00		
		26/09/2008	3.00	26/10/2008	0.00		
		27/09/2008	6.00	27/10/2008	0.00		
		28/09/2008	1.33	28/10/2008	0.00		
		29/09/2008	3.67	29/10/2008	0.00		
		30/09/2008	0.33	30/10/2008	0.00		
				31/10/2008	0.00		

Table 2. Total bat files by hours after sunset – used for Figure 3-3.

Hours After Sunset	Total Bat Files
1	83
2	131
3	192
4	82
5	76
6	30
7	10
8	21
9	17
10	25
11	3

Table 3. Total Bat Files vs. Wind Speed (m/s) for Met towers 1 and 6, rounded to whole numbers; used for Figures 3-4 and 3-5.

Wind Speed	**25 kHz**	**40 kHz**	**Hoary**	**All Bat Types**
0	5	20	4	**29**
1	33	89	33	**155**
2	33	98	43	**174**
3	28	91	16	**135**
4	24	39	15	**78**
5	15	27	18	**60**
6	11	4	8	**23**
7	5	0	4	**9**
8	1	1	1	**3**
9	3	1	0	**4**
TOTAL	**158**	**370**	**142**	**670**

Table 4. Total Bat Files vs. Wind Speed (m/s) for Met towers 1 and 2, rounded to whole numbers; used for Figures 3-6 and 3-7.

Wind Speed	**25 kHz**	**40 kHz**	**Hoary**	**All Bat Types**
0	0	10	3	13
1	22	69	24	115
2	18	81	38	137
3	24	71	13	108
4	24	39	17	80
5	21	38	23	82
6	19	18	12	49
7	7	9	6	22
8	5	17	2	24
9	7	5	1	13
10	3	4	2	9
11	2	2	0	4
12	0	1	0	1
13	0	2	0	2
14	0	2	1	3
15	4	1	0	5
16	1	0	0	1
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	1	0	0	1
22	0	1	0	1
TOTAL	**158**	**370**	**142**	**670**

Table 5. Temperature (C) vs. Bat phonic group using data from MET towers 1 and 6; used for Figures 3-8; 3-9.

Temperature (C)	25 kHz	40 kHz	Hoary	All Bat Types
2	3	0	3	6
3	1	0	2	3
4	0	0	0	0
5	2	2	26	30
6	8	2	10	20
7	20	5	16	41
8	28	14	34	76
9	5	11	6	22
10	10	30	8	48
11	11	15	13	39
12	8	31	6	45
13	5	58	1	64
14	6	50	1	57
15	7	35	0	42
16	12	37	0	49
17	8	27	1	36
18	6	28	5	39
19	9	11	2	22
20	3	5	3	11
21	1	5	2	8
22	2	3	2	7
23	3	1	1	5
TOTAL	**158**	**370**	**142**	**670**

Table 6. Temperature (C) vs. Bat phonic group using data from MET towers 1 and 2; used for Figures 3-10; 3-11.

Temperature (C)	25 kHz	40 kHz	Hoary	All Bat Types
2	3	0	3	6
3	0	0	0	0
4	0	0	0	0
5	3	1	26	30
6	3	1	2	6
7	15	4	21	40
8	27	10	33	70
9	7	10	8	25
10	11	30	11	52
11	8	14	13	35
12	6	33	7	46
13	10	44	1	55
14	2	34	1	37
15	5	38	0	43
16	10	32	0	42
17	16	40	1	57
18	7	30	5	42
19	10	15	2	27
20	3	15	3	21
21	3	10	2	15
22	6	6	2	14
23	3	3	1	7
TOTAL	**158**	**370**	**142**	**670**

Appendix C - Site Assessment for Coyote Wind, LLC

Site Assessment for
Coyote Wind, LLC

Compiled By

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July 4, 2004

Coyote Wind, LLC

Table of Contents

1 Introduction

Martin Wilde of Coyote Energy has compiled the following wind site assessment summary through site visits, communications with appropriate officials and through enlistment of the services of specialists. A summary of Wilde's qualifications are listed in the appendix.

Dr. Al Harmata, an experienced Montana wildlife biologist, was contracted to complete a phase 1 environmental review as per the US Fish and Wildlife relative Potential Impact Ranking of the Springdale site. Wilde accompanied personnel from MTDEQ and Dr. Harmata for a detailed site inspection of the flora and fauna. The resulting observations were entered by Harmata onto the potential impact checklist provided by US Fish and Wildlife for indexing potential wind sites prior to development.

The results of the potential impact report indicate that the Springdale site falls into the "moderate" range. This can be seen in the attached PII report in the appendix.

2 Avian, Wildlife Issues

2.1 Avian Issues

In the 1980s, significant avian mortality was documented at wind power facilities in California, including mortality of large raptors such as golden eagles and red-tailed hawks. In North America, migratory birds are protected under the MBTA and BEPA, in a similar manner to the protection of T&E species under the ESA. The USFWS has authority to enforce these laws, and fines and imprisonment can be imposed for those found to be in violation. Some birds occurring in the vicinity of the Coyote Wind project area are protected under one or more of these laws. Measures to mitigate potential avian mortality are discussed later in this section. The remainder of this section briefly describes the avifauna known to or likely to occur on the Coyote Wind project area.

John Carlson, Coordinator and Zoologist at the Montana Natural Heritage Program (MNHP) provided guidance with regard to compiling a list of birds found in the region of the Coyote Wind project and in cross referencing these with the species of special concern list.

According to the Montana Natural Heritage Program's Montana bird distribution list, an estimated 128 bird species are observed to utilize the region surrounding the Coyote Wind project area (Table 1). However, because the actual site does not include all possible habitats for these species, the number of avian species expected on and adjacent to the development site would likely be less. Waterfowl habitat on-site is negligible.

Table 1 Bird Species observed to Occurring in the 39B Quarter Latilong (QLL) Quadrant encompassing the Coyote Wind project.

Common Name	**Year**	**Month**	**Location**
American Crow	2000	5	within Quad MCLEOD BASIN
American Crow	2000	9	Sheep Mt.-Springdale float of Yellowstone River.
American Crow	2000	9	Sheep Mt.-Springdale float of Yellowstone River.
American Crow	2000	5	within Quad MCLEOD BASIN
American Goldfinch	2000	8	Yellowstone River, intersection of
American Goldfinch	2000	9	Yellowstone River
American Goldfinch	2000	8	Yellowstone River, intersection of
American Goldfinch	2000	9	Yellowstone River
American Kestrel	2000	9	Mayor's Landing to Pig Farm float of Yellowstone River.
American Kestrel	2000	9	Yellowstone River
American Pipit	2001	7	Contact, MT
American Pipit	2001	7	Contact, MT
American Robin	2000	6	Springdale, MT.
American Robin	2001	7	Trail to West Boulder Meadows
American Robin	2000	5	within Quad LIVINGSTON PEAK
American Robin	2000	6	Springdale, MT.
American Robin	2001	7	Trail to West Boulder Meadows
American Robin	2000	5	within Quad LIVINGSTON PEAK
American White Pelican[1]	2000	8	Yellowstone River, intersection of
Bald Eagle[1]	2000	9	Yellowstone River
Bank Swallow	2000	6	Trident, MT.
Bank Swallow	2000	6	Trident, MT.
Barn Swallow	2000	9	Sheep Mt.-Springdale float of Yellowstone River.
Barn Swallow	2000	9	Sheep Mt.-Springdale float of Yellowstone River.
Belted Kingfisher	2000	9	Sheep Mt.-Springfield float of Yellowstone River.
Belted Kingfisher	2000	6	within Quad MOUNT RAE
Belted Kingfisher	2000	6	within Quad MOUNT RAE
Black-billed Magpie	2000	9	Sheep Mt.-Springdale flaot of Yellowstone River.
Black-billed Magpie	2000	9	Sheep Mt.-Springdale flaot of Yellowstone River.
Black-capped	2000	9	Sheep Mt.-Springdale float of Yellowstone

Chickadee			River.
Black-capped Chickadee	2000	9	Sheep Mt.-Springdale float of Yellowstone River.
Black-headed Grosbeak	2000	6	Springdale
Black-headed Grosbeak	2000	6	Springdale
Blackpoll Warbler	2002	5	Mission Creek Rd near Livingston
Blackpoll Warbler	2002	5	Mission Creek Rd near Livingston
Blue Grouse	2000	5	within Quad LIVINGSTON PEAK
Bobolink	2000	6	Springdale
Brewer's Blackbird	2000	6	Springdale
Brown Creeper	2000	6	within Quad PICKET PIN MOUNTAIN
Brown-headed Cowbird	2000	6	within Quad MOUNT RAE
Bullock's Oriole	2000	6	Springdale
Canada Goose	2000	5	within Quad MCLEOD BASIN
Cassin's Finch	2000	5	within Quad MCLEOD BASIN
Cedar Waxwing	2000	6	Springdale access, Yellowstone River.
Chipping Sparrow	2000	5	within Quad MCLEOD BASIN
Chipping Sparrow	2001	7	Trail to West Boulder Meadows
Clark's Nutcracker	2000	5	within Quad MCLEOD BASIN
Common Grackle	2000	9	Yellowstone River
Common Raven	2000	9	Sheep Mt.-Springdale float of Yellowstone River.
Common Raven	2000	6	within Quad PICKET PIN MOUNTAIN
Common Yellowthroat	2000	9	Sheep Mt. Access, Yellowstone River.
Common Yellowthroat	2001	7	West Boulder Meadows
Dark-eyed Junco	2000	5	within Quad LIVINGSTON PEAK
Dusky Flycatcher	2000	5	within Quad MCLEOD BASIN
Eastern Kingbird	2000	6	Springdale access to Yellowstone River.
European Starling	2000	9	Sheep Mt.-Springdale float of Yellowstone River.
European Starling	2000	6	Springdale, MT.
Golden-crowned Kinglet	2000	5	within Quad LIVINGSTON PEAK
Golden-crowned Kinglet	2001	7	Trail to West Boulder Meadows
Gray Catbird	2000	6	Springdale access, Yellowstone River.
Great Blue Heron	2000	9	Near "pig farm" takeout on Yellowstone River.

Green-tailed Towhee	2000	5	within Quad MCLEOD BASIN
Hairy Woodpecker	2000	5	within Quad MCLEOD BASIN
Hammond's Flycatcher	2000	5	within Quad LIVINGSTON PEAK
Hermit Thrush	2000	6	within Quad PICKET PIN MOUNTAIN
House Wren	2000	6	Springdale, MT.
House Wren	2000	9	Sheep Mt. Access, Yellowstone River.
House Wren	2001	7	Trail to West Boulder Meadows
House Wren	2000	5	within Quad MCLEOD BASIN
Killdeer	2000	9	Put-in at Sheep Mt., Yellowstone River.
Lark Bunting	2002	6	Mission Creek Rd east of Livingston
Lazuli Bunting	2001	7	Trail to West Boulder Meadows
Least Flycatcher	2000	6	Yellowstone River access in Springdale, MT.
Lesser Scaup	2000	6	within Quad MOUNT RAE
Lincoln's Sparrow	2001	7	West Boulder Meadows
Lincoln's Sparrow	2000	6	within Quad PICKET PIN MOUNTAIN
Loggerhead Shrike	2002	9	Mission Road near Livingston
MacGillivray's Warbler	2000	5	within Quad MCLEOD BASIN
MacGillivray's Warbler	2001	7	Trail to West Boulder Meadows
Mountain Bluebird	2000	5	within Quad MCLEOD BASIN
Mountain Chickadee	2000	5	within Quad LIVINGSTON PEAK
Northern Flicker	2000	9	Sheep Mt.-Springfield float of Yellowstone River.
Northern Flicker	2000	5	within Quad LIVINGSTON PEAK
Oregon (Montana) Junco	2001	7	Trail to West Boulder Meadows
Ovenbird	2001	7	Trail to West Boulder Meadows
Pied-billed Grebe	2000	6	within Quad MOUNT RAE
Pine Siskin	2000	5	within Quad LIVINGSTON PEAK
Red Crossbill	2000	5	within Quad MCLEOD BASIN
Red-breasted Nuthatch	2000	5	within Quad LIVINGSTON PEAK
Red-naped Sapsucker	2000	5	within Quad MCLEOD BASIN
Red-tailed Hawk	2000	6	within Quad PICKET PIN MOUNTAIN
Red-winged Blackbird	2000	5	within Quad MCLEOD BASIN
Red-winged Blackbird	2001	7	West Boulder Meadows

Ruby-crowned Kinglet	2001	7	Trail to West Boulder Meadows
Ruby-crowned Kinglet	2000	5	within Quad LIVINGSTON PEAK
Ruby-crowned Kinglet	2000	8	Route 89 in Bridgers.
Ruffed Grouse	2000	5	within Quad LIVINGSTON PEAK
Sandhill Crane	2000	5	within Quad MCLEOD BASIN
Savannah Sparrow	2000	9	Yellowstone River
Sharp-shinned Hawk	2000	5	within Quad LIVINGSTON PEAK
Song Sparrow	2001	7	West Boulder Meadows
Song Sparrow	2000	6	within Quad MOUNT RAE
Spotted Sandpiper	2000	9	Sheep Mt.-Springdale float of Yellowstone River.
Spotted Sandpiper	2000	6	within Quad MOUNT RAE
Spotted Towhee	2000	5	within Quad MCLEOD BASIN
Sprague's Pipit[1]	2002	5	Livingston - Swingley Rd mile 3.6-5.0
Swainson's Thrush	2000	6	within Quad PICKET PIN MOUNTAIN
Swainson's Thrush	2001	7	Trail to West Boulder Meadows
Townsend's Solitaire	2000	5	within Quad LIVINGSTON PEAK
Tree Swallow	2000	6	Springdale access to Yellowstone River.
Tree Swallow	2000	5	within Quad MCLEOD BASIN
Veery	2000	6	Springdale access to Yellowstone River.
Violet-green Swallow	2000	6	within Quad MOUNT RAE
Warbling Vireo	2000	9	Sheep Mt. Access, Yellowstone River.
Warbling Vireo	2000	5	within Quad MCLEOD BASIN
Western Tanager	2000	6	within Quad PICKET PIN MOUNTAIN
Western Tanager	2001	7	Trail to West Boulder Meadows
Western Wood-Pewee	2000	8	Yellowstone River, intersection of
Western Wood-Pewee	2000	6	Along Yellowstone River near Springdale.
White-breasted Nuthatch	2002	10	At the Little Mission Creek Ranch 9-10 miles out Swingley Rd from Livingston
White-breasted Nuthatch	2000	6	within Quad MOUNT RAE
Wilson's Warbler	2000	6	within Quad MOUNT RAE
Yellow Warbler	2000	6	Springdale access, Yellowstone River.
Yellow Warbler	2001	7	West Boulder Meadows
Yellow Warbler	2000	6	within Quad MOUNT RAE
Yellow-rumped	2000	9	Near Springdale on Yellowstone River.

Warbler			
Yellow-rumped Warbler	2000	5	within Quad LIVINGSTON PEAK
Source: Montana Natural Heritage Program (http://nhp.nris.state.mt.us/) (2003). Scientific names not included. *[1] Species of concern (August 2002, update to be released by March 2003)*			

Of the avian species known to occur in the area, only one, the bald eagle (Haliaeetus leucocephalis), is listed by the USFWS (it is listed as threatened but is proposed for delisting). It is considered locally common. In addition, 2 species, the American White Pelican and the Sprague's Pipit, are listed as "species of special concern" by the MNHP. The White Pelican is included in the group; waterfowl, shorebirds, or waders for which there is negligible habitat on the Coyote Wind project area, however, good habitat occurs in the vicinity of the Yellowstone River.

2.2 Animals

In addition to bald eagle, two other species listed by the USFWS (http://mountain-prairie.fws.gov/mt.html) are known to occur in the vicinity, gray wolf (Canis lupus) (endangered), and Canada lynx (Lynx canadensis) (threatened). Bald eagle is known to nest in the vicinity and passes through the area during spring and fall migration. Due to the lack of large snags and good fisheries, the Coyote Wind project area contains little or no suitable bald eagle nesting or foraging habitat.

Transient wolf activity in the area has been recorded over the past decade and an individual was sighted in 1996 north of Big Timber near Melville within 25 miles of the Coyote Wind project area. This wolf ranged east from near Red Lodge, Montana; west to near Livingston, Montana; and then southeast into the rugged Absaroka Range of Montana north of Yellowstone Park. The Coyote Wind project area habitats--open grasslands, and shrubland areas--do not provide good wolf habitat.

The Canada lynx is known to inhabit the higher elevations west and north of the Coyote Wind project area. Canada lynx is considered a resident/transient, and suitable lynx habitat does not occur on the Coyote Wind project area.

2.3 Plants

No vascular or nonvascular plants listed by the USFWS as endangered or threatened occur in the area.

The MNHP lists 7 plant-"species of special concern" in Sweet Grass County (Table 2). Of these, none are known to occur at the development site and only six occur in proximity to the site (i.e., within approximately 40 miles). These are:

Table 2 Vascular Plant Species of Concern in Sweet Grass County.		
Aquilegia brevistyla	Short-styled Columbine	(Number of occurrences in county: 1 / Statewide: 12)
Carex stenoptila	Small-winged Sedge	(Number of occurrences in county: 2 / Statewide: 10)
Cypripedium parviflorum	Small Yellow Lady's-slipper	(Number of occurrences in county: 1 / Statewide: 73)
Eleocharis rostellata	Beaked Spikerush	(Number of occurrences in county: 1 / Statewide: 18)
Erigeron eatonii ssp eatonii	Eaton's Daisy	(Number of occurrences in county: 1 / Statewide: 2)
Juncus covillei var covillei	Coville's Rush	(Number of occurrences in county: 1 / Statewide: 5)
Ranunculus cardiophyllus	Heart-leaved Buttercup	(Number of occurrences in county: 1 / Statewide: 8)
Source: Montana Natural Heritage Program (nris.state.mt.us/mtnhp) (August 1, 2001).		

2.4 Avian Resources Mitigation

For Coyote Wind, reduction of avian risk begins with the initial site selection screening. Existing information is used to select sites that appear, based on a variety of available information, to have lower levels of avian use. Once a site is chosen, additional site-specific studies may be conducted to determine whether portions of the site have relatively higher or lower avian use levels. That information is used in the siting of individual turbine locations. The reduction of avian risk is an extremely site-specific issue that is frequently referred to during the site design process.

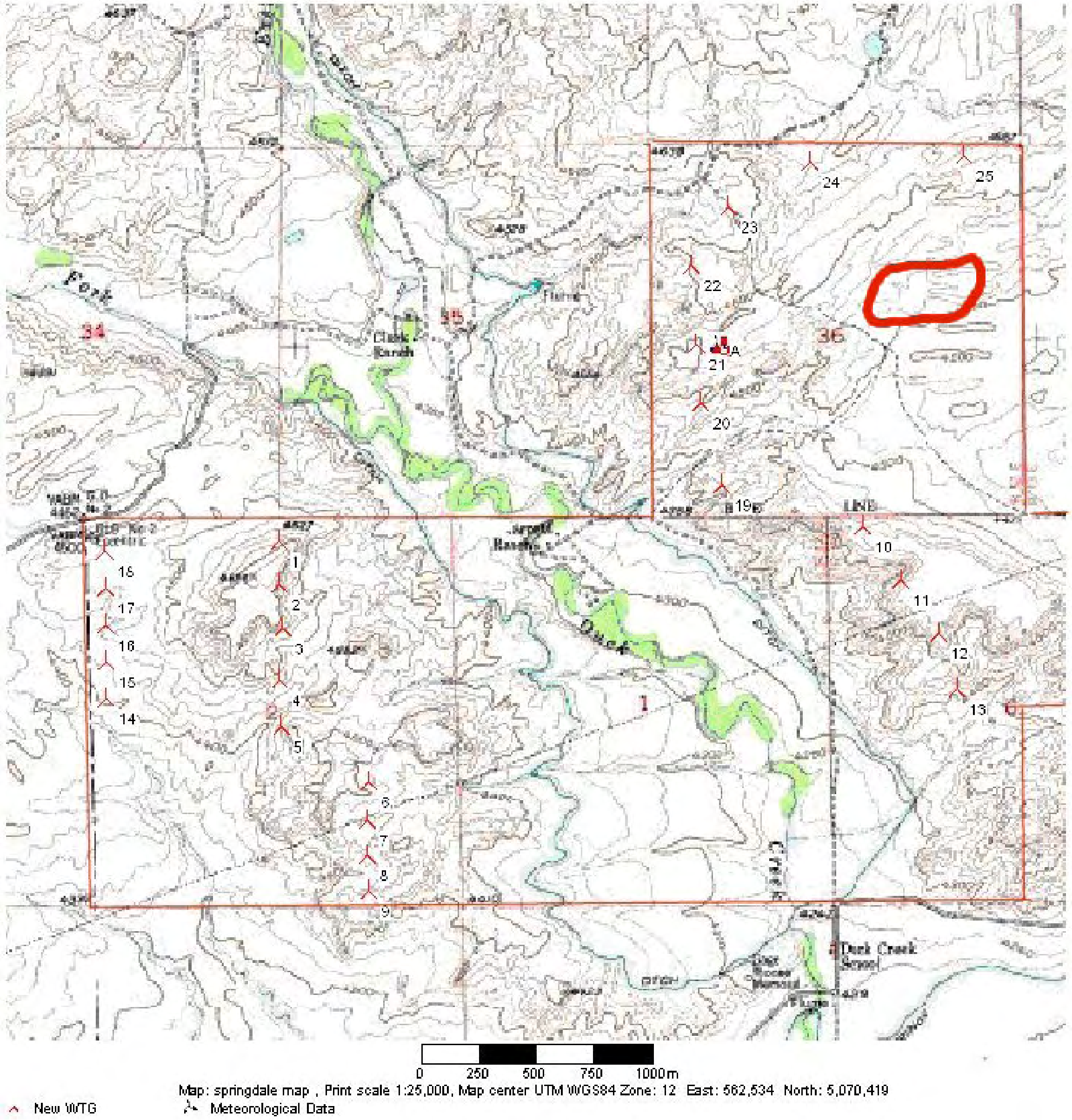
In addition to reducing avian risk through siting decisions, the selection of technology and careful planning to minimize avian perching opportunities on wind farm equipment are essential. The use of tubular, rather than less-expensive lattice, turbine towers; the use of perch-free smooth nacelles; the undergrounding of power collection and communication cables; the use of tall towers and slowly rotating turbine blades all contribute to reducing avian risk on the site.

Turbines are set back from the rim edge approximately 50 meters to avoid a zone of raptor use as well as of the rim edge. Similarly, based on its development experience, Coyote Wind used tubular (rather than less expensive lattice) towers and underground power collection cables to avoid creating avian perching opportunities. Finally, Coyote Wind used large capacity wind turbines to reduce the number of turbines and increase the spacing between turbines and rows of turbines. The slower rotational speed for blades of the large turbines and the tall towers that raised the blades high above the ground may be particularly important factors in reducing avian risk.

The Coyote Wind project site is in the “moderate” risk range for avian and wildlife impact, as seen on the USFWS PII checklist in the appendix. Site inspections reveal a prairie dog town in the eastern central area of section 36.In light of the attraction of food sources to hunting birds the area has been excluded form turbine installations. The approach to the food source will be from the east or south into the wind. This approach has been kept clear of turbines in the site layout.

Figure 1 shows the location of the Prairie Dog town in section 36 (in Red) in relation to the turbine sites.

Figure 1 Location of Prairie Dog town in respect to turbine siting.



Wind plant impacts on avian mortality have been taken into consideration during the design and development of this project. Three actions may be implemented to minimize the impacts of the proposed wind plants on avifauna:

1) Site plans for the Wind plant have taken into consideration the known annual cycle and seasonal patterns of avian use of the proposed Coyote Wind project area and attempted to avoid placing turbines in areas with high amounts of avian use. These areas include food source areas, like the Prairie Dog town and escarpments along the edges of hillsides, where air currents favor avian travel.

2) Turbines and tower installations will incorporate design aspects proven to reduce avian impact. Turbine and tower types will be selected to reduce perching opportunities, and will be coated with UV reflective paint to maximize their visibility to birds under a wide range of conditions. Red lights will be illuminated at night for FAA lighting requirements (white lights only during day). Tubular towers without ladders or catwalks will be used; power lines will be buried. Any aboveground structures within the wind plant will be equipped with anti-perching devices, thereby minimizing the number of new perches within the Coyote Wind project area. State of the art technology such as upwind turbines with rotors that typically rotate more slowly than traditional downwind turbines will be used.

3) Off-site mitigation, such as habitat enhancement, erecting artificial nest structures, etc. would be evaluated if deemed necessary by project stakeholders (e.g., project owners, agencies, public, special interest groups).

3 Visual Impact and Baseline Noise Issues.

3.1 Baseline Noise Levels

Wind, light farm equipment, and traffic from Interstate Highway 90 are the primary sources of ambient noise in the Coyote Wind project area vicinity. The area is rural/residential; the community of Big Timber is approximately 12 miles distant and is located in a primarily undeveloped and sparsely populated valley in Sweet Grass County. Rural/residential baseline noise levels are typically in the range of 30 to 40 A-weighted decibels (dBA) (EPA 1971; Mestre and Wooten 1980). Noise levels associated with wind noise may be in the range of 50-60 dBA in the afternoon, when wind speeds are generally greatest (BLM 1995).

If deemed necessary a noise analysis may be completed, wherein noise generated by turbines is modeled at various locations to determine effects on sensitive receptors. Analysis methods such as the American Wind Energy Association (AWEA) Procedure for Measurement of Acoustic Emissions from Wind Energy Turbine Generator Systems, (AWEA 1989) may be used, as appropriate.

3.2 Noise Mitigation

The Federal Interagency Committee on Noise (FICON) recommends noise abatement measures be assessed based on criteria relating to ambient noise levels of the area. These significance criteria (Table 3) are based on the assumption that the probability of an intrusive noise resulting in annoyance is dependent on existing ambient noise levels. The higher the ambient noise level, the smaller the increase in noise level required to generate a significant noise impact.

Table 3 FICON Significance Criteria for Noise Impacts[1]	
Ambient Noise Level Without Project (dBA)	Significant Impact (dBA)
<60	+5.0 or more
60-65	+3.0 or more
>60	+1.5 or more
[1] *FICON (1992).*	

The use of modern turbines will reduce wind plant-related noise. Other mitigations would include limiting construction to daytime hours; properly maintaining and muffling construction, operations, and maintenance equipment; properly maintaining the turbines; avoiding residences; and avoiding wildlife crucial and/or breeding and nesting habitats, where feasible.

3.3 Visual Resources Mitigation

Turbines and other wind plant facilities would be most visible to residents and tourists from Interstate 90, located approximately 5 miles south.

The Site layout includes assessment and mitigation of visual impact in the Coyote Wind project area. Mitigation for visual impacts may include measures such as minimizing construction disturbance and vegetation removal only to that which is necessary for safe and efficient construction; minimizing cuts and fills and other visible alterations; reclaiming any disturbed areas not needed for operations as soon as possible after construction; using native species for reclamation; burying power lines, where possible; screening wind plant facilities such as substations and operations and maintenance buildings from sensitive receptors; constructing access roads to avoid straight lines on prominent hillsides; painting facilities standard environmental colors; and locating facilities to blend with surrounding areas.

4 Local Resident Involvement in the Planning and Permitting Process

Constructing and operating a wind plant in the hills around Big Timber has been discussed among various entities for many years, so portions of the community are already, to some degree, aware of this opportunity. Residents and other interested parties will be provided with information on the intent of the project. Scoping and town meetings could be held to answer questions and to take comments on issues of concern.

4.1 Public Outreach

Coyote Wind typically engages in an extensive community outreach effort for each new project. However, it is premature to begin a public involvement program for this project. The Community Acceptance Plan outlined here is designed to address long-term acceptance by the residents of the project vicinity in three important areas. These consist primarily of creating and maintaining a positive image of the project in the areas of aesthetics, operational characteristics, community good will and education/community participation.

First, the aesthetics of the turbines and the project have been optimized to provide the best blend of performance and minimal visual impacts. This is accomplished by employing the following:

1. Utilizing modern, state of the art turbines that have excellent noise and visual characteristics. Because of the generally larger turbine size, this will result in greater acceptance overall due to fewer turbines being placed in the area. Lower noise levels are projected because newer turbine designs are quieter and fewer turbines are required to make up the specified number of megawatts - resulting in a lower noise level.

2. Employing a single color on external tower and nacelle components, chosen to blend with the sky to the greatest extent practical. Coyote Wind does not allow logos or advertising on its project towers or turbine nacelles.

3. Utilization of tubular towers, rather than less expensive lattice towers.

4. Minimization of inter-turbine above-ground overhead wiring, cables, antennas and external appurtenances on the towers and turbines.

Second, operation of the project has a direct effect on community acceptance, including the conduct of the project development team during construction, and continuing through years of operation. Coyote Wind will employ quality techniques and tight management practices during construction and over the long-term operation, which will serve to lessen or eliminate negative community reactions. These include the following:

1. Control of dust and on-going road maintenance from construction equipment and trucks during construction. This includes enforcing 25-mph speed limits within the turbine row roads, maintaining the roads on a clean, clear and rut-free condition, watering roads during dry dusty periods and using soil treatments where appropriate. Maintaining of public roads in clean and good condition is a very important part of maintaining a high level of community acceptance.

2. Control of on-site erosion, minimizing fugitive dust and topsoil transport, siltation to adjacent properties, and minimizing areas of construction impacts.

3. Efficient operation of the project through a coordinated program of turbine maintenance so that the maximum number of turbines are fully operational during times of wind, and so that the project is kept in a long-term mode of operation. This is accomplished through regular inspection, monitoring and repair of all critical components, preventive maintenance and sub-system upgrades and replacements. These techniques minimize visible "down-time", and thereby lessen community perception that the project is an inefficient use of the land.

Third, a key component is community good will. This is fostered by the following:

1. Employing local contractors, suppliers, engineers, surveyors, construction equipment, maintenance personnel, and local support businesses in order to involve the community in the project to the greatest extent practical.

2. Training local personnel to perform turbine maintenance and operation to develop and enhance local participation.

4.2 Native American Involvement

There are no Native American land issues involved with the Coyote Wind project site.

5 Wastewater & Storm Water

The project will not generate wastewater. The Montana DEQ storm water permit for construction will be applied for upon initial construction.

6 Emergency Planning

Wind Energy project O&M requires the storage of lubricants and other maintenance fluids on site. All fluids will be housed in the maintenance building and handled according to industry standards for safe use.

7 APPENDIX

7.1 Complete Fish and Wildlife Service impact index checklist (Dr. Al Harmata).

PHYSICAL ATTRIBUTE CHECKLIST

DATE 22 April 2004

Physical Attribute (max score = 36)				Springdale State Section
Topography	Mountain Aspect*	Side	W	
			E	
			N	
			S	
		Top		
		Foothill	W	
			E	
			N	
			S	✓
	Valley*			✓
	Pass*			
	Gap*			
	Ridge*			
	Bluff*			✓
	Butte*			
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 Migration			
Infrastructure To Build	Transmission			
	Roads			
	Buildings*	Storage		
		Maintenance		
		Daily Activity		
	Substation			
Increased Activity*				
			Totals	8

Avian Species of Special Concern Checklist
(Complete prior to SPECIES OCCURRENCE & STATUS CHECKLIST)

Birds ($n = 31$) **(max score = 62)**	Springdale		
Occurrence	**B**	**M/W**	Σ
Common Loon			
Clark's Grebe			
American White Pelican			
Black-crowned Night-heron			
White faced Ibis			
Trumpeter Swan			
Harlequin Duck			
Northern Goshawk		✔	1
Ferruginous Hawk	✔	✔	2
Peregrine Falcon		✔	1
Columbian Sharp-tailed Grouse			
Yellow Rail			
Black necked Stilt			
Franklin's Gull			
Caspian Tern			
Common Tern			
Forster's Tern			
Black Tern			
Flammulated Owl			
Burrowing Owl	?	?	?
Great Gray Owl			
Boreal Owl			
Black Swift			
Blackbacked Woodpecker			
Alder Flycatcher			
Cassin's Kingbird			
Blue-gray Gnatcatcher			
Dickcissel			
Baird's Sparrow			
Le Conte's Sparrow			
Nelson's Sharp tailed Sparrow			
Subtotals	2	4	6
		Total	6

Bat Species Of Special Concern Checklist
(Complete prior to SPECIES OCCURRENCE & STATUS CHECKLIST)

Bats (n = 5) (max score = 10)	Springdale		
Occurrence	**B**	**M/W**	**Σ**
Fringed Myotis	✔		1
Northern Long-eared Myotis		✔	1
Spotted Bat	✔	?	2
Townsend's Big-eared Bat	✔		1
Pallid Bat	?		1
Subtotals	4	2	6
Total			6

SPECIES OCCURRENCE & STATUS CHECKLIST

Species (n = 17)

Groups (n = 3)

Max score = 108

		Springdale		
	Occurrence	**B**	**M/W**	**Σ**
Threatened & Endangered	Bald Eagle	✔	✔	2
	Whooping Crane			
	Piping Plover			
	Interior Least Tern			
	Grizzly Bear			
	Gray Wolf		✔	1
	Black-footed Ferret			
	Pallid Sturgeon			
	Woodland Caribou			
	White Sturgeon (Kootenai River)			
	Bull Trout			
Candidate*	Mountain Plover			
	Yellow billed Cuckoo			
	Black-tailed Prairie Dog	✔	✔	2
	Swift Fox			
Special Concern*	Birds (max ∑=62)	2	4	6
	Bats (max ∑=10)	4	2	6
Golden Eagle*		✔	✔	2
Sage Grouse*		?	?	2
Bats*		✔	?	2
	Subtotals	11	12	23
	Total			23

ECOLOGICAL ATTRACTIVENESS CHECKLIST

Ecological Attractor (max score = 17)			Springdale
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*[1]*			
		Total	10

[1]Value of 2 used if true.

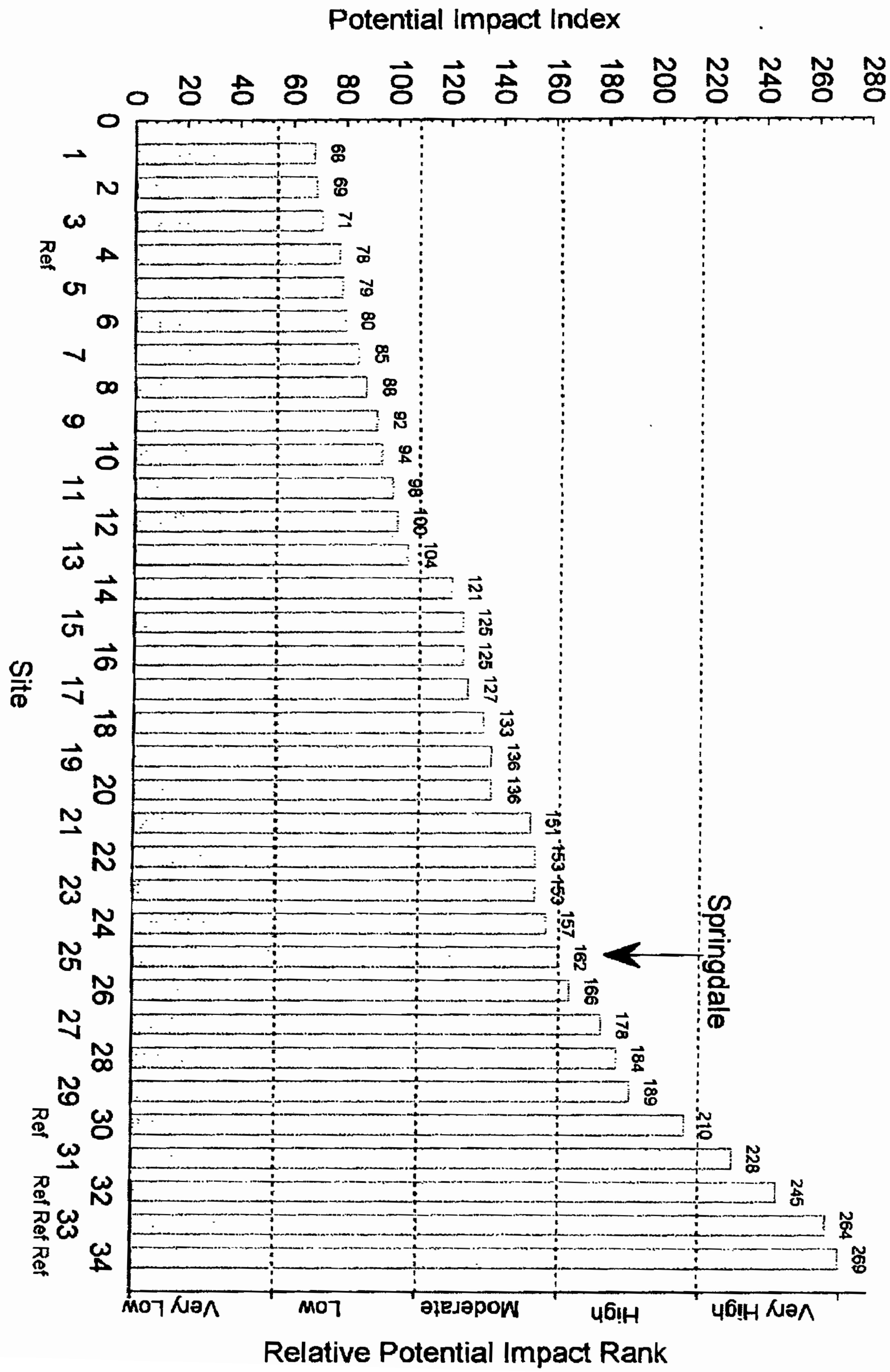
POTENTIAL IMPACT INDEX

Checklist (p)[1]	Springdale Σ	Springdale Σ/p
Physical (36 max = 36/161, $p = 0.22$)	8	36.4
Species Occurrence & Status (108 max, $p = .67$)	23	34.3
Ecological (17 max, $p = 0.11$)	10	90.9
Totals		161.6

[1]Proportion of total (161) checklist scores.

SITE SPECIFIC QUESTIONS/COMMENTS

Checklist	Springdale
Physical	
Species Occurrence	Do burrowing owls inhabit the prairie dog town? Do burrowing owls move through the site seasonally?
	Are spotted bats transient and pallid bats breeding in the vicinity (≤7km)? Do other bat species migrate, forage, or breed in the vicinity (≤7km)?
	Are sage grouse transient or breeding on or near (≤7km) the site?
	What is the intensity of use of the prairie dog town by the raptors (spp., #, freq., etc.)?
Ecological	Do birds migrate in numbers and/or by methods or concentrate over the site such that "significant" numbers may be at risk for collision with wind turbines?


Potential Impact Index
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280
Site
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34
Ref
Ref
Ref Ref Ref
68 69 71 78 79 80 85 88 92 94 98 100 104 121 125 125 127 133 136 136 151 153 153 157 162 166 178 184 189 210 228 245 264 269
Springdale
Very Low
Low
Moderate
High
Very High
Relative Potential Impact Rank

7.2 Investigator Qualifications

Martin H. Wilde is Principle Engineer at Coyote Energy, Inc of 4478 Trumble Creek Rd., Columbia Falls, MT 59912. Wilde's technical experience reflects expertise in Wind Project Design, Development, and Management, as well as technical excellence in Mechanical, Electrical, Welding and Materials Engineering, Utility-Scale Energy Systems, Failure Analysis and Litigation Support.

Over the last fifteen years, Wilde has worked as scientist, principal investigator, project developer and project manager for commercial and government teams developing wind energy and utility projects, as such; he has overseen project design, research, negotiation, procurement, engineering, construction, testing and reporting functions. Wilde has served as lead contact between Utility companies, Tribes, government and commercial developers and has created and managed grants, contracts, and training programs. Wilde has spearheaded a half dozen wind energy development initiatives for the US Department of Energy.

PROJECT EXPERIENCE

- **Coyote Wind, LLC** Managing partner of 50 MW wind project development. 2003 - present
- Project Manager –**US Department of Energy** Grant to the Makah Tribe 2003-2005
- **State of Montana** Principal investigator – wind resource assessment of state school trust lands. Meteorological data analysis. Project modeling. 2004-5
- Project Developer - **Cielo Wind Power** – develop commercial wind projects in western US. 2002
- Wind Energy Consultant – **State of Montana** – develop and write permitting guide for commercial wind plant construction in Montana. 2002
- Project Development Consultant- **Zilkha Renewable Energy** - researched and prepared market analysis and business plan for wind power development in Montana. December 2001.
- Project Development Specialist - **SeaWest** - 150 MW multi-site "Wheatland County" project for proposal to Montana Power Company. Developed sites in **Judith Gap, MT** and proposal with/for SeaWest. June 2001.
- Project Developer/Manager - **SeaWest** - created 50 MW "Copper Valley" project for construction on superfund site in Anaconda, MT. Proposed project as part of SeaWest portfolio bid to BPA in 2001.
- Project Technical Consultant - Southern Sierra Power Project - to land owner in negotiation with Florida Power and Light (FPLE) for, 276MW Wind Project near Tehachapi, CA.
- Project Lead/Manager - Blackfeet Indian Tribe / **SeaWest** - Brought BPA, The Blackfeet Tribe, **Montana Power Company** and SeaWest

WindPower together to implement the first large wind development in Montana, 66MW.

- Project Manager and Business manager - **U.S. Dept. of Energy** - 1999 "Field Verification Program for Small Wind Turbines" project. Created/constructed/operated utility scale wind project city sewer lagoon in Browning, MT.
- Project Manager and Business manager - **U.S. Dept. of Energy** - 1996 Title XXVI, "Indian Energy Resource Development" project. Created, constructed and operated the first utility scale wind project on Indian lands.
- Creator/Director of "Siyeh Development Corporation" - Blackfeet Indian Tribe - Created and headed up a federal corporation for utility and business development.
- Assembled and headed Blackfeet Wind Park Development Team consisting of Blackfeet Tribe, **BPA**, BEF, MPC, Western MT G&T, Dames & Moore, to set up wind farm on the Blackfeet Reservation.
- Principle Investigator - **U.S. Dept. of Energy** - technical outreach with **MSU** and **Montana Tech**.
- Project Manager - provided technical litigation support for underground fuel release remediation project in Browning, MT.
- Energy Development Planner - Blackfeet Indian Tribe
- Energy Technology Program Director - Blackfeet Community College
- Principal for the 1999, **U.S. Dept. of Energy** (USDOE), Field *Verification Program for Small Wind Turbines* grant
- Principal for 1999-2000 $200,000 **HUD** economic development grant.

Wilde possesses a Masters degree in Mechanical/Materials Engineering from Ohio State University and a BS from the University of Pittsburgh.

Wilde has extensive experience in the following areas:

1. Utility and energy business technical understanding
2. Identify and spearhead development opportunities
3. Project scoping, development strategy and bid formulation
4. Technical team leader and project manager
5. Wind resource assessment and meteorological science
6. Project design and modeling
7. Conduct meetings with land owners, communities, Utilities, stakeholders, governmental agencies and tribes
8. Contract and agreement formulation, negotiation and execution
9. Technical writing

REFERENCES

- Mr. James Yockey, Principal, URS Inc., Consultants in Economic Energy Purchase, 1605 Monroe Street, Suite 110, Madison, WI 53711-2052 (608) 258-9660

- Mr. John Pease, Wind and Renewables Group, Bonneville Power Administration (BPA), 905 NE 11th, MS PTS, Portland, OR 97208 (503) 230-3299
- Mr. David C. Roberts, Director - Business Development, OSIsoft, Inc., 777 Davis Street, Suite 250, San Leandro, CA, 94577 (510) 541 3237
- Mr. Paul Cartwright, Senior Energy Analyst, Planning Prevention and Assistance Division, Montana Department of Environmental Quality, 1100 N. Last Chance Gulch, Helena, MT 59620-0901 (406) 841-5234
- Mr. Ron Nierenberg, Consulting Meteorologist, 850 NW View Ridge Court, Camas, WA 98607 (360) 210-4066
- Mr. P.J. Dougherty, Chairman, Wind Powering America, US Department of Energy, 1000 Independence Ave., SW, Washing ton D.C. 20585 (202) 586-7950

Appendix D - Employment by industry, Sweet Grass and Park counties, Montana

Annual average employment by industry in Sweet Grass and Park counties in 2007. (Montana Department of Labor and Industry and Census and Economic Information Center 2007, 2008)

	Sweet Grass County			Park County		
Industry	**Number of Establishments**	**Average Employment**	**Average Weekly Wages ($)**	**Number of Establishments**	**Average Employment**	**Average Weekly Wages ($)**
Total, All Industries	180	1,373	916	845	5,094	488
Agriculture, Forestry, Fishing & Hunting	14	62	480	35	150	475
Crop Production	3	*	*	3	*	*
Animal Production	10	42	555	19	105	469
Forestry and Logging	*	*	*	6	21	471
Fishing, Hunting and Trapping	*	*	*	1	*	*
Agriculture & Forestry Support Activity	1	*	*	6	13	441
Mining	1	*	*	3	7	485
Mining (except Oil and Gas)	1	*	*	3	7	485
Utilities	1	*	*	7	48	840
Utilities	1	*	*	7	48	840
Construction	39	122	545	146	557	564
Construction of Buildings	18	*	*	54	150	535
Heavy and Civil Engineering Construction	1	*	*	8	57	161
Specialty Trade Contractors	20	57	478	84	350	642
Manufacturing	11	73	604	29	297	734
Food Manufacturing	2	*	*	4	21	778
Beverage and Tobacco Manufacturing	*	*	*	0	*	*
Textile Product Mills	*	*	*	3	3	270
Leather and Allied Product Manufacturing	*	*	*	1	*	*
Wood Product Manufacturing	2	*	*	1	*	*
Printing and Related Support Activities	*	*	*	3	*	*
Nonmetallic Mineral Product Mfg	2	*	*	1	*	*
Primary Metal Manufacturing	*	*	*	1	*	*
Fabricated Metal Product Manufacturing	4	37	646	1	*	*

	Sweet Grass County			Park County		
Industry	Number of Establishments	Average Employment	Average Weekly Wages ($)	Number of Establishments	Average Employment	Average Weekly Wages ($)
Machinery Manufacturing	*	*	*	2	*	*
Computer and Electronic Product Manufacturing	*	*	*	2	*	*
Electrical Equipment and Appliances	*	*	*	1	*	*
Transportation Equipment Manufacturing	1	*	*	4	8	245
Furniture and Related Product Manufacturing	*	*	*	2	*	*
Misc Manufacturing	*	*	*	4	26	629
Wholesale Trade	4	15	531	20	41	721
Merchant Wholesalers, Durable Goods	1	*	*	6	6	1,528
Merchant Wholesalers, Nondurable Goods	3	*	*	11	31	633
Electronic Markets and Agents/Brokers	*	*	*	3	5	151
Retail Trade	25	159	397	112	780	420
Motor Vehicle and Parts Dealers	6	37	582	11	108	578
Furniture and Home Furnishings Stores	*	*	*	10	33	449
Electronics and Appliance Stores	1	*	*	1	*	*
Building Material & Garden Supply Stores	3	15	643	10	60	404
Food and Beverage Stores	1	*	*	9	193	389
Health and Personal Care Stores	1	*	*	4	30	530
Gasoline Stations	3	*	*	12	139	324
Clothing and Clothing Accessories Stores	3	13	164	11	29	240
Sporting Goods/Hobby/Book/Music Stores	3	*	*	12	48	374
General Merchandise Stores	*	*	*	1	*	*
Miscellaneous Store Retailers	4	5	166	24	57	337
Nonstore Retailers				8	49	640
Transportation and Warehousing	1	*	*	19	37	396
Truck Transportation	1	*	*	13	16	423
Transit and Ground	*	*	*	2	*	*

	Sweet Grass County			Park County		
Industry	Number of Establishments	Average Employment	Average Weekly Wages ($)	Number of Establishments	Average Employment	Average Weekly Wages ($)
Passenger Transport						
Pipeline Transportation	*	*	*	1	*	*
Scenic and Sightseeing Transportation	*	*	*	1	*	*
Couriers and Messengers	*	*	*	1	*	*
Warehousing and Storage	*	*	*	1	*	*
Information	4	20	103	21	87	551
Publishing Industries	2	*	*	5	*	*
Motion Picture & Sound Recording Ind	1	*	*	6	12	438
Broadcasting (except Internet)	*	*	*	1	*	*
Telecommunications	*	*	*	5	13	829
ISPs, Search Portals, & Data Processing	1	*	*	1	*	*
Other information services				3	*	*
Finance and Insurance	7	36	699	30	169	716
Credit Intermediation & Related Activity	3	24	715	13	128	686
Financial Investment & Related Activity	1	*	*	6	11	1,292
Insurance Carriers & Related Activities	3	*	*	11	30	633
Real Estate and Rental and Leasing	7	12	459	27	42	416
Real Estate	5	*	*	25	*	*
Rental and Leasing Services	2	*	*	2	*	*
Professional and Technical Services	13	37	627	76	193	681
Professional and Technical Services	13	37	627	76	193	681
Management of Companies and Enterprises	1	*	*	2	*	*
Management of Companies and Enterprises	1	*	*	2	*	*
Administrative and Waste Services	4	6	494	33	122	432
Administrative and Support Services	3	*	*	31	*	*
Waste Management	1	*	*	2	*	*

	Sweet Grass County			Park County		
Industry	Number of Establishments	Average Employment	Average Weekly Wages ($)	Number of Establishments	Average Employment	Average Weekly Wages ($)
and Remediation Service						
Educational Services	1	*	*	10	80	394
Educational Services	1	*	*	10	80	394
Health Care and Social Assistance	5	18	270	40	655	645
Ambulatory Health Care Services	3	*	*	21	215	760
Hospitals	*	*	*	1	*	*
Nursing and Residential Care Facilities	*	*	*	6	133	372
Social Assistance	2	*	*	12	*	*
Arts, Entertainment, and Recreation	12	46	210	57	189	394
Performing Arts and Spectator Sports	*	*	*		21	434
Museums, Parks and Historical Sites	1	*	*	4	6	356
Amusement, Gambling & Recreation Ind	11	*	*	42	162	390
Accommodation and Food Services	16	170	229	113	1250	280
Accommodation	9	47	292	44	527	369
Food Services and Drinking Places	8	123	204	69	723	215
Other Services, Ex. Public Admin	15	38	314	66	353	404
Repair and Maintenance	4	14	489	21	81	461
Personal and Laundry Services	2	*	*	9	63	422
Membership Organizations & Associations	7	20	141	25	183	386
Private Households	3	*	*	11	26	312
Federal Government	7	40	875	13	81	802
State Government	6	22	798	10	69	911
Local Government	9	323	419	18	602	588

Appendix E - Cultural resources inventory of Section 36, T1N R12E: Sweet Grass County, Montana

CULTURAL RESOURCES INVENTORY OF SECTION 36, T1N R12E: SWEET GRASS COUNTY, MONTANA

Report prepared for
the Montana Department of Natural Resources and Conservation (DNRC)
Helena, MT 59620

by

Patrick J. Rennie
DNRC
Helena, MT 59620

January, 2006

DNRC Project No. 2006-5-1

ABSTRACT

During September 6 through September 8, 2005, the author and field assistant John Rittel completed a Class III level intensity inventory of cultural and paleontologic resources on a contiguous block of 640 acres of state owned land legally described as Section 36, T1N R12E in Sweet Grass County, Montana. During the course of inventory five cultural resources were identified, evaluated and formally recorded. The cultural resources consist of two low-profile cairns, a small rock wall/enclosure type structure, and two isolated finds. The isolated finds consist of a secondary flake of butterscotch colored chert and a biface thinning flake of a opaque, lavender colored chert. The aforementioned cultural resources were evaluated and recommended as not eligible for listing in the National Register of Historic Places. No additional archaeological investigative work is recommended in order for the proposed undertaking to proceed.

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1.0 INTRODUCTION

The Department of Natural Resources and Conservation (DNRC) has been requested by Coyote Energy to allow wind energy facility developments on a tract of state land in Sweet Grass County, Montana (Figure 1). The state tract consists of a 1 square mile block (640 acre) of land legally described as section 36, T1N R12E. Proposed developments on the state tract will consist of turbine towers, access roads, and transmission lines that connect each turbine (Figure 2). During September 6 through September 8, 2005, the author and field assistant, John Rittel, completed a Class III level intensity inventory of cultural and paleontologic resources of the subject state tract (Table 1). The following report provides a detailed description of the project area, the field methods used, and the results of that inventory.

2.0 PREFIELD STUDIES

Prior to conducting fieldwork, the senior author inspected the DNRC's sites/site leads database, land use records, General Land Office maps, and control cards for potential cultural resources on the state parcel. Additionally, a search of the CRIS and CRABS database was requested of staff of the Montana State Historic Preservation Office. That series of searches indicated that no known cultural resources were documented in the project area and that no previous cultural or paleontologic resource inventories had been conducted of the tract.

3.0 PROJECT AREA DESCRIPTION

The tract is situated northwest of Springdale in west-central Sweet Grass County, Montana (Figures 1 and 2). The terrain containing and surrounding the subject state parcel can be generalized as moderately undulating open prairie at the west margin of the Madison River valley (Figures 2 through 4). The native vegetative community of the area inspected primarily consists of short prairie grasses, prickly pear cactus, sagebrush, and fringed sagewort. Limited stands of Douglas fir and Rocky Mountain Juniper can be found on and immediately adjacent to the project area. The state parcel consists of native rangeland, but a major overhead powerline passes through the section inside its east margin. During the inspection reported on herein, ground surface visibility of was fair (30%- 35% visibility). Geology of the project area is described as moderately hard sandstones with soft gray shales. The soils in the survey area are coarse, loamy and stoney (Veseth and Montagne).

4.0 FIELD INVESTIGATIVE METHODS

All 640 acres comprising the state parcel were inventoried using generally parallel pedestrian transects spaced at a maximum width of 30 m. Tract boundaries are delimited with barbed-wire fences. Significance evaluations of cultural properties were restricted to surface examination. Subsurface inspection throughout the survey area generally consisted of an examination of existing exposures such as eroded/denuded ground surfaces, the eroded cut bank profiles of the minor ephemeral drainages on the parcel, and the spoil dirt generated from the activities of small and medium size burrowing mammals, and ant hills.

Table 1: Summary of land inventoried and cultural resources documented.

Legal Location	Cultural Resource	Property Type	NR Eligibility	Ownership
T1N R12E, NW1/4 Section 36	24SW494	Cairn	Recommended ineligible	State
T1N R12E, NW1/4 Section 36	24SW495	Cairn	Recommended ineligible	State
T1N R12E, NW1/4 Section 36	24SW496	Rockwall	Recommended ineligible	State
T1N R12E, NW1/4 Section 36	IF-1	IF-1	Recommended ineligible	State
T1N R12E, NW1/4 Section 36	IF-2	IF-2	Recommended ineligible	State

Total acreage inventoried to Class III standards= 640

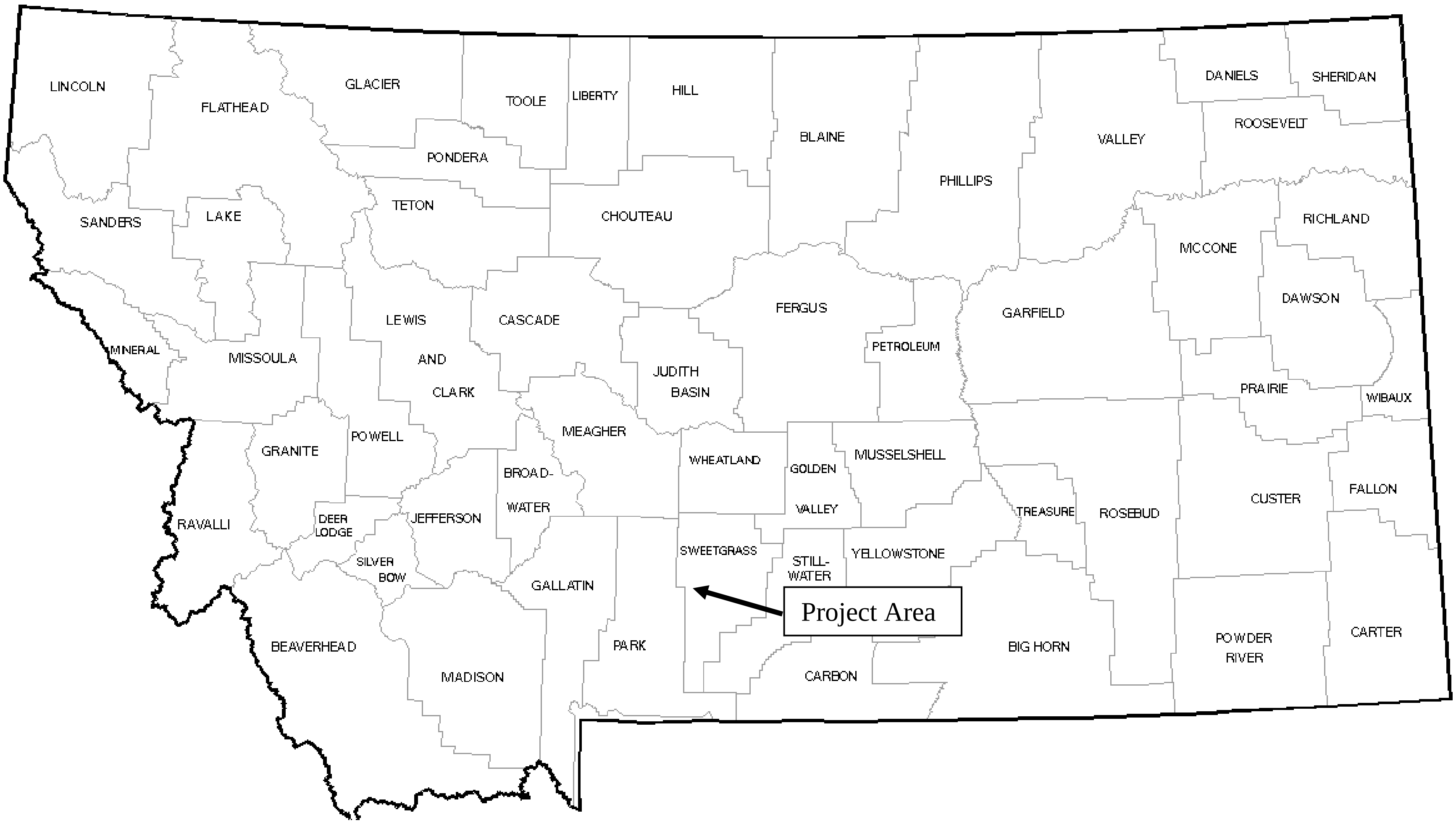

Figure 1: General location of the project area in Montana.

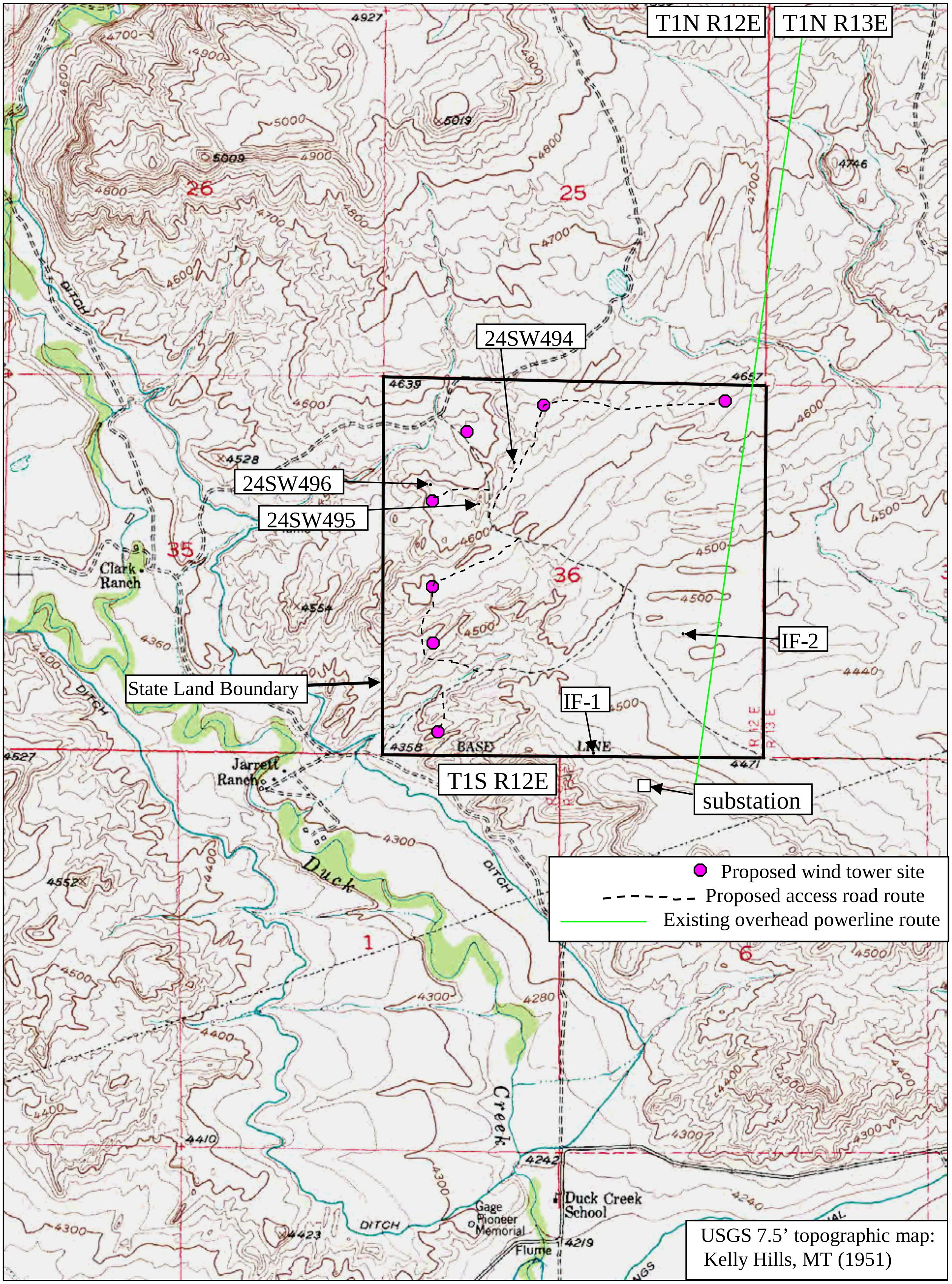

Figure 2: Map showing the area inspected and the locations of cultural resources identified.

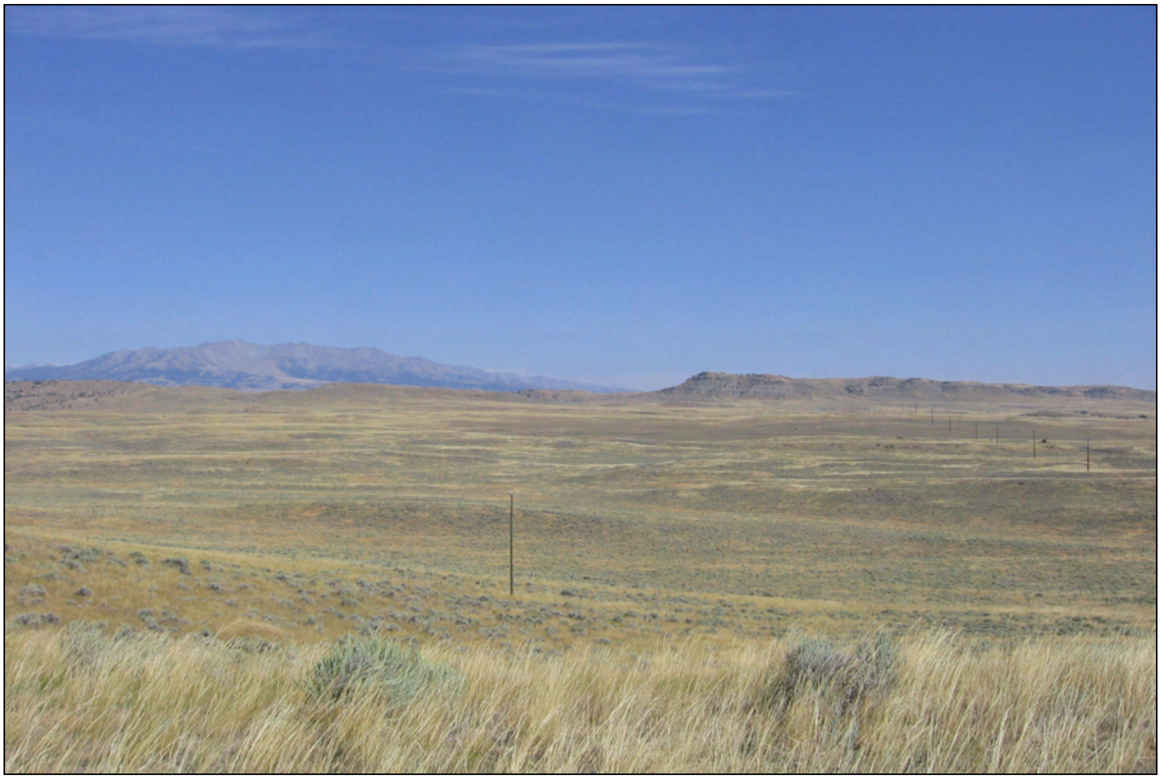
Figure 3: Looking N across the project area.

Identified cultural resources were recorded on standard CRIS and Isolated Find forms. Digital photographs were taken of the general setting of formally recorded cultural resource sites.

5.0 RESULTS OF FIELDWORK

During the course of inventory, five previously undocumented cultural resources were identified and formally recorded. The cultural resources consist of two low-profile cairns, a small rock wall type structure, and two islolated artifacts. Age of these cultural resources is presently unknown. A summary of each cultural property follows. Detailed discussions and illustrations of the identified cultural resources can be found at Appendix 1 of this report:

PROPERTY NUMBER AND NAME:

24SW494 (Table 1; Figure 2; Appendix 1)

PROPERTY TYPE:

Cairn

PROPERTY DESCRIPTION:

The site consists of a low-profile, two tiered, moderately-well consolidated cairn at the upper margin of a prominent ephemeral drainage in open prairie terrain. The site is contained within an area that arbitrarily measures 5 m in diameter with the cairn positioned at the center of the site. The cairn consists of 38 locally available, quartzite and basalt cobbles that measure between 20 cm and 30 cm in maximum dimension. The cairn measures 2.8 m N/S x 3.2 m E/W. The cairn is moderately sodded in and the exposed surfaces of the rocks comprising the feature exhibit a heavy and patterned lichen development. Three 30 cm x 30 cm x 30 cm shovel tests were excavated in and adjacent to the cairn with negative results. The date of construction, as well as the constructor of the cairn are unknowns. However, it is at least 25 years old based on lichen development.

CONDITION/INTEGRITY:

The site appears to be intact and is recommended here as largely retaining aspects of design, setting, location, workmanship and materials. Integrity of association and feeling is not readily apparent.

EVALUATION OF SIGNIFICANCE:

As indicated on page 12 of National Park Service Bulletin #15 (NPSB 15) a property can be considered significant in association with Criterion A if a relationship between the site and a significant event or pattern of events within a defined time period can be demonstrated. Additionally, "Mere association with historic events or trends is not enough, in and of itself, to qualify under Criterion A (NPSB 15:12)". Presently there is no way of determining the age or function of the site, although it is possible that it reflects field clearing activities in an effort to establish the adjacent prairie surface as a hayfield. This suggestion is based on the fact that an abandoned irrigation ditch is situated ca. ½ mile west of the cairn. Alternately, past and contemporary peoples constructed cairns for numerous possible reasons (Rennie and Lahren 2004). Because of the lack of evidence to substantiate the origin, age and original function of the cairn, the site is recommended here as lacking significance in association with Criterion A.

A property is considered significant in association with Criterion B if a link between the site and a person significant in local, regional, or national history or prehistory can be demonstrated (NPSB 15:14). Because no such association can be demonstrated, the site is recommended as insignificant in association with Criterion B.

A property can be considered significant in association with Criterion C if it can be demonstrated to, "Embody distinctive characteristics of a type, period, or method of construction (NPSB 15:18)." In order for a property to meet that requirement it must exhibit a sufficient number of" distinctive characteristics" representative of a particular method of construction. Further, "Characteristics can be expressed in terms such as form, proportion, structure, plan, style, or materials. They can be general, referring to ideas of design and construction such as basic plan or form... (NPSB 15:18)". The site consists of a low-profile cairn. Such features are common in the northern Plains and Intermontaine areas and could have originally functioned in a variety of ways (Rennie and Lahren 2004). No unusual or unique aspects such as engineering feats, or ethnic or temporally specific construction is identifiable for the cairn. Because of this, the site is recommended here as lacking significance in association with Criterion C.

Finally, a property is considered significant in association with Criterion D if it has yielded, or may be likely to yield, information important in prehistory or history (NPSB 15:21). The apparent lack of associated cultural material which might lend an understanding of the age and function of the cairn, or the ethnic affiliation of the individual(s) who constructed the cairn, suggests that the cairn represent the entirety of the site. That being the case, the site is recommended as insignificant in association with Criterion D.

Based on the previous analysis, the site cannot be placed within a meaningful temporal or cultural context, and it does not appear that the feature, or the location of the feature, will contribute anything meaningful to our understanding of human behavior, cultural change or adaptations in the northern Plains or Intermontaine areas. The site is therefore, recommended as insignificant in association with the aforementioned National Park Service Criteria.

NATIONAL REGISTER ELIGIBILITY:

The site is recommended here as ineligible for listing in the National Register of Historic Places.

POSSIBLE IMPACTS TO SITE:

Presently no ground disturbing activities are currently proposed that would physically impact the site.

RECOMMENDATIONS:

The cultural property has been evaluated and is recommended as ineligible for listing in the National Register of Historic Places. No additional archaeological investigative work is recommended.

PROPERTY NUMBER AND NAME:

24SW495 (Table 1; Figure 2; Appendix 1)

PROPERTY TYPE:

Cairn

PROPERTY DESCRIPTION:

The site consists of a low-profile, two tiered, moderately-well consolidated cairn at the upper margin of a prominent ephemeral drainage in open prairie terrain. The site is contained within an area that arbitrarily measures 5 m in diameter with the cairn positioned at the center of the site. The cairn consists of 38 locally available, quartzite and basalt cobbles that measure between 20 cm and 30 cm in maximum dimension. The cairn measures 2.8 m N/S x 3.2 m E/W. The cairn is moderately sodded in and the exposed surfaces of the rocks comprising the feature exhibit a heavy and patterned lichen development. Three 30 cm x 30 cm x 30 cm shovel tests were excavated in and adjacent to the cairn with negative results. The date of construction, as well as the constructor of the cairn are unknowns. However, it is at least 25 years old based on lichen development.

CONDITION/INTEGRITY:

The site appears to be intact and is recommended here as largely retaining aspects of design, setting, location, workmanship and materials. Integrity of association and feeling is not readily apparent.

EVALUATION OF SIGNIFICANCE:

As indicated on page 12 of National Park Service Bulletin #15 (NPSB 15) a property can be considered significant in association with Criterion A if a relationship between the site and a significant event or pattern of events within a defined time period can be demonstrated. Additionally, "Mere association with historic events or trends is not enough, in and of itself, to qualify under Criterion A (NPSB 15:12)". Presently there is no way of determining the age or function of the site, although it is possible that it reflects field clearing activities in an effort to establish the adjacent prairie surface as a hayfield. This suggestion is based on the fact that an abandoned irrigation ditch is situated ca. ½ mile west of the cairn. Alternately, past and contemporary peoples constructed cairns for numerous possible reasons (Rennie and Lahren 2004). Because of the lack of evidence to substantiate the origin, age and original function of the cairn, the site is recommended here as lacking significance in association with Criterion A.

A property is considered significant in association with Criterion B if a link between the site and a person significant in local, regional, or national history or prehistory can be demonstrated (NPSB 15:14). Because no such association can be demonstrated, the site is recommended as insignificant in association with Criterion B.

A property can be considered significant in association with Criterion C if it can be demonstrated to, "Embody distinctive characteristics of a type, period, or method of construction (NPSB 15:18)." In order for a property to meet that requirement it must exhibit a sufficient number of" distinctive characteristics" representative of a particular method of construction. Further, "Characteristics can be expressed in terms such as form, proportion, structure, plan, style, or materials. They can be general, referring to ideas of design and construction such as basic plan or form... (NPSB 15:18)". The site consists of a low-profile cairn. Such features are common in the northern Plains and Intermontaine areas and could have originally functioned in a variety of ways (Rennie and Lahren 2004). No unusual or unique aspects such as engineering feats, or ethnic or temporally specific construction is identifiable for the cairn. Because of this, the site is recommended here as lacking significance in association with Criterion C.

Finally, a property is considered significant in association with Criterion D if it has yielded, or may be likely to yield, information important in prehistory or history (NPSB 15:21). The apparent lack of associated cultural material which might lend an understanding of the age and function of the cairn, or the ethnic affiliation of the individual(s) who constructed the cairn, suggests that the cairn represent the entirety of the site. That being the case, the site is recommended as insignificant in association with Criterion D.

Based on the previous analysis, the site cannot be placed within a meaningful temporal or cultural context, and it does not appear that the feature, or the location of the feature, will contribute anything meaningful to our understanding of human behavior, cultural change or adaptations in the northern Plains or Intermontaine areas. The site is therefore, recommended as insignificant in association with the aforementioned National Park Service Criteria.

NATIONAL REGISTER ELIGIBILITY:

The site is recommended here as ineligible for listing in the National Register of Historic Places.

POSSIBLE IMPACTS TO SITE:

Presently no ground disturbing activities are currently proposed that would physically impact the site.

RECOMMENDATIONS:

The cultural property has been evaluated and is recommended as ineligible for listing in the National Register of Historic Places. No additional archaeological investigative work is recommended.

PROPERTY NUMBER AND NAME:

24SW496 (Table 1; Figure 2; Appendix 1)

PROPERTY TYPE:

Rock structure

PROPERTY DESCRIPTION:

The site consists of a low-profile, three tiered, arrangement of 18 locally available quartzite pieces (average size piece is 20 cm in maximum dimension) so as to form a short, dry-laid masonry type wall. The structure measures 2 m E/W x 30 cm N/S x 40 cm in height and is located at the apex of a small rocky knoll in open rolling prairie. The arrangement of the stacked pieces of rock also incorporates a portion of the naturally occurring outcrop into the wall. The site may have served as a blind for hunting purposes, or as a windbreak, or for some other purpose. The date of construction, as well as the constructor of the rockwall, are unknowns. However, it is at least 25 years old based on lichen development on the exposed surfaces of the stones comprising the feature.

CONDITION/INTEGRITY:

The site appears to be intact and is recommended here as largely retaining aspects of design, setting, location, workmanship and materials. Integrity of association and feeling is not readily apparent.

EVALUATION OF SIGNIFICANCE:

As indicated on page 12 of National Park Service Bulletin #15 (NPSB 15) a property can be considered significant in association with Criterion A if a relationship between the site and a significant event or pattern of events within a defined time period can be demonstrated. Additionally, "Mere association with historic events or trends is not enough, in and of itself, to qualify under Criterion A (NPSB 15:12)". Presently there is no way of determining the age or function of the site, although it is possible that it was constructed for use as a hunting blind or as a windbreak. Because of the lack of evidence to substantiate the origin, age and original function of the structure, the site is recommended here as lacking significance in association with Criterion A.

A property is considered significant in association with Criterion B if a link between the site and a person significant in local, regional, or national history or prehistory can be demonstrated (NPSB 15:14). Because no such association can be demonstrated, the site is recommended as insignificant in association with Criterion B.

A property can be considered significant in association with Criterion C if it can be demonstrated to, "Embody distinctive characteristics of a type, period, or method of construction (NPSB 15:18)." In order for a property to meet that requirement it must exhibit a sufficient number of" distinctive characteristics" representative of a particular method of construction. Further, "Characteristics can be expressed in terms such as form, proportion, structure, plan, style, or materials. They can be general, referring to ideas of design and construction such as basic plan or form... (NPSB 15:18)". The site consists of a short, low-profile rock wall of stacked construction and there are no unusual or unique aspects such as engineering feats, or ethnic or temporally specific construction identifiable in the feature. Because of this, the site is recommended here as lacking significance in association with Criterion C.

Finally, a property is considered significant in association with Criterion D if it has yielded, or may be likely to yield, information important in prehistory or history (NPSB 15:21). The apparent lack of associated cultural material which might lend an understanding of the age and function of the feature, or the ethnic affiliation of the individual(s) who constructed the rockwall, suggests that the rock structure represent the entirety of the site. That being the case, the site is recommended as insignificant in association with Criterion D.

Based on the previous analysis, the site cannot be placed within a meaningful temporal or cultural context, and it does not appear that the feature, or the location of the feature, will contribute anything meaningful to our understanding of human behavior, cultural change or adaptations in the northern Plains or Intermontaine areas. The site is therefore, recommended as insignificant in association with the aforementioned National Park Service Criteria.

NATIONAL REGISTER ELIGIBILITY:

The site is recommended here as ineligible for listing in the National Register of Historic Places.

POSSIBLE IMPACTS TO SITE:

Presently no ground disturbing activities are currently proposed that would physically impact the site.

RECOMMENDATIONS:

The cultural property has been evaluated and is recommended as ineligible for listing in the National Register of Historic Places. No additional archaeological investigative work is recommended.

PROPERTY NUMBER AND NAME:

IF-1 (Table 1; Figure 2; Appendix 1)

PROPERTY TYPE:

Secondary chert flake

PROPERTY DESCRIPTION:

The isolated find consists of a single, secondary flake (G-2 size grade) of a slightly translucent, vitreous, butterscotch colored cryptocrystalline silicate. The lithic raw material that the flake is produced on is common among sources throughout SW Montana, but was probably imported to the find locale. The artifact is a complete flake with a facetted platform.

CONDITION/INTEGRITY:

Because the property is considered an Isolated Find, its condition/integrity is a moot point.

EVALUATION OF SIGNIFICANCE:

Because the property is considered an Isolated Find, it is not considered a significant archaeological property.

NATIONAL REGISTER ELIGIBILITY:

Because the property is considered an Isolated Find, it is not considered a National Register eligible property.

POSSIBLE IMPACTS TO SITE:

Presently no ground disturbing activities are currently proposed that would physically impact the isolated artifact.

RECOMMENDATIONS:

The cultural property has been evaluated and is recommended as ineligible for listing in the National Register of Historic Places. No additional archaeological investigative work is recommended.

PROPERTY NUMBER AND NAME:

IF-2 (Table 1; Figure 2; Appendix 1)

PROPERTY TYPE:

Biface thinning flake

PROPERTY DESCRIPTION:

The isolated find consists of a single, biface thinning flake (G-1 size grade) of an opaque vitreous, lavender colored cryptocrystalline silicate. The source of the lithic raw material that the flake is produced on is presently unknown, but could have originated in any one of several sources within 100 miles of the find locale. The artifact is a complete flake with a facetted platform.

CONDITION/INTEGRITY:

Because the property is considered an Isolated Find, its condition/integrity is a moot point.

EVALUATION OF SIGNIFICANCE:

Because the property is considered an Isolated Find, it is not considered a significant archaeological property.

NATIONAL REGISTER ELIGIBILITY:

Because the property is considered an Isolated Find, it is not considered a National Register eligible property.

POSSIBLE IMPACTS TO SITE:

Presently no ground disturbing activities are currently proposed that would physically impact the isolated artifact.

RECOMMENDATIONS:

The cultural property has been evaluated and is recommended as ineligible for listing in the National Register of Historic Places. No additional archaeological investigative work is recommended.

6.0 SUMMARY AND CONCLUSIONS

During September 6 through September 8, 2005, the author and field assistant John Rittel completed a Class III level intensity inventory of cultural and paleontologic resources on a contiguous block of 640 acres of state owned land legally described as Section 36, T1N R12E in Sweet Grass County, Montana. During the course of inventory five cultural resources were identified, evaluated and formally recorded. The cultural resources consist of two low-profile cairns, a small rock wall/enclosure type structure, and two isolated finds. The isolated finds consist of a secondary flake of butterscotch colored chert and a biface thinning flake of a opaque, lavender colored chert. The aforementioned cultural resources were evaluated and recommended as not eligible for listing in the National Register of Historic Places. No additional archaeological investigative work is recommended in order for the proposed undertaking to proceed.

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Appendix 1: CRIS and IF Forms

Appendix F - Draft approach to an avian and bat post-construction monitoring plan, Coyote Wind Project, Sweet Grass County, Montana

Draft Approach to an Avian and Bat Post-Construction Monitoring Plan, Coyote Wind Project, Sweet Grass County, Montana

Prepared by:

Garcia and Associates
Bozeman, Montana
July 2009

1.0 Introduction

The Montana Department of Natural Resources and Conservation (DNRC) is evaluating whether to lease 640 acres of school trust land in Sweet Grass County (Section 36, Township 1 North, Range 12 East; state parcel) to Coyote Wind, LLC (Coyote Wind) for the placement of eight wind turbines to generate electricity (Figure 1). The Proposed Action is being evaluated under the Montana Environmental Policy Act (MEPA) via an Environmental Impact Statement (EIS). The action would be implemented as early as 2010 and would continue annually for at least 20 years based on the final terms of the lease between the State of Montana and Coyote Wind. The Coyote Wind Project (project) includes wind development on adjacent private land (36 wind turbines) which is considered under the No Action Alternative in the EIS.

The wind turbines planned for this project are manufactured by Vestas and are the V90-1.8 MW model. These turbines have a rotor diameter of 295 feet (90 meters) with a rotor swept area of 1.57 acres (6362 m^2). The main shafts of the turbines are 262 feet (80 meters) (base to hub). There is one meteorological tower (met tower) currently located on the state parcel. It is 161 feet high and has multiple sensors which collect wind and temperature data. The tower is supported with guy wires. This tower would be replaced with one that is 263 feet tall and would have a lattice or monopole construction with no guy wires.

The planned locations for the wind turbines on the state parcel are primarily in a grassland/forb/sage vegetation community. The other two vegetation communities on the state parcel are woody vegetation (trees and shrubs excluding *Artemisia* spp.) and small isolate wetlands.

2.0 Background

Garcia and Associates (GANDA) conducted pre-construction wildlife studies on the state parcel and adjacent private land to provide baseline information on wildlife use (primarily birds and bats) (see GANDA 2009 for detailed methods and results). Three methods were employed to survey for avian species in the project region; Small Bird Counts (SBCs), Bird Use Counts (BUCs), and an aerial survey for raptor nests. SBCs, conducted to assess breeding bird presence and relative abundance, were conducted between May 13 and June 20, 2008. BUCs, designed to detect larger birds such as raptors, waterfowl, and shorebirds, and to evaluate seasonal avian use, were conducted in spring (May and June 2008), summer (August 2008), fall (September and October 2008), and winter (December 2008 and January 2009). The aerial survey was conducted in June 2008. Passive acoustic monitoring to assess bat activity was conducted at one location on the state parcel and one on private land from late August to early November 2008.

The purpose of this monitoring plan is to assess project effects on birds and bats once the project is operational, and to determine if corrective action is warranted. The components of the monitoring plan are:

1) SBCs conducted during the breeding season at the same locations as during pre-construction
2) BUCs conducted during all four seasons during the first year, and depending on the results, either all four seasons or spring and fall the second year at the same locations as during pre-construction
3) Aerial survey to monitor nesting raptors within a two-mile radius of the project area
4) Passive acoustic monitoring for bats in August and September at the same locations as during pre-construction
5) Studies to determine bird and bat fatality rates
6) Formation of a Technical Advisory Committee (TAC) of relevant stakeholders to review methods and results and to provide guidance using adaptive management principles.

All studies should be conducted for two years (but not necessarily two consecutive years) after the wind project is fully operational unless it is determined by the TAC that additional post-construction monitoring is necessary. Any post-construction monitoring of project effects on the private land would be at the discretion of Coyote Wind, as DNRC has no authority on the private land. More details on each component of the plan are described below.

3.0 Bird Counts and Aerial Survey

3.1 Bird Counts (SBCs and BUCs)

Conducting SBCs and BUCs after the project is operational would serve the following purposes:

- Evaluate project effects such as displacement on birds
- Provide context in which to interpret fatality studies

Data from these counts would be compared with pre-construction data to assess displacement or disturbance, defined as the indirect loss of habitat if birds avoid otherwise suitable habitat due to turbine operation and maintenance (FWS 2009).

Results of these studies would aid in interpretation of results from fatality studies. For example, one would expect the abundance and distribution of birds detected on counts to correlate with the abundance and distribution of bird fatalities. Results of counts would help determine if certain taxa are more or less susceptible to turbine-caused fatality. This information is useful in developing measures to minimize impacts.

Bird count data can also be used to calculate the relative risk index of a bird-turbine collision (Erickson 2004). By comparing bird fatalities with relative abundance of the species or species group, one can assess the relative significance of the number of fatalities observed on a population level.

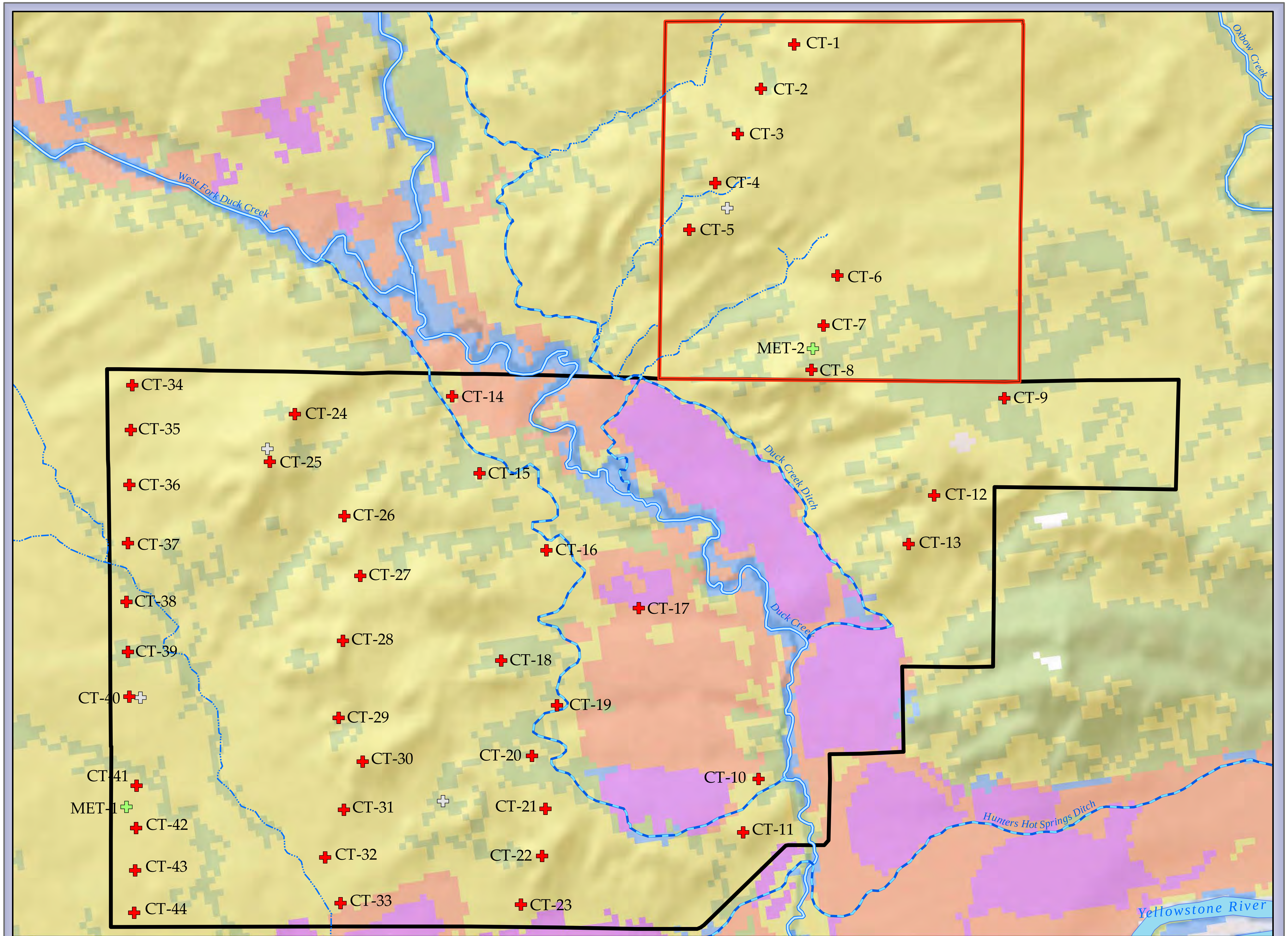

FIGURE 1.
THE PROPOSED COYOTE WIND PROJECT SHOWING GENERALIZED LAND COVER

Sweet Grass County, Montana

Map Legend:

- Shrubs
- Herbaceous Vegetation
- Grasses/Legumes
- Cropland
- Riparian/Wetlands
- State Parcel
- Private Parcel
- Proposed Turbine
- Proposed Met Tower
- Existing Met Tower
- Creek
- Ditch
- Intermittent Stream

N W E S

0 500 1,000 2,000 3,000 ft

0 100 200 400 600 800 m

One Inch is Equal to 1,500 Feet

GANDA

SOURCES:
MONTANA NATURAL RESOURCE INFORMATION SYSTEM (NRIS)
ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE (ESRI)
US GEOLOGICAL SURVEY, NATIONAL LAND COVER DATABASE (USGS-NLCB), 2006

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Because it may take several years of wind project operation before effects on bird populations are evident, it might be advisable to conduct studies in Year 1 and Year 3 after operation, instead of Years 1 and 2. Drewitt and Langston (2006) hypothesized that grassland passerines may not show immediate displacement due to their longer lifespan and high site fidelity, and that true impacts cannot be measured until new recruits have replaced current breeders.

3.2 Aerial Surveys for Raptor Nests

Aerial surveys to look for raptor nests within two miles of turbine locations would be conducted to assess use and productivity of nests found during pre-construction surveys, and to look for new nests. This information would help determine possible project effects on raptors such as nest abandonment. Of particular interest are the two active bald eagle nests along the Yellowstone River (DNRC 2009). One is within the nest management zones for all active bald eagle nests (MBEWG 1994). The nest is in Zone III, the home range area, where management objectives are to maintain suitability of foraging habitat, minimize disturbance within key areas, minimize hazards, and maintain integrity of the breeding area. An active golden eagle nest and a red-tailed hawk nest were also found within about 2 miles of the state parcel (DNRC 2009).

4.0 Passive Acoustic Monitoring for Bats

Passive acoustic monitoring performed pre-construction would be repeated for 2 years post-construction, during August and September. Researchers have found the greatest number of bat fatalities during these months (Arnett et al. 2007, TRC 2008, Young Jr. et al. 2003). The purpose of acoustic monitoring would be to help establish the correlation between pre-construction bat activity and post-construction mortality rates. Currently this relationship is not known (Kunz et al. 2007) and additional research would be a great benefit.

5.0 Fatality Studies

Fatality studies would follow the same general methods being used at other wind projects in Montana on DNRC land (TRC 2008, Erickson 2009), and those being contemplated by US Fish and Wildlife Service (FWS) Wind Turbine Advisory Committee in Version 3 of their Draft Recommended Guidelines (FWS 2009). Studies would include carcass searches, carcass removal trials, searcher efficiency trials, and an incidental casualty and injured bird reporting system. The primary objectives of the fatality studies are to:

1) Determine bird and bat fatality rates attributable to the project
2) Compare fatalities with site characteristics
3) Compare fatality rates among facilities
4) Compare actual and predicted fatality rates
5) Determine if fatality rates warrant corrective action

The number of avian and bat collisions with turbines would be estimated by correcting the number of carcasses found on search plots for carcass removal rates, and searcher efficiency as determined by trials. The results of the first year of data would be assessed to determine if any modifications are needed for the second year of study. The two years of fatality monitoring may not necessarily be conducted consecutively. Waiting several years may allow time for birds to become habituated and habitat to recover (CEC & CDFG 2007). To be consistent with data being collected at the Martinsdale Wind Farm, fatality studies would be conducted from March 15 to November 31; with one additional search in January (Erickson 2009). Fatality studies would begin within 30 days after all turbines begin commercially producing electricity, or as close as possible with the time period designated.

The final number of search plots for fatality studies would be determined based on Coyote Wind's decision regarding conducting studies on private land. At a minimum, the eight turbines and one met tower on the state parcel would be searched.

5.1 Carcass Searches

Square search plots would be established whose dimensions are determined by the maximum tip height of the rotor measured along the ground from the base of the turbines (Erickson 2009). Since the Vestas V90 1.8 MW turbines proposed to be used have a maximum height of 125 meters, the search area would extend 125 meters on all sides of the turbine. The plot would be divided into transects approximately 6-10 meters wide, depending on visibility of carcasses. Plots would be searched once every seven days unless results of carcass removal trials indicate otherwise (FWS recommends search intervals be no greater than twice the mean carcass removal rate; FWS 2009).

Trained observers would walk transects at a pace of approximately 45-60 meters/minute, searching for casualties (Erickson 2009). Data collected for each carcass found would be the same at that collected at the Martinsdale Wind Farm (Erickson 2009) and includes condition of carcass species, sex and age if possible date and time collected; GPS location; and any other comments. Condition categories would follow standard protocols (CEC & CDFG 2007, Erickson 2009) and are:

- Intact – a carcass that is not badly decomposed and shows no sign of having been fed upon by a predator or scavenger, although it may show signs of traumatic injury such as amputation from a turbine collision
- Scavenged – an entire carcass that shows signs of having been fed upon by a predator or scavenger or a partial carcass that has been scavenged, with portions of it (for example, wings, skeletal remains, legs, pieces of skin) found in more than one location
- Feather spot – 10 or more feathers at one location, indicating predation or scavenging.

All casualties would be photographed as found, bagged, labeled with a unique number, and frozen for future reference or necropsy. A copy of the data sheet would be kept with each frozen carcass. Any injured native birds would be transported to a designated wildlife rehabilitation center. Any required permits from Montana Department of Fish, Wildlife and Parks (FWP) or FWS would be obtained.

5.2 Searcher Efficiency

Searcher efficiency trials would be conducted using the same methods used at the Martinsdale Wind Farm and described in Erickson (2009). It has long been recognized that there are differences in searchers' abilities to detect carcasses on transects. These differences are influenced by individual differences in visual acuity and experience; habitat and plant phenology at the site; and size of birds and bats. Searcher efficiency trials are designed to quantify efficiency so that carcass counts can be adjusted to account for this variability.

Searcher efficiency trials would be conducted in the same areas as carcass searches occur. Personnel conducting the searches would not know when the trials are conducted or the location of the detection carcasses. During each season carcasses of birds of two different size classes would be placed in the search area throughout the search period for that season. The total number of trial carcasses would be determined based on the number of turbines included in carcass searches. A minimum of two dates would be used for each season. The species of the carcasses used would depend on availability. An attempt would be made to use birds of similar size and color to bats to simulate bat carcasses if actual bat carcasses are not available.

All carcasses would be placed at random locations within search plots prior to carcass searches on that date. Each trial carcass would be discreetly marked for later identification and the number and location of each trial carcass placed on plots, and those found would be recorded.

5.3 Carcass Removal Trials

Carcass counts must also be adjusted for carcasses removed by predators or scavengers before observers conduct counts. As with the searcher efficiency trials, carcass removal rates may vary by season, weather, carcass size, scavenger habituation, and other factors. Carcass removal trials therefore must also be conducted during all seasons that fatality surveys are planned. Estimates of carcass removal rates would also be incorporated into the fatality rate estimates.

Carcass removal trials would also follow methodology outlined by Erickson (2009) and summarized below. Trials would occur within spring migration, breeding, and fall migration seasons. Carcasses would be planted randomly within separate, carcass removal trial plots (but not on carcass search plots). Again, the number of carcasses would be determined based on the number of turbines included in the fatality study.

Carcasses would be checked for a period of 20 days to determine removal rates. Exact intervals may vary, but would likely be similar to the following. Carcasses would be checked every day for the first four days, and then on Day 7, Day 10, Day 14, and Day 20. Experimental carcasses would be marked discreetly and would be left on location until the end of the carcass removal trial.

5.4 Data Analysis and Metrics

The estimate of total number of wind turbine-related fatalities would be based on the total number of observed carcasses adjusted for observer bias and carcass removal rates as determined by the trials described above. The most current accepted formulas would be used to estimate all three parameters (fatality rate per MW of installed capacity, carcass removal rate, and observer bias) (CEC & CDFG 2007, Erickson 2009, FWS 2009). Separate fatality rates for raptors, large birds, small birds, all birds combined, and bats would be calculated.

6.0 Wildlife Response and Handling System and Incidental Fatality Discoveries

The Wildlife Response and Handling System (WRHS) was proposed for use at the Martinsdale Wind Farm (Erickson 2009) and would be used at the Coyote Project as well. This system is set up to record carcasses found incidental to operation and maintenance of the wind project. All carcasses found would be recorded, photographed and reported to a Project Respondent (person trained in the monitoring program and listed on any state and federal permits). The Respondent would fill out a Casualty Information Form. The fatality would be collected unless it is a federally listed threatened or endangered species (not expected at the Coyote Project). Fatalities discovered on standardized carcass search plots but not during scheduled searches would be included in the fatality estimates (Erickson 2009).

7.0 Technical Advisory Committee

Consistent with Judith Gap and Martinsdale wind projects, a TAC would be established to evaluate results of the monitoring program and to make recommendations for program adaptations. In addition, the TAC may advise on measures to minimize project impacts if warranted. The TAC would include Coyote Wind, FWP, FWS, DNRC, Montana Audubon Society, and consultants conducting monitoring studies. The TAC would meet at a minimum after completion of one year of monitoring, and would be provided progress reports quarterly. Any recommendations by the committee must be substantiated based on the “weight of evidence” and be scientifically based. The weight-of-evidence approach would consider the total number of carcasses, the precision of the estimates, the relative abundance of the species based on the baseline and monitoring studies, results of similar studies in the region, and legal and social issues (Erickson 2009).

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Appendix G - Coyote Wind Farm environmental noise study

COYOTE WIND FARM
ENVIRONMENTAL NOISE STUDY

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July 3, 2009

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FIGURES

APPENDIX

1.0 INTRODUCTION

Coyote Wind is proposing to develop the Coyote Wind Project near Springdale, Montana. The wind farm will consist of 36 wind turbines on private land and eight wind turbines on State School Trust land owned by the State of Montana (i.e., "the state parcel") (**Figure 1**, attached). The project area currently consists of open space, ranch and farming land with seven scattered rural residences generally located within 0.5 mile of the proposed project boundaries.

Big Sky Acoustics, LLC (BSA) was hired as a subconsultant to Garcia and Associates, Inc. to prepare the noise sections of the Environmental Impact Statement (EIS), and this technical report was prepared to support the EIS. The Proposed Action Alternative for the EIS includes the portion of the wind farm on the state parcel. The No Action Alternative assumes that no wind turbines would be located on the state parcel, but the wind farm would still be developed on the private land.

For the noise analysis, BSA conducted measurements of the existing ambient noise levels near the project site, and predicted the noise levels of the wind turbines at locations up to 1-mile from the No Action and Proposed Action alternative boundaries. This report summarizes the analysis and results of the Environmental Noise Study for the Coyote Wind Project.

2.0 NOISE TERMINOLOGY

Noise is generally defined as unwanted sound, and can be intermittent or continuous, steady or impulsive, stationary or transient. Noise levels heard by humans and animals are dependent on several variables, including distance and ground cover between the source and receiver and atmospheric conditions. Perception of noise is affected by intensity, frequency, pitch and duration. Noise can influence people by interfering with normal activities or diminishing the quality of the environment.

The ambient noise at a receptor location in a given environment is the all-encompassing sound associated with that environment, and is due to the combination of noise sources from many directions, near and far, including the noise source of interest. When traveling from a noise source to a receptor in an outdoor environment, noise levels decrease as the distance increases between the source and receptor. Noise levels typically decrease by approximately 6 dBA every time the distance between the source and receptor is doubled, depending on the characteristics of the source and the conditions over the path that the noise travels. The reduction in noise levels can be increased if a solid barrier or natural topography is located between the source and receptor.

Noise levels are quantified using units of decibels (dB). Decibels are logarithmic values, so the combined noise level of two 50 dB noise sources is 53 dB, not 100 dB. The normal human ear can detect sounds that range in frequency from about 20 to 15,000 Hz. All sounds in this wide range of frequencies are not heard equally by the human ear, which is most sensitive to frequencies in the 250 to 4,000 Hz range. Weighting curves have been developed to correspond to the sensitivity and perception of different types of sound. A-weighting, or A-weighted decibels (dBA), accounts for frequency dependence by adjusting the very high and very low frequencies (below 500 Hz and above 10,000 Hz) to approximate the human ear's lower sensitivities to these frequencies.

C-weighting, or C-weighted decibels (dBC), is nearly flat throughout the audible human frequency range, hardly deemphasizing low frequency sound and giving equal emphasis to sounds of most frequencies. This dBC scale is generally used to describe low frequency noise, such as the bass notes of music, the "rumble" of large fans and wind turbines, and the "boom" of blasting. Because A-weighting underestimates the human annoyance caused by these types of low frequency sounds, C-weighting is used to assess disturbance due to low frequency sounds.

Some common noise sources are shown for reference in **Table 2-1**, and although a "subjective evaluation" is provided for a range of noise levels, the perception of noise can vary widely from person to person, and is provided only for general information.

Table 2-1: Common Noise Sources

Noise Level (dBA)	Noise Source	Subjective Evaluation
120 110	• Hard rock concert • Motorcycle accelerating a few feet away	Deafening
100 90	• Automobile horn 10 feet away • Gas lawnmower 3 feet away • Diesel truck 50 feet away • Inside a computer equipment room	Very Loud
80 70	• Garbage disposal 3 feet away • Very loud speech 3 feet away • Vacuum cleaner 10 feet away • Outdoors in a commercial area	Loud
60 50	• Normal speech 3 feet away • Typical office activities • Background noise in a conference room	Moderate
40 30	• Library background noise • Quiet suburban environment at night • Typical background noise in a residence • Whisper 3 feet away • Quiet rural environment at night	Faint
20 10	• Concert hall background noise • Human breathing	Very Faint
0	• Threshold of human hearing or audibility	

Sources: Egan 1988, Cavanaugh 1998, and Burge 2002.

Many different metrics can be used to describe and quantify noise levels. The equivalent noise level, L_{eq}, during a certain time period uses a single number, similar to an average, to describe the constantly fluctuating instantaneous ambient noise levels at a receptor location during a period of time. The L_{eq} accounts for all of the noises and quiet periods that occur during that time period.

The 90th percentile-exceeded noise level, L_{90}, is a metric that indicates the single noise level that is exceeded during 90% of a measurement period, although the actual instantaneous noise levels fluctuate continuously. The L_{90} noise level is typically considered the ambient noise level, and is often near the low end of the instantaneous noise levels during a measurement period. It typically does not include the influence of discrete noises of short duration, such as car doors closing, bird chirps, dog barks, car horns, wind gusts, etc. For example, if a continuously operating piece of equipment is audible at a measurement location, typically it is the noise created by the equipment that determines the L_{90} of a measurement period even though other noise sources may be briefly audible and occasionally louder than the equipment during the same measurement period.

3.0 NOISE GUIDELINES

No state, county or federal noise regulations exist to govern environmental noise levels or noise generated by the project. Although the U.S. Environmental Protection Agency has developed noise level guidelines with the intent to protect public health and welfare, wind turbines have been found to produce higher levels of annoyance than other urban, transportation and industrial sources, and therefore, it is more appropriate to evaluate wind farms using different criteria (Pedersen and Waye 2004).

Although the noise from wind turbines can be masked by the sound created by surface wind blowing across grass, through trees and against buildings, relatively calm and stable atmospheric conditions near the ground can occur while wind at the turbine hub height is sufficient enough to generate power, particularly at night (van den Berg, G.P 2004). Locations in valleys can also be sheltered from the wind, resulting in low ambient noise on the ground while strong wind exists at the turbine hub (SEPA 2003).

The noise level criteria for the project are based on noise level criteria specifically for wind turbines, and were developed as limits to identify potential annoyance at residences due to the wind turbines (ETSU 1996, Kamperman and James 2008, SAEPA 2007). Since the noise produced by a turbine and the ambient noise at a receptor location will vary with wind speed, the criteria presented in **Table 3-1** are based on the L_{eq} noise levels produced by the turbines and the ambient noise levels (L_{90}) related to wind speed.

Table 3-1: Wind Turbine Noise Level Criteria at Residences

Turbine noise level:	L_{eq} 35 dBA
Turbine noise vs. ambient noise:	$L_{eq} < L_{90} + 5$ (dBA)
Low frequency turbine noise vs. ambient noise:	L_{eq}(dBC) – L_{90}(dBA) < 20

The ambient L_{90} noise level helps quantify the acoustical character of an environment, such as "rural area," "urban area," or "noisy neighborhood" because it represents the residual noise between individual noise events, such as a vehicle pass-by or aircraft over flight. The more noise events that occur close together, the higher the L_{90} will be. The L_{eq} represents the noise level of a noise source. If a person was listening to one continuously operating noise source, such as a wind turbine, the L_{eq} and L_{90} noise levels at that location would be approximately equal. If the L_{eq} noise level of a proposed wind farm is greater than the existing ambient L_{90} noise level by 5 dBA or more, then the acoustical character of the environment will be altered, and will likely be noticed by people. The difference between the existing L_{90} and the L_{eq} of a proposed noise source in an area also helps determine if the new noise source will be audible. The higher the L_{eq} is above the L_{90}, the more clearly audible the new noise source will be. In general, a L_{eq} due to a continuous noise source that is less than the L_{90} will not be heard (**Table 3-1**).

Because A-weighting underestimates the human annoyance caused by low frequency sounds such as a "rumble" or a "boom,", C-weighting is used to assess annoyance due to low frequency sounds. If the C-weighted noise level is 20 dB greater than the A-weighted noise level for the same noise source, then the low frequency noise of the source is considered excessive, and will likely be bothersome to people.

4.0 EXISTING ENVIRONMENT

To help quantify the approximate pre-construction ambient noise levels in the project area, BSA conducted ambient noise level measurements on November 10-11, 2008 in general accordance with the American National Standard (ANSI) S12.18-1994, *Procedures for Outdoor Measurement of Sound Pressure Level*. BSA conducted the noise level measurements using a CEL Instruments Model 593.C1 Type I Sound Level Meter with a preamplifier, and 0.5-inch diameter CEL Instruments Model 192/2F microphone. The meter was calibrated prior to the measurements using a CEL Instruments Model 284/2 Acoustical Calibrator, and set to "slow" response. A windscreen was used over the microphone, and the microphone was approximately 5 feet above ground level (agl) at each measurement location.

4.1 Weather Conditions

Temperature, relative humidity and wind speed during the noise level measurements were recorded using a Kestrel 3000 Pocket Weather Meter. **Table 4-1** summarizes the atmospheric conditions during the noise level measurements at approximately 5 feet agl.

**Table 4-1: General Atmospheric Conditions
During the Noise Level Measurements**

Date	Approximate Time (hours)	Temperature (ºF)	Relative Humidity (%)	Wind Speed (mph) and Direction
11/10/08	1546 to 1706	45-50ºF	50-60%	5 to 10 mph from the west
11/10–11/08	2332 to 0039	30-40ºF	60-70%	2 to 4 mph from the west

4.2 Observations and Results

The project is located in a sparsely populated rural area with ranching and agricultural uses. Existing noise sources in the area include wind-generated noise through grass and trees, farm equipment, vehicles traveling on county and private roads, wildlife and insects, aircraft flying overhead, water flowing in the Yellowstone River and nearby creeks, traffic on local roads and Interstate 90 (I-90), and trains on the tracks south of the Yellowstone River. However, not all the existing noise sources were audible during the noise level measurements.

Ambient noise level measurements were conducted at three representative locations within approximately 0.5 mile from the proposed wind farm boundaries (**Figure 1**). The total measurement period at each location was 15-minutes, and the L_{eq} and L_{90} levels were recorded in one-minute intervals during the measurement period. **Table 4-2** summarizes the measured ambient noise levels. The measured daytime and nighttime L_{90} dBA levels are typical for sparsely-populated, rural locations (Harris 1998). However, the measured daytime A-weighted and C-weighted L_{eq} and C-weighted L_{90} noise levels were influenced by the low frequency wind noise, and high intensity "thumps" due to wind gusts.

Table 4-2: Measured Ambient Noise Levels

Measurement Location	Date and Time (hours)	Measured L_{eq}	Measured L_{90}	Noise Sources Noted During Measurements
1	11/10/08 1546-1601	37 dBA 64 dBC	31 dBA 56 dBC	Wind in the trees and a pick-up driving by near the residence.
	11/11/08 0024-0039	37 dBA 50 dBC	26 dBA 37 dBC	Intermittent dog barks and howling coyotes in the distance, and flowing water in creek.
2	11/10/08 1651-1706	43 dBA 67 dBC	38 dBA 60 dBC	Wind in the trees and traffic on I-90.
	11/10–11/08 2357-0012	33 dBA 46 dBC	32 dBA 42 dBC	Traffic on I-90, water in small creek, geese honking briefly, and airplane in distance.
3	11/10/08 2332-2347	29 dBA 51 dBC	25 dBA 45 dBC	Traffic on I-90.

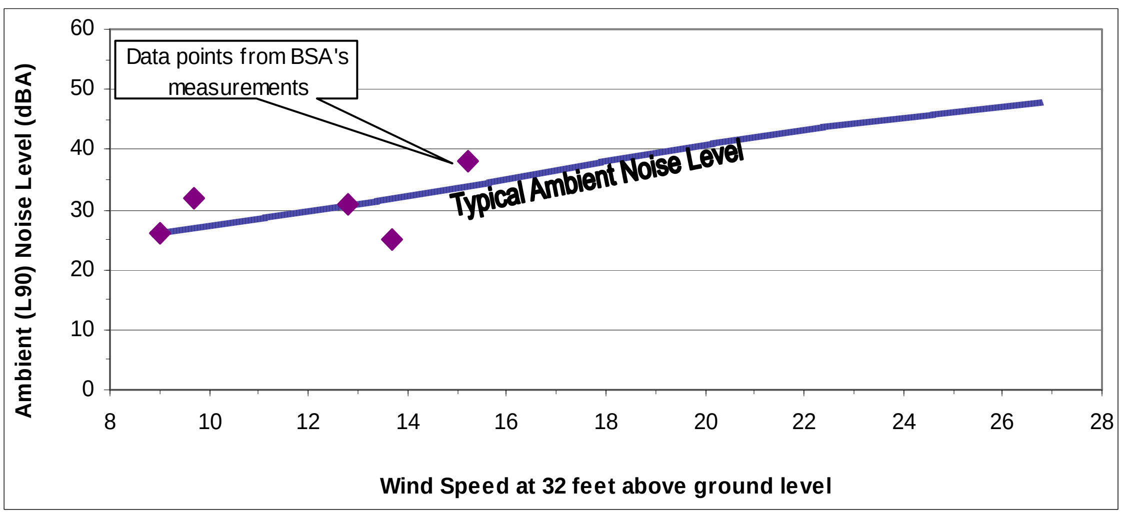
4.3 Ambient Noise vs. Wind Speed

Ambient noise levels in a rural setting are often related to wind speed. Common sources of wind-generated noise include the interaction between wind and trees, grasses, and buildings. As the wind speed increases, the ambient noise also increases.

The power output and noise levels generated by a wind turbine are also related to wind speed. Wind speeds tend to increase with increasing elevation, and the operating characteristics of turbines are typically referenced to a height of 32 feet (10 meters) agl. Wind turbines typically begin to turn, or "cut-in", when the wind is blowing approximately 8.9 miles per hour (mph) (4 meters per second [m/s]), and reach a maximum sound level output at about 17.9 mph (8 m/s). Once wind speeds reach 17.9 mph, the turbine noise level does not typically increase even though the wind speed increases. Therefore, a noise analysis of a wind farm typically compares the ambient noise level at a receptor location and the turbine noise to a range of wind speeds at 32 feet agl.

The existing ambient noise levels at receptor locations versus wind speeds at 32 feet agl were estimated by BSA based on calculated data correlating ambient noise level versus wind speed for typical rural areas (ETSU 1996). The measured A-weighted ambient (L_{90}) noise levels (**Table 4-2**) were associated with wind data at 32 feet agl (Enerfin 2008) from an existing meteorological tower located on the state parcel (**Figure 1**). The measured L_{90} and wind speed values were compared to the calculated typical ambient noise level versus wind speed curve (ETSU 1996) and the results are shown on **Graph 4-1**. Although there were only five BSA-measured data points, the correlation with the calculated typical curve appears to be reasonable. Therefore, the calculated typical ambient noise level versus wind speed curve at 32 feet agl was used to estimate the ambient noise levels at receptors for the noise analysis **(Section 5)**, and the calculated ambient noise levels used for the analysis are shown in **Table 4-3**. Using the calculated ambient noise level versus wind speed data allowed the noise analysis to be competed for a wider range of wind speeds than were recorded during the noise level measurements (**Section 4.2**).

Graph 4-1: Measured L_{90} Noise Levels Compared to Typical Ambient Noise Levels at Various Wind Speeds



Source: ETSU 1996.

Table 4-3: Calculated Ambient Noise Levels at Ground Level vs. Wind Speed at 32 feet agl

Wind Speed at 32 feet agl:	**8.9 mph (4 m/s)**	**13.4 mph (6 m/s)**	**17.9 mph (8 m/s)**	**22.4 mph (10 m/s)**	**26.8 mph (12 m/s)**
Ambient (L_{90}) Noise Level at Ground Level:	26 dBA	32 dBA	38 dBA	44 dBA	48 dBA

5.0 AFFECTED ENVIRONMENT

Noise will be produced from various sources during the construction, operation and maintenance phases of the project. During the construction phase, standard construction equipment will be used to construct the roads, turbine foundations, the wind turbines and the electrical system. The primary operation and maintenance noise sources include the wind turbines, at various wind speeds, and light truck traffic on the access roads.

The primary noise sensitive receptors are the nearby human and animal populations that live, forage and pass through the project area. Seven rural residences (**Figure 1**) are generally located within 0.5 mile of the Coyote Wind Project, and people frequently use the Yellowstone River and adjacent Lewis and Clark National Historic Trail, located within 1 mile south of the project, for recreational purposes (see EIS Section 4.4). Livestock and numerous wildlife species (see EIS Section 4.8) live or frequent the area.

5.1 Construction Noise

Construction activities could be audible at some or all of the nearby residences at any given time, and the sound will most often consist of diesel-powered heavy equipment. Noise levels at a listener location will vary depending on the type of equipment used, the number of pieces of equipment used simultaneously, the mode of operation for each piece of equipment, the length of time a piece of equipment is used, the distance between the equipment and a listener, and whether a direct line of sight is available between the equipment and a listener.

Quantifying the noise associated with construction is difficult because the operations and equipment will move around the project site as the wind farm is built. Construction typically occurs in several phases:

- Access road construction and electrical tie-in trenching
- Site preparation and wind turbine foundation work
- Material and subassembly delivery
- Erection of the wind turbine towers

Table 5-1 lists the anticipated construction equipment and noise levels for the individual pieces of equipment, assuming that a direct line of sight between the equipment and a listener is available. If the line of sight is blocked, then lower noise levels should be expected at the same distances. Comparing the estimated construction equipment noise levels in **Table 5-1** and the estimated existing ambient noise levels (L_{90} dBA) shown in **Table 4-3**, construction noise could be audible up to 1-mile from the equipment.

Table 5-1: Construction Equipment Noise Levels

Type of equipment	Reference Noise Level at 50 ft. from Equipment (dBA)	Estimated Noise Level at 1,000 ft. from Equipment (dBA)	Estimated Noise Level at 0.5 mile from Equipment (dBA)	Estimated Noise Level at 1 mile from Equipment (dBA)
Cranes (500 ton and 350 ton)	88	62	49	38
Support crane	88	62	49	38
Backhoes	80	54	41	30
Vehicles (4x4 light truck)	70	44	31	20
Trenchers	85	59	46	35
Dumper trucks	88	62	49	38
Concrete portable plant	85	59	46	35
Trucks (material & equipment transport)	88	62	49	38

Sources: FTA 1995, FHWA 1998.

5.2 Operation Noise

BSA predicted the operational noise levels and developed noise level contours for the No Action and Proposed Action alternatives using the Cadna-A Version 3.7 noise prediction software from DataKustik. Cadna-A uses algorithms from the International Organization for Standardization (ISO) Standard 9613-2, *Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation* (ISO 1996). This standard specifies the calculations to determine the reduction in noise levels due to the distance between the noise source and the receiver, the effect of the ground on the propagation of sound, and the effectiveness of natural barriers due to grade or man-made barriers, such as walls. The Cadna-A noise model used for the analysis of the Coyote Wind Project also included adjustments for wind speed, wind direction and atmospheric stability, as defined by the Conservation of Clean Air and Water in Europe (CONCAWE 1981). Since atmospheric conditions can vary dramatically at large distances between a noise source and a receptor, the estimated levels presented in this report should be assumed to be average noise levels, and temporary significant positive and negative deviations from the averages can occur (Harris 1998).

For the noise level predictions, BSA used the following information and assumptions:

1. The proposed wind turbines are Vestas V90-1.8 megawatt (MW) and Vestas V80-2.0 MW models, with hub heights of 262 feet (80 meters) agl. One of the 36 wind turbines on private land for the No Action Alternative, and two of the eight wind turbines on the state parcel for the Proposed Action Alternative, will be V80 models. The remaining wind turbines will be V90 models.

2. Based on the general specifications for the V80 and V90 models, the overall A-weighted sound power level of the wind turbines versus wind speed at 32 feet agl is similar (Vestas 2008a and 2008b). Since only three V80s will be used for the project, only the sound power level versus wind speed data for the V90 model were used for the analysis, and is summarized in **Table 5-2**. Note that 8.9 mph (4 m/s) at 32 feet agl is the wind speed at which

the turbine will begin to operate, also known as the "cut-in" wind speed, and the maximum sound power remains constant even as the wind speed increases, beginning at 17.9 mph (8 m/s).

Table 5-2: Wind Turbine Sound Power Level vs. Wind Speed

Wind Speed at 32 feet agl:	**8.9 mph (4 m/s)**	**13.4 mph (6 m/s)**	**17.9 mph (8 m/s)**	**22.4 mph (10 m/s)**	**26.8 mph (12 m/s)**
A-weighted sound power level:	95 dBA	102 dBA	104 dBA	104 dBA	104 dBA

Source: Vestas 2008b.

3. Based on octave-band data for the V90 model (Vestas 2008c), the octave-band sound power levels versus wind speeds shown in **Table 5-3** were used for the analysis.

Table 5-3: A-Weighted Octave-Band Wind Turbine Sound Power Levels vs. Wind Speed

Wind Speed at 32 feet agl	**Frequency (Hertz)**								**Total (dBA)**
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	
8.9 mph (4 m/s)	77	81	84	87	90	88	86	77	95
13.4 mph (6 m/s)	84	89	92	95	97	96	94	85	102
17.9 mph (8 m/s)	86	90	92	95	97	96	98	90	104
22.4 mph (10 m/s)	85	90	92	95	98	97	96	91	104
26.8 mph (12 m/s)	85	90	92	95	98	97	96	91	104

Source: Vestas 2008c

4. Wind direction is 290 degrees, i.e. from the west-northwest (Wilde 2005).

5. The average weather conditions are 45^{o}F and 60% relative humidity (Wilde 2005).

6. The atmospheric stability category is D at all wind speeds. Atmospheric stability is ranked based on wind speed and incoming solar radiation from Category A (very unstable) to Category G (strongly stable), with Category D as "neutral" (CONCAWE 1981). Typically, Categories A through D apply during the day, Category D applies one hour before sunset or one hour after sunrise and Categories D through G apply at night. Category D was used as a conservative estimate that atmospheric conditions were favorable for noise propagation.

7. The ground absorption coefficient is 0.2. A coefficient of 1.0 is highly sound-absorptive, such as loose, plowed soil, and a coefficient of 0.0 is highly sound-reflective, such as smooth pavement. A coefficient of 0.2 was chosen as a conservative estimate of the hard-packed ranch and rocky soil conditions in the area.

8. The wind turbines are the only operational noise sources analyzed for the noise analysis. The Cadna-A models do not include the noise of other potential sources for the project area discussed in **Section 4.2**.

9. The wind turbines all operated simultaneously and continuously for each scenario modeled. Therefore, the predicted L_{eq} noise levels of the turbines would be the same for any time period (i.e., daytime and nighttime hours).

10. The receptor height and the height of the noise contours are 6.5 feet (2 meters) agl.

5.2.1 No Action Alternative

The results for the No Action Alternative are summarized on **Figures 2A through 2E** (attached), and in **Tables 5-4 through 5-6**. The noise contours shown on the figures, which account for topography, indicates the predicted L_{eq} noise levels of the turbines at various wind speeds. The sound of a wind turbine is typically described as a "swishing" (van den Berg, Frits 2008, Pedersen and Waye 2004).

Table 5-4 summarizes the predicted No Action Alternative turbine L_{eq} noise levels at the nearby residences. At lower wind speeds 32 feet agl, the turbine noise is predicted to exceed the L_{eq} 35 dBA noise level criteria (**Table 3-1**) at five of the seven residences (**Figures 2A through 2C**) at ground level. Therefore, the wind turbines may be heard at lower wind speeds at residences located within 0.75 miles downwind or crosswind (i.e., north, east and south) from the turbines.

Table 5-5 compares the predicted No Action Alternative turbine L_{eq} noise levels to the calculated ambient (L_{90}) noise levels at the nearby residences (**Table 4-3**), per the noise level criteria listed in **Table 3-1**. The wind turbine L_{eq} is predicted to exceed the existing L_{90} noise level by +5 dBA or more at wind speeds of 8.9 mph and 13.4 mph at five of the seven nearby residences, and at 17.9 mph at two residences (**Figures 2A through 2C**). The largest differences between the wind turbine noise and the existing ambient noise occur at relatively low wind speeds and in these cases, the wind turbine noise is predicted to be heard at the nearby residences. The turbines will be operating at these lower wind speeds approximately 32% of the time (Martin pers. com. 2009). The turbines will be operating at higher wind speeds (>17.9 mph) approximately 68% of the time, and therefore, it is unlikely that the wind turbines will be audible at the nearby residences due to the ambient noise on the ground created by higher wind speeds.

Table 5-6 evaluates the low frequency wind turbine noise for the No Action Alternative. The highest difference between the C-weighted turbine L_{eq} and the A-weighted ambient noise with the wind turbines operating is +13. Therefore, the low frequency criteria of +20 (**Table 3-1**) is not predicted to be exceeded.

Table 5-4: Predicted Wind Turbine L_{eq} Noise Levels at Residential Receptors – No Action Alternative

Residential Receptor	Receptor Distance to Nearest No Action Wind Turbine	Wind Speed at 32 feet agl (mph)	Ground Level Calculated Ambient (L_{90}) Noise Level (dBA) (Table 4-3)	Predicted Ground Level No Action Turbine L_{eq} (dBA)
R1	0.53 miles	8.9	26	31
		13.4	32	38
		17.9	38	38
		22.4	44	39
		26.8	48	39
R2	1,500 feet	8.9	26	38
		13.4	32	46
		17.9	38	46
		22.4	44	47
		26.8	48	47
R3	0.7 miles	8.9	26	24
		13.4	32	32
		17.9	38	32
		22.4	44	32
		26.8	48	32
R4	0.47 miles	8.9	26	35
		13.4	32	43
		17.9	38	43
		22.4	44	43
		26.8	48	43
R5	0.75 miles	8.9	26	33
		13.4	32	40
		17.9	38	40
		22.4	44	41
		26.8	48	41
R6	0.57 miles	8.9	26	34
		13.4	32	42
		17.9	38	42
		22.4	44	42
		26.8	48	42
R7	1.2 miles	8.9	26	26
		13.4	32	34
		17.9	38	34
		22.4	44	34
		26.8	48	34

Shading: Predicted turbine L_{eq} noise level equals or exceeds the 35 dBA criteria (**Table 3-1**) and is greater than the calculated L_{90} noise level.

Table 5-5: Predicted Wind Turbine Noise vs. Calculated Ambient Noise at Residential Receptors – No Action Alternative

Residential Receptor	Wind Speed at 32 feet agl (mph)	Ground Level Calculated Ambient (L_{90}) Noise Level (dBA) (Table 4-3)	Predicted Ground Level No Action Turbine L_{eq} (dBA)	Ground Level No Action Turbine L_{eq} minus Ambient L_{90} (dBA)
R1	8.9	26	31	+5
	13.4	32	38	+6
	17.9	38	38	0
	22.4	44	39	-5
	26.8	48	39	-9
R2	8.9	26	38	+12
	13.4	32	46	+14
	17.9	38	46	+8
	22.4	44	47	+3
	26.8	48	47	-1
R3	8.9	26	24	-2
	13.4	32	32	0
	17.9	38	32	-6
	22.4	44	32	-12
	26.8	48	32	-16
R4	8.9	26	35	+9
	13.4	32	43	+11
	17.9	38	43	+5
	22.4	44	43	-1
	26.8	48	43	-5
R5	8.9	26	33	+7
	13.4	32	40	+8
	17.9	38	40	+2
	22.4	44	41	-3
	26.8	48	41	-7
R6	8.9	26	34	+8
	13.4	32	42	+10
	17.9	38	42	+4
	22.4	44	42	-2
	26.8	48	42	-6
R7	8.9	26	26	0
	13.4	32	34	+2
	17.9	38	34	-4
	22.4	44	34	-10
	26.8	48	34	-14

Shading: The turbine L_{eq} noise level exceeds the noise level criteria (**Table 3-1**).

Table 5-6: Low Frequency Wind Turbine Noise vs. Calculated Ambient Noise at Residential Receptors (Ground Level) – No Action Alternative

Residential Receptor	Wind Speed at 32 feet agl (mph)	Calculated Ambient (L_{90}) Noise Level (dBA) (Table 4-3)	Predicted No Action Turbine L_{eq} (dBA)	Predicted No Action Ambient L_{90} (dBA)[1]	Predicted No Action Turbine L_{eq} (dBC)	Predicted Turbine L_{eq} (dBC) minus Predicted No Action Ambient L_{90} (dBA)
R1	8.9	26	31	32	44	+12
	13.4	32	38	39	51	+12
	17.9	38	38	41	52	+11
	22.4	44	39	45	52	+7
	26.8	48	39	49	52	+3
R2	8.9	26	38	38	48	+10
	13.4	32	46	46	57	+11
	17.9	38	46	47	57	+10
	22.4	44	47	49	58	+9
	26.8	48	47	51	58	+7
R3	8.9	26	24	28	40	+12
	13.4	32	32	35	48	+13
	17.9	38	32	39	48	+9
	22.4	44	32	44	48	+4
	26.8	48	32	48	48	0
R4	8.9	26	35	36	47	+11
	13.4	32	43	43	54	+11
	17.9	38	43	44	56	+12
	22.4	44	43	47	56	+9
	26.8	48	43	49	56	+7
R5	8.9	26	33	34	45	+11
	13.4	32	40	41	53	+12
	17.9	38	40	42	53	+11
	22.4	44	41	46	54	+8
	26.8	48	41	49	54	+5
R6	8.9	26	34	35	46	+11
	13.4	32	42	42	54	+12
	17.9	38	42	43	54	+11
	22.4	44	42	46	54	+8
	26.8	48	42	49	54	+5
R7	8.9	26	26	29	39	+10
	13.4	32	34	36	46	+10
	17.9	38	34	39	48	+9
	22.4	44	34	44	47	+3
	26.8	48	34	48	47	-1

1 No Action ambient is the sum of the calculated ambient (L_{90}) plus the turbine L_{eq} using logarithmic addition.
Shading: The difference between the C-weighted turbine L_{eq} noise level exceeds the A-weighted No Action ambient noise level by +20 or more (**Table 3-1**).

5.2.2 Proposed Action Alternative

The results for the Proposed Action Alternative are summarized on **Figures 3A through 3E** (attached), and in **Tables 5-7 through 5-9**. The noise contours shown on the figures indicate only the predicted L_{eq} noise levels of the wind turbines located on the state parcel at various wind speeds. As shown in the tables and described below, the incremental increase in noise due to the Proposed Action Alternative will not result in a direct noise impact at the nearby residences, but will increase the ambient noise on the state parcel.

Table 5-7 summarizes the predicted Proposed Action Alternative turbine L_{eq} noise levels at the residential receptor locations. The highest predicted turbine L_{eq} for the Proposed Action is 30 dBA. Therefore the L_{eq} 35 dBA noise level criteria (**Table 3-1**) is not exceeded at the nearby residences by the Proposed Action (**Figures 3A through 3E**).

Table 5-8 compares the predicted Proposed Action Alternative turbine L_{eq} noise levels to the calculated ambient noise (**Table 4-3**) at the residential receptor locations. The Proposed Action turbine L_{eq} is predicted to be less than the ambient noise level for each wind speed. Therefore, the noise from only the eight Proposed Action wind turbines will not exceed the ambient +5 dBA noise level criteria (**Table 3-1**).

Table 5-9 evaluates the low frequency turbine noise for the Proposed Action Alternative. The highest difference between the C-weighted turbine L_{eq} and the A-weighted ambient noise with the turbines operating is +12. Therefore, the low frequency noise level criteria of +20 (**Table 3-1**) is not predicted to be exceeded.

Table 5-7: Predicted Wind Turbine L_{eq} Noise Levels at Residential Receptors – Proposed Action Alternative

Residential Receptor	Receptor Distance to Nearest Proposed Action Turbine	Wind Speed at 32 feet agl (mph)	Ground Level Calculated Ambient (L_{90}) Noise Level (dBA) (Table 4-3)	Predicted Ground Level Proposed Action Turbine L_{eq} (dBA)
R1	0.7 miles	8.9	26	19
		13.4	32	27
		17.9	38	27
		22.4	44	27
		26.8	48	27
R2	0.6 miles	8.9	26	22
		13.4	32	30
		17.9	38	30
		22.4	44	30
		26.8	48	30
R3	3.1 miles	8.9	26	0
		13.4	32	6
		17.9	38	7
		22.4	44	7
		26.8	48	7
R4	2.3 miles	8.9	26	10
		13.4	32	17
		17.9	38	18
		22.4	44	18
		26.8	48	18
R5	2.4 miles	8.9	26	12
		13.4	32	19
		17.9	38	20
		22.4	44	20
		26.8	48	20
R6	1.8 miles	8.9	26	22
		13.4	32	29
		17.9	38	29
		22.4	44	30
		26.8	48	30
R7	1.8 miles	8.9	26	14
		13.4	32	22
		17.9	38	22
		22.4	44	22
		26.8	48	22

Shading: Predicted turbine L_{eq} noise level equals or exceeds the 35 dBA criteria (**Table 3-1**) and is greater than the calculated L_{90} noise level.

Table 5-8: Predicted Wind Turbine Noise vs. Predicted Ambient Noise at Residential Receptors – Proposed Action Alternative

Residential Receptor	Wind Speed at 32 feet agl (mph)	Ground Level Calculated Ambient (L_{90}) Noise Level (dBA) (Table 4-3)	Ground Level Predicted Proposed Action Turbine L_{eq} (dBA)	Proposed Action Turbine L_{eq} minus Predicted Ambient L_{90} (dBA)
R1	8.9	26	19	-7
	13.4	32	27	-5
	17.9	38	27	-11
	22.4	44	27	-17
	26.8	48	27	-21
R2	8.9	26	22	-4
	13.4	32	30	-2
	17.9	38	30	-8
	22.4	44	30	-14
	26.8	48	30	-18
R3	8.9	26	0	-26
	13.4	32	6	-26
	17.9	38	7	-31
	22.4	44	7	-37
	26.8	48	7	-41
R4	8.9	26	10	-16
	13.4	32	17	-15
	17.9	38	18	-20
	22.4	44	18	-26
	26.8	48	18	-30
R5	8.9	26	12	-14
	13.4	32	19	-13
	17.9	38	20	-18
	22.4	44	20	-24
	26.8	48	20	-28
R6	8.9	26	22	-4
	13.4	32	29	-3
	17.9	38	29	-9
	22.4	44	30	-14
	26.8	48	30	-18
R7	8.9	26	14	-12
	13.4	32	22	-10
	17.9	38	22	-16
	22.4	44	22	-22
	26.8	48	22	-26

Shading: The turbine L_{eq} noise level exceeds the ambient noise (L_{90}) level by +5 dBA or more (**Table 3-1**).

Table 5-9: Low Frequency Wind Turbine Noise vs. Combined Ambient Noise at Residential Receptors (Ground Level) – Proposed Action Alternative

Residential Receptor	Wind Speed at 32 feet agl (mph)	Calculated Ambient (L_{90}) Noise Level (dBA) (Table 4-3)	Proposed Action Turbine L_{eq} (dBA)	Combined Ambient (dBA)[1]	Proposed Action Turbine L_{eq} (dBC)	Proposed Action Turbine L_{eq} (dBC) minus Combined Ambient (dBA)
R1	8.9	26	19	27	36	+9
	13.4	32	27	33	44	+11
	17.9	38	27	38	44	+6
	22.4	44	27	44	45	+1
	26.8	48	27	48	45	-3
R2	8.9	26	22	27	37	+10
	13.4	32	30	34	46	+12
	17.9	38	30	39	46	+7
	22.4	44	30	44	47	+3
	26.8	48	30	48	47	-1
R3	8.9	26	0	26	18	-8
	13.4	32	6	32	24	-8
	17.9	38	7	38	25	-13
	22.4	44	7	44	25	-19
	26.8	48	7	48	25	-23
R4	8.9	26	10	26	27	+1
	13.4	32	17	32	35	+3
	17.9	38	18	38	36	-2
	22.4	44	18	44	37	-7
	26.8	48	18	48	37	-11
R5	8.9	26	12	26	29	+3
	13.4	32	19	32	37	+5
	17.9	38	20	38	38	0
	22.4	44	20	44	38	-6
	26.8	48	20	48	38	-10
R6	8.9	26	22	27	35	+8
	13.4	32	29	34	43	+9
	17.9	38	29	39	43	+4
	22.4	44	30	44	45	+1
	26.8	48	30	48	45	-3
R7	8.9	26	14	26	28	+2
	13.4	32	22	32	35	+3
	17.9	38	22	38	35	-3
	22.4	44	22	44	36	-8
	26.8	48	22	48	36	-12

1 Combined ambient noise level is the sum of the calculated ambient plus the Proposed Action turbine L_{eq} using logarithmic addition.

Shading: The difference between the C-weighted Proposed Action turbine L_{eq} noise level and the A-weighted combined ambient noise level is +20 or more (**Table 3-1**).

5.2.3 Cumulative Noise

The cumulative noise of the project turbines are summarized in **Tables 5-10 through 5-12** and on **Figures 4A through 4E** for the combination of noise of the No Action Alternative plus the Proposed Action Alternative. Because the No Action Alternative consists of 36 wind turbines and will locate turbines closer to existing residences than the Proposed Action, the No Action Alternative will become the dominant noise source in the area, as indicated in **Tables 5-10 through 5-12**.

Table 5-10 summarizes the cumulative predicted turbine L_{eq} noise levels at the residential receptor locations. As shown, the noise levels at the residences due to the No Action Alternative are greater than those for the Proposed Action Alternative, and therefore will have a greater effect on the noise levels. The cumulative turbine L_{eq} exceeds the L_{eq} 35 dBA criteria at the same receptors and for the same conditions as the No Action Alternative (**Section 5.2.1**).

Table 5-11 compares the cumulative predicted turbine L_{eq} noise levels to the existing estimated ambient (L_{90}) noise levels (**Table 4-3**) at the residential receptor locations. The cumulative turbine L_{eq} exceeds the ambient +5 dBA criteria at the same residences and for the same conditions as the No Action Alternative (**Section 5.2.1**).

Table 5-12 evaluates the cumulative low frequency wind turbine noise. The highest difference between the cumulative C-weighted turbine L_{eq} and the A-weighted cumulative ambient noise with the turbines operating is +13, which is similar to the results for the No Action Alternative (**Section 5.2.1**). Therefore, low frequency noise from the wind turbines is not predicted to exceed the +20 criteria (**Table 3-1**).

Table 5-10: Predicted Cumulative Wind Turbine L_{eq} Noise Levels at Residential Receptors (Ground Level)

Residential Receptor	Wind Speed at 32 feet agl (mph)	No Action Turbine L_{eq} (dBA)	Proposed Action Turbine L_{eq} (dBA)	Cumulative Turbine Noise L_{eq} (dBA)[1]
R1	8.9	31	19	31
	13.4	38	27	39
	17.9	38	27	39
	22.4	39	27	39
	26.8	39	27	39
R2	8.9	38	22	39
	13.4	46	30	46
	17.9	46	30	46
	22.4	47	30	47
	26.8	47	30	47
R3	8.9	24	0	24
	13.4	32	6	32
	17.9	32	7	32
	22.4	32	7	32
	26.8	32	7	32
R4	8.9	35	10	35
	13.4	43	17	43
	17.9	43	18	43
	22.4	43	18	43
	26.8	43	18	43
R5	8.9	33	12	33
	13.4	40	19	40
	17.9	40	20	40
	22.4	41	20	41
	26.8	41	20	41
R6	8.9	34	22	34
	13.4	42	29	42
	17.9	42	29	42
	22.4	42	30	42
	26.8	42	30	42
R7	8.9	26	14	26
	13.4	34	22	34
	17.9	34	22	34
	22.4	34	22	34
	26.8	34	22	34

1 Combined turbine noise level is the sum of No Action turbine L_{eq} plus the Proposed Action turbine L_{eq} using logarithmic addition.

Shading: Predicted turbine L_{eq} noise level equals or exceeds the 35 dBA criteria (**Table 3-1**) and is greater than the calculated L_{90} noise level.

Table 5-11: Predicted Cumulative Wind Turbine Noise vs. Calculated Ambient Noise at Residential Receptors (Ground Level)

Residential Receptor	Wind Speed at 32 feet agl (mph)	Calculated L_{90} Noise Level (dBA)	Cumulative Turbine L_{eq} (dBA)[1]	Cumulative Turbine L_{eq} minus Calculated Ambient L_{90} (dBA)
R1	8.9	26	31	+5
	13.4	32	39	+7
	17.9	38	39	+1
	22.4	44	39	-5
	26.8	48	39	-9
R2	8.9	26	39	+13
	13.4	32	46	+14
	17.9	38	46	+8
	22.4	44	47	+3
	26.8	48	47	-1
R3	8.9	26	24	-2
	13.4	32	32	0
	17.9	38	32	-6
	22.4	44	32	-12
	26.8	48	32	-16
R4	8.9	26	35	+9
	13.4	32	43	+11
	17.9	38	43	+5
	22.4	44	43	-1
	26.8	48	43	-5
R5	8.9	26	33	+7
	13.4	32	40	+8
	17.9	38	40	+2
	22.4	44	41	-3
	26.8	48	41	-7
R6	8.9	26	34	+8
	13.4	32	42	+10
	17.9	38	42	+4
	22.4	44	42	-2
	26.8	48	42	-6
R7	8.9	26	26	0
	13.4	32	34	+2
	17.9	38	34	-4
	22.4	44	34	-10
	26.8	48	34	-14

1 Combined turbine L_{eq} is the combination of the No Action turbine L_{eq} and the Proposed Action turbine L_{eq} from **Table 5-10**.
Shading: The combined turbine L_{eq} noise level exceeds the ambient noise (L_{90}) level by +5 dBA or more (**Table 3-1**).

Table 5-12: Cumulative Low Frequency Wind Turbine Noise vs. Cumulative Ambient Noise at Residential Receptors (Ground Level)

Residential Receptor	Wind Speed at 32 feet agl (mph)	Cumulative Ambient (dBA)[1]	No Action Turbine L_{eq} (dBC)	Proposed Action Turbine L_{eq} (dBC)	Cumulative Turbine L_{eq} (dBC)[2]	Cumulative Turbine L_{eq} (dBC) minus Cumulative Ambient (dBA)
R1	8.9	32	44	36	45	+13
	13.4	40	51	44	52	+12
	17.9	42	52	44	53	+11
	22.4	45	52	45	53	+8
	26.8	49	52	45	53	+4
R2	8.9	39	48	37	48	+9
	13.4	46	57	46	57	+11
	17.9	47	57	46	57	+10
	22.4	49	58	47	58	+9
	26.8	51	58	47	58	+7
R3	8.9	28	40	18	40	+12
	13.4	35	48	24	48	+13
	17.9	39	48	25	48	+9
	22.4	44	48	25	48	+4
	26.8	48	48	25	48	0
R4	8.9	36	47	27	47	+11
	13.4	43	54	35	54	+11
	17.9	44	56	36	56	+12
	22.4	47	56	37	56	+9
	26.8	49	56	37	56	+7
R5	8.9	34	45	29	45	+11
	13.4	41	53	37	53	+12
	17.9	42	53	38	53	+11
	22.4	46	54	38	54	+8
	26.8	49	54	38	54	+5
R6	8.9	35	46	35	46	+11
	13.4	42	54	43	54	+12
	17.9	43	54	43	54	+11
	22.4	46	54	45	55	+9
	26.8	49	54	45	55	+6
R7	8.9	29	39	28	39	+10
	13.4	36	46	35	46	+10
	17.9	39	48	35	48	+9
	22.4	44	47	36	47	+3
	26.8	48	47	36	47	-1

1 Combined ambient noise level is the sum of the predicted No Action ambient (**Table 5-6**) plus the Proposed Action turbine L_{eq} from **Table 5-7**, using logarithmic addition.

2 Combined C-weighted turbine L_{eq} is the sum of the C-weighted No Action turbine L_{eq} plus the C-weighted Proposed Action turbine L_{eq} using logarithmic addition.

Shading: The difference between the C-weighted combined turbine L_{eq} noise level and the A-weighted combined ambient noise level is +20 or more (**Table 3-1**).

The primary noise sensitive receptors are the nearby human and animal populations that live, forage and pass through the project area. In addition to the nearby residences shown on the figures, other human receptors include the recreational users of the Yellowstone River and the Lewis and Clark Historic Trail located along the north side of the river. Ambient noise along the Yellowstone River depends on the water flow rate and the surface turbulence of the moving water, as well as traffic on I-90 and other existing sources.

At its closest point, the Yellowstone River is approximately 0.7 miles south of the private land boundary between residential receptors R3 and R5, and therefore, the noise levels of the turbines will be slightly lower at the river than at the residences (**Figure 1**). As shown on **Figures 2A through 4E**, the turbine L_{eq} noise levels along the river are predicted to be approximately 20 to 40 dBA for the No Action Alternative and as a cumulative effect. Therefore, the turbines may be audible if a listener is along calm water stretches of the river south of the project during low wind speeds. Either increased water turbulence, increased wind speed, or other area noise sources (e.g., I-90 traffic) may create enough noise to mask the sound of the turbines.

5.3 Maintenance Noise

For project maintenance activities, it is anticipated that four people will work on site using two vehicles (light trucks). BSA calculated the predicted noise from the site access roads assuming a 25 mph speed limit on the gravel roads. At 25 mph, the maximum noise level of a typical light truck as it passes by a listener location is approximately 70 dBA (FHWA 1998). The maximum noise level as a vehicle passes by a listener location occurs briefly when the vehicle is at the closest point to the listener. The closest residence to a county road is R3 (approximately 500 feet north), and R2 is the closest residence to an access road (approximately 1,400 feet east) (**Figure 1**).

As shown in **Table 5-13**, a predicted light truck noise level of 31 dBA occurs at approximately 0.5 mile from a road, which is equivalent to existing vehicle noise. A noise level of 31 dBA is typically considered a “faint” noise if it is audible (**Table 2-1**), and 31 dBA is within the range of measured ambient L_{90} noise levels (**Table 4-2**). Therefore, up to 0.5 mile from a road, the maintenance trucks will be briefly audible as the truck passes by a receptor, and inaudible at distances greater than 0.5 mile from a road.

Table 5-13: Maximum Noise Level for a Maintenance Vehicle Pass-By at 25 mph

Type of equipment	Reference Noise Level at 50 ft. from Road (dBA)	Estimated Noise Level at 1,000 ft. from Road (dBA)	Estimated Noise Level at 0.5 mile from Road (dBA)	Estimated Noise Level at 1 mile from Road (dBA)
Vehicles (4x4 light truck)	70	44	31	20

Source: FHWA 1998.

5.4 Potential Noise Effects

Nearby residences and recreational users, as well as livestock and wildlife that live, forage, or pass through the wind farm area will be exposed to various noise sources during the construction, operation and maintenance project phases.

Wind turbine noise greater than 45 dBA may cause sleep disturbances or increased stress for some individuals, but otherwise, noise created by wind turbines does not cause health problems (van den Berg, Frits 2008). For the No Action Alternative, noise levels above L_{eq} 45 dBA are only predicted at residential receptor R2 (**Table 5-4**).

The effects of wind turbine noise on humans tends to be related to visibility of the wind turbines, economic benefit for a landowner related to the turbines, and a person's attitude toward wind turbines in general (van den Berg, Frits 2008, Pedersen and Waye 2004). When wind turbines are visible, residents are far more likely to be bothered by turbine noise. Benefiting economically from a wind farm decreases the level of irritation by residents due to noise.

Numerous studies have been conducted documenting the effects of noise on wildlife. Animal response to noise is a function of many other variables besides noise, including the characteristics of the noise and its duration, life history characteristics of the species, habitat type, season and current activity of the animal, sex, age, previous noise exposure, and other physical stressors such as drought (CST 1996). General animal responses to human-made noise are attraction, tolerance and aversion, which are summarized in the following list (CST 1996, USEPA 1971, Bowles 1995).

- The sight and actions of noise sources can cause greater impact than the noise itself.
- Birds can detect low-frequency man-made noise transmitted through the ground before it arrives in the air.
- Most animals habituate to sounds (e.g., truck and equipment noise) disassociated with other threatening stimuli (e.g., gunshots).
- Animals (e.g., ungulates) that habituate to traffic noise are vulnerable to oncoming vehicles.
- Steady sounds are less prone to startle animals than sudden onset noise.
- Human-made noise can mask meaningful noise (e.g., mating and other communication). Animals can compensate for noise masking through avoiding the area, waiting until the noise stops, or shifting the level or frequency of their signals.
- Herding or flocking animals are often as sensitive as the most sensitive individual in the group. However, animals rarely respond with uncontrolled panic.
- Motivation to find food make can make animals tolerant of noise.
- Animal aversion is measured in avoidance responses and can be lessened if animals can control or predict exposures.
- Large mammals may alter their movements for up to two days after intense noise exposure, but if exposed repeatedly to the same noise stimulus without harassment, responses decline rapidly.

6.0 MITIGATION

Noise mitigation measures were considered for the construction, operation and maintenance phases of the wind farm project. Construction and maintenance project noise could be reduced by implementing the following possible noise mitigation measures:

- Restrict the construction and maintenance operations to daytime hours (7:00 am to 7:00pm).
- Combine noisy operations to occur for short durations during the same time periods.
- Use new equipment rather than older equipment.
- On all diesel-powered construction equipment, replace standard back-up alarms with approved manually adjustable, ambient-sensitive, directional sound technology, or strobe light alarms. Adjustable and ambient-sensitive alarms typically limit the alarm noise to 5 to 10 dBA above the background noise, which will still typically be audible behind the equipment.
- Install high-grade mufflers on all diesel-powered equipment.
- Implement a regular maintenance schedule to ensure that all construction and maintenance equipment, as well as the wind turbine motors, blades, etc. are operating properly.

The effects of operational noise from the project could be reduced by relocating those wind turbines expected to be most audible at residences. However, Enerfin has reached agreements about turbine placement with the private landowners whose land would be used for the project, so this should not be necessary (deVicente pers. com. 2009). The proposed Vestas wind turbines are currently the best available technology with regard to noise abatement.

7.0 SUMMARY

BSA completed a noise analysis for the proposed Coyote Wind Project, and this technical report was prepared to support the EIS. For the noise analysis, BSA conducted ambient noise level measurements, predicted the noise levels of the turbines for the No Action Alternative and the Proposed Action Alternative, and evaluated construction noise and the noise of maintenance vehicles on the project site.

Existing noise sources in the area include wind-generated noise through grass and trees, farm equipment, wildlife and insects, aircraft flying overhead, water flowing in the Yellowstone River and nearby creeks, traffic on local roads and I-90, and trains on the tracks south of the Yellowstone River. These noise sources are expected to remain in the future.

Existing ambient noise levels in the project area were measured at three representative locations, and compared to typical ambient (L_{90}) noise levels on the ground with wind speeds at 32 feet agl (**Section 4.0**). The measured daytime and nighttime L_{90} dBA levels are typical for sparsely-populated, rural locations (Harris 1998). However, the measured daytime A-weighted and C-weighted L_{eq} and C-weighted L_{90} noise levels were influenced by the low frequency wind noise, and high intensity “thumps” due to wind gusts.

Construction activities may be audible at some of the receptors at any given time, and the sound will most often consist of diesel-powered heavy equipment. Comparing the estimated construction equipment noise levels in **Table 5-1** and the estimated existing ambient noise levels shown in **Table 4-3**, construction noise may be audible at up to 1-mile from the equipment.

BSA predicted the operational noise levels of the turbines and developed L_{eq} noise level contours for the No Action Alternative and the Proposed Action Alternative using the Cadna-A Version 3.7 noise prediction software. The Cadna-A noise model also included adjustments for wind speed, wind direction and atmospheric stability, and incorporated the information and assumptions listed in **Section 5.2**.

The results of the noise analysis for the No Action Alternative are shown on **Figures 2A through 2E**, and summarized in **Table 7-1**. The No Action Alternative turbine L_{eq} noise is predicted to exceed the L_{eq} 35 dBA criteria at five of the seven nearby residences. The turbine L_{eq} is also predicted to exceed the calculated L_{90} noise level by +5 dBA or more at the same five residences. The largest differences between the turbine noise and the calculated ambient noise occur at relatively low wind speeds because the L_{90} noise levels are low when the wind speed is low and increase as the wind speed increases.

The results for the Proposed Action Alternative are summarized on **Figures 3A through 3E**, and in **Table 7-2**. The highest predicted turbine L_{eq} for the Proposed Action Alternative is 30 dBA, and therefore the L_{eq} 35 dBA noise level criteria is not exceeded at the residences by the Proposed Action. The Proposed Action turbine L_{eq} is also predicted to be less than the No Action ambient noise level for each wind speed. Therefore, the Proposed Action Alternative is not predicted to exceed the noise level criteria or create noise impacts.

The cumulative effects are summarized in **Table 7-3** and on **Figures 4A through 4E** for the combination of the No Action and Proposed Action alternatives. Because the No Action Alternative consists of 36 wind turbines and will locate turbines closer to existing residences than the Proposed Action Alternative, the No Action Alternative turbines will become the dominant noise source in the area.

Table 7-1: Summary of Results – No Action Alternative

Residential Receptor	Wind Speed at 32 feet agl (mph)	Predicted Ground Level No Action Turbine L_{eq} (dBA)	Ground Level No Action Turbine L_{eq} minus Calculated Ambient L_{90} (dBA)	Ground Level Turbine L_{eq} (dBC) minus No Action Ambient (dBA)
R1	8.9	31	+5	+12
	13.4	38	+6	+12
	17.9	38	0	+11
	22.4	39	-5	+7
	26.8	39	-9	+3
R2	8.9	38	+12	+10
	13.4	46	+14	+11
	17.9	46	+8	+10
	22.4	47	+3	+9
	26.8	47	-1	+7
R3	8.9	24	-2	+12
	13.4	32	0	+13
	17.9	32	-6	+9
	22.4	32	-12	+4
	26.8	32	-16	0
R4	8.9	35	+9	+11
	13.4	43	+11	+11
	17.9	43	+5	+12
	22.4	43	-1	+9
	26.8	43	-5	+7
R5	8.9	33	+7	+11
	13.4	40	+8	+12
	17.9	40	+2	+11
	22.4	41	-3	+8
	26.8	41	-7	+5
R6	8.9	34	+8	+11
	13.4	42	+10	+12
	17.9	42	+4	+11
	22.4	42	-2	+8
	26.8	42	-6	+5
R7	8.9	26	0	+10
	13.4	34	+2	+10
	17.9	34	-4	+9
	22.4	34	-10	+3
	26.8	34	-14	-1

Shading: Noise level equals or exceeds the noise level criteria in **Table 3-1**.

Table 7-2: Summary of Results – Proposed Action Alternative

Residential Receptor	Wind Speed at 32 feet agl (mph)	Predicted Ground Level Proposed Action Turbine L_{eq} (dBA)	Ground Level Proposed Action Turbine L_{eq} minus No Action Ambient (dBA)	Ground Level Proposed Action Turbine L_{eq} (dBC) minus Cumulative Ambient (dBA)
R1	8.9	19	-7	+9
	13.4	27	-5	+11
	17.9	27	-11	+6
	22.4	27	-17	+1
	26.8	27	-21	-3
R2	8.9	22	-4	+10
	13.4	30	-2	+12
	17.9	30	-8	+7
	22.4	30	-14	+3
	26.8	30	-18	-1
R3	8.9	0	-26	-8
	13.4	6	-26	-8
	17.9	7	-31	-13
	22.4	7	-37	-19
	26.8	7	-41	-23
R4	8.9	10	-16	+1
	13.4	17	-15	+3
	17.9	18	-20	-2
	22.4	18	-26	-7
	26.8	18	-30	-11
R5	8.9	12	-14	+3
	13.4	19	-13	+5
	17.9	20	-18	0
	22.4	20	-24	-6
	26.8	20	-28	-10
R6	8.9	22	-4	+8
	13.4	29	-3	+9
	17.9	29	-9	+4
	22.4	30	-14	+1
	26.8	30	-18	-3
R7	8.9	14	-12	+2
	13.4	22	-10	+3
	17.9	22	-16	-3
	22.4	22	-22	-8
	26.8	22	-26	-12

Shading: Noise level equals or exceeds noise level criteria in **Table 3-1**.

Table 7-3: Summary of Results – Cumulative Noise

Residential Receptor	Receptor Distance to Nearest No Action Turbine	Wind Speed at 32 feet agl (mph)	Ground Level Cumulative Turbine Noise L_{eq} (dBA)[1]	Ground Level Cumulative Turbine L_{eq} minus Ground Level Ambient L_{90} (dBA)	Ground Level Cumulative Turbine L_{eq} (dBC) minus Ground Level Cumulative Ambient L_{90} (dBA)
R1	0.53 miles	8.9	31	+5	+13
		13.4	39	+7	+12
		17.9	39	+1	+11
		22.4	39	-5	+8
		26.8	39	-9	+4
R2	1,500 feet	8.9	39	+13	+9
		13.4	46	+14	+11
		17.9	46	+8	+10
		22.4	47	+3	+9
		26.8	47	-1	+7
R3	0.7 miles	8.9	24	-2	+12
		13.4	32	0	+13
		17.9	32	-6	+9
		22.4	32	-12	+4
		26.8	32	-16	0
R4	0.47 miles	8.9	35	+9	+11
		13.4	43	+11	+11
		17.9	43	+5	+12
		22.4	43	-1	+9
		26.8	43	-5	+7
R5	0.75 miles	8.9	33	+7	+11
		13.4	40	+8	+12
		17.9	40	+2	+11
		22.4	41	-3	+8
		26.8	41	-7	+5
R6	0.57 miles	8.9	34	+8	+11
		13.4	42	+10	+12
		17.9	42	+4	+11
		22.4	42	-2	+9
		26.8	42	-6	+6
R7	1.2 miles	8.9	26	0	+10
		13.4	34	+2	+10
		17.9	34	-4	+9
		22.4	34	-10	+3
		26.8	34	-14	-1

Shading: Noise level equals or exceeds noise level criteria in **Table 3-1**.

In addition to the nearby residences shown on the figures, other human receptors include the recreational users of the Yellowstone River and the historic Lewis and Clark Trail located along the north side of the river. Ambient noise along the Yellowstone River depends on the water flow rate and the surface turbulence of the moving water, as well as traffic on I-90 and other existing sources. As shown on **Figures 2A through 4E**, the turbine L_{eq} noise levels along the river are predicted to be approximately 20 to 40 dBA for the No Action Alternative and as a cumulative effect. Therefore, the turbines may be audible if a listener is along the calm water stretches of the river, during low wind speeds, but either increased water turbulence, increased wind speed at the ground or other area noise sources may create enough noise to mask the sound of the turbines.

For project maintenance activities, it is anticipated that four people will work on site using two vehicles (light trucks) (**Section 5.3**). As shown in **Table 5-13**, a predicted light truck noise level of 31 dBA occurs at approximately 0.5 mile from a road, which is equivalent to existing vehicle noise. Therefore, the maintenance trucks will be briefly audible as the truck passes by a receptor, and inaudible at distances greater than 0.5 mile from a road.

Wind turbine noise greater than 45 dBA may cause sleep disturbances or increased stress for some individuals, but otherwise, noise created by wind turbines does not cause health problems (van den Berg, Frits 2008). For the No Action Alternative, noise levels above L_{eq} 45 dBA are only predicted at residential receptor R2 (**Table 5-4**).

The effects of wind turbine noise on humans tends to be related to visibility of the wind turbines, economic benefit for a landowner related to the turbines, and a person's attitude toward wind turbines in general (van den Berg, Frits 2008, Pedersen and Waye 2004). When wind turbines are visible, residents are far more likely to be bothered by turbine noise. Benefiting economically from a wind farm decreases the level of irritation by residents due to noise.

Numerous studies have been conducted documenting the effects of noise on wildlife. Animal response to noise is a function of many other variables besides noise, including the characteristics of the noise and its duration, life history characteristics of the species, habitat type, season and current activity of the animal, sex, age, previous noise exposure, and other physical stressors such as drought. General animal responses to human-made noise are attraction, tolerance and aversion, which are summarized in **Section 5.4**.

Noise mitigation measures were considered for the construction, operation and maintenance phases of the wind farm project, as described in **Section 6.0**. The effects of operational noise from the project could be reduced by relocating those wind turbines expected to be most audible at residences. Also, the proposed Vestas wind turbines are currently the best available technology with regard to noise abatement.

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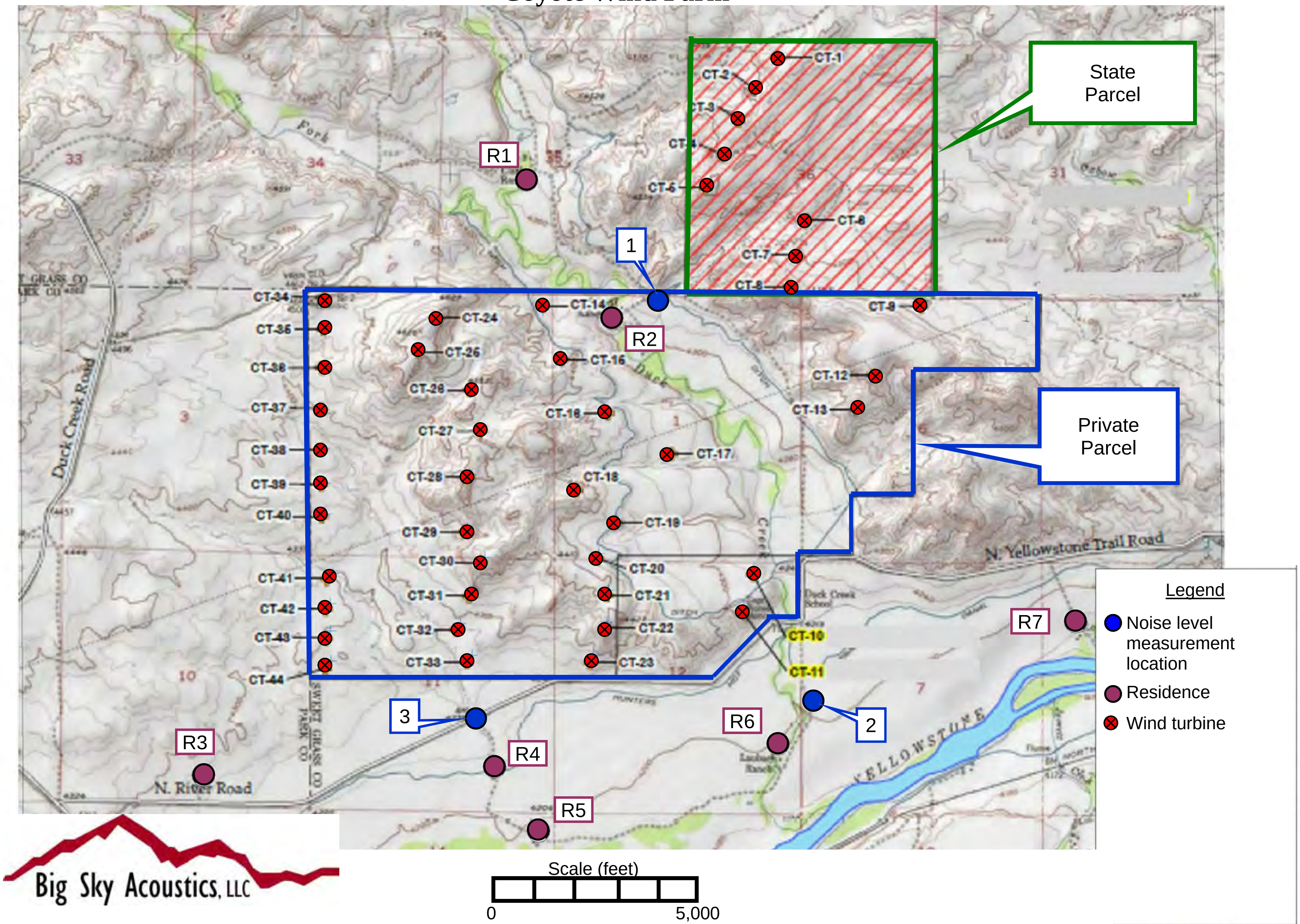
9.0 STANDARD OF CARE

To complete this report, BSA has endeavored to perform its work in a manner consistent with that degree of care and skill ordinarily exercised by members of the acoustical profession currently practicing under similar circumstances. BSA makes no warranty, either express or implied, as to the professional services it has rendered to complete this report.

For the completion of this report, BSA has used data provided by Garcia and Associates, Inc., Enerfin Sociedad de Energia, and Vestas Wind Systems in performing services and is entitled to rely upon the accuracy and completeness thereof. Therefore, if the information and assumptions (i.e., change in equipment, new wind turbine locations, other residences, etc.) used to create this report change, then the noise study may need to be reevaluated.

FIGURES

Figure 1: Ambient Noise Level Measurement and Receptor Locations
Coyote Wind Farm



Big Sky Acoustics, LLC

Figure 2A: No Action Alternative Noise Contours (Wind Speed 8.9 mph)
Coyote Wind Farm

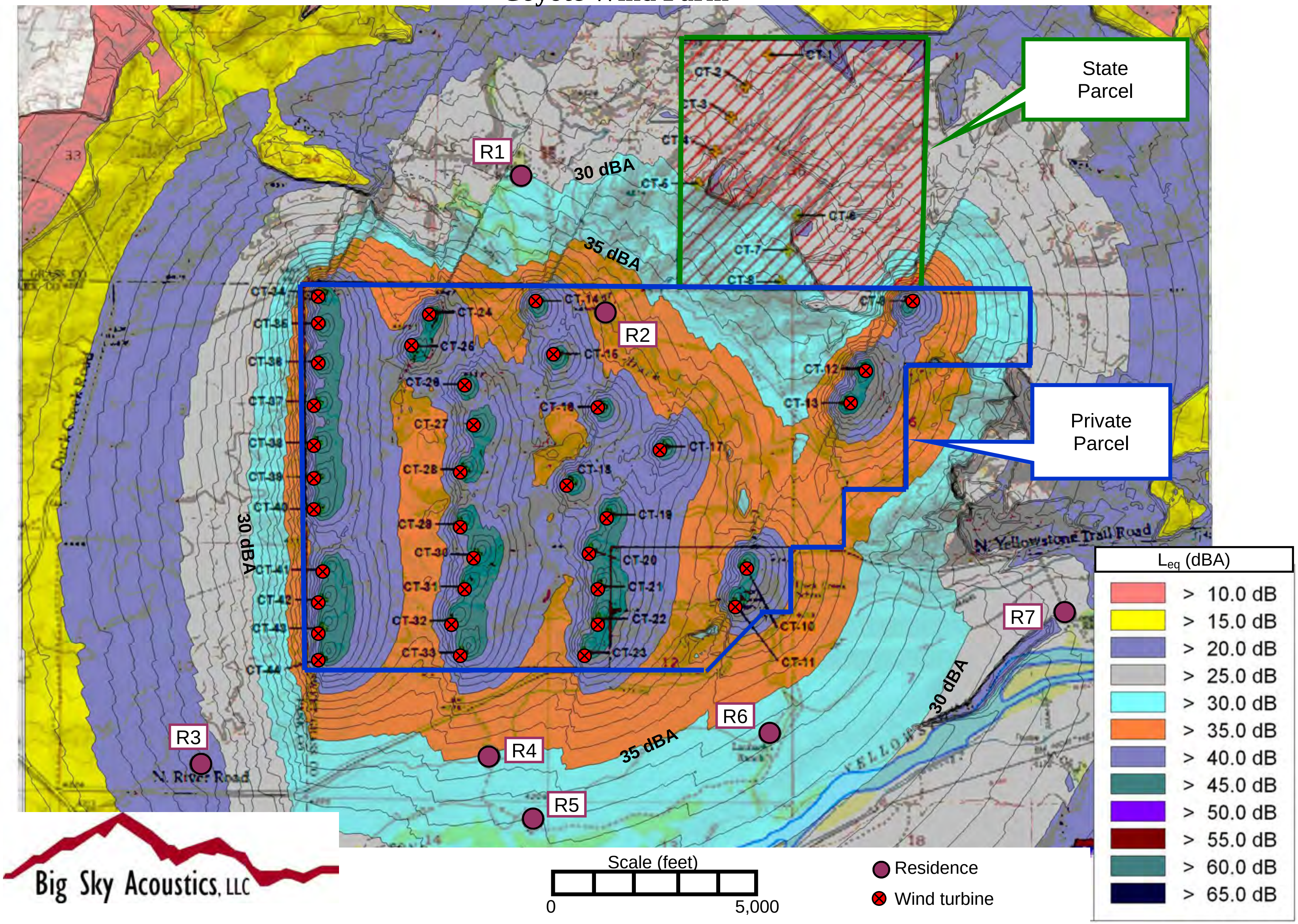


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Figure 2B: No Action Alternative Noise Contours (Wind Speed 13.4 mph)
Coyote Wind Farm

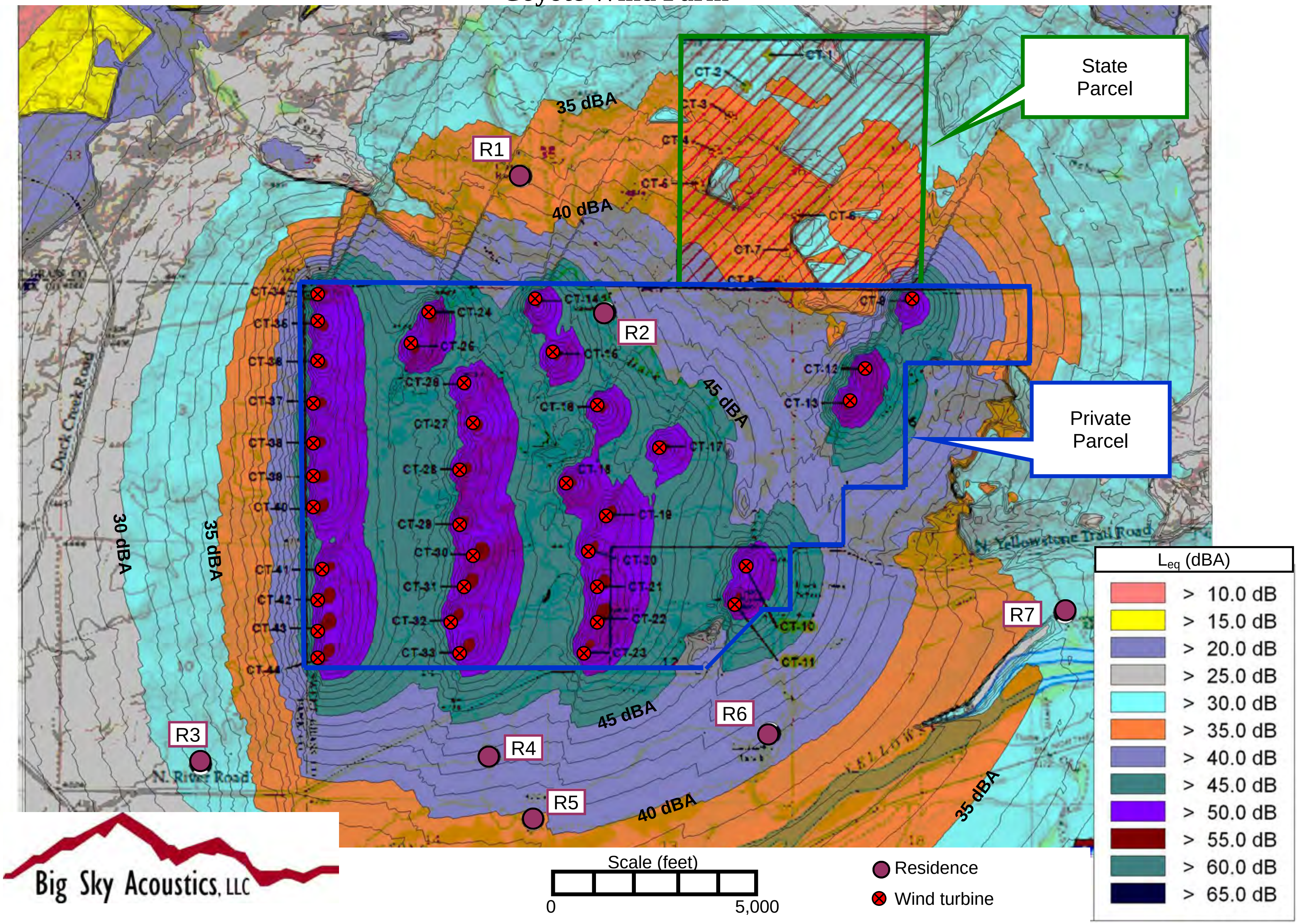

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Figure 2C: No Action Alternative Noise Contours (Wind Speed 17.9 mph)
Coyote Wind Farm

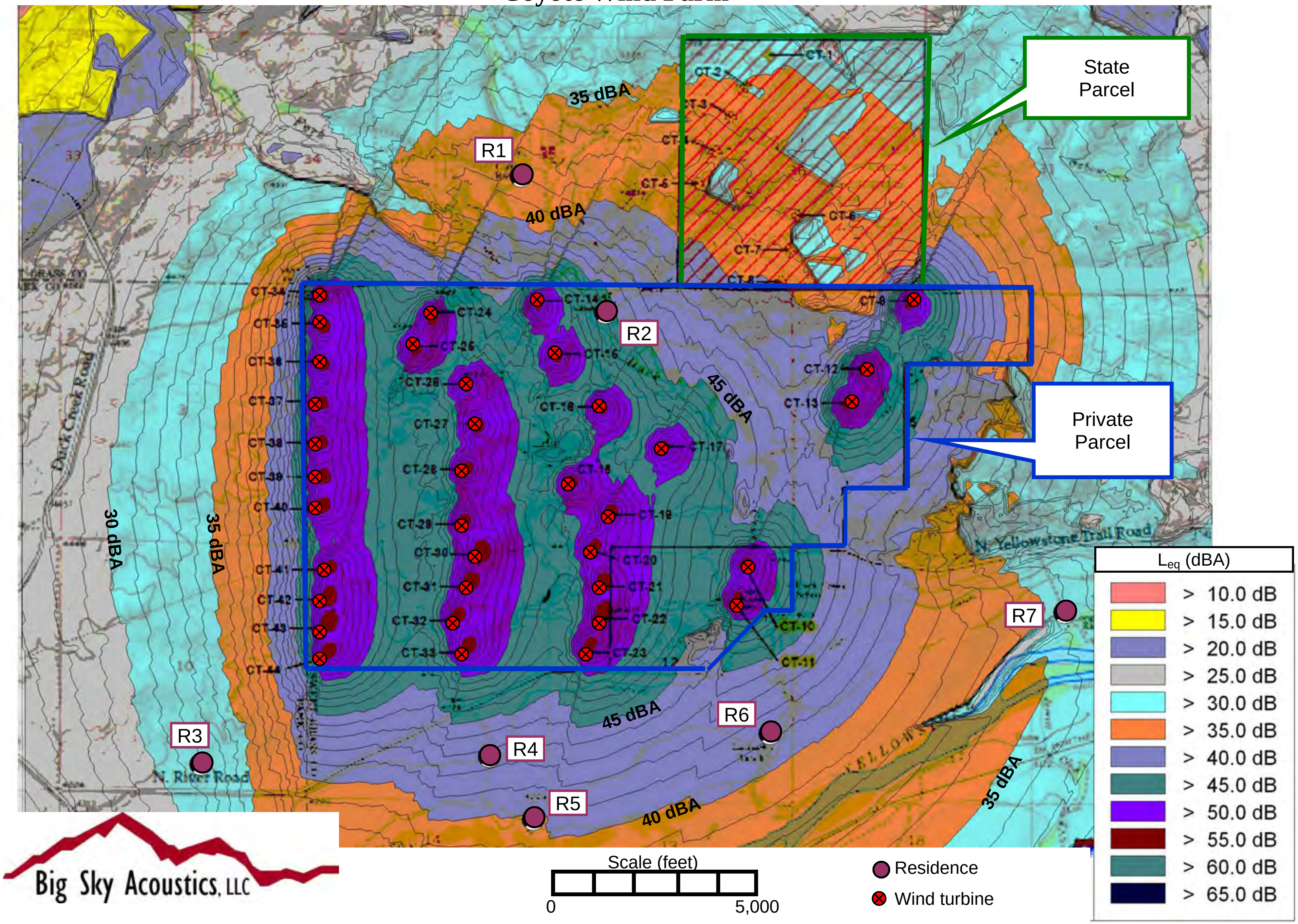

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Figure 2D: No Action Alternative Noise Contours (Wind Speed 22.4 mph)
Coyote Wind Farm

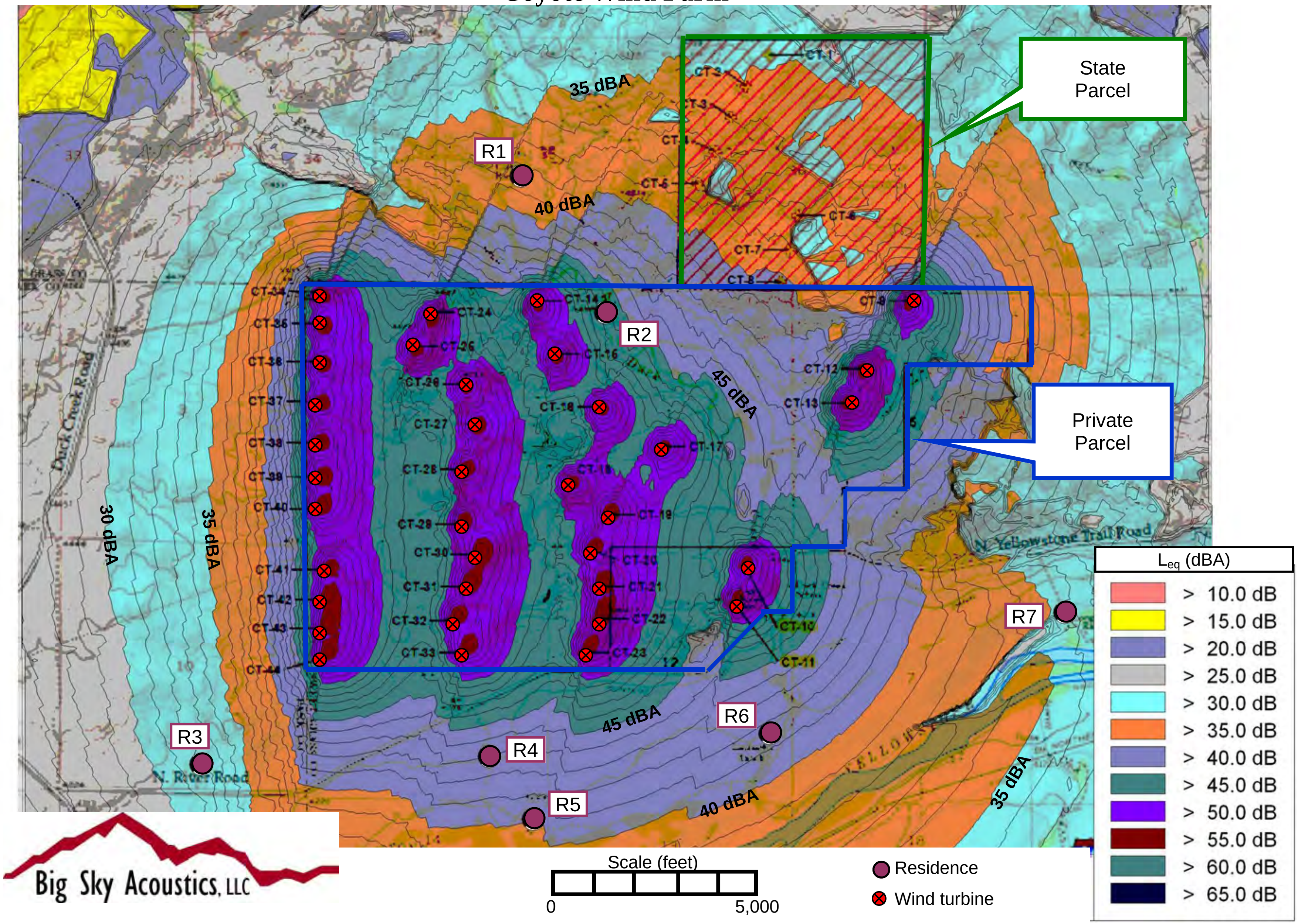

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Figure 2E: No Action Alternative Noise Contours (Wind Speed 26.8 mph)
Coyote Wind Farm

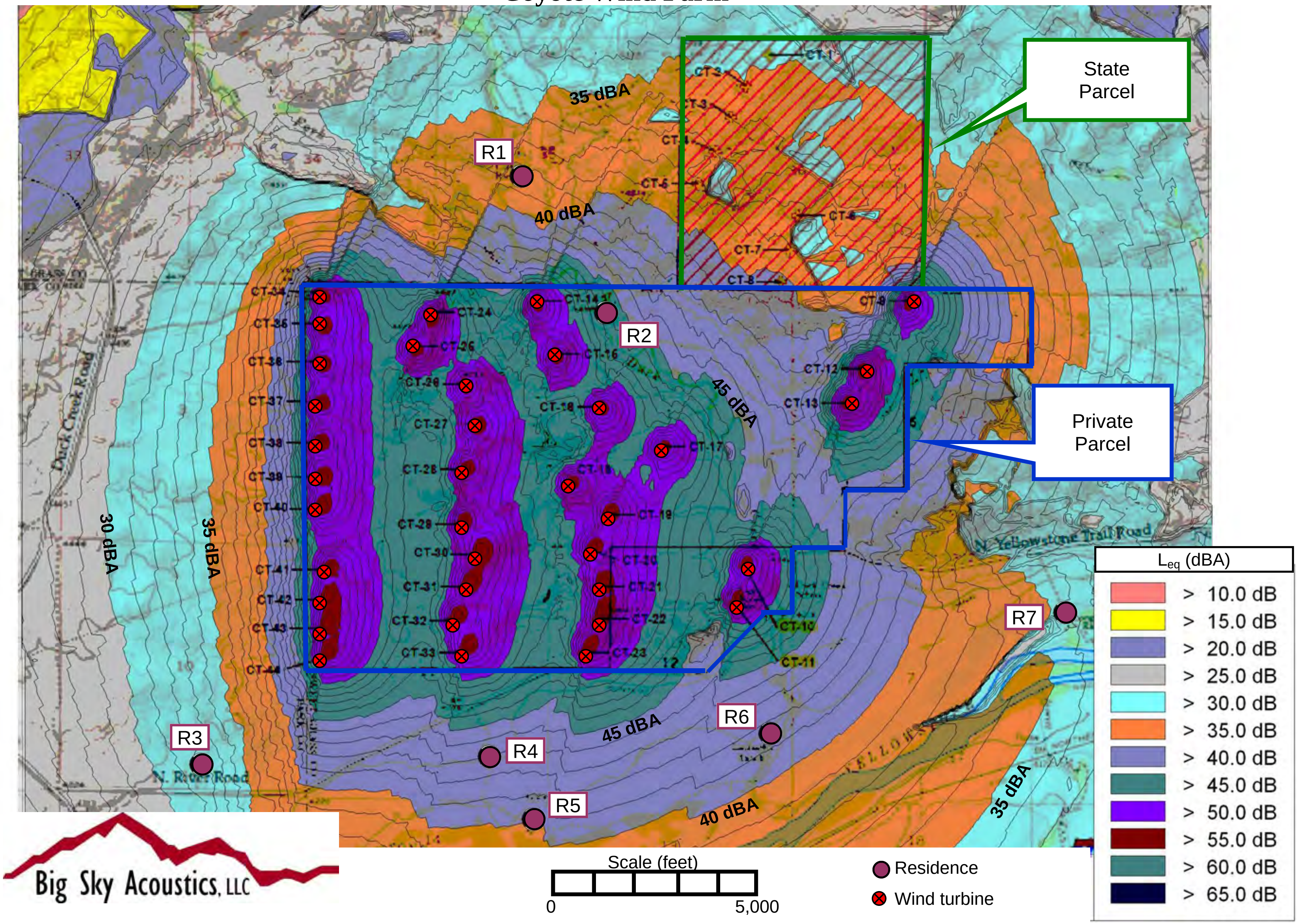

Figure 3A: Proposed Action Noise Contours (Wind Speed 8.9 mph)
Coyote Wind Farm

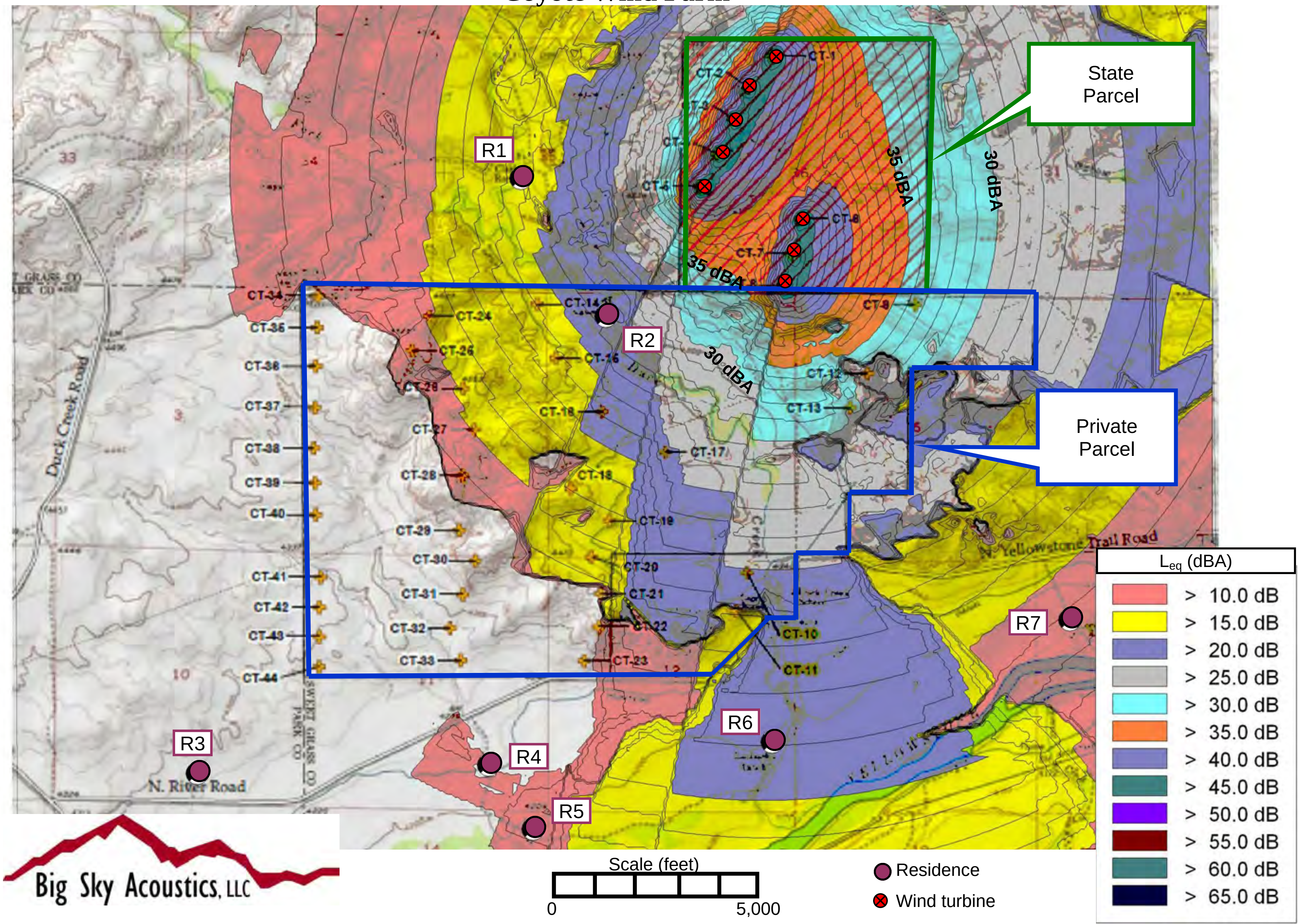

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Figure 3B: Proposed Action Noise Contours (Wind Speed 13.4 mph)
Coyote Wind Farm

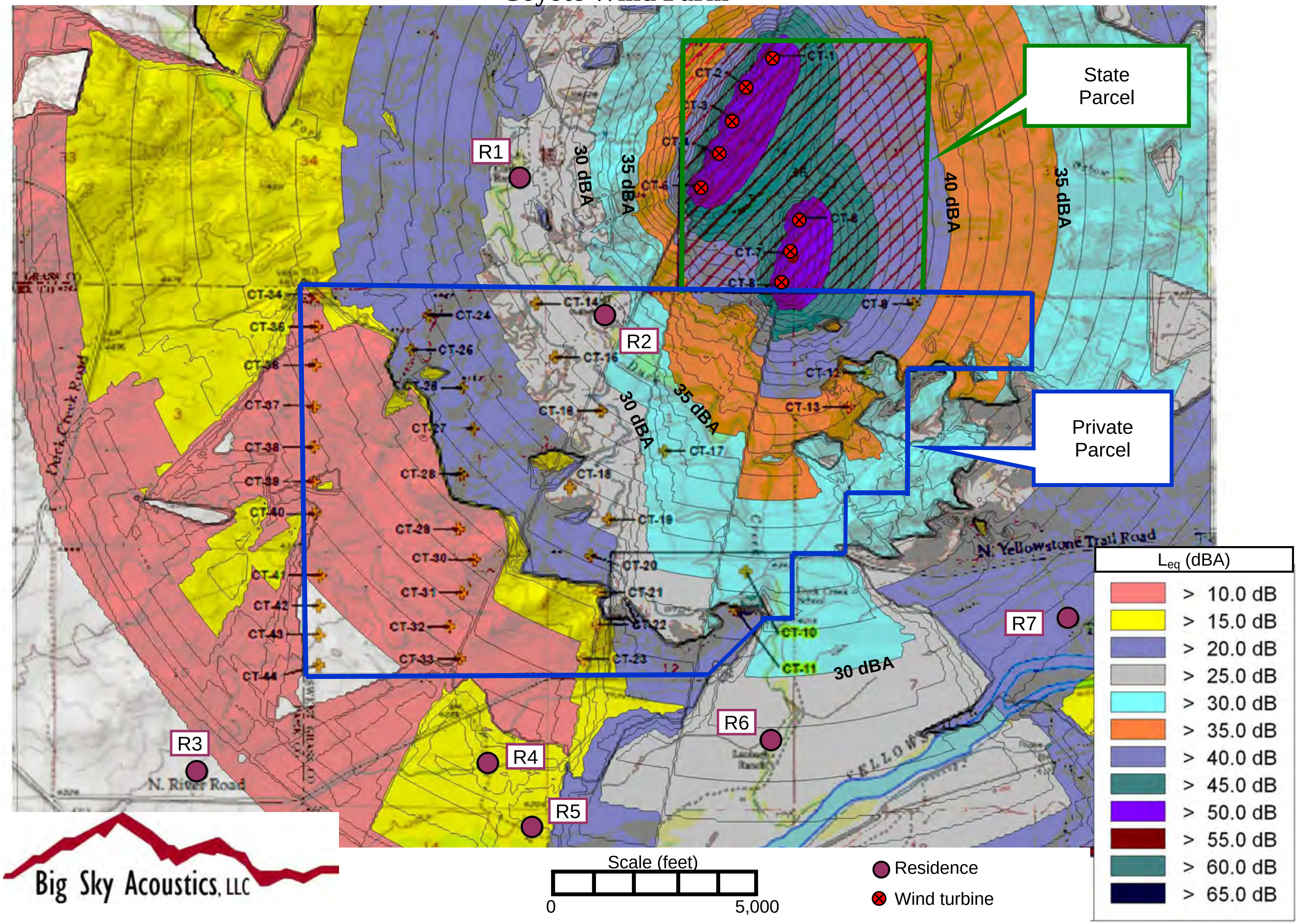

Figure 3C: Proposed Action Noise Contours (Wind Speed 17.9 mph)
Coyote Wind Farm

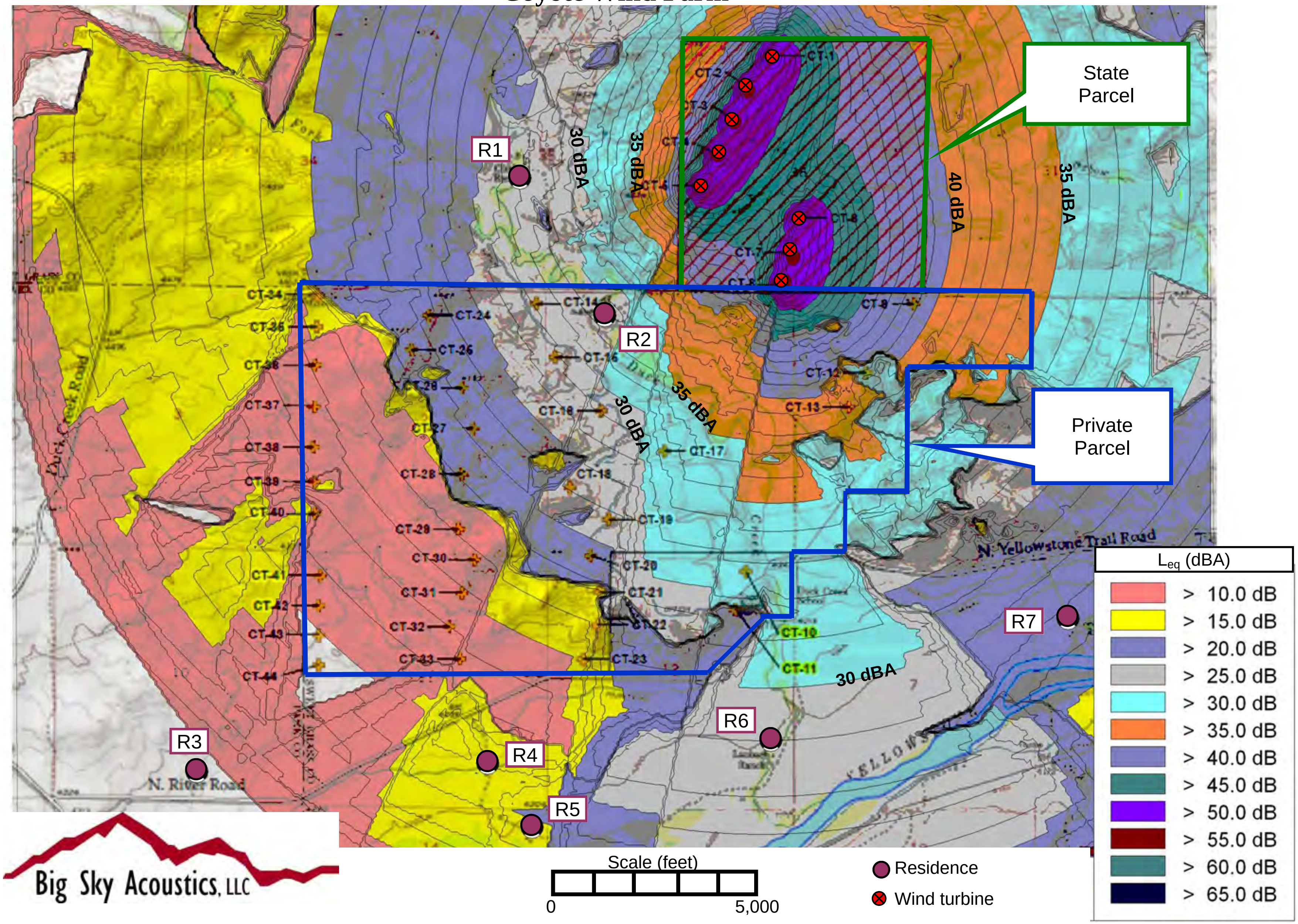

Figure 3D: Proposed Action Noise Contours (Wind Speed 22.4 mph)
Coyote Wind Farm

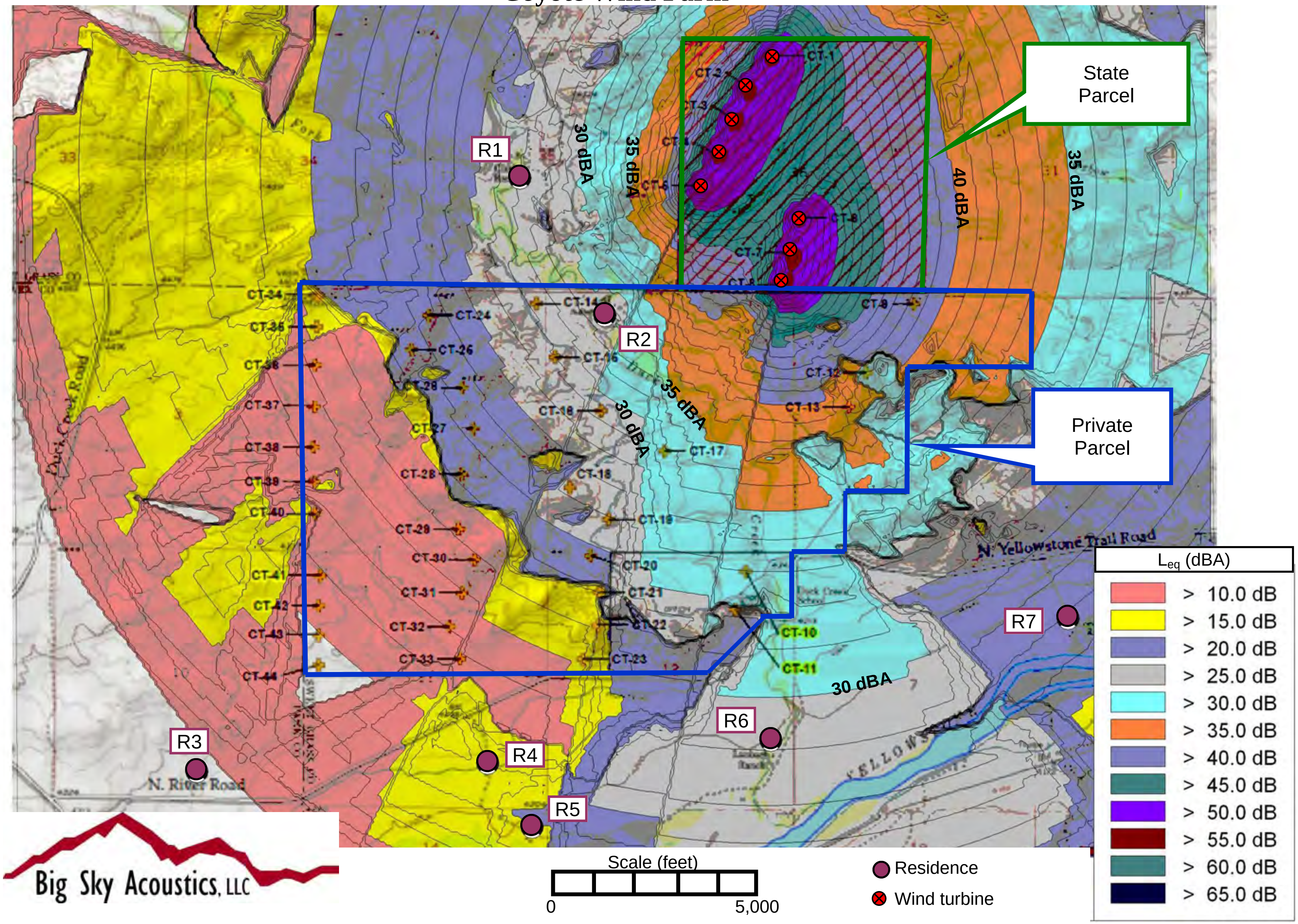

Figure 3E: Proposed Action Noise Contours (Wind Speed 26.8 mph)
Coyote Wind Farm

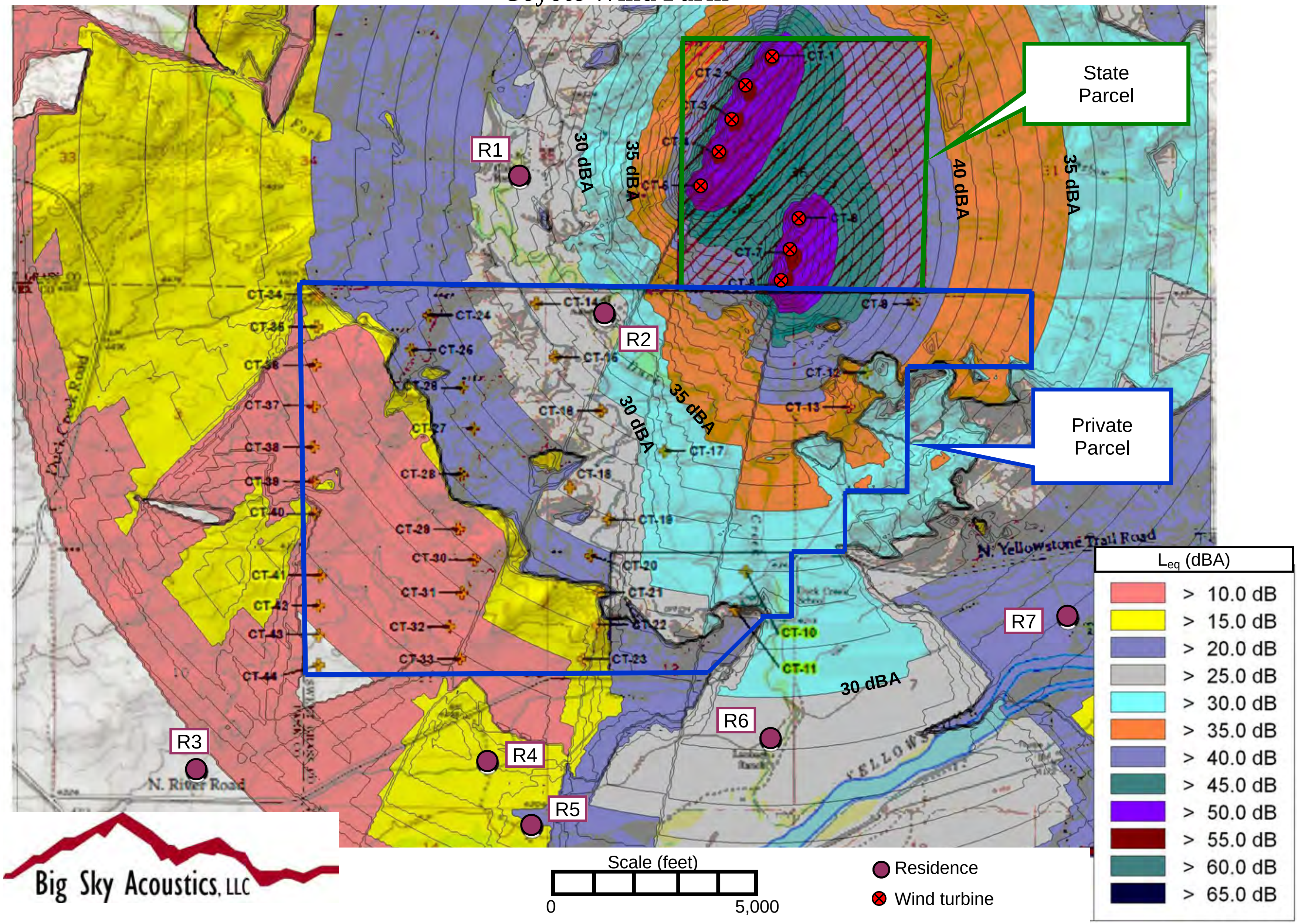

Figure 4A: Cumulative Noise Contours (Wind Speed 8.9 mph)
Coyote Wind Farm

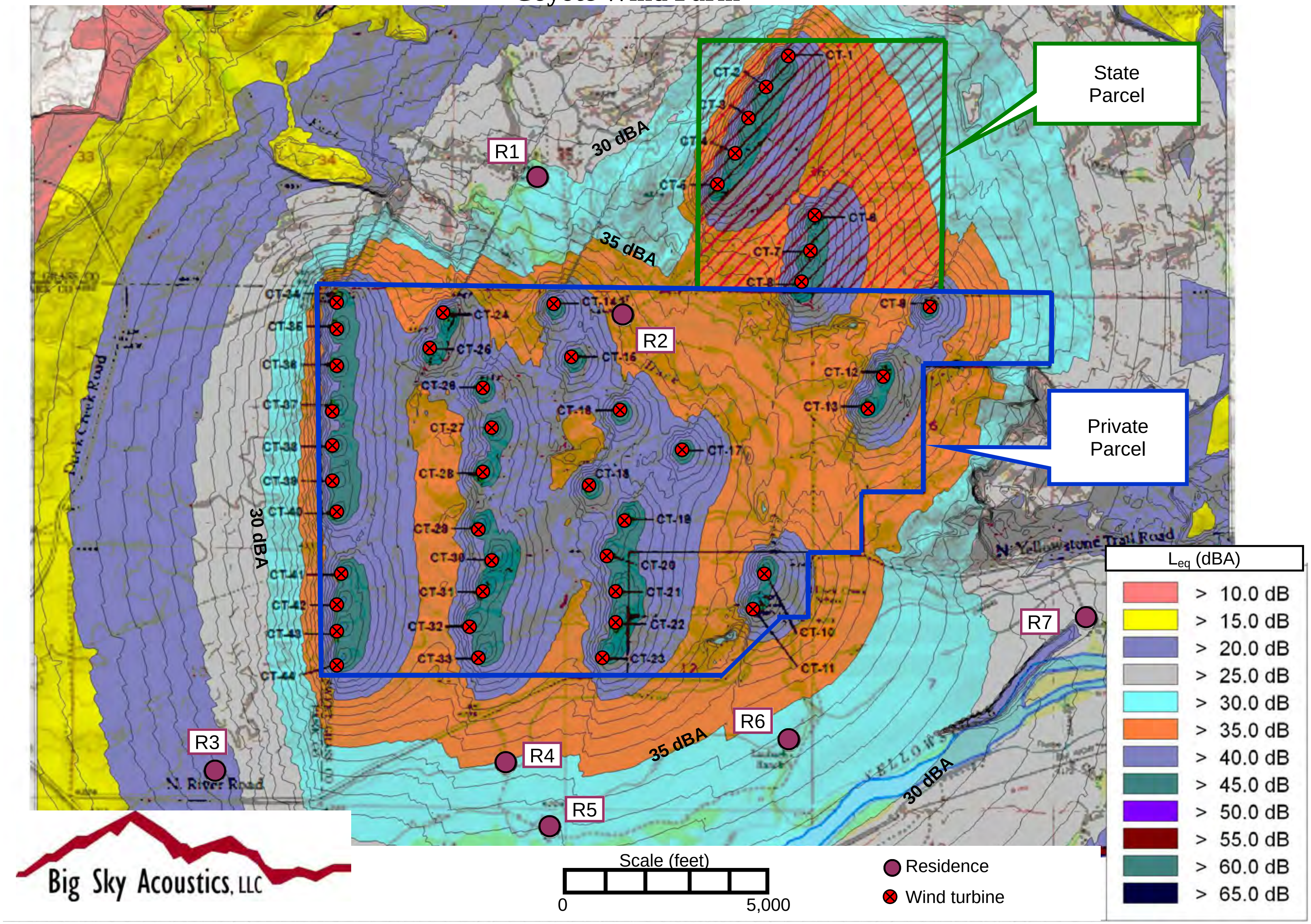

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Figure 4B: Cumulative Noise Contours (Wind Speed 13.4 mph)
Coyote Wind Farm

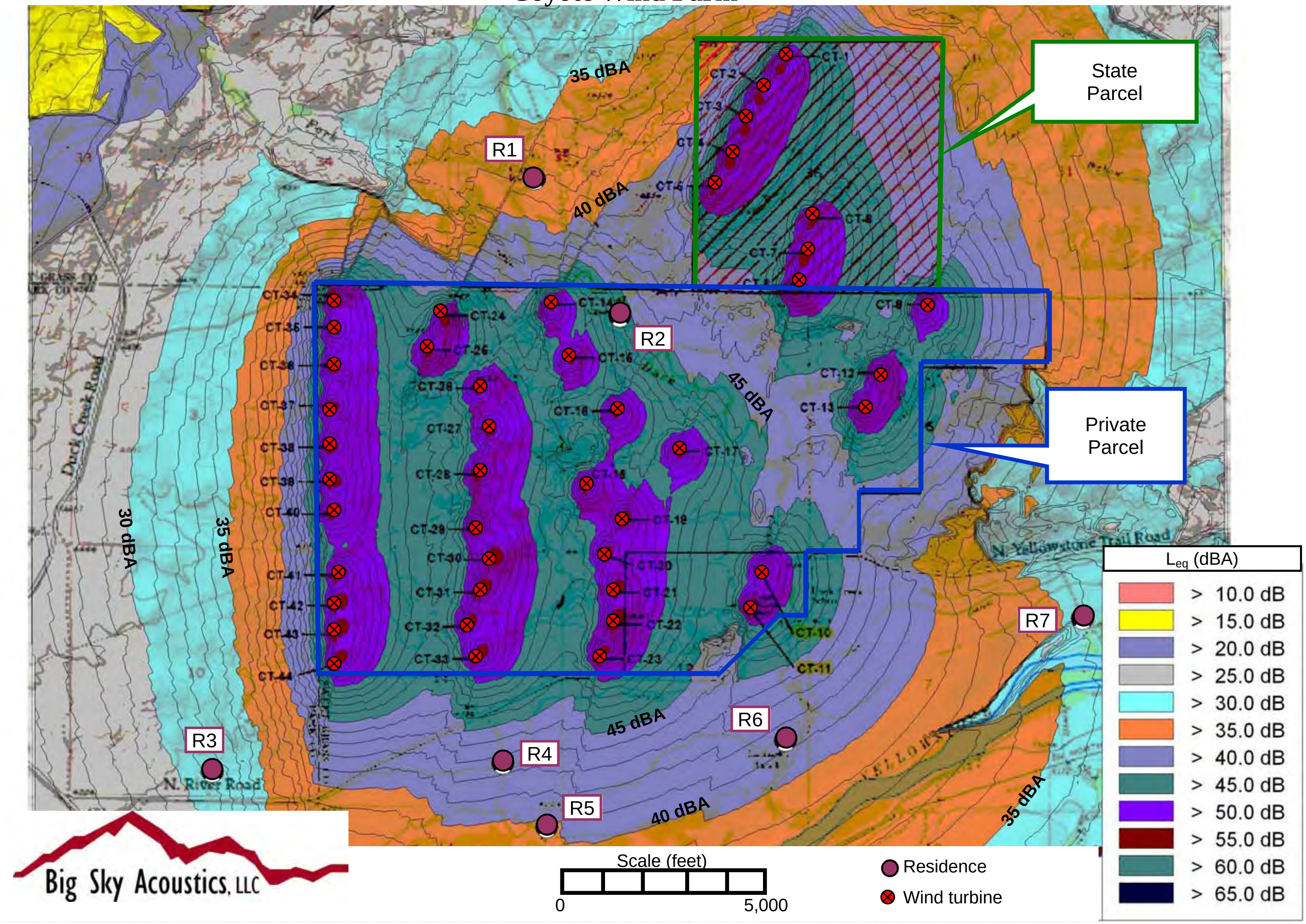

Figure 4C: Cumulative Noise Contours (Wind Speed 17.9 mph)
Coyote Wind Farm

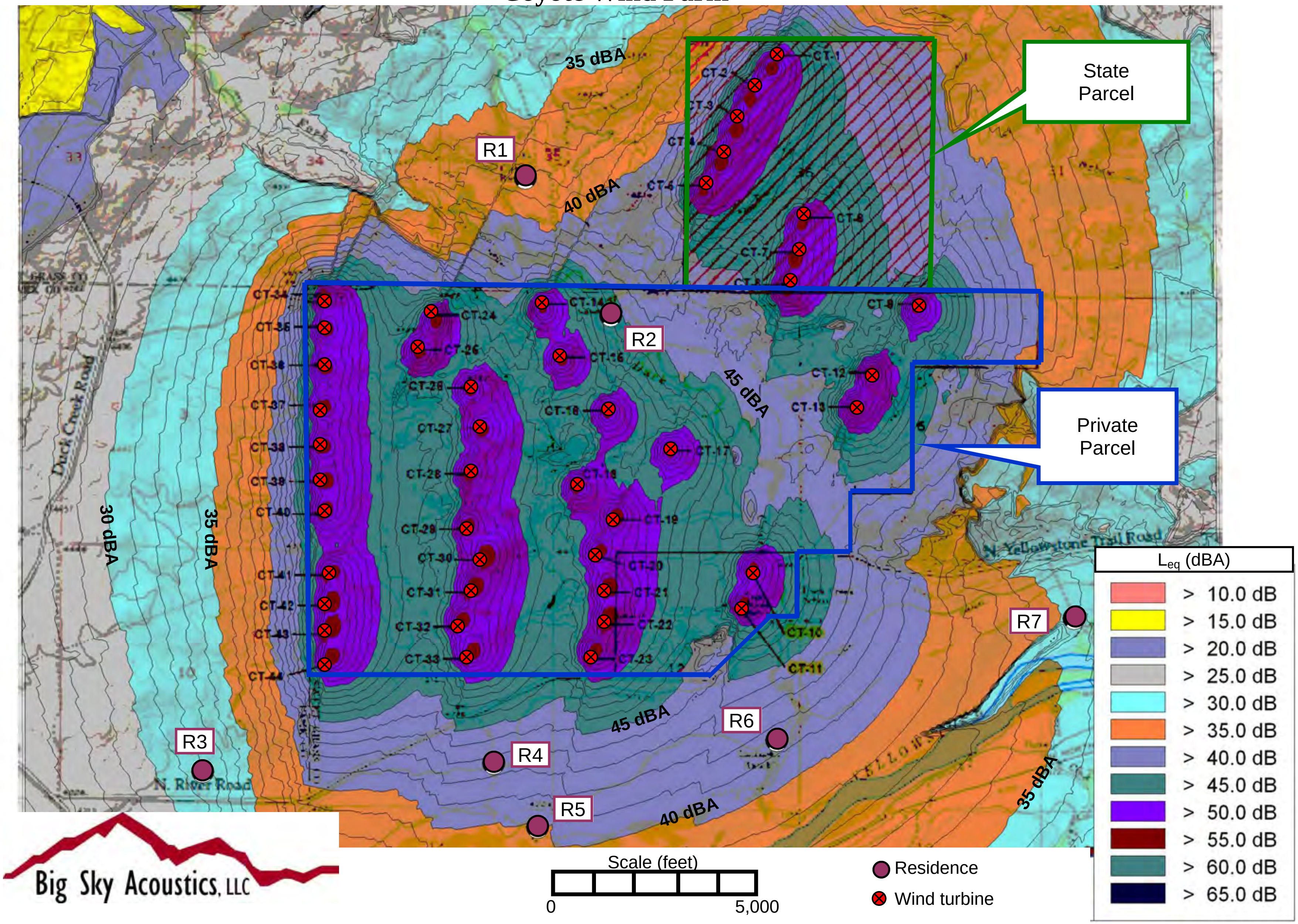

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Figure 4D: Cumulative Noise Contours (Wind Speed 22.4 mph)
Coyote Wind Farm

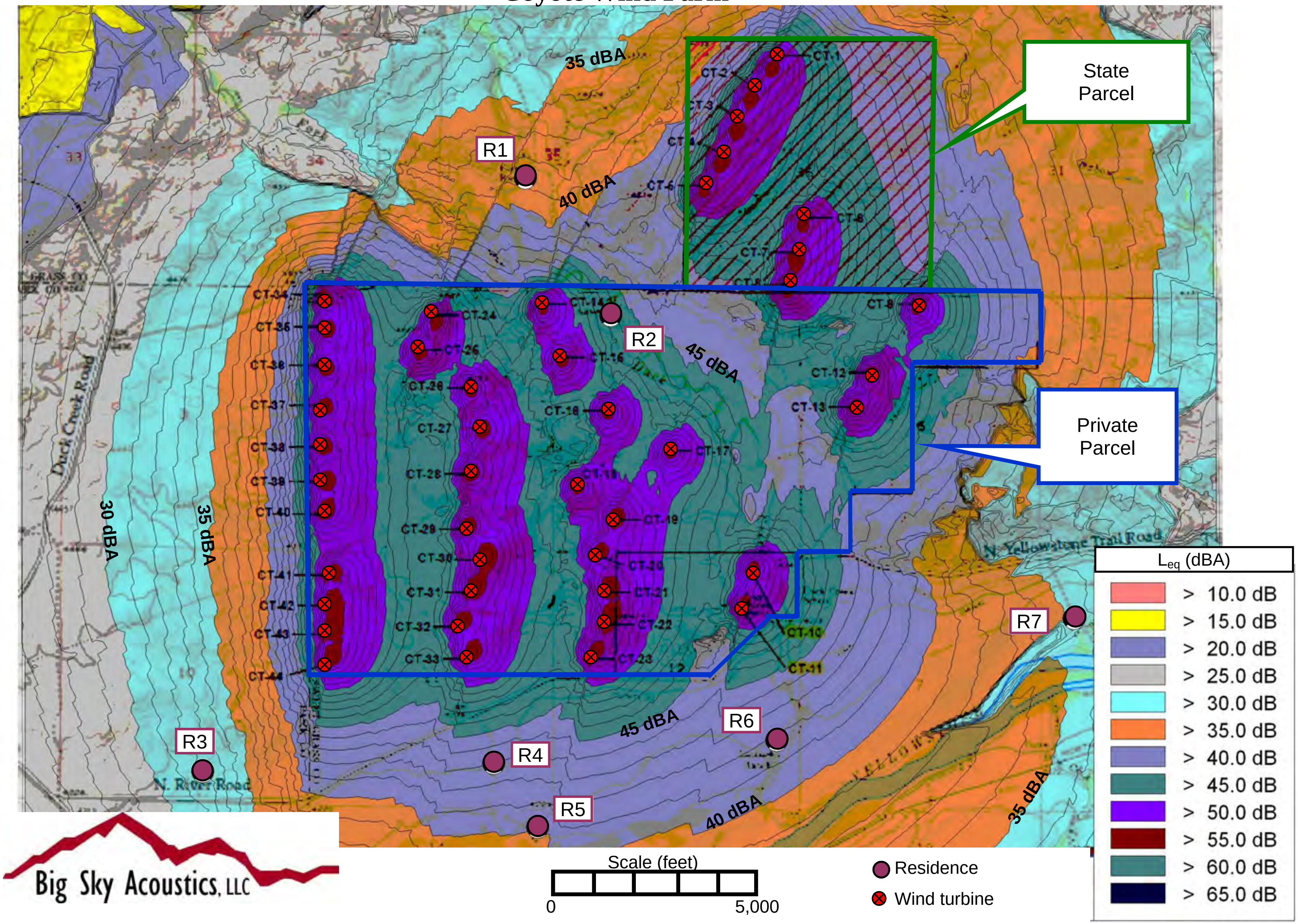

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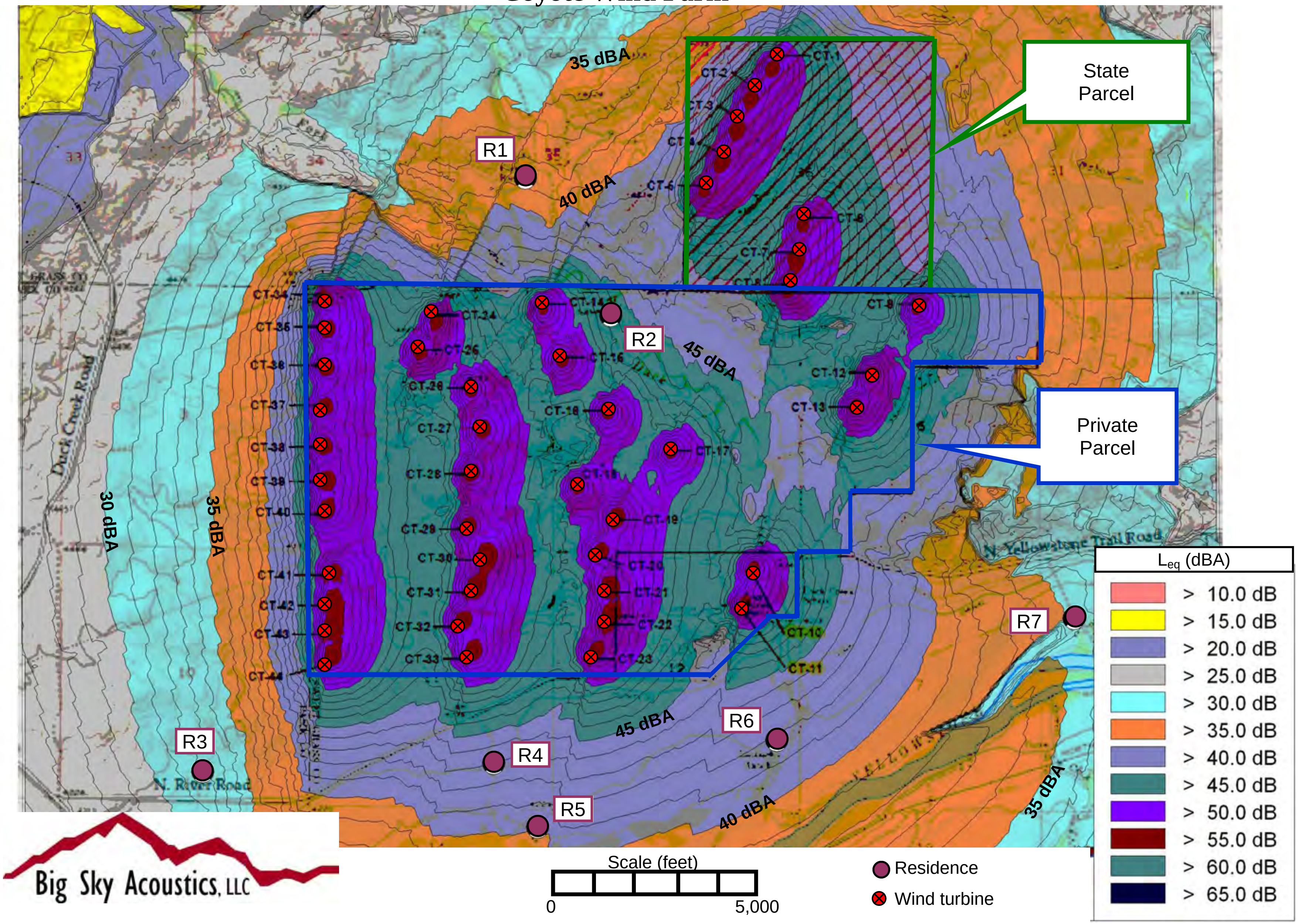
Figure 4E: Cumulative Noise Contours (Wind Speed 26.8 mph)
Coyote Wind Farm



APPENDIX A
Predicted Noise Levels –
Coyote Wind Project

Coyote Wind Farm
#08132
3-Jul-09

Location: R1

dBA (from Cadna) to dB

	63	125	250	500	1000	2000	4000	8000	Total:
dBA	18	22	21	22	17	5	0	0	27 dBA
dBA	18	22	21	22	17	5	0	0	27 dBA
A-wt	-25	-15	-8	-3	0	1	1	-1	
dB	43	37	29	25	17	4	-1	1	44 dB

dB to dBC

	63	125	250	500	1000	2000	4000	8000	Total:
C-wt	-1	0	0	0	0	0	-1	-3	
dBC	44	37	29	25	17	4	0	4	45 dBC

Wind Turbine Noise at receptor

No Action (36 Wind Turbine's on private land)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - new amb. dBA
4	8.9	26	41	36	33	30	26	9	-1	1	43	31	44	32	5	11
6	13.4	32	49	43	41	38	33	17	-1	1	51	38	51	39	6	12
8	17.9	38	50	45	41	38	33	17	-1	1	52	38	52	41	0	11
10	22.4	44	50	44	41	38	34	18	-1	1	51	39	52	45	-5	7
12	26.8	48	50	44	41	38	34	18	-1	1	51	39	52	49	-9	4

Cumulative (8 Wind Turbines on State land + 36 Wind Turbine's on private land)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - dBA
4	8.9	26	42	36	33	30	26	9	-1	1	43	31	44	32	5	12
6	13.4	32	49	44	41	38	33	17	-1	1	51	39	52	40	7	12
8	17.9	38	51	45	41	38	33	17	-1	1	51	39	52	42	1	10
10	22.4	44	50	45	41	38	34	18	-1	1	51	39	52	45	-5	7
12	26.8	48	50	45	41	38	34	18	-1	1	51	39	52	49	-9	3

Proposed Action (Est. for 8 Wind Turbines on State land only)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - new amb. dBA
4	8.9	26	34	28	21	17	9	-1	-1	1	35	19	36	27	-7	9
6	13.4	32	42	36	29	25	17	3	-1	1	43	27	44	33	-5	11
8	17.9	38	42	35	29	25	16	3	-1	1	43	27	44	38	-11	5
10	22.4	44	43	37	29	25	16	3	-1	1	44	27	45	44	-17	1
12	26.8	48	43	37	29	25	17	4	-1	1	44	27	45	48	-21	-3

Coyote Wind Farm
#08132
3-Jul-09

Location: **R2**

dBA (from Cadna) to dB

	63	125	250	500	1000	2000	4000	8000	Total:
dBA	19	23	23	24	20	10	0	0	29 dBA
dBA	19	23	23	24	20	10	0	0	29 dBA
A-wt	-25	-15	-8	-3	0	1	1	-1	
dB	44	38	31	27	20	9	-1	1	45 dB

dB to dBC

	63	125	250	500	1000	2000	4000	8000	Total:
C-wt	-1	0	0	0	0	0	-1	-3	
dBC	45	38	31	27	20	9	0	4	46 dBC

Wind Turbine Noise at receptor

No Action (36 Wind Turbine's on private land)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - new amb. dBA
4	8.9	26	47	41	40	37	36	29	14	1	47	38	48	38	12	10
6	13.4	32	55	49	47	45	43	36	22	1	56	46	57	46	14	11
8	17.9	38	57	51	47	46	43	37	27	1	56	46	57	47	8	10
10	22.4	44	56	51	48	46	44	38	24	1	57	47	58	49	3	9
12	26.8	48	56	51	48	46	44	38	24	1	57	47	58	51	-1	7

Cumulative (8 Wind Turbines on State land + 36 Wind Turbine's on private land)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - new amb. dBA
4	8.9	26	48	42	40	38	36	29	14	1	49	39	49	39	13	10
6	13.4	32	55	49	47	45	43	36	22	1	55	46	56	46	14	10
8	17.9	38	57	51	47	46	43	37	27	1	57	46	57	47	8	10
10	22.4	44	57	51	48	46	44	38	24	1	57	47	58	49	3	9
12	26.8	48	57	51	48	46	44	38	24	1	57	47	58	51	-1	7

Proposed Action (Est. for 8 Wind Turbines on State land only)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - new amb. dBA
4	8.9	26	36	30	24	21	15	1	-1	1	37	22	37	27	-4	10
6	13.4	32	44	38	31	29	22	1	9	1	45	30	46	34	-2	12
8	17.9	38	44	37	31	28	22	9	-1	1	45	30	46	39	-8	7
10	22.4	44	45	39	31	29	21	9	-1	1	46	30	47	44	-14	3
12	26.8	48	44	38	31	27	20	9	-1	1	46	30	47	48	-18	-1

Coyote Wind Farm
#08132
3-Jul-09

Location: **R3**

dBA (from Cadna) to dB

	63	125	250	500	1000	2000	4000	8000	Total:
dBA	1	2	0	0	0	0	0	0	10 dBA
dBA	1	2	0	0	0	0	0	0	10 dBA
A-wt	-25	-15	-8	-3	0	1	1	-1	
dB	26	17	8	3	0	-1	-1	1	27 dB

dB to dBC

C-wt	-1	0	0	0	0	0	-1	-3	
dBC	27	17	8	3	0	-1	0	4	28 dBC

Wind Turbine Noise at receptor

No Action (36 Wind Turbine's on private land)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - new amb. dBA
4	8.9	26	39	32	26	23	16	0	-1	1	39	24	40	28	-2	12
6	13.4	32	46	39	34	31	24	8	-1	1	47	32	48	35	0	13
8	17.9	38	47	41	35	31	22	6	-1	1	47	32	48	39	-6	9
10	22.4	44	47	41	35	31	23	7	-1	1	47	32	48	44	-12	4
12	26.8	48	47	41	35	31	23	7	-1	1	47	32	48	48	-16	0

Cumulative (8 Wind Turbines on State land + 36 Wind Turbine's on private land)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - dBA
4	8.9	26	39	32	26	23	16	0	-1	1	39	24	40	28	-2	12
6	13.4	32	46	39	34	31	23	6	-1	1	47	32	48	35	0	13
8	17.9	38	47	41	35	31	22	6	-1	1	47	32	48	39	-6	9
10	22.4	44	47	41	35	31	23	7	-1	1	47	32	48	44	-12	4
12	26.8	48	47	41	35	31	23	7	-1	1	47	32	48	48	-16	0

Proposed Action (Est. for 8 Wind Turbines on State land only)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - new amb. dBA
4	8.9	26	25	15	8	3	0	-1	-1	1	17	0	18	26	-26	-8
6	13.4	32	25	16	9	3	0	-1	-1	1	23	6	24	32	-26	-8
8	17.9	38	25	16	8	3	0	-1	-1	1	24	7	25	38	-31	-13
10	22.4	44	27	17	8	3	0	-1	-1	1	24	7	25	44	-37	-19
12	26.8	48	26	17	8	3	0	-1	-1	1	24	7	25	48	-41	-23

Coyote Wind Farm
#08132
3-Jul-09

Location: R4

dBA (from Cadna) to dB

	63	125	250	500	1000	2000	4000	8000	Total:
dBA	10	12	13	13	4	0	0	0	18 dBA
dBA	10	12	13	13	4	0	0	0	18 dBA
A-wt	-25	-15	-8	-3	0	1	1	-1	
dB	35	27	21	16	4	-1	-1	1	36 dB

dB to dBC

	63	125	250	500	1000	2000	4000	8000	Total:
C-wt	-1	0	0	0	0	0	-1	-3	
dBC	36	27	21	16	4	-1	0	4	37 dBC

Wind Turbine Noise at receptor

No Action (36 Wind Turbine's on private land)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - new amb. dBA
4	8.9	26	45	39	38	35	31	17	-1	1	46	35	47	36	9	12
6	13.4	32	52	47	45	42	38	24	-1	1	53	43	54	43	11	11
8	17.9	38	54	49	45	43	38	26	3	1	55	43	56	44	5	12
10	22.4	44	54	48	46	43	39	27	0	1	55	43	56	47	-1	9
12	26.8	48	54	48	46	43	39	27	0	1	55	43	56	49	-5	7

Cumulative (8 Wind Turbines on State land + 36 Wind Turbine's on private land)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - dBA
4	8.9	26	45	39	38	35	31	17	-1	1	46	35	46	36	9	10
6	13.4	32	53	47	36	43	38	26	-1	1	54	43	55	43	11	12
8	17.9	38	54	49	45	43	38	26	3	1	54	43	55	44	5	11
10	22.4	44	54	49	46	43	39	27	0	1	54	43	55	47	-1	8
12	26.8	48	54	49	46	43	39	27	0	1	54	43	55	49	-5	6

Proposed Action (Est. for 8 Wind Turbines on State land only)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - new amb. dBA
4	8.9	26	26	18	13	8	0	-1	-1	1	26	10	27	26	-16	1
6	13.4	32	34	26	21	15	3	-1	-1	1	34	17	35	32	-15	3
8	17.9	38	34	26	21	15	3	-1	-1	1	35	18	36	38	-20	-3
10	22.4	44	35	27	20	16	3	-1	-1	1	36	18	37	44	-26	-7
12	26.8	48	35	27	21	16	4	-1	-1	1	36	18	37	48	-30	-12

Coyote Wind Farm
#08132
3-Jul-09

Location: R5

dBA (from Cadna) to dB

	63	125	250	500	1000	2000	4000	8000	Total:
dBA	12	17	20	19	7	0	0	0	24 dBA
dBA	12	17	20	19	7	0	0	0	24 dBA
A-wt	-25	-15	-8	-3	0	1	1	-1	
dB	37	32	28	22	7	-1	-1	1	39 dB

dB to dBC

	63	125	250	500	1000	2000	4000	8000	Total
C-wt	-1	0	0	0	0	0	-1	-3	
dBC	38	32	28	22	7	-1	0	4	39 dBC

Wind Turbine Noise at receptor

No Action (36 Wind Turbine's on private land)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - new amb. dBA
4	8.9	26	43	37	35	32	26	6	-1	1	44	33	45	34	7	12
6	13.4	32	50	45	43	40	33	14	-1	1	52	40	53	41	8	12
8	17.9	38	52	46	43	40	33	15	-1	1	52	40	53	42	2	11
10	22.4	44	52	46	43	41	34	16	-1	1	53	41	54	46	-3	8
12	26.8	48	52	46	43	41	34	16	-1	1	53	41	54	49	-7	5

Cumulative (8 Wind Turbines on State land + 36 Wind Turbine's on private land)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - dBA
4	8.9	26	43	37	35	32	26	6	-1	1	45	33	45	34	7	12
6	13.4	32	51	45	43	40	33	15	-1	1	52	40	52	41	8	11
8	17.9	38	52	47	43	40	33	15	-1	1	52	40	52	42	2	10
10	22.4	44	52	46	44	41	34	16	-1	1	54	41	54	46	-3	8
12	26.8	48	52	46	44	41	34	16	-1	1	54	41	54	49	-7	5

Proposed Action (Est. for 8 Wind Turbines on State land only)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - new amb. dBA
4	8.9	26	28	20	15	10	0	-1	-1	1	28	12	29	26	-14	3
6	13.4	32	36	28	23	17	5	-1	-1	1	36	19	37	32	-13	5
8	17.9	38	37	30	27	21	7	-1	-1	1	37	20	38	38	-18	0
10	22.4	44	38	32	27	22	7	-1	-1	1	37	20	38	44	-24	-6
12	26.8	48	37	32	28	22	7	-1	-1	1	37	20	38	48	-28	-10

Coyote Wind Farm
#08132
3-Jul-09

Location: **R6**

dBA (from Cadna) to dB

	63	125	250	500	1000	2000	4000	8000	Total:
dBA	17	21	24	25	17	0	0	0	29 dBA
dBA	17	21	24	25	17	0	0	0	29 dBA
A-wt	-25	-15	-8	-3	0	1	1	-1	
dB	42	36	32	28	17	-1	-1	1	43 dB

dB to dBC

	63	125	250	500	1000	2000	4000	8000	Total:
C-wt	-1	0	0	0	0	0	-1	-3	
dBC	43	36	32	28	17	-1	0	4	44 dBC

Wind Turbine Noise at receptor

No Action (36 Wind Turbine's on private land)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - new amb. dBA
4	8.9	26	42	36	34	31	24	4	-1	1	46	34	46	35	8	11
6	13.4	32	50	44	42	39	32	12	-1	1	54	42	54	42	10	12
8	17.9	38	51	45	42	39	31	12	-1	1	54	42	54	43	4	11
10	22.4	44	51	45	43	39	32	13	-1	1	54	42	54	46	-2	8
12	26.8	48	51	45	43	39	32	13	-1	1	54	42	54	49	-6	5

Cumulative (8 Wind Turbines on State land + 36 Wind Turbine's on private land)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - dBA
4	8.9	26	42	37	35	32	24	4	-1	1	46	34	47	35	8	12
6	13.4	32	50	45	43	40	32	11	-1	1	54	42	55	42	10	13
8	17.9	38	52	46	43	40	31	12	-1	1	54	42	55	43	4	12
10	22.4	44	51	46	43	40	32	13	-1	1	54	42	55	46	-2	9
12	26.8	48	51	46	43	40	32	13	-1	1	54	42	55	49	-6	6

Proposed Action (Est. for 8 Wind Turbines on State land only)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - new amb. dBA
4	8.9	26	33	28	26	21	8	-1	-1	1	35	22	35	27	-4	8
6	13.4	32	40	35	33	28	16	-1	-1	1	42	29	43	34	-3	9
8	17.9	38	40	35	33	28	16	-1	-1	1	42	29	43	39	-9	4
10	22.4	44	42	36	32	28	16	-1	-1	1	44	30	45	44	-14	1
12	26.8	48	42	36	32	28	17	-1	-1	1	44	30	45	48	-18	-3

Coyote Wind Farm
#08132
3-Jul-09

Location: **R7**

dBA (from Cadna) to dB

	63	125	250	500	1000	2000	4000	8000	Total:
dBA	9	14	17	18	10	0	0	0	22 dBA
dBA	9	14	17	18	10	0	0	0	22 dBA
A-wt	-25	-15	-8	-3	0	1	1	-1	
dB	34	29	25	21	10	-1	-1	1	35 dB

dB to dBC

C-wt	-1	0	0	0	0	0	-1	-3	
dBC	35	29	25	21	10	-1	0	4	36 dBC

Wind Turbine Noise at receptor

No Action (36 Wind Turbine's on private land)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - new amb. dBA
4	8.9	26	36	31	29	25	17	-1	-1	1	38	26	39	29	0	10
6	13.4	32	44	38	37	33	24	-1	-1	1	46	34	46	36	2	10
8	17.9	38	45	40	37	33	24	1	-1	1	47	34	48	39	-4	8
10	22.4	44	45	40	37	34	25	2	-1	1	47	34	47	44	-10	3
12	26.8	48	45	40	37	34	25	2	-1	1	47	34	47	48	-14	-1

Cumulative (8 Wind Turbines on State land + 36 Wind Turbine's on private land)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - dBA
4	8.9	26	36	31	29	25	17	-1	-1	1	38	26	39	29	0	10
6	13.4	32	44	39	37	34	24	0	-1	1	46	34	47	36	2	11
8	17.9	38	45	40	37	34	24	1	-1	1	47	34	48	39	-4	8
10	22.4	44	45	40	37	34	25	2	-1	1	47	34	48	44	-10	3
12	26.8	48	45	40	37	34	25	2	-1	1	47	34	48	48	-14	0

Proposed Action (Est. for 8 Wind Turbines on State land only)

wind speed at 10 m (m/s)	wind speed at 10 m (mph)	Calculated Ambient (dBA)	Predicted Wind Turbine Noise 63	125	250	500	1000	2000	4000	8000	Total dB	Total dBA	Total dBC	New total Ambient (dBA)	Difference in Leq-L90 (dBA)	dBC - new amb. dBA
4	8.9	26	25	20	17	13	1	-1	-1	1	27	14	28	26	-12	1
6	13.4	32	32	28	25	20	9	-1	-1	1	34	22	35	32	-11	3
8	17.9	38	33	28	25	20	9	-1	-1	1	34	22	35	38	-17	-3
10	22.4	44	34	29	25	21	9	-1	-1	1	36	22	36	44	-22	-8
12	26.8	48	34	29	25	21	10	-1	-1	1	35	22	36	48	-26	-12