

**Draft Supplemental Environmental Assessment
DOE/SEA-1611-S1**

**Request for Modification of Interconnection Agreement
for the
Colorado Highlands Wind Project**

Logan County, Colorado



**U. S. Department of Energy
Western Area Power Administration
Rocky Mountain Region
Loveland, Colorado**



September 2014

EXECUTIVE SUMMARY

Project Location

The Colorado Highlands Wind Project Expansion (Project) would be constructed on private and state land located northeast of Fleming, in Logan County, Colorado. The Project is located east of the existing wind farm boundary, on roughly 1,200 acres of private and state land with similar characteristics to the existing wind project site.

Project Participants

Colorado Highlands Wind, LLC (CHW) applied to the Western Area Power Administration (Western) to modify the existing Interconnection Agreement (Agreement) between Western and CHW for their Colorado Highlands Wind power facility. The proposed modification would allow CHW to increase the generation allowed onto the transmission system at Western's Wildhorse Creek Switching Station from 90 MW to 110 MW.

No physical changes or additional equipment at Western's switching station would be necessary for this Agreement modification. CHW is the applicant/Project proponent. Western is the lead Federal agency for compliance with the National Environmental Policy Act of 1969 (NEPA) as amended. There are no cooperating agencies.

Purpose and Need

CHW requests to modify their existing Agreement to increase the generation allowed onto the transmission system at Western's Wildhorse Creek Switching Station.

Western's purpose and need is to consider and respond to the request to modify the Agreement in accordance with its Tariff and the Federal Power Act.

Under the Tariff, Western offers capacity on its transmission system to deliver electricity when capacity is available. The Tariff also contains terms for processing requests for the interconnection of generation facilities to Western's transmission system. In reviewing agreement modifications, Western must ensure that existing reliability and service is not degraded. Western's Tariff provides for transmission and system studies to ensure that system reliability and service to existing customers are not adversely affected by new or modified interconnections. These studies also identify system upgrades or additions necessary to accommodate the proposed Project and/or agreement modifications and address whether the upgrades/additions are within the project scope.

Proposed Project

The proposed expansion Project would include the addition of up to eleven (11) wind turbine generators (WTGs) to the existing 56 WTGs at the CHW wind power facility. With the additional WTGs, the total Project output nameplate capacity would be 110.7 MW. Due to the wind regime at the site, the average MW output is less than 50 percent of the nameplate capacity.

The GE 1.79MW wind turbine is a monopole tower design with an 80-meter hub height and a 100-meter rotor diameter. Total maximum blade tip height for the GE 1.79 MW wind turbine is

130 meters (427 feet). Figure 2-1 illustrates the proposed distribution of the towers. The expansion (Project) will utilize the site support facilities that are already constructed and in use by the existing wind farm.

Access to the proposed Project area would be via Interstate 76 or US Highway 6 and a network of existing County and private roads within the proposed Project area. Access to the proposed Project facilities, including individual turbines, would be provided by new access roads to be constructed for the purposes of proposed Project construction and operation.

CHW proposes to implement Western's standard construction, operation and maintenance practices, where applicable, to avoid and minimize impacts to the environment to the extent practicable. These measures are part of CHW's proposed Project and Western's Proposed Action and are considered in this Supplemental Environmental Assessment's (Supplemental EA's) impact analysis.

Proposed Federal Action

Western proposes to modify the existing interconnection Agreement with CHW to increase the generation allowed onto the transmission system at Western's Wildhorse Creek Switching Station from 90 MW to 110 MW.

No Action Alternative

Under the No Action Alternative, Western would not modify the existing Interconnect Agreement with CHW. Although CHW could continue to pursue its proposed expansion Project by applying for interconnection with another transmission provider, for the purposes of analysis under this Supplemental EA, it is assumed the No Action Alternative would result in the proposed Project not being constructed.

Summary of Impacts of the Proposed Action

The potential impacts of the Proposed Action, including the beneficial impacts, are summarized below.

Air Quality. The Proposed Action would have beneficial impacts on air quality because greenhouse gases and other pollutants emitted by conventional fossil fuel combustion for energy generation would not be produced. Construction and operation would result in direct and short term impacts from small amounts of dust and tail pipe emissions from vehicle traffic. Dust control measures during construction would minimize the potential for adverse impacts. Operational traffic would be predominantly consistent with routine road travel for an agricultural area.

Topography. Impacts to topography would include temporary or permanent changes in the land surface and slope due to cut-and-fill activities required to excavate foundations and build access roads.

Paleontology. Direct impacts to fossils could include the inadvertent destruction of scientifically important fossils during excavation. However, because the proposed Project footprint is small and no significant fossils were discovered during the field reconnaissance, the potential for loss

of important fossils is considered low. Additionally, the review of archives at the Denver Museum of Natural History did not reveal the presence of either current or historical fossil collection sites within 24 km (15 miles) of the proposed Project.

Soils. The proposed Project would encompass approximately 486 hectares (1,200 acres). Approximately 29.7 hectares (73.5 acres) of soils would be temporarily impacted during construction prior to re-vegetation. Approximately 2.8 hectares (6.8 acres) would remain under roads, turbines, and facilities for the life-of-Project (assumed to be 30 years). Therefore, impacts to soils due to the proposed Project would be either minor and temporary or minor and long term (less than 1% of the entire Project footprint for life-of-Project impacts). Impacts would include soil loss through erosion, compaction, and loss of structure in soils that are disturbed or driven on during construction. All surfaces that are disturbed or compacted in areas not needed for operation would be loosened, re-graded, and re-vegetated in accordance with landowner wishes or easement agreements.

Water Resources. There are no expected direct impacts to surface water as there are no surface water bodies in the proposed Project area. Impacts to off-site surface water are expected to be minimal during construction and operation due to the distance from the site to off-site surface water. Indirect impacts could occur if the proposed Project resulted in water depletions in the South Platte River. The proposed Project would require the consumption of surface and/or ground water during construction and operation/maintenance activities. The proposed Project estimates a one-time need for less than 5 acre-feet of water during construction for concrete foundations and dust control. Construction water would come from off-site existing municipal or private sources, likely from Fleming or Haxtun, Colorado which may derive its water from surface water, groundwater or a combination of the two.

The existing project currently obtains water for operations/maintenance activities from an on-site well. CHW is a member of the South Platte Water Related Activities Program, Inc. (SPWRAP), which is a Colorado component of the South Platte River Recovery Program, described below. The membership in SPWRAP includes an allocation of up to 3.5 acre-feet of water per year through 2019. The possible addition of one (1) permanent O&M employee is not expected to significantly increase the annual on-site water consumption.

It should be noted that for the existing wind farm, water used for construction was obtained from municipal water supply wells in the Town of Fleming, which are non-tributary to the South Platte River basin. Consequently, CHW has not used any of its 22.6 acre-feet construction water increment for which consultation with the USFWS was documented in the 2009 Project Biological Opinion (BO# ES/LK-6-CO-09-F-006; TAILS: 65412-2009-F-0108) issued to Western. Since the estimated construction water use for the proposed Project (less than 5 acre-feet) is below the remaining available increment from the 2009 Project BO, informal consultation with the USFWS is ongoing for the proposed Project's water use.

Vegetation. Direct impacts to vegetation would include 29.7 hectares (73.5 acres) of temporary surface disturbance during construction and 2.8 hectares (6.8 acres) of permanent loss of habitat for roads, turbine foundations, and facilities for the life-of-Project. All of the temporary disturbance areas would be reclaimed and revegetated. Direct, and long term impacts would be

minimal. Permanent impacts to agricultural lands would be less than 1.2 hectares (3 acres). The proposed Project would not impact any riparian vegetation, including the vegetation of playas or depressional wetlands.

Floodplains and Wetlands. Floodplains and wetlands are not located in the proposed Project area and would not be impacted by construction or operation of the proposed Project.

Wildlife. Impacts to mammals, reptiles, and amphibians are expected to be minimal because the land is primarily agricultural and has been subjected to regular human activity from farming and ranching activities. Mammals are relatively mobile, amphibians and reptiles are a little less so, and, while mortality due to collisions with vehicles or during construction is possible, these occurrences are anticipated to be infrequent.

Birds may be directly impacted due to collisions with turbines and through both direct and effective habitat loss. The closest active raptor nest is approximately one mile to the closest turbine (Turbine 62). The potential impact of wind power development on birds is well-documented, but wind power-related mortality is low compared with other sources of bird mortality.

Bats may be impacted due to collision-related mortality associated with operating wind turbines. However, since no Federal or state-listed threatened, endangered, proposed, or candidate (TEP or C) bat species are anticipated to occur, impacts to bat populations is expected to be minor. Bat acoustical monitoring conducted in the fall of 2008 and throughout 2009 on the existing project site only identified two (2) species of widely distributed North American bats, the silver-haired bat and the hoary bat, neither of which is identified as protected in State or Federal laws and regulations. Since these bats are tree-roosting species, minimal habitat exists for year-round occurrence of these bats in the proposed Project area.

The proposed Project is in general conformance with state and Federal recommendations for avoiding and minimizing impacts to wildlife from wind turbines. Prior coordination with USFWS and CPW resulted in letters outlining desirable approaches and mitigation for protection of wildlife resources, as provided in Appendix A of the original EA (DOE/EA-1611). The Project layout and schedule reflect this coordination with the agencies. Activities for surface occupation and timelines impacted by construction would be consistent with agency requirements for timing restrictions and activity buffers. The resulting impacts to wildlife due to the proposed Project would result from long and short term effects on their habitats including vegetation impacts, human disturbance and the construction, operation and maintenance of the proposed Project. Overall impacts are expected to be minor.

Special Status Species. No Federal TEP or C plant species are expected to occur in Logan County, and the State of Colorado has no listed plant species or communities. Eagle nest surveys conducted as part of the proposed Project did not identify any active eagle nests with a 10 mile radius of the proposed Project. However, a juvenile golden eagle fatality was discovered near one of the existing wind turbines in April 2014. CHW personnel continue to coordinate with the USFWS on this issue. The pallid sturgeon and least tern do not occur in the proposed Project area and the piping plover and the whooping crane are unlikely to occur in the proposed Project

area. No habitat for pallid sturgeon, interior least tern, piping plover, or whooping crane occurs in the proposed Project area, but these species are of concern since potential water depletions in the South Platte River drainage basin due to the proposed Project may affect the species and/or critical habitat downstream.

The proposed Project estimated a one-time use of less than five acre-feet of water during construction. During the Operations and Maintenance phase, the Project estimates that there will be ongoing need for water. Impacts from such water uses will be addressed by CHW's participation in the Federally-approved Platte River Recovery Implementation Program, under the SPWRAP one time use certification and annual membership options. CHW's participation in the Platte River Recovery Implementation Program (PRRIP), via SPWRAP membership, allowed Western to request streamlined consultation with the USFWS, as reflected in the 2009 Project BO.

The proposed Project is expected have low to no impacts on state-listed species, including plains sharp-tailed grouse, American peregrine falcon, bald eagle, burrowing owl, greater sandhill crane, long-billed curlew, mountain plover, western yellow-billed cuckoo, black-tailed prairie dog, swift fox, and yellow mud turtle. Impacts to the greater prairie chicken are expected to be minimal as the nearest identified lek is located approximately 2 miles from the nearest proposed WTG, which exceeds the recommended CPW set-backs from leks.

Cultural Resources. The Class III cultural resources inventory for the proposed Project identified one homestead (5LO877) recommended to be eligible, under Criterion D, for inclusion on the National Register. CHW plans to avoid this site. Impacts to cultural resources will be minimized through avoidance and compliance with Federal protection requirements. If unexpected resources are discovered during construction, activities will cease in the area of the discovery and the proposed Project will consult with the SHPO. The proposed Project commits to supporting Western with completion of consultation under Section 106 of the National Historic Preservation Act.

Land Use, Recreation and Transportation. Most impacts to land use, transportation and recreation due to the proposed Project would be short term and minor. However, some land use impacts (i.e., recreation in the form of hunting) may be long term and minor.

The proposed Project would result in the initial disturbance of approximately 36.6 hectares (73.5 acres) and life-of-Project disturbance of 2.8 hectares (6.8 acres). Land use within the proposed Project area is primarily undeveloped with uses such as agricultural, grazing, native prairies and CRP land. There is limited residential development in the proposed Project area. These existing land uses would continue as they currently exist, with only minor long term impacts. There would be minor loss of land use under permanent structures and roads affecting grazing. Agriculture activities would potentially be more difficult around towers and minor loss of CRP land and prairie would occur.

There is no state or National Parks, Wild and Scenic rivers or other areas of recreational, scenic or aesthetic importance in the proposed Project area.

All recreational land uses would continue, with the exception of hunting, which would be precluded in the vicinity of wind turbines due to the potential for damage to transformers and other electrical facilities from ammunition fired during hunting. This may have a minor effect on a landowner's income, as well as the recreational use of the area by hunters; however, the income impacts would be more than offset by the rent paid by CHW to the landowners. The reduction in hunting opportunity would be minor.

Traffic would increase on the roads leading to and within the proposed Project area during the construction stage as equipment and materials are transported into the area. Large pieces of equipment such as rotor blades that are oversized loads may temporarily slow traffic on some county roads as they are moved into the proposed Project area. This additional heavy traffic would also cause additional wear on existing roads, but transportation would be conducted in accordance with Colorado Department of Transportation and Logan County regulations and therefore adverse impacts to roads are not anticipated. The increase in traffic would not cause a major change in the transportation network in the proposed Project area.

Public Health and Safety. Public access to private lands is already restricted by landowners and would continue to be restricted in accordance with easement agreements. Public access to State lands would continue except in the immediate vicinity of the wind turbines to prohibit members of the general public from accessing the wind farm facility for their safety. During construction, the proposed Project would result in short term and minor impacts to public health and safety due to the intermittent presence of construction crews and vehicles and associated increased traffic. All contractors, subcontractors and their personnel are required to comply with all state and Federal worker safety requirements, specifically all of the applicable requirements of the Occupational Safety and Health Administration (OSHA).

Access to the proposed Project area is via the County Road system from State and Interstate Highways. Traffic in the area of the proposed Project is primarily local residents. Traffic accidents and interference with local school buses or emergency vehicles are not anticipated since the County roads in the proposed Project area are not heavily used as a result of the sparse population in the general area. Local aircraft or radar or television signals within the area can be impacted by EMF produced by electrical equipment; however, the proposed Project is not located in the vicinity of a local or regional airport or a military air base. In the event that the proposed Project impacts radar, microwave, television or radio transmissions, CHW would work with the owner of the impacted communication system to resolve any problem.

Noise. Construction noise would exceed ambient noise levels and may be heard for some distance within the proposed Project area. Truck traffic, heavy equipment and possibly foundation excavation (or the unlikely possibility of blasting) would cause elevated noise levels at and near construction sites.

The nearest residence is over 305 meters (1,000 feet) to the closest turbine (Turbine 68) and the closest active raptor nest is approximately one mile to the closest turbine (Turbine 62). Consequently, wind turbine noise levels would be on the order of 40 A-weighted decibels (dBA), similar to rural night-time ambient noise levels. Generally, the sound of the wind will mask turbine noise, especially since turbines only operate when wind speeds reach a certain threshold.

CHW would use state-of-the-art turbines that have been designed to minimize noise levels (e.g., upwind rotors, thinner blade tips, streamlined towers and nacelles). Wind turbine noise would be at or below ambient levels at the nearest residences. Due to the temporary and intermittent nature of noise effects and the presence of similar noise sources within the proposed Project area, noise impacts to residents and wildlife would be minor.

Visual Resources. The proposed Project will be visible from U.S. Hwy 6 and from County Roads. The proposed Project would not impact any national or state parks or designated scenic areas with recognized regionally important viewsheds. Northeastern Colorado is home to numerous wind turbines and the visual elements of the proposed Project area are quite common, with over 600 wind turbines in Logan County already. The access roads, vehicles, and dust during construction would temporarily impact visual resources. Electrical connections within the proposed Project area (from the individual turbines to the Collector Substation) would be placed underground and would not result in an adverse effect on visual resources. The construction of an additional 3.5 miles of access roads would constitute a minor increase in the number of roads (County and private) in the proposed Project area.

Socioeconomics/Minority and Low Income Populations. No new community or county infrastructure would be required to support the proposed Project construction or operations. The proposed Project would generate sales and use taxes for goods and services purchased during construction and operation. Logan County will also receive increased property taxes from CHW. The proposed Project would employ an estimated 100 workers during construction and will create possibly one additional permanent O&M job. All of these impacts would be beneficial to the affected towns/cities, to Logan County and to the state of Colorado. Logan County and the Town of Fleming are low income communities in the area of potential effect, but the proposed Project is expected to generate revenue needed by the County and the town. No adverse effects to low income communities would occur. Furthermore, the proposed Project would generate revenue for the private landowners on whose land the proposed Project is located, benefiting the area's economy.

Cumulative Impacts. Cumulative impacts are expected to be absent or minor.

Unavoidable Adverse Effects. Unavoidable adverse effects – residual impacts that likely would remain after mitigation – would include:

- The consumption of fossil fuels and water and labor and materials would be expended during construction and to a much lesser extent, during operation (e.g., fuel for O&M vehicles, energy to heat O&M building). Some damage to, or illegal collection of, paleontological or cultural resources may occur during construction.
- Up to 29.7 hectares (73.5 acres) of soil and vegetation disturbance would occur, resulting in some soil loss and some drainage sedimentation, until surface disturbed areas are successfully reclaimed (26.9 hectares [66.7 acres]). Up to 2.8 hectares (6.8 acres) of vegetation would be lost for the life-of-Project.
- Some additional emissions of fugitive dust, sulfur dioxide, nitrogen oxides, carbon monoxide, carbon dioxide and volatile organic compounds would occur, mostly during construction of the proposed Project.

- Some wildlife mortality could occur during construction (e.g. vehicle related accidents) and during operation.

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The above Appendices may be viewed online at: <http://go.usa.gov/yKRW> (please note the required capitalization)

LIST OF ACRONYMS AND ABBREVIATIONS

ATV	All-terrain vehicle
AWEA	American Wind Energy Association
BLM	Bureau of Land Management
BO	Biological Opinion
C.F.R.	<i>Code of Federal Regulations</i>
CAA	Clean Air Act
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health and Environment
CEQ	Council on Environmental Quality
CGS	Colorado Geological Society
CHW	Colorado Highlands Wind
CNDIS	Colorado Natural Diversity Information Source
CNHP	Colorado Natural Heritage Program
CO	Carbon Monoxide
Corps	U.S. Army Corps of Engineers
CPW	Colorado Parks and Wildlife (formerly CDOW - Colorado Division of Wildlife)
CRP	Conservation Reserve Program
CU	Colorado University
CWA	Clean Water Act
dBA	Decibels
dBuV/m	Decibels above one microvolt per meter
DMNH	Denver Museum of Natural History
DMNS	Denver Museum of Nature & Science
DOE	Department of Energy
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Association
FONSI	Findings of No Significant Impact
FR	<i>Federal Regulations</i>
GIS	Geographical Information Systems
GLO	General Land Office
GMU	Game Management Unit
gpm	Gallons per minute
GPS	Global positioning system
kV	Kilovolt(s)
kV/m	Kilovolts per meter
MBTA	Migratory Bird Treaty Act
mph	Miles per hour
MVA	Megavoltampere (line capacity)

MW	Megawatt(s)
NAAQS	National Ambient Air Quality Standards
NEPA	<i>National Environmental Policy Act</i>
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
NRHP	National Register of Historic Places
NWCC	National Wind Coordinating Committee
NWI	National Wetlands Inventory
OAHP	Office of Archaeology and Historic Preservation
O&M	Operations and Maintenance
OSHA	Occupational Safety and Health Administration
REA	Rural Electric Association
RMP	Resource Management Plan
ROW	Right of Way
RV	Recreational Vehicle
SCS	Soil Conservation Service
SDWA	Safe Drinking Water Act
SEO	Colorado State Engineers Office
SHPO	State Historic Preservation Office
SPCC	Spill Prevention, Control and Countermeasures Plan
SR	State Route or State Highway
SWA	State Wildlife Area
SWMP	Storm Water Management Plan
T&E	Threatened and endangered
TCP	Traditional Cultural Property
TEP or C	Threatened, endangered, proposed, or candidate
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
V	Volt(s)
VRM	Visual Resources Management
WAPA	Western Area Power Administration
WECC	Western Electricity Coordinating Council
WEP	Wind Energy Prototypes
Western	Western Area Power Administration
WRCC	Western Regional Climate Center
WSA	Wilderness Study Area

1. INTRODUCTION

1.1 Background

Colorado Highlands Wind, LLC (CHW) submitted an interconnection request to the U.S. Department of Energy (DOE), Western Area Power Administration (Western), to interconnect the existing 90 MW Colorado Highlands Wind project to Western's existing Sterling-Frenchman Creek 115-kV transmission line. An EA (DOE/EA-1611) was prepared in 2008 that identified and analyzed the consequences of Western's proposed action for the original wind project. It analyzed the impacts on the human and natural environment and established mitigation strategies for potential adverse effects. Based on that analyses, Western prepared a Mitigation Action Plan (MAP) dated January 19, 2009, and issued a Finding of No Significant Impact (FONSI) for the 90 MW project on February 2, 2009.

The original project constructed in 2012 was smaller than originally intended and included only 42 WTGs with a 67.2 MW nameplate capacity on 4,000 acres. In 2013, CHW expanded the wind resource generation project through an additional 14 WTGs to increase the nameplate capacity to 91 MW (capable of delivering only the previously approved 90 MW).

1.2 Purpose and Need

1.2.1 Western's Purpose and Need

CHW requests to modify their existing Agreement to increase the generation allowed onto the transmission system at Western's Wildhorse Creek Switching Station.

Western's purpose and need is to consider and respond to the request to modify the Agreement in accordance with its Tariff and the Federal Power Act.

Under the Tariff, Western offers capacity on its transmission system to deliver electricity when capacity is available. The Tariff also contains terms for processing requests for the interconnection of generation facilities to Western's transmission system. In reviewing agreement modifications, Western must ensure that existing reliability and service is not degraded. Western's Tariff provides for transmission and system studies to ensure that system reliability and service to existing customers are not adversely affected by new or modified interconnections. These studies also identify system upgrades or additions necessary to accommodate the proposed Project and/or agreement modifications and address whether the upgrades/additions are within the project scope.

1.2.2 CHW Purpose and Need

The primary purpose of the proposed Project is to provide additional wind-generated electricity in response to recent legislative mandates in the State of Colorado for rural areas to increase their supplies of renewable energy, as well as to meet customer demand for competitively priced energy from renewable resources. In addition, the proposed Project furthers the objectives of the President's National Energy Policy to diversify energy sources by making greater use of non-hydroelectric renewable sources such as wind power (National Energy Policy Development Group 2001).

1.3 Public Scoping

During the proposed Project planning, CHW notified stakeholders of the proposed Project and solicited information on their concerns. Every landowner was personally contacted about the proposed Project and CHW entered into Option Agreements for easements with landowners in the proposed Project Area for the purposes of construction and operation of the wind turbines.

On March 25, 2014, Western issued a Determination to Prepare a Supplemental Environmental Assessment for the Project and posted the memorandum to the Western website: <http://go.usa.gov/yKRW> (please note the required capitalization)

Western sent notices on April 23, 2014 to Federal and State agencies announcing Western's decision to prepare a Supplemental Environmental Assessment, to request comments on Western's proposal to approve the interconnection modification request and on the proposed Project. The notice was also sent to local units of government and other agencies (Colorado State Lands Board, Colorado Energy Office and The Wildlife Society).

The CHW Project team coordinated with the Colorado Parks and Wildlife, U.S Fish and Wildlife Service, Colorado State Historic Preservation Office and Logan County during development of the proposed Project (see Section 5).

Consultation with Native American tribes occurred through written correspondence dated April 22, 2014 to the Rosebud Sioux Tribal Council, the Eastern Shoshone Tribe, the Northern Arapaho Tribe, the Ute Tribe, the Northern Cheyenne Tribe, the Oglala Lakota Nation, the Standing Rock Sioux, the Crow Tribe, and the Shoshone-Bannock Tribes.

CHW applied for a Conditional Use Permit for the proposed Project from Logan County in September of 2013. Two public meetings were held, one before the Logan County Planning Commission on October 22, 2013 and the second before the Logan County Commissioners on October 29, 2013. Comments were supportive of the proposed Project and the Conditional Use Permit was approved unanimously at both meetings (minutes of the two meetings are available from Logan County).

2 DESCRIPTION OF CHANGES TO FACILITY DESIGN AND OPERATION

Section 2.1 describes the modifications to the activities that would occur if Western approves the modification to the Interconnect Agreement between Western and CHW.

2.1 Western’s Proposed Action

Western proposes to modify the existing Agreement to increase the generation allowed onto the transmission system at Western’s Wildhorse Creek Switching Station.

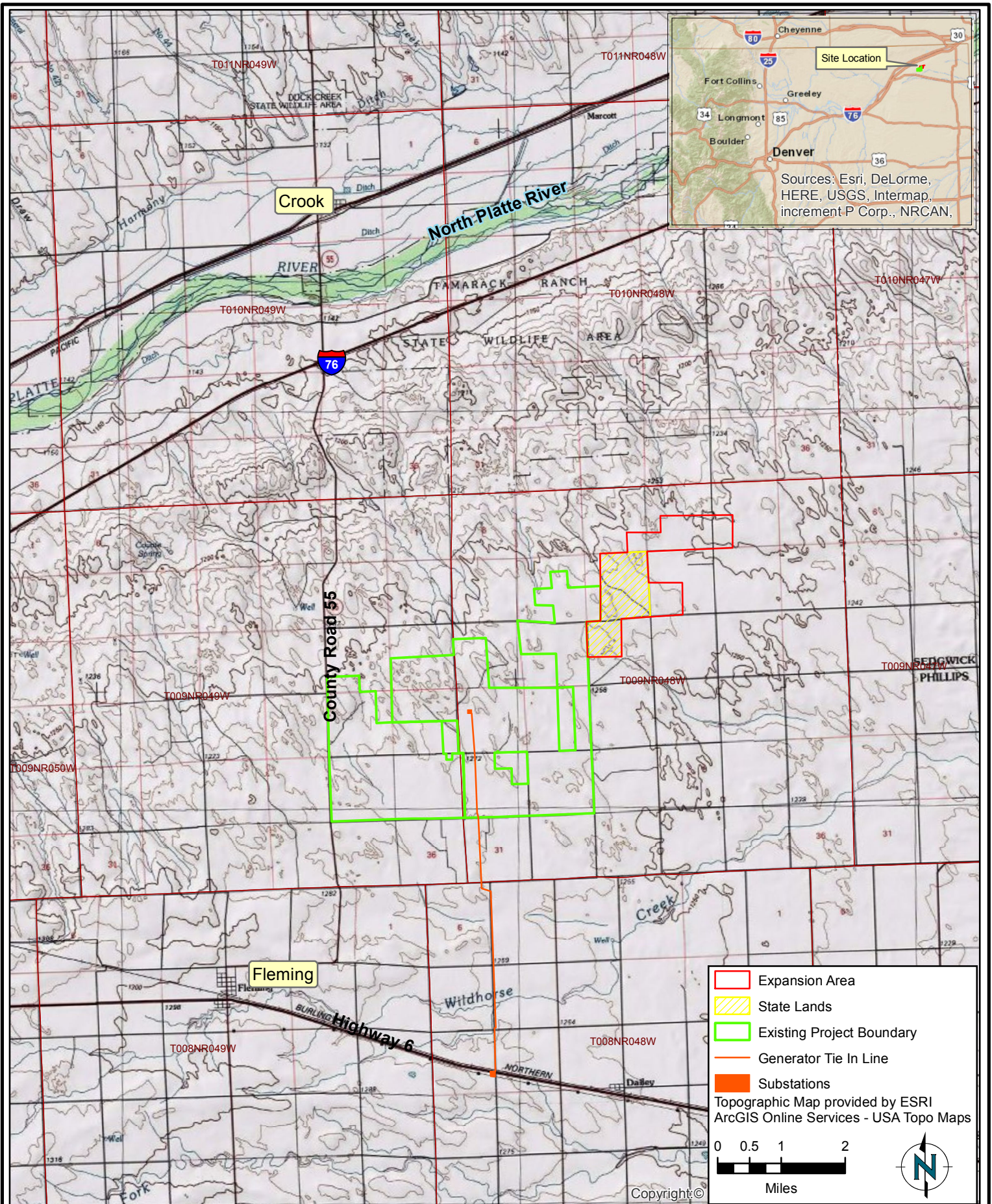
2.2 Description of the Proposed Project

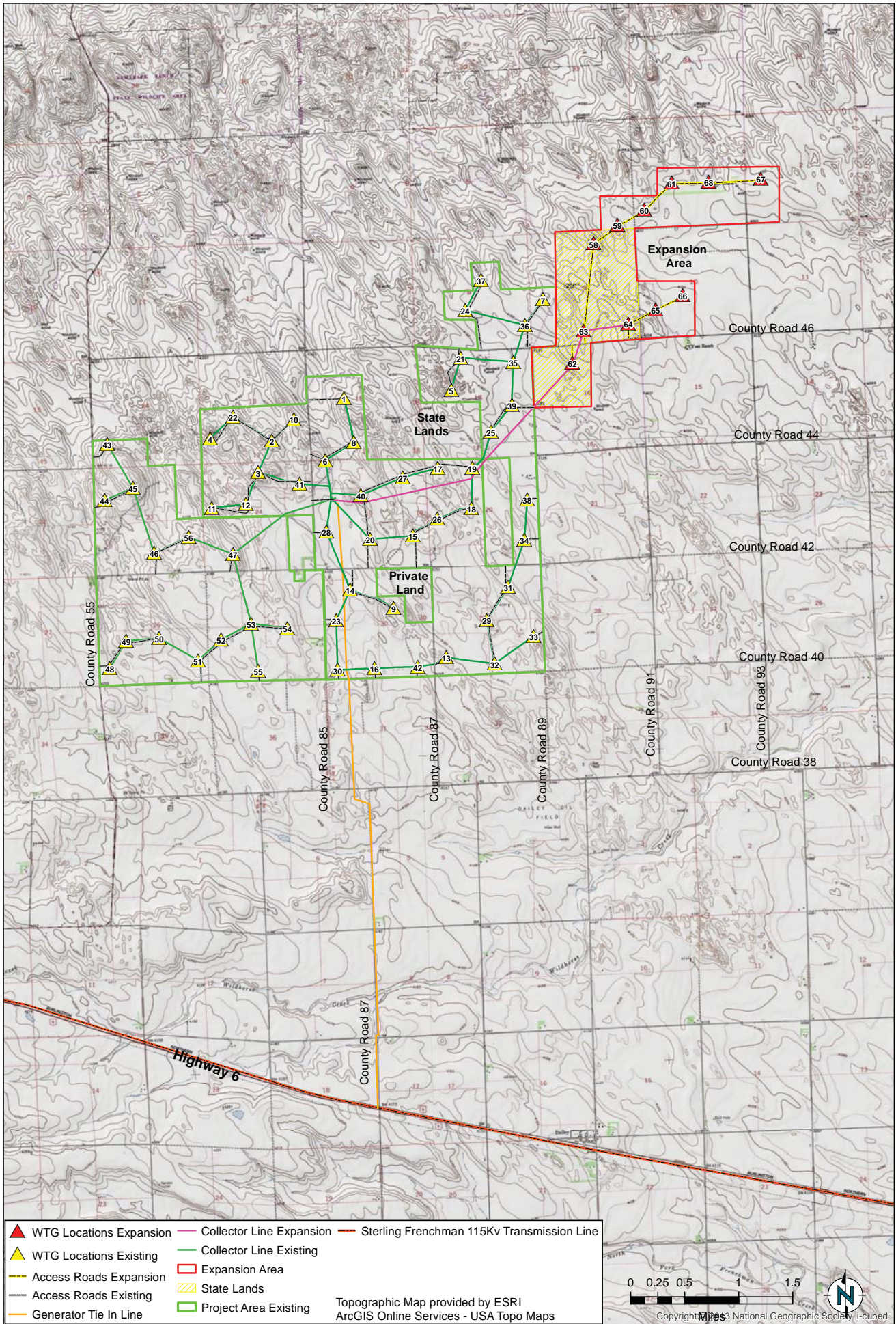
The proposed Project would include eleven (11) General Electric (GE) 1.79 megawatt (MW) wind turbine generators (WTGs). These additional WTGs, when considered with the exiting 56 WTGs, result in a total renewable energy generation nameplate capacity of 110.7 MW. Figure 2.1 provides the site location and Figure 2.1 illustrates the proposed distribution of towers in the proposed Project area. Table 2.1 summarizes the components of the proposed Project.

The existing wind farm includes a collector substation, a 115-kV generator tie-line, and an Operations and Maintenance facility. No additions or modifications would be necessary. Consequently, the proposed Project only includes the construction of 11 new WTGs and buried collector cables to transmit electricity from each WTG to the existing collector substation.

Table 2.1 Components of the Proposed Project

Attributes	Units	Proposed Project
Number of Turbines		11
Nameplate Capacity	MW	19.7
Turbine Model		GE 1.79-100
Rotor Diameter	meters	100
Rotor Rotation Speed	rpm	9.65 - 17.9
Tip Speed	m/s	84.2 – 86.0
Turbine Swept Area	m ²	7,854
Total Swept Area	m ²	86,394
WTG Noise Emissions (max)	dB	105
Hub Height	M	80
Tip Blade Height	M	130
Initial Surface Disturbance	Acre	73.5
Life of Project Disturbance	Acre	6.8





PROPOSED TURBINE, POWERLINES, SUBSTATIONS,
ROADS, AND GENERATOR TIE IN LINE
COLORADO HIGHLANDS WIND SITE, LOGAN COUNTY, COLORADO

Figure
2.2

The proposed Project footprint (i.e., the area to be disturbed during construction and throughout the 30-year life-of-Project) would be limited to the areas immediately adjacent to turbines, access roads, and other facilities (Table 2.2).

Table 2.2 Estimated Surface Disturbance Acreage

Disturbance Type	Initial Disturbance (acres)	Life-of-Project Disturbances (acres)
Turbine assembly areas/pads ¹	22	0.04
Turbine string corridors (collection line trenches and access roads) ²	18.9	6.0
Other access roads (outside turbine corridors) ³	1.75	0.8
Collection line trenches (outside turbine corridors) ⁴	20.8	0
Crane paths ⁵	0	0
Temporary Concrete Batching Plant/Laydown yard	10	0
TOTAL	73.5	6.84

¹ Assumes a 2 acre assembly area during construction and a 15 m (48 foot) octagonal foundation with only 5 m (15-foot) diameter foundation extending to grade; assumes 11 1.79 MW turbines.

² Assumes approximately 5 km (3.1 miles of corridors), approximately 15 m (50 ft) wide during construction, reclaimed to approximately 5 m (16 ft) wide for the life-of-Project.

³ Assumes conservatively that approximately 0.7 km (0.4 miles) of additional access roads outside of turbine corridors, approximately 10 m (35 ft) wide during construction, reclaimed to approximately 5 m (16 ft) wide for the life-of-Project.

⁴ Assumes approximately 5.7 km (3.5 miles), of collection line trenches outside of turbine corridors approximately 15 m (50 ft) wide during construction, reclaimed to existing ground surface.

⁵ Crane paths would not be constructed but would result from the overland passage of the large crane over the roads constructed for the proposed Project.

The proposed Project will be constructed in the same manner as the existing project. CHW proposes to implement Western’s standard construction, operation and maintenance practices, where applicable, to avoid and minimize impacts to the environment to the extent practicable (Table 2.2, DOE/EA-1611). These measures are part of CHW’s proposed Project and Western’s Proposed Action and are considered in this Supplemental EA’s impact analysis.

2.3 No Action Alternative

Under the No Action Alternative, Western would not modify the Interconnect Agreement with CHW and, for the purposes of this analysis, it is assumed the proposed Project would not be constructed and the environmental impacts associated with the proposed Project would not occur.

2.4 Applicant-committed Mitigation Measures

For the existing wind farm, CHW complied with the mitigation measures included in the 2008 FONSI and associated Mitigation Action Plan: <http://go.usa.gov/yKRW> (please note the required capitalization).

CHW proposes to implement the same mitigation measures to avoid, reduce or eliminate impacts related to the proposed Project. The mitigation measures are summarized below.

2.4.1 Fire Control

CHW would notify the appropriate landowners and the sheriff's office of any fires observed during construction. In the event of a fire, CHW or its contractors would initiate fire suppression actions in the work area. Suppression would continue until the fire is out or until the crew is relieved by an authorized representative of the landowner on whose land the fire occurred. Heavy equipment would not be used for fire suppression outside of the proposed Project area without prior approval of the landowner unless there is imminent danger to life or property. CHW or its contractors would be responsible for all costs associated with the suppression of fires and the rehabilitation of fire damage resulting from its operations.

CHW would designate a representative to be in charge of fire control during construction. The fire representative would ensure that each construction crew has appropriate types and amounts of firefighting tools and equipment, such as extinguishers, shovels, and axes available at all times. CHW would, at all times during construction and operation, require that satisfactory spark arresters be maintained on internal combustion engines.

2.4.2 Cultural Resources

A Class III cultural resource inventory has been completed on all lands within the proposed Project boundary that may be subjected to surface disturbance related to the proposed Project. CHW and its contractors would train their employees about Federal regulations relevant to protection of cultural resources.

If any cultural resources (prehistoric or historic site or object) are discovered by CHW or any person working on its behalf during construction, the discovery would be reported immediately to Western. All operations in the immediate vicinity of the discovery would be suspended at once, and the area would be secured with temporary fencing and/or flagging. Western would document and evaluate the discovery and would determine appropriate actions to be taken in order to prevent the loss of important cultural or scientific values. Western may consult with the Colorado State Historic Preservation Office (SHPO) to determine National Register of Historic Places eligibility or mitigation measures. CHW would be responsible for the cost of evaluation, and any decision as to proper mitigation measures would be made by Western after consulting with CHW. Operations in the vicinity of the discovery would not resume until written authorization to proceed has been received from Western.

2.4.3 Paleontological Resources

Construction personnel would be instructed about the types of fossils that may be encountered and the steps to take if fossils are discovered during construction. Instruction would stress the

nonrenewable nature of paleontological resources and that fossils are part of Colorado's prehistoric heritage and should be preserved for study. Any paleontological resource discovered during construction by CHW or any person working on its behalf would be immediately reported to Western. If paleontological resources are encountered, additional avoidance and mitigation measures are described in Section 3. While unlikely, if oversight is deemed necessary, monitors would also receive training in the identification of paleontological resources specific to the site.

2.4.4 Air Quality/Noise

All vehicles and construction equipment would be maintained to minimize exhaust emissions and would be properly muffled to minimize noise. Dust suppression using water or other approved material would be performed in disturbed areas, as required.

2.4.5 Vegetation

The following measures would be implemented to minimize impacts to vegetation.

- All surface-disturbed areas would be restored to the approximate original contour and reclaimed in accordance with the SWMP and landowner easement agreements.
- Procedures would be implemented to restore native prairie, including topsoil salvage and replacement.
- Removal or disturbance of vegetation would be minimized through site management to only that which is necessary for safe and efficient construction (e.g., by utilizing previously disturbed areas, designating limited equipment/materials storage yards and staging areas, and scalping) and reclaiming all disturbed areas not required for operations.

2.4.6 Noxious Weeds

The following measures would be implemented to minimize impacts due to noxious weeds.

- All disturbed areas would be reclaimed with a native seed mixture recommended by the NRCS, at the first practicable opportunity following disturbance in order to minimize the potential for noxious weed invasion.
- Weed-free seed mixtures and mulches would be utilized.
- Noxious weeds would be mechanically controlled if necessary in all surface-disturbed areas if determined to be a concern.
- If herbicides are needed to control weeds following reclamation, they would be applied by a licensed contractor in accordance with all applicable laws and requirements.
- Equipment would be washed at a commercial facility prior to being brought to the site and onsite during construction if weeds are encountered in the proposed Project area.

2.4.7 Streams, Wetlands and Floodplains

Section 404 of the Clean Water Act regulates the discharge of dredged or fill material into waters of the United States. The Corps of Engineers and the EPA regard the use of mechanized earth-moving equipment to conduct land clearing, ditching, channelization, in-stream mining or other earth-moving activity in the United States as resulting in a discharge of dredged material unless project-specific evidence shows that the activity results in only incidental fallback. No streams or wetlands are located within the proposed Project footprint area; only overland surface drainage features (sheet flow) are present. In addition, there are no critical action (100 year)

floodplains in the proposed Project area. To minimize impacts from construction activities, CHW would implement the following measures:

- Refueling and staging as well as the location of the temporary concrete batch plant would occur at least 30.5 m (100 feet) from any defined drainage feature.
- Sediment and erosion control measures would be utilized.
- Disturbance of vegetation would be limited to only that which is necessary for construction.

2.4.8 Soils

To minimize impacts to soils, the following measures would be implemented:

- Construction or routine maintenance would not be conducted when soil is too wet to adequately support construction equipment (i.e., if equipment creates excessive ruts).
- Silt fences, water bars, straw mulches (certified weed-free), hay bale barriers (certified weed-free), or other appropriate alternatives would be used to control soil erosion.
- Soil erosion control measures would be monitored, especially after storms, and would be repaired or replaced if needed.
- Surface disturbance would be limited to that which is necessary for safe and efficient construction.
- All disturbed areas would be restored to the approximate pre-construction conditions and restored in accordance with the SWMP and landowner easement agreements.
- Construction activities in areas of moderate to steep slopes would be avoided where possible.

2.4.9 Wildlife

The following measures would be implemented to minimize impacts to wildlife.

- CHW would adhere to Colorado Parks and Wildlife (CPW) and U.S. Fish and Wildlife Service (USFWS) guidance as agreed to in our letter to the CDOW dated July 18, 2008, letters received from both the CDOW and USFWS as provided in Appendix A of the EA and the numerous meetings and discussions held with staff from both agencies, as well as the Land-Based Wind Energy Guidelines (USFWS 2012).
- Surface occupancy (i.e. structures) and surface-disturbing activities would be prohibited as follows for the following species:
 - great horned owls - no surface occupancy within 402 m (0.25 mi) of nest; no construction within 805 m (0.5 mi) of nest from January 1 to July 15;
 - red-tailed hawk - no surface occupancy within 402 m (0.25 mi) of nest; no construction within 805 m (0.5 mi) of nest from February 15 to July 15;
 - Swainson's hawk - no surface occupancy within 402 m (0.25 mi) of nest; no construction within 805 m (0.5 mi) of nest from April 1 to July 15;
 - burrowing owl – no construction within 46 m (150 feet) of an active nest area from March 1 through October 31; and
 - greater prairie chicken lek – no surface structures or overhead construction within 805 m (0.5 mi) of lek.

- Additional mitigation for raptors would be designed on a site-specific basis, as necessary, in consultation with the USFWS and CPW. CHW would notify the USFWS or CPW immediately if raptors are found nesting on proposed Project facilities (i.e., power poles, towers).
- CHW would minimize noise, prohibit hunting, fishing, dogs, or possession of firearms by its employees and its designated contractor(s) in the proposed Project area during construction, operation, and maintenance.
- Surface disturbance would be avoided or minimized in areas of high wildlife value (e.g., prairie dog colonies, playas, shelterbelts, and stock ponds).
- Potential increases in poaching would be minimized through employee and contractor education regarding wildlife laws. If violations are discovered, the offending employee or contractor would be disciplined and may be dismissed by CHW and/or prosecuted by the CPW.
- CHW would set and enforce speed limits on roads to minimize wildlife mortality due to vehicle collisions, travel would be restricted to designated roads; no off-road travel would be allowed except in emergencies.
- CHW is using state-of-the-art wind turbines and wind industry standard practices.
- CHW would conduct raptor nest searches and avoid activities in buffer areas around active nests. The raptor nest searches would be conducted monthly in March, and every two weeks from April through July. These searches coincide with other ongoing surveys (greater prairie chicken and spring avian surveys, etc.). Preconstruction nest surveys will also be performed.
- CHW would minimize surface disturbance and conduct prompt reclamation, including restoration of shortgrass prairie.
- CHW would use best management practices to minimize erosion and harm from spills.
- CHW would conduct post-construction mortality monitoring (for both avian and bat species) in accordance with Land-Based Wind Energy Guidelines (USFWS 2012).

If other species are found nesting in the proposed Project area, CPW or USFWS recommended standard buffer would be applied unless otherwise approved by these agencies. The buffer distance and restriction dates may vary on a case-by-case basis as determined by the USFWS or CPW, depending on such factors as the activity status of the nest, species involved, natural topographic barriers, line-of-sight distances, and other conflicting issues such as cultural values. Exceptions may be granted in writing by the USFWS and/or CPW.

2.4.10 Federally Listed Threatened, Endangered, Proposed and Candidate Species and State-listed Threatened and Endangered Species

If Federal- and state-listed threatened, endangered, proposed, or candidate (TEP or C) species are encountered, the following measures would be implemented to minimize impacts to raptors and other TEP or C species or sensitive wildlife species.

- CHW would minimize surface disturbance and conduct prompt reclamation, including restoration of shortgrass prairie and use of best management practices to minimize erosion and harm from any spills that occur.
- CHW would minimize noise, and prohibit hunting, dogs, and possession of firearms by employees.

- CHW would set and enforce speed limits, and limit traffic to designated roads.
- Western encourages CHW to work closely with USFWS and CPW in determining additional mitigation activities related to TEP or C species, and their habitats.
- Raptor nest surveys have been conducted in the proposed Project area and identified raptor nests within a mile of the proposed Project boundary. Confirmatory raptor nest surveys will be conducted within a 1.6 km (1.0-mi) radius of proposed construction areas prior to construction to confirm raptor nest location activity status and species prior to construction as well as during the raptor nesting season (January 1 through July 31). A raptor nest survey is planned for spring 2014 prior to construction activities.

2.4.11 Sanitation

Good housekeeping practices would be utilized at all times and the construction site would be maintained in a sanitary condition. Waste materials (e.g., human waste, trash, garbage) would be disposed of promptly at an appropriate permitted waste disposal site. CHW and its contractors would prohibit littering in the proposed Project area.

2.4.12 Existing Utilities

CHW would notify other authorized easement users of any structures planned near existing utilities. Care would be taken, including hand/shovel excavation/air knife, etc. where appropriate, for all construction work that is located in the vicinity of existing subsurface utilities (e.g., pipelines, cables, power lines).

2.4.13 Ditches and Culverts

If encountered, all irrigation, overflow and roadway ditches; lead-offs from culverts or cut sections; and lead-in ditches that are intersected or crossed by the proposed Project construction activities would be cleared of any material that may obstruct water flow. Work would be accomplished so that reasonable conformance to the previous line, grade, and cross section is achieved. If any culverts clog due to proposed Project activities, the culvert would be cleaned to provide an unobstructed flow to and through the culvert. Any loose material on the backslope adjacent to the entrance of culverts would be removed.

2.4.14 Litter

Contractors and other consultants working on the site would be instructed to maintain good housekeeping practices and would be informed that any littering in the proposed Project area would not be tolerated and repeated infractions may result in their dismissal. Construction vehicles would be equipped with litter disposal containers. Garbage and other refuse would be disposed of at authorized disposal sites or permitted landfills. Construction sites would be maintained in a sanitary condition at all times.

2.4.15 Stormwater Management Plan

Stormwater Management Plans (SWMPs) are required for any construction project with land disturbance of one acre or more. A construction SWMP would be prepared to ensure that erosion is minimized during storm events and it would be kept on site at all times, as well as in the construction contractor's offices. Routine inspections as mandated in the SWMP would be performed in accordance with the requirements of Logan County and the State of Colorado.

2.4.16 Traffic and Public Safety

Construction and operation are not expected to cause safety hazards or to inconvenience motorists or other adjacent users because construction-related traffic would be restricted to existing roads and routes constructed on private land. Temporary use permits for access to interstate, state and county roads would be obtained prior to construction

2.5 Summary of Potential Environmental Impacts and Mitigation Measures

Table 2.3 presents a summary of potential environmental impacts and mitigation measures for the Proposed Action and the No Action Alternative. A detailed analysis of proposed Project impacts and mitigation measures is provided in Chapter 3.

Table 2.3 Summary of Environmental Consequences

Resource	Possible Impacts from Proposed Action	Possible Impacts from No Action Alternative	Mitigation (includes mitigation measures discussed in Chapters 2.0 and 4.0)
Climate and Air Quality	Climate would not be impacted; temporary increases in fugitive dust during construction; long-term minor increases in fugitive dust during O&M; beneficial impacts to air quality from generating electricity from a non-polluting resource	Loss of beneficial impacts to air quality from generating electricity from a non-polluting resource	Dust suppression during construction; proper maintenance of construction equipment; perform site restoration and reclamation
Geology	No impacts to physiography; some direct long term changes in topography due to cuts and fills; negligible impacts to stream channels as none are located in immediate vicinity of the site; no impacts to geologic or mineral resources	No impacts to physiography, topography, stream channels, geologic hazards or mineral resources	Avoid steep slopes; perform site restoration and reclamation
Paleontology	Possible inadvertent destruction of fossils during construction	No impacts	Preconstruction survey for fossils; if a fossil site is discovered, halt construction and evaluate for significance; determine mitigation as appropriate; employee education.

Table 2.3 Summary of Environmental Consequences

Resource	Possible Impacts from Proposed Action	Possible Impacts from No Action Alternative	Mitigation (includes mitigation measures discussed in Chapters 2.0 and 4.0)
Soils	Temporary disturbance of 29.7 hectares (73.5 acres); life-of-Project disturbance of 2.8 hectares (6.8 acres); minor short term erosion and soil compaction	No impacts	Avoid areas with high erosion potential where feasible; avoid activities when soils are too wet to support equipment; use of weed-free mulches, straw bales, silt fences and water bars to control erosion; design and construct proposed Project roads properly; minimize disturbance; implement soil erosion best management practices until sites are permanently reclaimed; prompt stabilization and reclamation
Water Resources	Some increased runoff and sediment would likely reach local drainages; accidental spills may occur; construction consumption of water; negligible impacts to stream channels as none are located in immediate vicinity of site	No impacts	Avoid erosion prone areas; stabilize and reclaim promptly; appropriate road and turbine location design and maintenance; locating the concrete batch plant and refueling and staging areas at least 30.5 m (100 ft) from drainage features; utilize sediment control measures; adhere to SWMPs and SPCC Plans
Floodplains and wetlands	No impacts	No impacts	No mitigation is warranted
Vegetation including Noxious Weeds	Initial disturbance of 29.7 hectares (73.5 acres) of vegetation; life-of-Project disturbance of 2.8 hectares (6.8 acres); potential for spread of non-native invasive species on surface disturbed areas	No impacts	Minimize surface disturbance; manage construction sites; control noxious weeds; use weed-free seed mixtures and mulches; revegetate with native, adapted species; implement procedures to restore native prairie, including topsoil salvage and replacement

Table 2.3 Summary of Environmental Consequences

Resource	Possible Impacts from Proposed Action	Possible Impacts from No Action Alternative	Mitigation (includes mitigation measures discussed in Chapters 2.0 and 4.0)
Wildlife and fisheries	Direct effects from collision-related mortality or electrocution; direct and indirect effects from 29.7 hectares (73.5 acres) of temporary and 2.8 hectares (6.8 acres) of life-of-Project habitat loss; temporary displacement during construction; long-term displacement during operations; potential loss of breeding, nesting, and brood-rearing habitat; habitat fragmentation; inadvertent destruction of grassland bird nests; potential reduction in breeding and brood rearing success; no impacts to fisheries	No impacts	As with the existing wind farm, CHW plans to adhere to CPW and USFWS guidelines, as described in the July 18, 2008 letter and Land-Based Wind Energy Guidelines (USFWS 2012) for the proposed Project; use state of the art wind turbine generators and wind industry standard practices; minimize noise; prohibit hunting, dogs and possession of firearms by employees; set and enforce speed limits; limit traffic to designated roads; conduct confirmatory raptor nest search and avoid activities in buffer around active nests; minimize surface disturbance; prompt reclamation including restoration of shortgrass prairie; use best management practices to minimize erosion and harm from spills
Special Status and Sensitive Species	Minor impacts to state-listed species; direct effects from collision-related mortality or electrocution; direct and indirect effects from 29.7 hectares (73.5 acres) of temporary and 2.8 hectares (6.8 acres) of life-of-Project habitat loss; temporary displacement during construction; long-term displacement during operations; potential loss of breeding, nesting, and brood-rearing habitat; habitat fragmentation; inadvertent destruction of grassland bird nests; potential reduction in breeding and brood-rearing success.	No impacts	Adhere to CPW and USFWS guidelines, as described in the July 18, 2008 letter and Land-Based Wind Energy Guidelines (USFWS 2012); use state-of-the-art turbines and wind industry standard practices; minimize noise; prohibit hunting, dogs, and possession of firearms by employees; set and enforce speed limits; limit traffic to designated roads; conduct confirmatory raptor nest searches prior to construction and avoid activities in buffer around active nests; minimize surface disturbance; prompt reclamation, including restoration of shortgrass prairie; best management practices to minimize erosion and harm from spills.

Table 2.3 Summary of Environmental Consequences

Resource	Possible Impacts from Proposed Action	Possible Impacts from No Action Alternative	Mitigation (includes mitigation measures discussed in Chapters 2.0 and 4.0)
Cultural Resources	Some unidentified sites and artifacts may be disturbed or destroyed; beneficial impacts if important cultural sites are discovered and recorded during construction	No impacts; potential loss of beneficial impacts	If a site is discovered, halt construction and evaluate for eligibility to National Register of Historical Places; determine treatment as appropriate; employee education
Land Use, Transportation, and Recreation	No change in land ownership; loss of about 2.8 hectares (6.8 acres) of life-of-Project cropland, rangeland, grazing land, wildlife habitat and recreation; increased traffic and increased wear-and-tear on existing roads; beneficial additional land use of generating electricity from a renewable resource	No impacts	Project-related traffic yields to emergency vehicles; repair roads that are impacted by the proposed Project activities; avoid heavy traffic when roads are too wet to support traffic without creating ruts greater than 4-inches deep
Noise	Temporary short-term construction related increases in noise; long-term turbine and substation noise and noise from O&M traffic	No impacts	Properly muffle all construction equipment; use state-of-the-art wind turbine generators to reduce noise emissions; avoid noise sensitive areas at critical times
Visual Resources	Change in landscape due to presence of tall towers and rotating blades and flashing lights; presence of substation and proposed Project roads	No impacts	Adhere to FAA lighting requirements including but not limited to nighttime lighting and no lights during the day
Socioeconomics	Temporary beneficial economic impacts to local and state economies during construction and operation; long term benefits due to increased employment and tax base; no environmental justice concerns; long-term royalty payments to landowners	Loss of beneficial impacts to local and state economies	Use local workers and contractors, where feasible; buy locally, where feasible
Hazardous Materials	Possible spills	No impacts	Implementation of appropriate spill prevention and control measures

Table 2.3 Summary of Environmental Consequences

Resource	Possible Impacts from Proposed Action	Possible Impacts from No Action Alternative	Mitigation (includes mitigation measures discussed in Chapters 2.0 and 4.0)
Public Health and Safety	No impacts anticipated	No impacts	Light turbines in accordance with FAA requirements; fence high voltage facilities; maintain proposed Project area in sanitary condition at all times; prohibit littering; set and enforce speed limits; extinguish fires unless dangerous to life or limb
Worker Health and Safety during Construction	Possible injuries during construction	No impacts	All qualified contractors, subcontractors and personnel required to follow all state and Federal regulations, specifically all requirements of OSHA, and ensure project-wide safety through activity-specific hazard assessments and Job Safety Assessments (JSAs)

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Descriptions of the natural, human and cultural environmental resources present in the proposed Project area are presented below by resource. For the purposes of this analysis, the proposed Project area for each resource includes all land within the proposed Project boundary as shown on Figure 2.1 unless noted otherwise. Direct and indirect impacts of the Proposed Action and the No Action Alternative are identified for each resource. Additional mitigation measures for specific affected resources in addition to the standard mitigation measures are discussed. Cumulative effects of the Project with other foreseeable past, present and future developments are addressed.

This chapter describes the affected environment and environmental consequences of the Proposed Action and proposed Project. Proposed Project impact areas are identified for resource topics to account for the areas that may be affected by the construction and operation of the proposed Project. Impacts are described according to whether the effects would be short-term or long-term, direct or indirect. Cumulative impacts of the Project with other foreseeable past, present, and future development in the overall region are discussed at the end of this chapter. Each of these types of impacts is briefly defined.

Direct Impacts. These impacts occur at the same time and the same place as the proposed Project. For example, soil compaction occurs during construction, and results directly from the activities occurring during the proposed Project implementation.

Indirect Impacts. These impacts are not a direct result of the proposed Project, but may occur away from the original source of impact or as a result of a complex pathway. Indirect impacts are often called secondary impacts because there is typically one step in between the original source and its impact. For example, construction of a power plant (direct impact) leads to declines in coniferous forest health (indirect impact) due to increased pollution deposition.

Short-Term Impacts. These are impacts that generally occur only during construction or for a limited time thereafter, generally not for longer than 1 or 2 years. For example, air quality impacts from the use of heavy equipment occur during construction and intermittently during routine maintenance.

Long-Term Impacts. These are impacts that are expected to occur for the life of the Project, or for more than two years after construction, dependent upon the resource. For example, a long-term impact to vegetation would include the removal of vegetation where a new structure is constructed, resulting in a long term loss of vegetation in that area.

Cumulative Impacts. These are the additive impacts to a resource by the proposed Project to impacts from other actions in the proposed Project area. For example, surface water quality degradation from the proposed Project, plus all other construction projects, land uses, and other activities in the proposed Project area, contributing to an incremental decrease in surface water quality.

3.1 Environmental Categories Evaluated and Eliminated from Further Analysis

This Supplemental EA describes the proposed Project and evaluates the potential impacts that could result from its implementation. Environmental factors for which the effects of the proposed Project are expected to be similar in extent or magnitude to those of the existing wind farm are not reiterated in this document. These resources include:

- Climate and Air Quality;
- Geology, Paleontology and Soils;
- Water Resources;
- Floodplains and Wetlands;
- Land Use, Transportation and Recreation;
- Public Health and Safety; and
- Socioeconomics and Environmental Justice

For these environmental factors, the detailed evaluations of these resources and mitigation measures are provided in the 2008 EA (DOE/EA-1611) which can be viewed online at: <http://go.usa.gov/yKRW> (please note the required capitalization)

The environmental factors with the potential to be affected differently by the proposed Project and analyzed in this document are discussed in detail below.

- Vegetation
- Wildlife
- Special Status and Sensitive Species
- Cultural Resources
- Noise
- Visual Resources

The site setting of the proposed Project is presented on Figure 3.1 (geologic map of surficial deposits), Figure 3.2 (soil survey), Figure 3.3 (site topography), Figure 3.4 (playa locations), Figure 3.5 (habitat areas), Figure 3.6 (raptor nest locations), and Figure 3.7 (highways).

3.2 Vegetation

3.2.1 Environmental Setting for the Proposed Project

Based on a habitat assessment conducted in September 2013 (Walsh, 2013), the proposed Project area is located in the Lower South Platte River watershed of the central short-grass prairie ecoregion of the United States (Hazlett 1998) and the southern portion of the Great Plains-Palouse Dry Steppe Province (Bailey 1995). The proposed Project area's rolling terrain is formed by a series of roughly east-west trending ridges separated by swaths of upland grasses and agricultural fields. A shift in plant species composition from areas dominated by sandsage to areas dominated by grasses is associated with shifts in topography from the sides and tops of ridges and the flat fields, respectively. Moisture regime is limited due to the rain shadow effect created by the Rocky Mountains (Hazlett 1998).

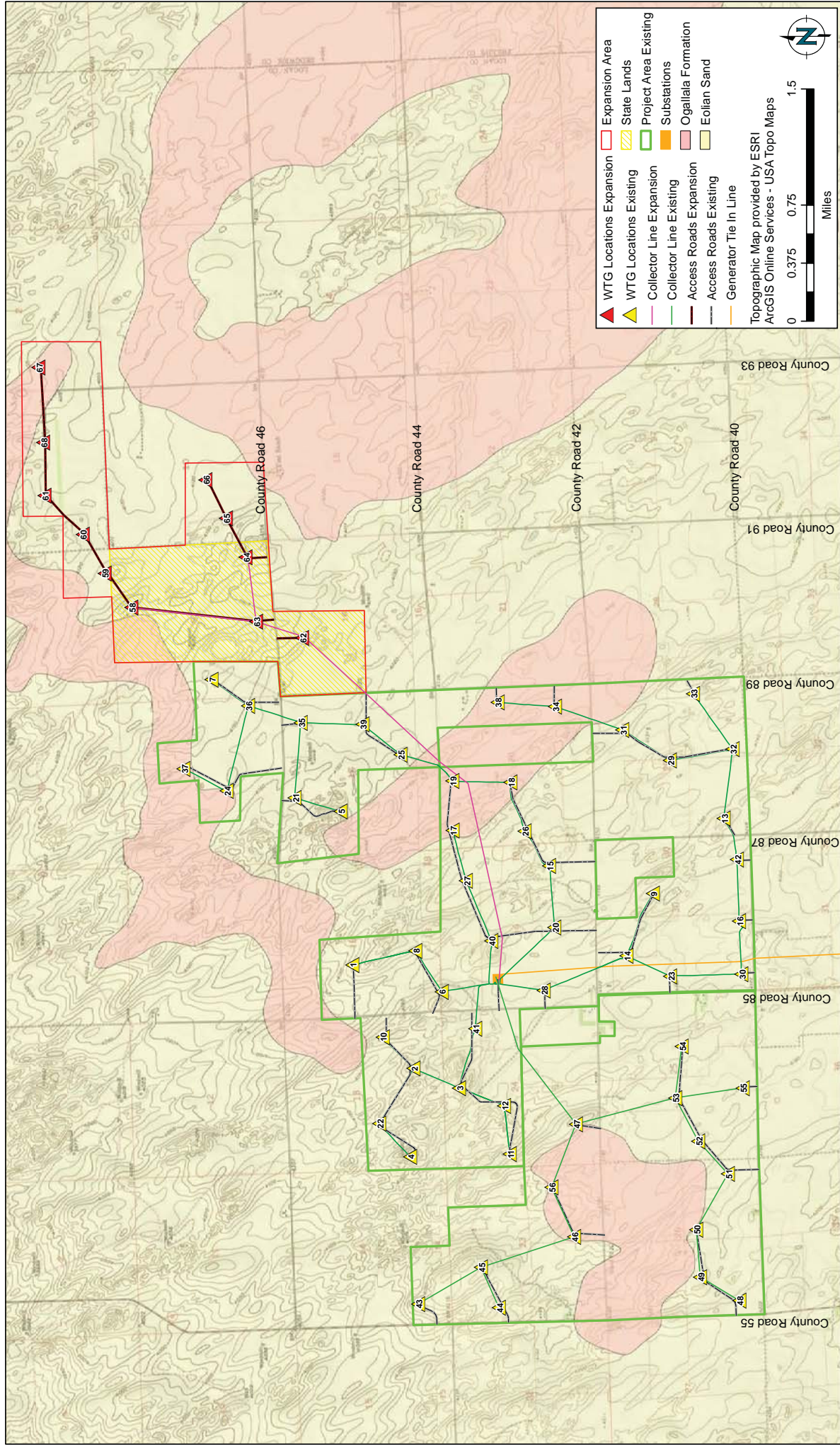


Figure 3.1
GEOLOGIC MAP OF SURFICIAL DEPOSITS MODIFIED FROM SCOTT (1978)
COLORADO HIGHLANDS WIND SITE, LOGAN COUNTY, COLORADO

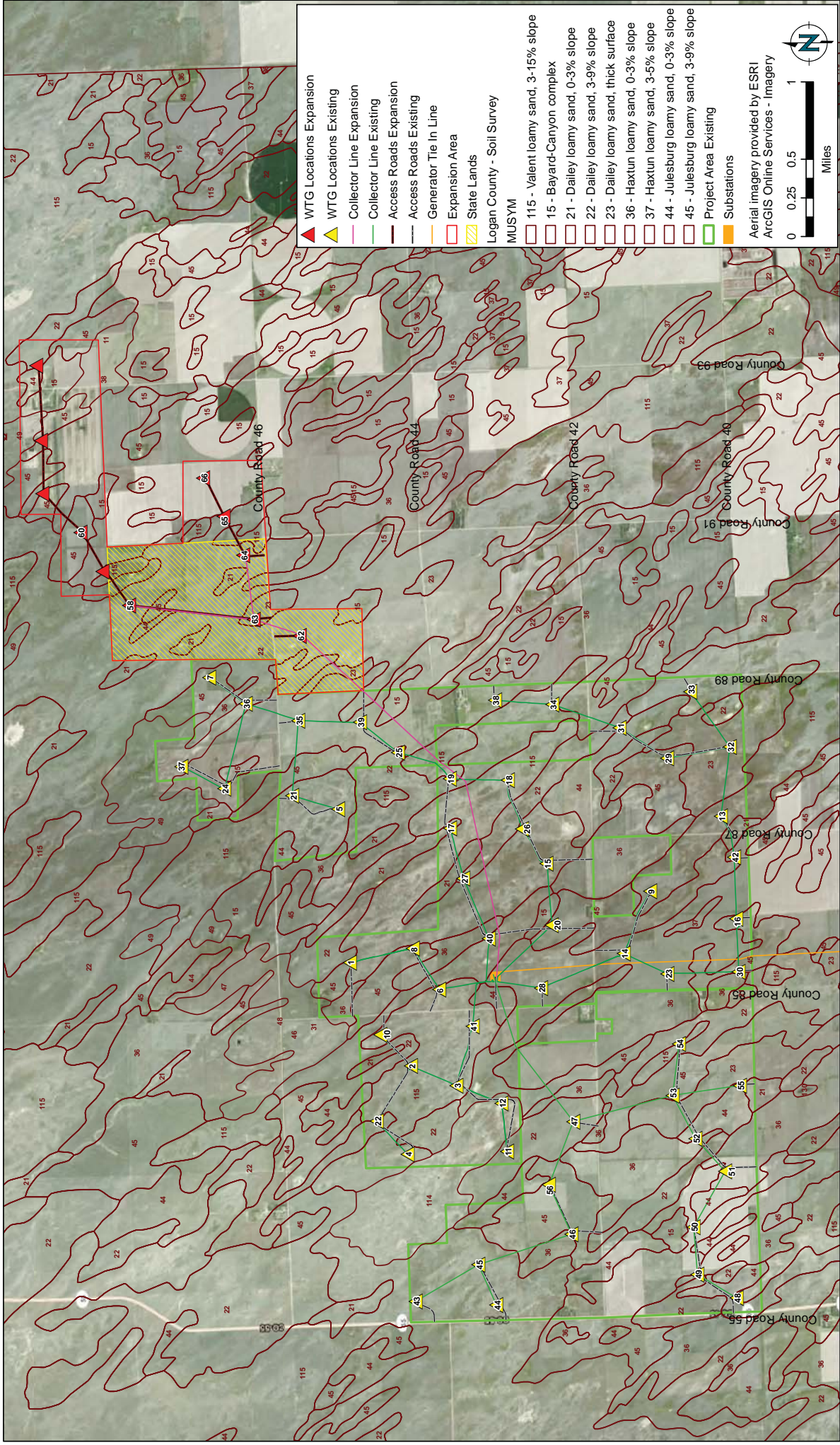


Figure 3.2

SOIL SURVEY
 COLORADO HIGHLANDS WIND SITE, LOGAN COUNTY, COLORADO



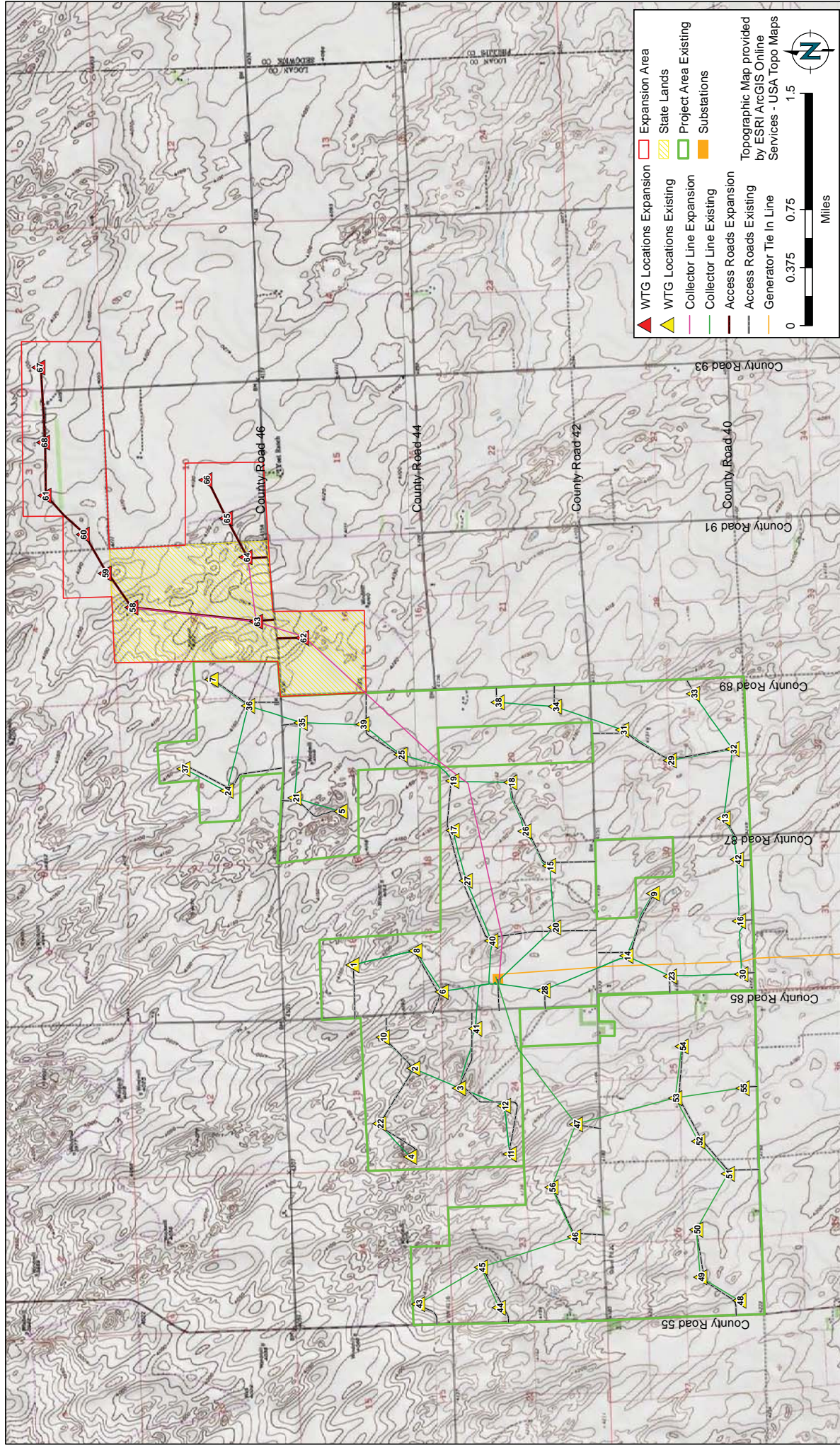
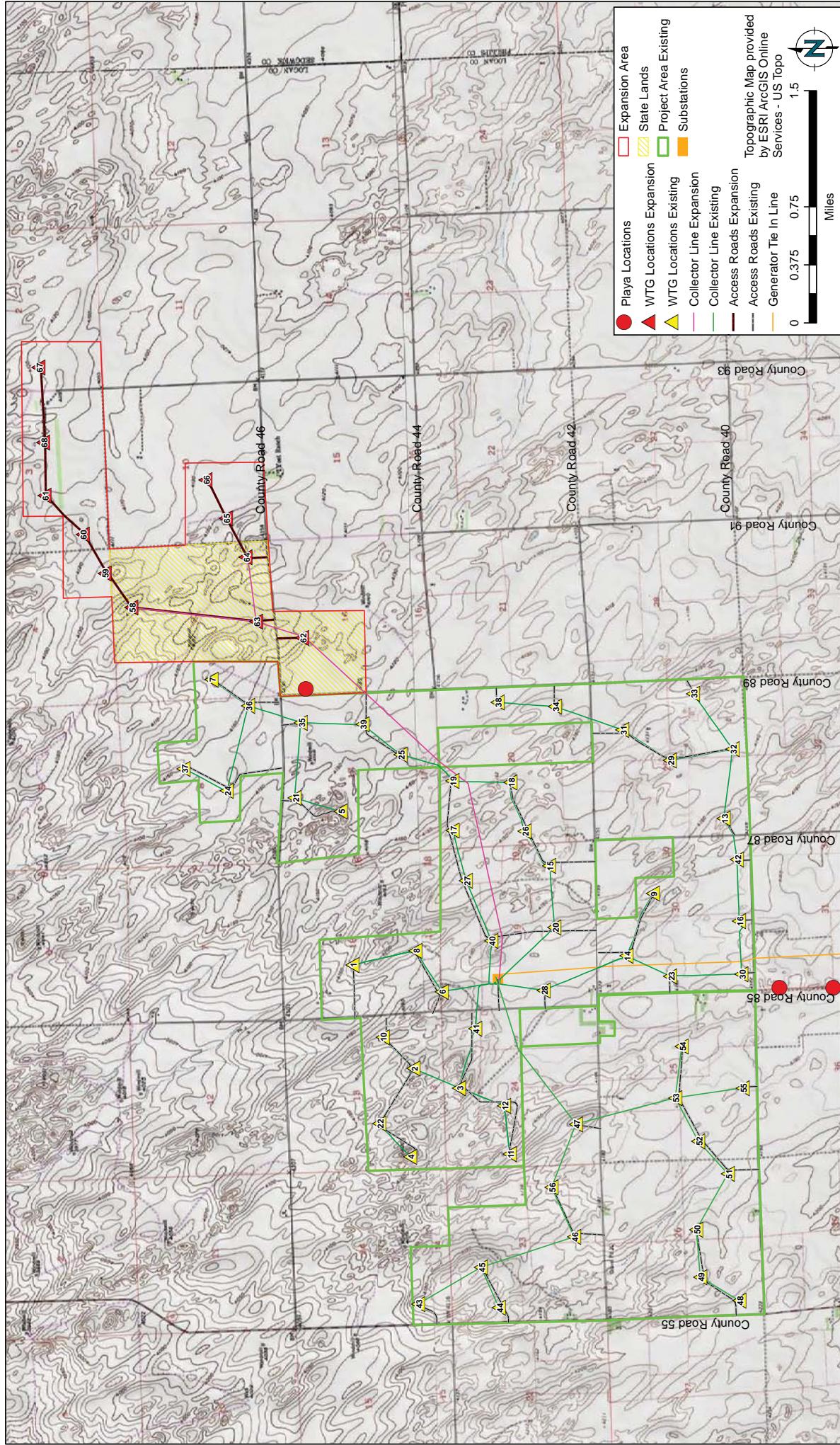


Figure 3.3

SITE TOPOGRAPHY
 COLORADO HIGHLANDS WIND SITE, LOGAN COUNTY, COLORADO





Figure

PLAYA LOCATIONS
 COLORADO HIGHLANDS WIND SITE, LOGAN COUNTY, COLORADO



Over the past 100 or more years since settlement, the landscape has shifted from intact short-grass prairie to pasture and agricultural lands with remnants of short-grass prairie in level, low-lying areas and remnants of sandsage prairie on ridges. Since 1986, much of eastern Colorado's lands have been enrolled in the Natural Resource Conservation Service's CRP program, which offers payments to farmers that remove land from annual crop production and plant back to native, perennial grassland communities to lessen erosion and water-quality problems on a long-term basis.

There are four major habitat types characterized in the proposed Project area: grassland, agricultural, CRP, and shelterbelt (Figure 3.5). These habitat types are described in more detail below. Developed lands were also mapped, but only constituted 0.6 acres (including residential structures) and consequently are not discussed further.

With the exception of cheatgrass, very few noxious weeds or introduced species occur on the proposed Project site. In areas of higher disturbance such as roadway edges and adjacent field edges, species diversity tends to be lower with smooth brome dominating. Areas with discontinued human activities, such as abandoned farmsteads, tend to have a greater diversity of weeds including cheatgrass, Russian-thistle, and purple mustard.

Grassland

Grassland makes up the majority of the habitat in the proposed Project area (60 percent). Grasslands are flat or gently rolling plains dominated by grass species with some forb and shrub species. The grassland communities are characterized by sand dropseed and sand sagebrush, as well as pasture lands.

Sand sagebrush is a dominant plant all along the fringes of the South Platte River, where it occurs in the sandy soils deposited there over time. Sandsage prairie is found primarily on ridges and occasionally in the low lying areas. In flatter areas, sandsage begins to co-occur with grasses including sand dropseed, switchgrass, and little bluestem. Pastures of grazed grasslands are characterized by open areas and short vegetation. Forbs are scarce but include purple prairie clover, chamomile, purple mustard, and alfalfa. Patches dominated by blue grama, sand dropseed, and buffalograss occur throughout and at the base of ridges. Blowout areas (sandy areas scoured clear of vegetation) occur in grassland habitat adjacent to the proposed Project area.

Historically, sandsage prairie on Colorado's eastern plains was dominated by sand sagebrush. Associated grass, forb, and shrub species included Indian ricegrass, sand dropseed, sand bluestem, prairie sandreed, blowout grass, little bluestem, lemon scurfpea, and rabbitbrush (EPA undated). Some yucca and skunkbrush shrubs were also observed.

Agricultural

Agricultural lands account for 38 percent of the proposed Project area. Agricultural habitat is characterized by open fields with flat or gently rolling topography, planted in crops such as corn or grains.

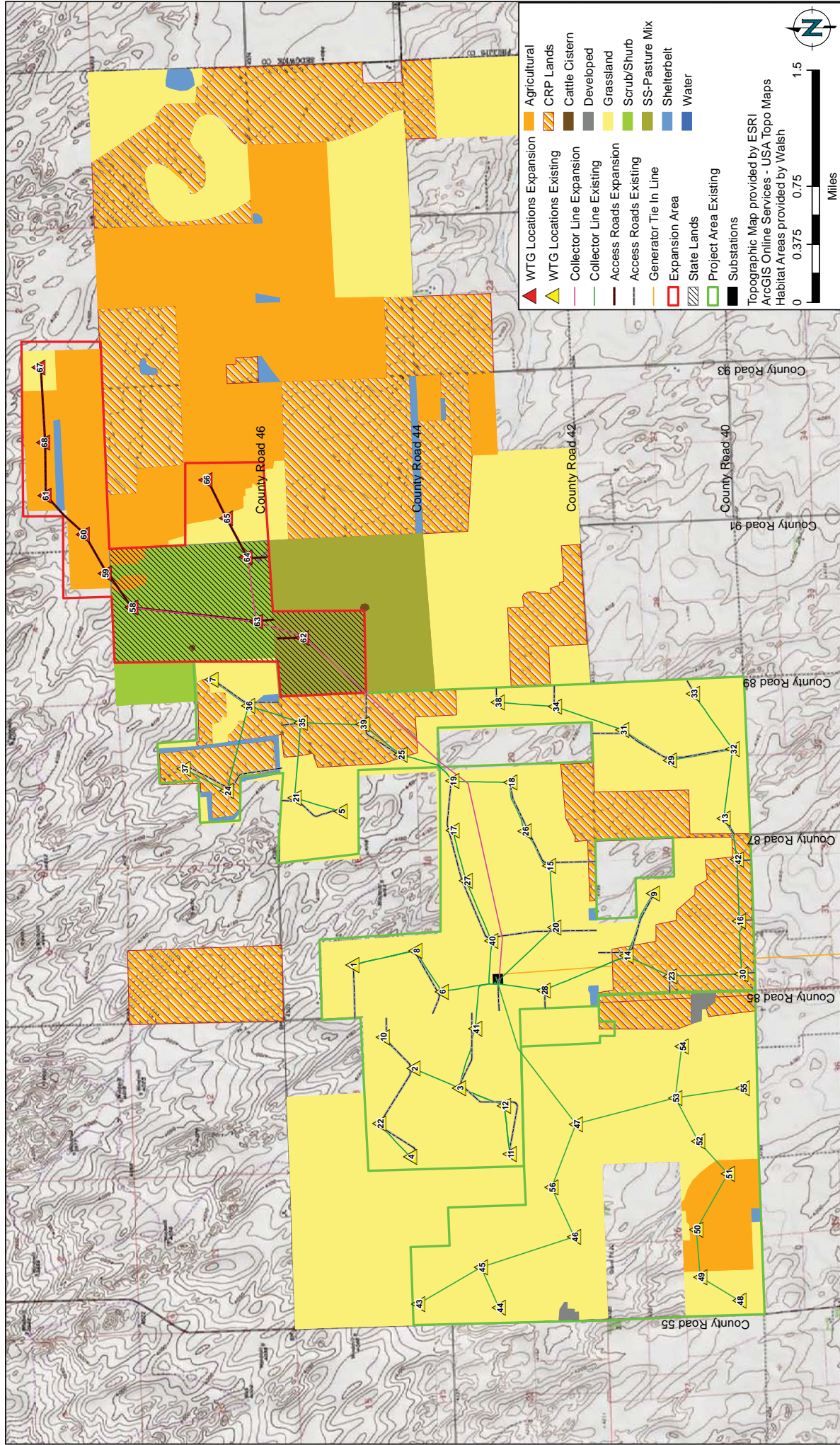


Figure 3.5

HABITAT AREAS
 COLORADO HIGHLANDS WIND SITE, LOGAN COUNTY, COLORADO



CRP Land

CRP land accounts for 0.3 percent of the proposed Project area. Within the proposed Project area, very small areas of seeded CRP grass are present, including introduced smooth brome, and native switchgrass, Indian ricegrass, little bluestem, and western wheatgrass. Sand dropseed is the dominant naturally-occurring grass species (Travis McCay, personal communication, May 2008). Sand dropseed dominated habitat occurs on open flat areas with sandy, well-draining soils. In many disturbed areas such as roadsides and along fence lines, sand dropseed occurs with smooth brome and less frequently with cheatgrass.

Shelterbelt

Shelterbelts cover 1.3 percent of the proposed Project area. Shelterbelts or windbreaks are characterized by trees and shrubs planted to protect downwind habitat. In the proposed Project area, shelterbelts are planted in closely spaced rows between fields or grasslands, or they are planted in groves around homesteads for wind protection or privacy. Dominant tree species include plains cottonwood, Siberian elm, juniper, ponderosa pine; skunkbrush is the dominant shrub.

3.2.2 Environmental Impacts and Mitigation Measures

3.2.2.1 Significance Criteria

Impacts to vegetation would be considered significant:

- Introduction or spread of invasive plant species to a pristine area (i.e., an area of native vegetation void of invasive species)
- Loss of agricultural land production jeopardizing a ranch or farms existence

3.2.2.2 Impacts of the Proposed Project

Direct impacts to vegetation would include 29.7 hectares (73.5 acres) of temporary surface disturbance during construction of and 2.8 hectares (6.8 acres) of permanent loss of habitat for roads, turbine foundations, and facilities for the life of the Project. Table 3.1 shows acreage impacted by vegetation type during construction and for the life of the Project. Since the permanent life-of-Project footprint (2.8 hectares [6.8 acres]) would be relatively small compared with the overall size of the proposed Project area (over 486 hectares [1,200 acres]), amounting to less than one percent of the proposed Project area, these direct, long term impacts would be minimal. Permanent impacts to agricultural lands would be less than 1.2 hectares (3 acres). The proposed Project would not impact any riparian vegetation, including the vegetation of playas or depressional wetlands, because no riparian vegetation occurs within the proposed Project footprint. Weed infestations could constitute an adverse effect; however, CHW would take measures to minimize potential infestation (e.g., prompt revegetation avoiding weedy areas once onsite, and controlling weeds by mechanical and herbicidal means if necessary). Given these measures, noxious weed invasion and impacts from weeds are anticipated to be minimal. No tree removal that would constitute impacts to shelterbelts is anticipated. However, if tree removal becomes necessary, it would be limited to those trees that impede safe and efficient project operation. Any disturbed areas that are not required for operations would be revegetated as soon as possible after construction.

The impacts to vegetation due to the installation and operation of the structures, buildings and access roads proposed for the proposed Project would be direct, long term, and minor. Other vegetation impacts would be direct, short term, and minor.

Table 3.1 Project Impacts by Vegetation/Habitat Type			
Vegetation Type	Disturbance Type	Initial Disturbance (Acres)	Life-Of-Project Disturbances (Acres)
Agricultural Land	Turbines	10	0.02
	Access roads	6.6	3.0
	Other facilities	0	0
	subtotal	16.6	3.02
CRP Land	Turbines	0	0
	Access roads	0	0
	Other facilities	0	0
	subtotal	0	0
Grassland	Turbines	4	0.01
	access roads	1.5	0.7
	Other facilities	0	0
	subtotal	5.5	0.71
Shelterbelt	Turbines	0	0
	access roads	0	0
	Other facilities	0	0
	subtotal	0	0
Shrub/Scrub	Turbines	8	0.02
	access roads	6.4	2.9
	Other facilities	0	0
	subtotal	14.4	2.92
Grand Total		36.5	6.65

3.2.2.3 Impacts of the No Action Alternative

No impacts to vegetation would occur under the No Action Alternative.

3.2.2.4 Mitigation Measures

Implementation of the BMPs relating to onsite vegetation and noxious weeds would reduce or eliminate potential impacts to vegetation. These BMPs would include:

- Prompt revegetation
- Avoiding weedy areas on site
- Washing trucks between sites if weedy areas are encountered, and
- Controlling weeds in accordance with landowner wishes or easement agreements, through mechanical means or the use of herbicides, if necessary.

Mitigation would include limiting erosion and colonization by noxious weeds after construction. A native seed mix would be applied to the cleared areas, as necessary, to minimize noxious weed invasion and to initiate immediate cover for the area.

3.3 Wildlife

3.3.1 Environmental Setting for the Proposed Project

Surveys have been conducted at the Project site since 2011 including surveys for greater prairie chickens, avian point counts, raptor nests and eagle point counts. All surveys have been conducted as recommended by the CPW and USFWS. Consequently, wildlife that occurs at the proposed Project site is well understood.

Habitats for Federal or state-listed threatened, endangered, proposed, or candidate (TEP or C) species were identified based on current habitat descriptions provided by the USFWS. Lists of wildlife species known to occur or that may occur in Logan County were obtained from review of reference texts including Fitzgerald et al (1994), Hammerson (1999), and Kingery (1998).

Federally Listed Species

The pallid sturgeon and least tern do not occur in the proposed Project area, and the piping plover and the whooping crane are unlikely to occur in the proposed Project area. No habitat for pallid sturgeon (endangered), interior least tern (endangered), piping plover (threatened in Colorado), or whooping crane (non-essential experimental population) occurs in the proposed Project area, but these species are of concern in Logan County since potential water depletions in the South Platte River drainage basin due to the proposed Project during construction and operation may affect the species and/or critical habitat downstream (off-site). The 2009 Project BO determined that the proposed one-time withdrawal of 22.6 acre-feet of water would not jeopardize the existence of federal listed species in the central and lower Platte River because CHW chose to participate in the PRRIP, via its SPWRAP membership, which was the 2009 BO's reasonable and prudent alternative for offsetting project water use.

State-listed Species

The proposed Project area's grassland, CRP land, and/or agricultural fields provide suitable habitat for plains sharp-tailed grouse, burrowing owl, ferruginous hawk, mountain plover, black-tailed prairie dog, swift fox, and yellow mud turtle (Appendix C). Other state-listed species are ones that may be migrants, and include American peregrine falcon, bald eagle, greater sandhill crane, long-billed curlew, and western yellow-billed cuckoo.

As described in the 2008 EA (DOE/EA-1611), the project area provides habitat for a variety of wildlife species typical of native sandsage prairie and CRP grasslands in northeastern Colorado. Additional wildlife studies of the project area completed as part of the mitigation requirements of the 2008 EA are summarized below.

Bat Surveys

Bat acoustical monitoring was conducted in the fall of 2008 and throughout 2009 on the CHW project site. Two (2) species of bats were identified from the vocal signatures, the silver-haired bat and the hoary bat, neither of which is identified as protected in State or Federal regulations. Since these bats are tree-roosting species, minimal habitat exists for year-round occurrence of these bats in the Project area. These are two widely distributed North American bats.

Greater Prairie-Chicken Lek Surveys

Greater prairie-chicken lek surveys were conducted in the spring of 2011 and the spring and summer of 2012. Greater prairie-chicken leks were not observed in the proposed Project area. CHW will conduct a spring survey in 2014 and a preconstruction survey for greater prairie-chickens.

Greater prairie-chickens are classified as a small game bird (CPW 2013), and CPW permits limited hunting of greater prairie-chickens in Logan County. Nevertheless, the CPW has a special conservation interest in this species.

Raptor Nest Surveys

Raptor nest surveys were conducted in the spring of 2011 and the spring and summer of 2012 in the existing and proposed Project area. There were no raptor nests identified within the proposed Project boundary. The closest raptor nest to a WTG is located approximately 1,439 m (4,720 feet) from turbine #62 as shown of Figure 3.6. CHW plans to conduct a spring raptor nest survey in 2014.

No bald or golden eagle nests occur within the proposed Project area or within a 10-mile buffer. CPW had no records of nests within the proposed Project and two records of nests were well beyond the 10-mile buffer of the proposed Project comprising the eagle nest survey area. An incidental observation of one golden eagle in flight occurred near Highway 138 and County Road 93, on the northern boundary of the 10-mile buffer. CPW concurred that there was no need to conduct a second nest survey.

No bald or golden eagles were observed during eagle point count surveys. However, a juvenile golden eagle fatality was discovered near one of the existing wind turbines in April 2014. CHW personnel continue to coordinate with the USFWS on this issue. An Eagle Risk Assessment

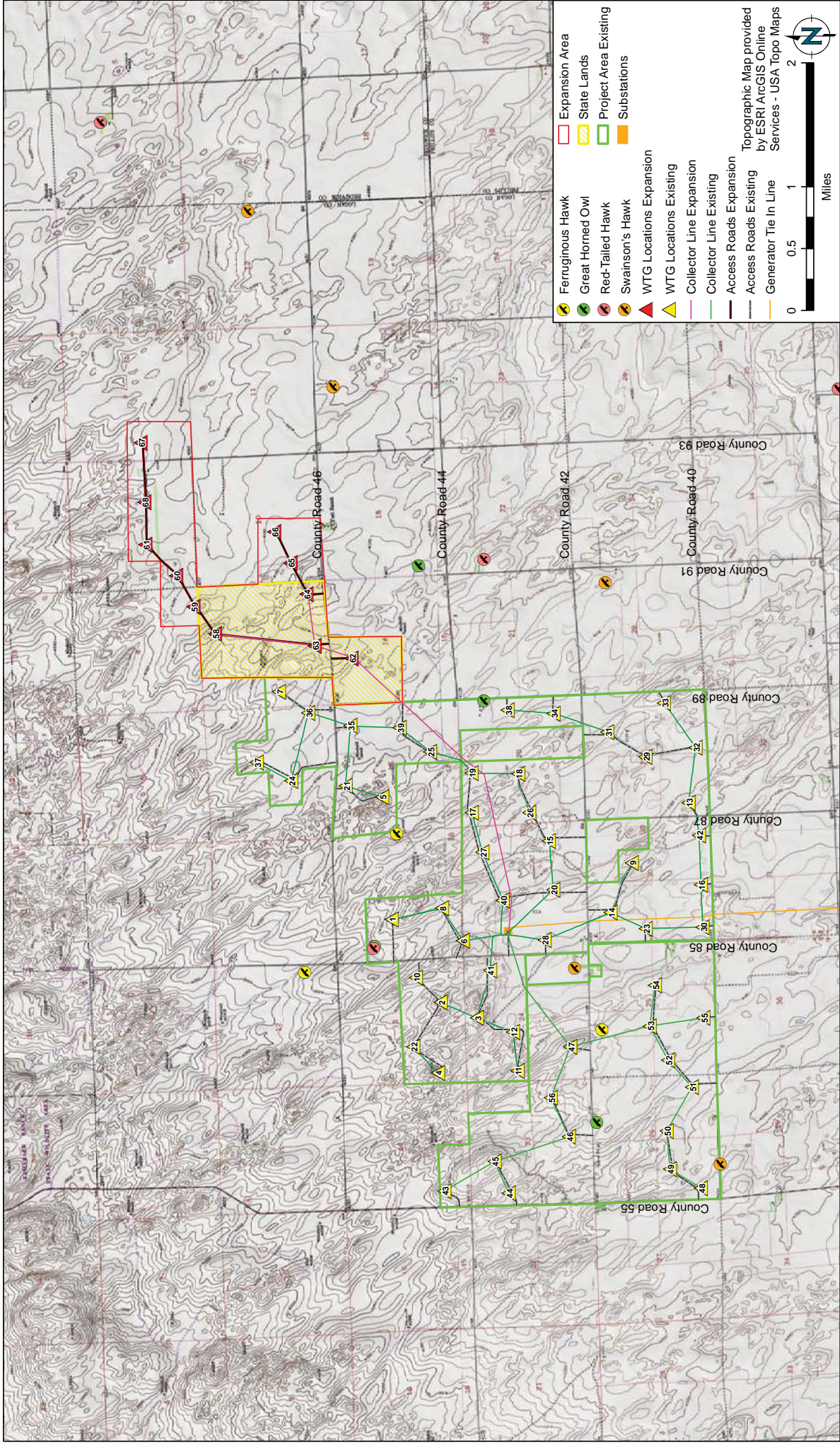


Figure 3.6

RAPTOR NEST LOCATIONS
 COLORADO HIGHLANDS WIND SITE, LOGAN COUNTY, COLORADO



prepared according to USFWS guidance for the 2013 expansion of the existing wind farm estimated 2.8 eagle fatalities over a 30-year period. An updated Eagle Risk Assessment is being prepared that will include all available eagle data for the existing project, as well as the proposed Project. The existing Bird and Bat Conservation Strategy document will also be updated to include the proposed Project.

Migratory Birds

Migratory birds, their eggs, and active nests are protected under the Migratory Bird Treaty Act (MBTA) (USFWS 1918). Nest destruction that results in the unpermitted take of migratory birds or their eggs is prohibited under the MBTA. Take is defined as to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb. In Colorado, all non-game birds except for European starling, house sparrow, and rock dove are protected under MBTA. The MBTA does not prohibit the dismantling of an unoccupied bird nest (without birds or eggs); however, unoccupied nests may not be collected. Eagles are further protected by the Bald and Golden Eagle Protection Act, which prohibits the take of eagle species.

3.3.2 Environmental Impacts and Mitigation Measures

3.3.2.1 Significance Criteria

Impacts to wildlife resources would be considered significant if:

- Construction activities occur on established greater prairie-chicken leks or breeding grounds during the nesting season;
- Critical big game winter range is affected by construction during critical winter periods, causing disturbance or displacement of wintering animals;
- Mortality of birds from collisions with wind turbines reduced local numbers of the affected species to the point where there are measurable population declines; and
- Mortality of bats from collisions with wind turbines reduced populations to the point where a species needs protection under state or Federal law.

3.3.2.2 Impacts of the Proposed Project

As described in the 2008 EA (DOE/EA-1611), potential impacts to wildlife from the proposed Project may result from direct mortality, habitat loss, and effective habitat loss. Direct mortality is the result of collisions with turbines, meteorological towers, overhead power lines, and substation structures and, for bats, may be caused by rapid reduction in air pressure close to the turbine blades that may result in barotrauma-related lung injuries. Habitat loss is due to the footprint of turbine pads, other infrastructure, and roads. Effective habitat loss is the loss of the use of seemingly suitable habitat because of human activity in the vicinity; this can disturb many species to the extent that they would not use habitat and it is effectively lost.

Ground disturbance impacts would include temporary and permanent loss of habitats for wildlife. Habitat disturbance would include a corridor consisting of tower assembly areas and pads (up to 2 acres at each tower location during construction) and upgrading access roads. Upon completion of construction, turbine assembly areas would be reduced to a 5 m (15 foot) diameter foundation pad area and road width would be reduced from 15 m (50 ft) to approximately 5 m (16 ft).

Trenches for utilities and communications lines would be excavated along access roads or in cross-country utility line easement corridors. Where possible, these temporary and permanent ROWs would be re-vegetated and allowed to return to their previous use and condition. The timing of revegetation would be variable, depending on the time of year that construction in an area is completed and rainfall amounts during the years following the revegetation.

Long-term impacts include permanent loss of habitat and habitat fragmentation due to the presence of the new facility, as well as regular disturbance from humans during periodic maintenance. Specific impacts on wildlife are discussed below.

Impacts to the greater prairie chicken are expected to be minimal as the nearest identified lek is located approximately 2 miles from the nearest proposed WTG, which exceeds the recommended CPW set-backs from leks.

Impacts to big game are expected to be minimal because the land is primarily pasture land and is subject to regular human activity from farming and ranching activities. Impacts to big game could include direct mortality due to collisions with vehicles, loss of foraging habitat, and displacement from portions of the proposed Project area during construction due to human presence or noise. Mortality due to collisions with vehicles would be minimal. Because the total footprint of the proposed Project (turbine pads, roads, and substation) would be small relative to the size of the proposed Project area, loss of forage would be negligible. Forage distribution has already been substantially altered by past and current agricultural activities, and the footprint of the proposed wind Project likely would be unnoticeable within this larger agricultural management system. Big game using the area likely would habituate to the turbines and operation activities in time, although they may avoid roads as occurs at oil and gas development projects (BLM 2008). However, no detectable changes in pronghorn antelope abundance occurred at the Arlington, Wyoming wind project after construction (Johnson et al. 2000), so pronghorn may habituate to wind development. Mule deer also are fairly tolerant of human activities (Reed 1981; Irby et al. 1988), and there is already frequent human presence due to farming and ranching activities, so it is probable that any displacement would likely be temporary and displacement effects would be minimal. No crucial winter range or known birthing areas occur onsite, so big game critical habitats would not be affected.

Impacts to small mammals and carnivores include an increase in vehicle kills with increased roads and traffic, and some loss of habitat. The impacts are anticipated to be minimal overall. Bats may be impacted due to collision-related mortality, and some wind projects are known to cause substantial bat mortality (Arnett et al. 2008, USFWS 2003, Kunz et al. 2007). New findings show that the reduced air pressure in the vicinity of the turbines causes internal trauma leading to death (Baerwald et al. 2008). Other sources of fatality are also being investigated (Energetics Inc. 2004). Because bats are not known to roost in the area and no Federal or state-listed TEP or C bat species are anticipated to occur, impacts to protected bat species are not expected. Bat acoustical monitoring established that two migratory tree-roosting bats (hoary bats, and silver-haired bats) likely migrate through the proposed Project area and thus may be at risk.

Birds may be directly impacted due to collisions with turbines and through both direct and effective habitat loss. This occurs when animals avoid a buffer zone around a road or other man-made structure. The potential impact of wind power development on birds is well-documented.

A post-construction bird and bat fatality study was performed for the initial 42 wind turbines in the existing wind farm in 2013 (Walsh, 2013), as required by the 2008 EA. The objective of this study was to estimate the potential operational fatality impacts of the project on birds and bats. A total of eight bird and 31 bat fatalities were found during carcass searches. Of the eight avian fatalities, two were raptors, and six were songbirds. All the bat fatalities were tree-roosting migratory bats. A ferruginous hawk was the only Special Status species fatality. The total study period (summer and fall 2013) estimate of bird and bat fatalities for the project was 437, with an estimated 6.50 fatalities per MW. The bird fatality estimate for the entire site was 94 for the study period, with an estimated 1.39 bird fatalities per MW. The bat fatality estimate for the entire site was 344 for the study period, with an estimated 5.11 fatalities per MW.

The bird fatality estimate for the entire site was well below what was predicted (Walsh 2013), while the bat fatality estimate was higher than predicted. A dataset of all available regional studies with similar vegetation community types shows the fatality results to be within the ranges presented for the region. Bird fatalities ranged from 0.6 to 3.0 per MW and there were 0.85 bird fatalities per MW in the present study. Bat fatalities ranged from 0.8 to 8.9 per MW and there were 3.58 bat fatalities per MW in the present study.

An eagle nest survey and risk assessment was conducted in 2013 for a portion of existing project constructed that year. No bald or golden eagle nests occur within the Project area or within the 10-mile buffer studied. CPW had no records of nests within the Project; and two records of nests well beyond the 10-mile buffer of the Project. An incidental observation of one golden eagle flying occurred near Highway 138 and County Road 93, on the northern boundary of the 10-mile buffer. CPW concurred that there was no need to conduct a second nest survey.

Five eagle point count stations were established to assess eagle use across the entire Project site. Each point was visited five times throughout the spring and early summer for a total of 25 point count surveys. No bald or golden eagles were observed during the 500 minutes of observations. For the eagle risk assessment, two models were run using the observation data: Model 1 incorporated all daylight hours, and Model 2 used the estimated operational daylight hours. Model 2 results, which are considered more representative of actual operations, predict an annual fatality rate of 0.094 golden eagles at the 80 percent credible limit (Bayesian equivalent of confidence interval), and 2.8 golden eagle fatalities over the 30-year life of the Project.

Subsequent to completion of the eagle risk assessment, a juvenile golden eagle fatality was discovered at the northwestern-most turbine location (#43) on April 23, 2014. CHW personnel contacted USFWS and CPW to report the fatality and continue to coordinate with the agencies on this issue.

Wind power-related mortality is low compared with other sources of bird mortality (National Wind Coordinating Committee [NWCC] 2001). As with bats, the issue is not what proportion of overall mortality is due to wind farms, but rather whether wind farms cause significant

population declines or are a significant contributor to cumulative effects on populations. This issue is difficult to address due to the lack of reliable abundance data from which to make these determinations (National Research Council 2007).

Impacts to other mammals, amphibians, and reptiles are expected to be minimal. Mammals are relatively mobile, amphibians and reptiles are a little less so, and, while mortality due to collisions with vehicles or during excavation is possible, these occurrences are anticipated to be infrequent. As with big game, the overall agricultural management system within the Project area already strongly influences forage/prey availability, therefore the short-term 29.7 hectares (73.5 acres) of loss of habitat (2.8 hectares [6.8 acres] over the life-of-Project) from the Project footprint would probably have a minimal effect on other mammals and reptiles.

The USFWS has developed a set of recommendations to avoid and minimize impacts to wildlife from wind turbines (USFWS 2012). These recommendations and a discussion of proposed Project adherence to these recommendations are presented in Table 3.2.

Table 3.2 Site Development and Turbine Design and Operation Recommendations

USFWS Land-Based Wind Energy	Existing Conditions and Proposed Action
Guidance	
Site Development	
1. Avoid placing turbines in documented locations of any species of wildlife, fish, or plant protected under the Federal Endangered Species Act (ESA).	No documented locations of any species of wildlife, fish, or plants protected under the ESA occur in the Project area. While both Federal and state-listed TEP or C species may occur in the proposed Project area, impacts are expected to be minimal.
2. Avoid locating turbines in known local bird migration pathways or in areas where birds are highly concentrated, unless mortality risk is low (e.g., birds present rarely enter the rotor-swept area). Examples of high concentration areas for birds are wetlands, State or Federal refuges, private duck clubs, staging areas, rookeries, leks, roosts, riparian areas along streams, and landfills. Avoid known daily movement flyways (e.g., between roosting and feeding areas) and areas with a high incidence of fog, mist, low cloud ceilings, and low visibility.	There are no known local bird migration pathways in the proposed Project area. There are no known high concentration areas such as wetlands, etc. in the proposed Project area. Daily movements may occur among the proposed Project area’s agricultural land, grassland, CRP land, shelterbelts, and playa habitats, but these are common features of the landscape, and thus the proposed Project is not located in an area where daily movements would pose more risk than other sites. Greater prairie-chickens are classified as a small game bird (CPW 2013), and CPW permits limited hunting of greater prairie-chickens in Logan County. CHW will follow the CPW recommended setbacks of 805 m (0.5 mile) of a known prairie-chicken lek and 402 m (0.25 mile) of known raptor nests. There are no identified prairie chicken leks within 2 miles of a proposed WTG. The proposed Project area does not have a high incidence of fog, mist, or other conditions of low visibility.
3. Avoid placing turbines near known bat hibernation, breeding, and maternity/nursery colonies, in migration corridors, or in flight paths between colonies and feeding areas.	There are no known bat colonies in the proposed Project area. Migration corridors or flight paths may occur in the proposed Project area. Bat acoustical monitoring was conducted in 2008 and 2009.

Table 3.2 Site Development and Turbine Design and Operation Recommendations

USFWS Land-Based Wind Energy	Existing Conditions and Proposed Action
Guidance	
4. Configure turbine locations to avoid areas or features of the landscapes known to attract raptors (hawks, falcons, eagles, and owls). For example, golden eagles, hawks, and falcons use cliff/rim edges extensively; setbacks from these edges may reduce mortality. Other examples include not locating turbines in a dip or pass in a ridge, or in or near prairie dog colonies.	Turbines have been located on relatively flat lands, away from shelterbelts (i.e., potential raptor nesting sites). No turbines or other proposed Project facilities would be placed in prairie dog colonies.
5. Configure turbine arrays to avoid potential avian mortality where feasible. For example, group turbines rather than spreading them widely, and orient rows of turbines parallel to known bird movements, thereby decreasing the potential for bird strikes. Implement appropriate storm water management practices that do not create attractions for birds, and maintain contiguous habitat for area-sensitive species.	CHW has configured the proposed Project to group turbines as closely as possible without losing energy-generating capacity due to wake effects among turbines. Widely spacing turbines increases overall project costs because of the need for more power lines and roads, therefore, from a cost perspective, the proposed Project is designed with the closest spacing possible. The proposed Project would result in habitat fragmentation in grassland and CRP land wildlife species.
6. Avoid fragmenting large, contiguous tracts of wildlife habitat. Where practical, place turbines on lands already altered or cultivated and away from areas of intact and healthy native habitats. If not practical, select fragmented or degraded habitats over relatively intact areas.	Approximately 0.3 hectares (0.7 acres) of grassland would be lost. No active cultivation currently occurs in the proposed Project area.
7. Avoid placing turbines in habitat known to be occupied by prairie-chickens or other species that exhibit extreme avoidance of vertical features and/or structural habitat fragmentation.	There are no identified prairie chicken leks within 2 miles of a proposed WTG.
8. Minimize roads, fences, and other infrastructure. All infrastructure should be capable of withstanding periodic burning of vegetation, as natural fires or controlled burns are necessary for maintaining most prairie habitats.	CHW is using existing roads for much of its access; it would construct about 5.7 km (3.5 miles) of new roads. The number of roads, fences, and other infrastructure is minimized to reduce the proposed Project development and operation costs.
9. Develop a habitat restoration plan for the proposed site that avoids or minimizes negative impacts on vulnerable wildlife while maintaining or enhancing habitat values for other species. For example, avoid attracting high densities of prey animals (rodents, rabbits, etc.) used by raptors.	All disturbed areas would be reclaimed with native, locally-adapted species. CHW would control weeds.

Table 3.2 Site Development and Turbine Design and Operation Recommendations

USFWS Land-Based Wind Energy	Existing Conditions and Proposed Action
Turbine Design and Operation	
10. Use tubular supports with pointed tops rather than lattice supports to minimize bird perching and nesting opportunities. Avoid placing external ladders and platforms on tubular towers to minimize perching and nesting. Avoid use of guy wires for permanent turbine or meteorological tower supports.	CHW would use tubular towers. Turbines would not use guy wires, but they would be necessary for the meteorological tower support. Any guy wires would be marked for airplane warning and bird deterrent devices would be included if necessary.
11. Follow USFWS lighting recommendations and the minimum amount of pilot warning and obstruction avoidance lighting specified by FAA should be used (FAA 2000).	CHW has prepared a plan to meet FAA requirements.
12. Where the height of the rotor-swept area produces a high risk for wildlife, adjust tower height where feasible to reduce the risk of strikes.	The height of the rotor-swept area for the Colorado Highlands wind Project is not known to pose an undue high risk to wildlife.
13. Where feasible, place electric power lines underground or on the surface as insulated, shielded wire to avoid electrocution of birds. Use recommendations of the APLIC (2006) for any required above-ground lines, transformers, or conductors.	All in-field collection and communications lines would be installed underground. No new overhead transmission lines are required for the proposed Project.
14. High seasonal concentrations of birds may cause problems in some areas. If, however, power generation is critical in these areas, an average of 3 years monitoring data (e.g., acoustic, radar, infrared, or observational) should be collected and used to determine peak use dates for specific sites. Where feasible, turbines should be shut down during periods when birds are highly concentrated at those sites.	No seasonal high concentrations of birds are known to occur in the proposed Project area.

The proposed Project is in general conformance with state and Federal recommendations for avoiding and minimizing impacts to wildlife from wind turbines. Prior coordination with USFWS and CPW resulted in letters outlining desirable approaches and mitigation for protection of wildlife resources, as provided in Appendix A of the EA (DOE/EA-1611), which CHW considers applicable to the proposed Project.

The layout and proposed Project schedule presented for the wind farm and associated turbines reflects this coordination with the agencies. Activities for surface occupation and timelines impacted by construction are consistent with agency requirements for timing restrictions and activity buffers. The resulting impacts to wildlife due to the proposed Project would result from both long and short term effects on their habitats including vegetation impacts, human disturbance and the construction, operation and maintenance of the Project. Overall impacts are expected to be minor.

3.3.2.3 Impacts of the No Action Alternative

No impacts to wildlife would occur under the No Action Alternative.

3.3.2.4 Mitigation Measures

For the proposed Project, CHW has committed to the following measures as described in the 2008 EA. Following consideration of these measures, no impacts have been identified to wildlife.

- Turbines would be located greater than 402 m (0.25 mile) of known raptor nests.
- Since CPW manages greater prairie chickens as a game bird, turbines would be located greater than the CPW recommendation of 805 m (0.5 mile) from any greater prairie-chicken lek.
- Construction schedules would avoid breeding season activities and buffers for nesting raptors and prairie-chicken.
- Spring raptor surveys (including bald and golden eagles) would be conducted prior to the start of construction to confirm absence of any raptors in proposed Project area. In the event a raptor nest is observed, CHW will relocate any impacted WTGs.
- Lek survey would be conducted in spring 2014 to confirm absence of any leks in proposed Project area. In the event a lek is observed, CHW will relocate any impacted WTGs
- Grassland nesting bird sweeps would be conducted in advance of construction vehicles during the nesting season to avoid impacts to nesting birds.

CHW will follow the existing mitigation plan outlining these actions and commits to implement them.

3.4 Special Status and Sensitive Species

3.4.1 Environmental Setting for the Proposed Project

A list of endangered, threatened, proposed, and candidate species was prepared with the use of the USFWS and CPW websites (Appendix C). A query was also made to the Colorado Natural Heritage Program (CNHP) concerning sensitive species in the Project area (Appendix D). The CNHP query included a two-mile buffer surrounding the Project area. This database query resulted in records of natural plant communities (northern sandhill prairie, riparian woodland, etc.) and wildlife (greater prairie-chicken, ferruginous hawk, Cassin's sparrow, northern many-lined skink) in the Project area and beyond. None of these records were unanticipated or different from general observations reported in this Supplemental EA.

Fieldwork was conducted by Walsh in 2011 and 2012 that included 1) wildlife studies, 2) searching for state listed TEP or C and special concern species including specific searches for swift fox dens, 3) viewing the greater prairie-chicken lek and searching for any additional leks, 4) searching for raptor nests onsite and one-half mile beyond the site boundaries, 5) conduct habitat mapping, and 6) conduct eagle nest search within a 10-mile radius of the proposed Project. All potential raptor nesting habitat was searched by looking for nests using the naked eye, binoculars, or a spotting scope. All nest locations (regardless of species) were mapped. Habitats for TEP or C species were identified based on current habitat descriptions provided by the USFWS.

Federally Listed Species

The piping plover (*Charadrius melodus*) is listed as Threatened in Logan County Colorado and the interior population of least tern (*Sterna antillarum*) is listed as Endangered in Logan County under the Endangered Species Act (ESA). Whooping cranes (*Grus americana*), from a non-essential experimental population under the ESA, may occur in Logan County. Additionally, the proposed Project area is not within the vicinity of the 200-mile whooping crane corridor. No habitat for pallid sturgeon (*Scaphirhynchus albus*), interior least tern, piping plover, or whooping crane occurs in the proposed Project area, but these species are of concern in Logan County because water depletions in the South Platte River may affect the species and/or critical habitat downstream (off-site). The pallid sturgeon and least tern do not occur in the proposed Project area. Both the piping plover and the whooping crane are unlikely to occur in the proposed Project area. There is no breeding habitat, nesting habitat, suitable habitat or critical habitat for these species in the proposed Project area. The installed facilities would not affect these species. The existing project consulted with the USFWS under Section 7 of the Endangered Species Act for the use of water for construction and operation/maintenance activities and prepared a Biological Assessment for the pallid sturgeon, interior least tern, piping plover and whooping crane in compliance with the Endangered Species Act (BO# ES/LK-6-CO-09-F-006). Water use for the proposed Project has been previously discussed.

State-listed Species

The proposed Project area's grassland, CRP land, and/or agricultural fields provide suitable habitat for plains sharp-tailed grouse, burrowing owl, ferruginous hawk, mountain plover, black-tailed prairie dog, swift fox, and yellow mud turtle (Appendix C). Other state-listed species are ones that may be migrants, and include American peregrine falcon, bald eagle, greater sandhill crane, long-billed curlew, and western yellow-billed cuckoo.

The CPW state-listed species were evaluated for their potential occurrence using appropriate local references, consultations with CPW, and staff knowledge of the species and habitats of Logan County. These species are discussed below.

Plains Sharp-Tailed Grouse (*Tympanuchus phasianellus jamesii*) – This endangered species traditionally occurred across much of eastern Colorado, but has been nearly eliminated from the state. Individuals have wandered into nearby Tamarack Ranch (a State Wildlife Area located 1.6 to 3.2 km (1.0 to 2.0 miles) north of County Road 46 outside the proposed Project area) from Nebraska, where they occupy sandsage prairie. These individuals have hybridized with greater prairie-chickens (Kingery 1998). Although suitable habitat occurs for this species in the proposed Project area, no individuals were observed during the assessment.

American Peregrine Falcon (*Falco peregrinus anatum*) – This species has a broad area of migration, and will forage on birds in grassland habitat, especially during spring and fall. Adequate nesting habitat (cliffs) does not exist in the proposed Project area. One individual was observed flying over the greater prairie-chicken lek during surveys of the existing project, likely in migration.

Bald Eagle (*Haliaeetus leucocephalus*) – Bald eagles were recently de-listed from Federal listing, but are listed on the State list. Good foraging habitat for this species, especially black-tailed prairie dog colonies, does not exist in the proposed Project area; however, taller trees could occasionally host a bird in transition from breeding grounds to wintering areas. No bald eagles were observed during point count surveys.

Burrowing Owl (*Athene cunicularia*) – This species generally prefers shortgrass prairie associated with black-tailed prairie dog colonies, as they often nest in burrows within an active colony. Individuals could certainly use other mammal burrows, but taller grasses and shrubs usually preclude their occurrence. A small black-tailed prairie dog (*Cynomys ludovicianus*) colony (roughly 150 meters by 200 meters in size) was found east of the transmission line outside of the Project area. Associated with this colony, a family of burrowing owls (*Athene cunicularia*) comprising six or seven individuals was observed.

Ferruginous Hawk (*Buteo regalis*) – One individual of this state species of Special Concern was observed south of the proposed Project area near the intersections of County Road 42 and 89, but none were observed on the proposed Project area. A hawk of grasslands and shrublands, this species forages primarily upon prairie dogs, ground squirrels, and jackrabbits. Surveys failed to detect prairie dogs in the proposed Project area; alternative prey species were present. No nests were located. Nesting occurs in Logan County and a possible nest site was reported north of the proposed Project site during the Breeding Bird Atlas survey in the 1990s. These records are recorded in 4.3 km by 5.6 km (2.9 mile by 3.5 mile) blocks; the block's southern boundary is County Road 44. Conversion of native grassland habitats to agriculture, energy development, and urbanization as well as the eradication of the majority of black-tailed prairie dogs in eastern Colorado has led to the Special Concern status (non-statutory). Nests of this species are prone to abandonment if disturbed during the incubation period (Wheeler 2003).

Greater Sandhill Crane (*Grus canadensis tabida*) – Suitable nesting habitat for this species does not exist in the proposed Project area. Birds on migration could make a stopover in agricultural fields.

Whooping Crane (*Grus Americana*) – Suitable habitat for this species does not exist in the proposed Project area. There is no breeding habitat, nesting habitat or critical habitat at the proposed Project site. Although whooping cranes have been sighted north of the proposed Project area in the Nebraska panhandle it is unlikely that they would occur at the proposed Project site. The installed Project facilities would not affect this species. The Whooping Crane is the subject of a Biological Assessment related to the water use for the proposed Project and will be addressed with the USFWS.

Piping Plover (*Charadrius melodus*) – Suitable habitat for this species does not exist in the proposed Project area. There is no breeding habitat, nesting habitat or critical habitat at the proposed Project site. The installed Project facilities would not affect this species. The piping plover is the subject of a Biological Assessment related to the water use for the proposed Project and will be addressed with the USFWS.

Snowy Plover (*Charadrius alexandrinus*) – Suitable habitat for this species does not exist in the proposed Project area and this species is an unlikely migrant.

Mountain Plover (*Charadrius montanus*) – This species is intimately associated with heavily grazed shortgrass prairie, as occurs where cattle and/or prairie dogs are present. Fallow fields may also be used. Surveys failed to detect this species or suitable habitat for this species. This species is unlikely to be present, although listed as possible in Appendix C.

Long-Billed Curlew (*Numenius americanus*) – This species nests in shortgrass prairie and occasionally in wheat or fallow fields. However the lack of adequate standing water would preclude this species nesting in the proposed Project area. Migrant birds could stopover in pastures and open grasslands.

Western Yellow-Billed Cuckoo (*Coccyzus americanus*) – Closed canopy riparian forests are the preferred nesting habitat of this species, and do not occur on the site. Although unlikely, shelterbelts in the Project area could host migrant cuckoos. The proposed Project would not affect this species.

Black-Tailed Prairie Dog (*Cynomys ludovicianus*) – This species inhabits short and mixed-grass prairies. Suitable habitat occurs in the proposed Project area, but it is likely that the species was extirpated from the proposed Project area in years past. A small black-tailed prairie dog colony (approximately 150 meters by 200 meters in size) was found east of the transmission line within the powerline ROW east of the proposed Project Area.

Swift Fox (*Vulpes velox*) – This species inhabits short and mixed-grass prairies throughout eastern Colorado. Suitable habitat occurs in the proposed Project area in the form of remnant short-grass prairie, and grazed areas. Habitat mapping can serve to elucidate the extent of suitable habitat present, which can serve to suggest likelihood of occurrence (Martin et al. 2007). Surveys for swift fox dens initially were conducted during the habitat mapping effort for the existing project in 2008. The CDOW joined in a subsequent search conducted in July 2008, using all-terrain-vehicles (ATV) to access areas not visible from roads. No swift foxes or their dens were found.

Yellow Mud Turtle (*Kinosternon flavescens*) – Habitat for this reptile includes permanent and semi-permanent ponds, temporary rain pools near grasslands and sand sage prairie. Sand sage habitat is especially used in the summer time by nesting females. The CDOW website shows this species only as “likely to occur,” not “known to occur,” indicating perhaps a lower likelihood of its presence (CDOW undated, http://ndis.nrel.colostate.edu/plugins/co_maps/030998.jpg).

3.4.2 Environmental Impacts and Mitigation Measures

3.4.2.1 Significance Criteria

Impacts to wildlife resources would be considered significant if potential exists for a take of a species protected under the Federal Endangered Species Act. This would include direct

mortality or injury of a listed species, harassment of a species, and/or impacts to habitat suitable to support a listed species.

Impacts to state sensitive species would be considered significant if:

- Construction activities displace occupied or potentially occupied habitat of listed species; or
- Construction and operations result in mortality of state sensitive species.

3.4.2.2 Impacts of the Proposed Project

Federally Listed Species

The Platte River Species are the interior least tern, piping plover, whooping crane and pallid sturgeon. There is no suitable habitat, critical habitat, nesting habitat or breeding habitat for any of these species at the proposed Project Site. The installed facilities would not affect these species. These species are of concern based on water use by the proposed Project and the potential of cumulative uses of water in the South Platte River basin and other tributaries to the Platte River to affect the critical habitats of these species in the Platte River.

Indirect impacts could occur if the proposed Project resulted in water depletions in the South Platte River. The existing project currently obtains water for operations/maintenance activities from an on-site well. CHW is a member of the South Platte Water Related Activities Program, Inc. (SPWRAP), which is a Colorado component of the South Platte River Recovery Program, for recurring water use requirements during operations and maintenance. The membership in SPWRAP includes an allocation of up to 3.5 acre-feet of water per year through 2019. The possible addition of one (1) permanent O&M employee is not expected to significantly increase the annual on-site water consumption.

The proposed Project estimates a one-time construction use of less than five acre-feet of water. It should be noted that for the existing wind farm, water used for construction was obtained from municipal water supply wells in the Town of Fleming which are non-tributary to the South Platte River basin. Consequently, CHW has not used any of its 22.6 acre-feet construction water increment for which consultation with USFWS was documented in the 2009 Project BO issued to Western. The estimated construction water use for the proposed Project (less than 5 acre-feet) is below the remaining available increment from the 2009 Project BO. Informal consultation with USFWS is ongoing for the proposed Project's water use.

State-listed Species

Impacts to State-listed species could include direct mortality due to collisions with vehicles, power lines, and/or turbines; inadvertent nest destruction; and displacement from habitat due to noise and human activity. Although suitable habitat is potentially present onsite for plains sharp-tailed grouse and mountain plover, these species were not observed. Neither species is likely to be present. Migratory species that may be present include peregrine falcon, bald eagle, greater sandhill crane, long-billed curlew, and western yellow-billed cuckoo.

Bald eagles are unlikely in the proposed Project area because of lack of prey and roosting sites. Occasional individuals would be rare visitors to the proposed Project area. Both construction and operation impacts are expected to be minimal for these migrant species.

Greater sandhill cranes may migrate through the proposed Project area and may stop to feed in agricultural fields. Impacts during construction would include displacement from potential resting and feeding areas, but this impact is expected to be minimal because there are abundant agricultural fields throughout the region that provide this habitat. Impacts during operation could include sandhill crane mortality due to collisions with turbines and overhead lines. Sandhill cranes typically migrate at heights well above 122 m (400 ft) (Toepler and Crete 1978) and thus would only be affected if taking off or landing on or near the site during resting/feeding stopovers or if they are forced down during bad weather. With the use of modern turbines, the potential for mortality is expected to be low.

The long-billed curlew could be an occasional migrant, with a stopover in pastures and open grasslands. Impacts to long-billed curlew during construction could include mortality of individuals due to collisions with vehicles. Because of the lack of suitable nesting habitat (lack of adequate standing water), the potential to impact long-billed curlew nests is low. Because long-billed curlews are mobile, potential for collisions with vehicles is also low. Operational impacts could include mortality due to collisions with turbines and overhead lines, but mortalities are expected to be rare events.

Western yellow-billed cuckoos could use shelterbelts during migration. They would not nest onsite. There is the potential for mortality due to collisions with turbines and overhead lines, but mortalities are expected to be rare events. Impacts to yellow-billed cuckoos are expected to be low.

Burrowing owl, ferruginous hawk, black-tailed prairie dog, swift fox, and yellow mud turtle have either been observed in the vicinity or are species for which suitable habitat is present. Prairie dogs or burrowing owls have not been observed in the proposed Project area. During operation, impacts to burrowing owls could include mortality due to collisions with vehicles or wind turbines. Because burrowing owls are mobile, collisions with vehicles are unlikely, and since CHW will use state-of-the-art turbines with tubular towers and slow-turning rotors, mortalities during and after construction are anticipated to be rare events. Impacts to burrowing owls are expected to be low.

Construction-related impacts to ferruginous hawks could include nest abandonment and the resultant loss of eggs or chicks if an active nest occurs on or near the proposed Project area. CHW would conduct an additional raptor nest survey prior to construction, and any active nests would be avoided by an appropriate buffer until the chicks have fledged or the nest fails (Craig, 2008). Ferruginous hawks may be displaced from the proposed Project area because of construction noise and human activity, but are expected to resume the use of proposed Project area habitat after construction is complete. Operational impacts would include the potential for mortality due to collisions with turbines, but with the use of modern turbines, mortalities are expected to be rare events. Impacts to ferruginous hawks are expected to be low. Post-construction monitoring would be conducted to determine if ferruginous hawk mortality is

occurring. Additional mitigation may be required if unacceptable levels of mortality occur, as determined by the CPW and USFWS.

CHW would avoid surface disturbance in black-tailed prairie dog colonies, therefore black-tailed prairie dogs would not be impacted by the proposed Project with the exception of the potential for vehicle-related mortality.

Swift fox are probably rare visitors to the proposed Project area, and thus potential for impacts to this species is low. The yellow mud turtle is unlikely onsite due to the lack of ponds. Potential impacts include vehicle collisions during construction and operation. However, because of the lack of suitable habitat and lack of records of the species in the area, this likelihood is low. For these species discussed above, with impacts assessed as very low or unlikely, CHW would coordinate with CDOW and USFWS. Should fatalities arise, CHW will cooperate with the agencies on a solution to the extent feasible.

3.4.2.3 Impacts of the No Action Alternative

Under the No Action Alternative, no Federal or State-listed species would be impacted by the proposed Project.

3.4.2.4 Mitigation Measures

CHW will use state-of-the-art turbine technology, including large un-guyed turbines with tubular towers, slow-moving rotors, and few perching surfaces, thus reducing the potential for bird collisions. CHW would conduct an additional raptor nest survey prior to construction that would include bald and golden eagles, and any active nests would be avoided by an appropriate buffer until the chicks have fledged or the nest fails. CHW will conduct mountain plover surveys in all potential habitat prior to construction as part of the spring avian survey. If nests are found, CHW would avoid construction within 402 m (0.25 mi) of a nest until the chicks are mobile (about 35 days after the nest is discovered or 7 days post-hatching) unless otherwise approved by the CPW and USFWS.

Due to the potential impacts from water use occurring during the proposed construction, Western, via CHW's participation in the PRRIP, is currently engaged in streamlined consultation with the USFWS.

No additional mitigation is proposed beyond these protection measures committed to by CHW in Chapter 2 and Table 3.2.

3.5 Cultural Resources

3.5.1 Environmental Setting for the Proposed Project

The proposed Project area is located in northeastern Colorado near the dividing line between the Colorado Piedmont and High Plains physiographic provinces (Fenneman 1946). The area is characterized as gently rolling hills and ridges with few areas where either remnants of the High Plains escarpment or the underlying bedrock are exposed (Chronic and Williams 2002). More specifically, the proposed Project area lies near the southern edge of the South Platte dune field approximately 5.4 miles south of the South Platte River.

Surface sediments in the proposed Project area are aeolian sands and silts mostly deposited during the late Pleistocene and early Holocene (Madole 1995). The underlying geology of the area is the Ogallala Formation, a loose to well-cemented sand and gravel deposited during the mid-Tertiary uplift period (Chronic and Williams 2002; Tweto 1979). Modern impacts to the area are largely agricultural in nature. Most of the eastern portion of the proposed Project area has been plowed, some of which is currently cultivated with winter wheat. The plow has mixed the top 20-30 cm of sediments, destroying any subsurface integrity. The margins of many of the cultivated fields have deep deposits of recently transported sand as the wind has moved much of the topsoil, indicating the probability of taphonomically active layers deeper than the plow zone, possibly up to 50 cm below ground surface. Active wind turbines are located to the southwest.

Culture History

The proposed Project area is located within the Platte River Basin prehistoric context, which encompasses the entirety of northeastern Colorado (Gilmore et al. 1999). Additional information about the cultural history of the Project area can be found in the 2008 EA (DOE/EA-1611) which can be viewed online at: <http://go.usa.gov/yKRW> (please note the required capitalization).

Previous Work

A files search was conducted through the Colorado Office of Archaeology and Historic Preservation’s (OAHP) online *Compass* database on October 8, 2013, by Melissa Elkins. GLO plats were also inspected for evidence of historic features. A one-mile radius around the proposed Project area was examined.

The files search indicates that only one project has been previously conducted within one mile of the current project area (3.3). The project is the original survey and report for the wind farm, conducted in 2008 by Centennial Archaeology (Anderson et al. 2008).

Table 3.3 Summary of previous projects within one mile files search radius

OAHP Accession #	Location (T/R/Sec)	Project Type	Project Description	Client	Company	Year
LO.E.R8	9/49/13, 24 9/48/19, 30, 31	Linear/block	Wind Farm inventory	Department of Energy	Centennial	2008

T/R/Sec = Township/Range/Section; OAHP = Office of Archaeology and Historic Preservation; Centennial = Centennial Archaeology, Inc.

As a result of the proposed Project, six cultural resources were identified and recorded. These include four sites and two isolated finds (Table 3.4). All four of the sites are historic and include two homesteads, one artifact scatter, and one powerline segment. The homesteads date to the first half of the 20th century, and the artifact scatter is dated to the latter part of the 19th century to the early part of the 20th century. All four sites are officially not eligible for inclusion on the NRHP. The isolated finds include one Late Archaic tool and one historic windmill.

Table 3.4 Summary of previously recorded cultural resources within one mile files search radius

Site No.	Type	Description	NRHP
5LO642.1	Historic	Powerline segment	NE-OAHP
5LO649	Prehistoric	Isolated find	NE
5LO654	Historic	Homestead	NE-OAHP
5LO655	Historic	Artifact scatter	NE-OAHP
5LO658	Historic	Homestead	NE-OAHP
5LO659	Historic	Isolated find	NE

NRHP = National Register of Historic Places; OAHP = Office of Archaeology and Historic Preservation; E-OAHP = Officially eligible; NE-OAHP = Officially not eligible; NE = Not eligible

Fieldwork was conducted from October 10 to 15, 2013, under the direction of Metcalf Archaeological Consultants, Inc. (MAC) archaeologist Stephanie Slaughter and assisted by Nicole Sauvageau Rockwell, Rebecca Simon, and John White. A copy of the cultural resources report is provided in Appendix E.

The proposed Project area was inventoried with pedestrian transects at intervals no greater than 20 m apart. Special attention was given to areas that allowed observation of subsurface sediments, such as road cuts, drainage cutbanks, animal burrows, and animal trails. Field conditions at the time of survey were generally good for discovery, with sunny skies for the majority of the fieldwork.

Sites are defined as five artifacts or more within a 30 m radius and represent a discrete location that is believed to be the locus of patterned human activity. Historic sites are defined as having more than 50 historic artifacts dating pre-1962, or a feature, structure, or trail; or any combination of these elements. Fewer than 50 historic artifacts not associated with a feature, building, or structure, or in an established trash dump were recorded as an isolate. Windmills plotted on the topographic map and not directly associated with a larger complex, such as a homestead, are also considered isolates.

When cultural material was encountered, the immediate area was intensively examined to determine the nature and extent of the resource. Once defined, resources were recorded on appropriate OAHP forms, a site map was produced utilizing a hand-held Trimble GEO XT unit, all tools and features were described and photographed, and overview photographs of the site were taken. Although mapping datums were used, no physical datum stakes were left on the sites because they are all located on private property. All field GPS data was collected using Trimble GEO XT units in NAD 83 UTM coordinate system.

Artifacts were analyzed in the field. MAC analyzes artifacts by type and materials. Diagnostic historic artifacts were photographed or drawn in the field for further analysis in the office. No artifacts were collected.

Results

As a result of this inventory, three sites and five isolated finds were discovered and recorded (Table 3.5). All of the cultural resources are historic. The sites include one silo foundation (5LO873), one homestead (5LO877), and one degrading road (5LO878.1). Two of the sites

(5LO873, 5LO878.1) are recommended to be not eligible for inclusion on the NRHP. The homestead (5LO877) is recommended to be eligible for inclusion on the NRHP.

Table 3.5 Summary of cultural survey inventory results

SITS No.	Temporary No.	Age/Cultural Affiliation	Description	NRHP	Recommendations
5LO871	SS02	Historic	Isolated find	NE	No further work
5LO872	SS01	Historic	Isolated find	NE	No further work
5LO873	MM 13-1000	Historic	Silo foundation	NE	No further work
5LO874	SS04	Historic	Isolated find	NE	No further work
5LO875	SS05	Historic	Isolated find	NE	No further work
5LO876	SS03	Historic	Isolated find	NE	No further work
5LO877	MM 13-1002	Historic	Homestead	E	Avoidance
5LO878.1	MM 13-1001	Historic	Degrading road	NE	No further work

SITS = Smithsonian Institution Trinomial System; NRHP = National Register of Historic Places; E = Eligible; NE = Not eligible

Five historic isolated finds (IF) were recorded and include three fragments of ceramics, one complete bottle, and one small debris scatter (Table 3.6). The ceramics include two pieces of stoneware and one piece of white earthenware. Each was found in a field that had been cultivated, each is located in general proximity to a homestead, and none exhibit diagnostic attributes to aid in dating the artifacts.

Two of the IFs are located on state land that had not been cultivated. One (5LO874) is a colorless Listerine bottle with a circle-diamond-I maker’s mark, indicating the Owens-Illinois Bottling Company manufactured the bottle. The date code indicates the bottle was manufactured in 1936. 5LO875 is a small scatter of less than 10 artifacts in an area that measures 49 ft by 56 ft. The scatter lies in a small, wind-blown depression near the crest of a larger dune. Artifacts include a graniteware kettle, a galvanized metal tub, one sanitary can, a few pieces of scrap metal, a crown cap amber bottle with no maker’s marks, and a light green soda bottle with “Sterling Bottling Works/Sterling, Colo.” embossed on the side. A Google search for the Sterling Bottle Works was generally uninformative, although one reference to the industry was found in a Business Directory Archive dated to 1911 (Colorado State Business Directory 1911). The debris scatter was likely deposited in a single episode at some point after 1911.

Table 3.6 Summary of isolated finds

Smith No.	Temp No.	Age/Cultural Affiliation	Description
5LO871	SS02	Historic	Stoneware fragment
5LO872	SS01	Historic	White earthenware fragment
5LO874	SS04	Historic/1936	Colorless Listerine bottle
5LO875	SS05	Historic/post-1911	Debris scatter
5LO876	SS03	Historic	Stoneware fragment

3.5.2 Environmental Impacts and Mitigation Measures

3.5.2.1 Significance Criteria

Impacts to cultural resources would be considered significant if cultural resource sites eligible for the NRHP are adversely affected by construction or operation of the proposed Project.

3.5.2.2 Impacts of the Proposed Project

The majority of resources found as a result of this inventory are recommended to be not eligible for inclusion on the NRHP. They include all of the isolated finds and two of the sites (5LO873, 5LO878.1). No further work is recommended for these resources. One site (5LO877) is recommended as eligible for inclusion on the NRHP. This site is a historic homestead with extant structures and good potential for buried deposits. Additional investigation of the site, including excavation, has the potential to provide data that could further our understanding of small, family farms in the early part of the 20th century in this part of Colorado (Criterion D). CHW will avoid this site and no WTGs or transmission lines are planned in its vicinity.

3.5.2.3 Impacts of the No Action Alternative

Under the No Action Alternative, cultural resources would not be impacted by the proposed Project.

3.5.2.4 Mitigation Measures

Subject to concurrence and consultation with the SHPO, no additional mitigation is proposed other than what has been described above.

3.6 Noise

3.6.1 Environmental Setting for the Proposed Project

A description of the Environmental Setting of the proposed Project, relative to noise, was outlined in DOE/EA-1611, Chapter 3.11. This chapter also addressed noise terminology and noise descriptors relevant to the proposed Project.

3.6.2 Environmental Impacts and Mitigation Measures

3.6.2.1 Significance Criteria

As summarized in Chapter 3.11 of DOE/EA-1611, impacts from noise would be considered significant if the proposed Project's operation resulted in regular annoyance to the residents within 1,000 feet of a wind turbine.

3.6.2.2 Environmental Impacts

A description of expected noise from construction activity is found in DOE/EA-1611. Noise impacts associated with operations are expected to be minimal to humans. At the base of a wind turbine, it should be possible to have a conversation without raising one's voice (American Wind Energy Association [AWEA] 2004b). At the nacelle, the wind turbines proposed for this Project generate approximately 107 dBA, depending on wind speed. The nearest residences are at least 396 m (1,300 feet) to the closest turbines (Turbines 67 and 68) and the closest active raptor nest is approximately 1,439 m (4,721 feet) to the closest turbine (Turbine 62).

A description of the model used to evaluate noise from the proposed Project (CadnaA) is found in DOE/EA-1611.

Noise calculations were based on the assumption that the entire wind farm would operate at maximum wind-speed capacity over a 24-hour period (i.e., at the cut-out speed of 9 m/s at hub height).

The noise assessment was completed to evaluate whether the proposed Project would introduce noise sources to the proposed Project area that would result in an increase in noise levels at previously modeled receptors. Further, the noise assessment was completed to evaluate if new receptors would be impacted by the proposed Project.

Noise levels were predicted at 9 receiver locations, each representing a suspected residence. Receivers included:

- Receivers identified in DOE/EA-1611: R1, R2, and R3;
- Receivers added for consideration of 14 additional wind turbines, added to the original project in 2013: R2a, R2b, R2c (note that R2 from DOE/EA-1611 was separated into three receivers to account for precise location of homes in the vicinity of R2);
- Receivers in the vicinity of the 11 new wind turbines of the proposed Project: R5, R6, and R7.

As stated in DOE/EA-1611, and as applicable to all newly identified receivers, the proposed Project is located in an area that is subject to relatively high wind speeds. As a result, ambient sound levels will likely vary (i.e., higher wind speeds typically result in higher sound levels due to noise generated by wind and wind rustling shrubs, trees, etc.). Higher wind speeds typically occur during daylight hours, and therefore existing noise levels are likely typically higher during the day than at night. Because noise generated by wind turbines is also higher under windier conditions, noise from the proposed wind farm would be expected to be higher during daylight hours than at night.

Results of initial assessment, as documented in DOE/EA-1611, included predicted sound levels at R1, R2, and R3. The EA also identified ambient sound levels below which the turbines may be audible at each receiver. The report concluded that the turbines would emit sound levels that would be comparable to a quiet home, or nighttime levels in a rural area.

The wind turbines added in 2013, as well as those included as part of the proposed Project, have slightly higher electrical output than those in the original EA (i.e., 1.7 MW units vs. 1.6 MW units). The noise emissions of these newer units are slightly higher. However, result of noise modeling of the *entire* project, including those proposed as part of the original project, and the new WTGs, as assessed at all 9 receiving locations, indicate that the expected levels of noise in the vicinity would be similar or less than what was predicted in DOE/EA-1611.

The following summary of noise modeling results assumes a wind speed of 9 meters per second, continuous over a 24-hour period, and is considered a worst-case scenario (i.e., noise levels from

the wind turbines would be highest). The following assessment compares predicted noise levels of the proposed Project with those assessed in the DOE/EA-1611, and those added in early 2013.

The following table summarizes the noise modeling results.

Table 3.7 Noise Modeling Summary at Nearest Identified Receivers

Receiver ^(a)	Distance from Nearest Wind Turbine (feet)	Predicted Wind Farm Noise Levels, dBA ^(b) All WTG, including Proposed Project (WTG #1 – 67) ^(d)
R1	1,290	42
R2a ^(c)	1,400	39
R2b	1,400	39
R2c	1,400	40
R3	2,435	40
R4	6,795	17
R5	2,275	37
R6	2,375	38
R7	1,285	43

Source: *ENVIRON, 2013*

- ^(a) Receiver location based on house locations
- ^(b) Assumes continuous operation at wind speed operation (9 m/s at hub height).
- ^(c) R2a is identical to the location of R2, as identified in DOE/EA-1611
- ^(d) Noise modeling completed with newer version of CadnaA (version 4.2), reflecting updated noise propagation algorithms

As summarized in Table 3.7, the predicted noise levels at the closest residential receivers to the proposed Project are similar or less than what was predicted in DOE/EA-1611. Further, noise levels from the proposed Project are comparable to levels anticipated in quiet rural environments.

3.6.2.3 Impacts of the No Action Alternative

Under the No Action Alternative, the area’s noise levels would not change.

3.6.2.4 Mitigation Measures

CHW would minimize construction noise impacts by ensuring that construction equipment is maintained and properly muffled, limiting the amount of equipment on-site to that which is necessary for construction and limiting construction activities to daytime hours.

3.7 Visual Resources

3.7.1 Environmental Setting for the Proposed Project

Visual resources refer to all objects (man-made and natural, moving and stationary) and features (e.g., landforms and water bodies) that are visible on a landscape. These resources contribute to

the scenic or visual quality of the landscape, that is, the visual appeal of the landscape. A visual impact is the creation of an intrusion or perceptible contrast that affects the scenic quality of a landscape. A visual impact can be perceived by an individual or group as either positive or negative, depending on a variety of factors or conditions (e.g., personal experience, time of day, weather/seasonal conditions). Landscapes and their visual qualities, like other public resources, exist in a dynamically changing physical, social and economic context, resulting in shifting and competing demands for their use.

The area exhibits a typical rural setting with both occupied and abandoned farmsteads scattered along gravel roads throughout the landscape, which is a mixture of tilled and CRP agricultural fields and native grassland used for grazing. The landscape is characteristically flat to rolling, with the green and brown colors of the agricultural fields, linear features such as roads and transmission lines. The proposed Project would not impact any national or state parks or designated scenic areas with recognized regionally important viewsheds.

This area of eastern Colorado is home to numerous wind turbines and the site of wind farms in the area is common. There are reportedly more than 600 wind turbines in the County already (Logan County) including the 56 wind turbines as part of the existing wind farm. The visual elements of the proposed Project area are common in northeastern Colorado.

U.S. Highway 6 is located approximately 4 miles south of the Project wind site and runs just north of the existing Wildhorse Creek Switchyard (Figure 3.7). U.S. State Highway 6 is a regionally significant highway that carries traffic between the rural towns of Holyoke to the east at the intersection with U.S. Highway 385, Fleming and Sterling to the west near the intersection with Interstate Highway 76. Several county roads traverse the area generally on section lines. The county roads in the proposed Project area are not used often due to the sparse population within the overall area. Any route that carries the official designation of a scenic highway tends to attract motorists for the sole purpose of viewing scenery. Neither U.S. Highway 6 nor any of the county roads are designated as a scenic highway.

3.7.2 Environmental Impacts and Mitigation Measures

3.7.2.1 Significance Criteria

Impacts to visual resources would be considered significant if construction of the proposed wind Project would result in high visual contrasts in highly sensitive or visually unique areas in proximity to high to medium numbers of high sensitivity viewers.

3.7.2.2 Environmental Impacts

The proposed Project Site is visible from U.S. Hwy 6 and from County Roads. The proposed Project would primarily result in long term visual effects, resulting from the visibility of the proposed facilities for the life-of-the-Project. The changes would primarily affect representative landscapes of northeastern Colorado and residential and county highway viewer groups in the proposed Project area. The wind turbines would change the aesthetics of the landscape with the addition of more tall towers and rotating blades. This effect may be deemed a beneficial or adverse effect depending on the viewer perspective and sensitivity.

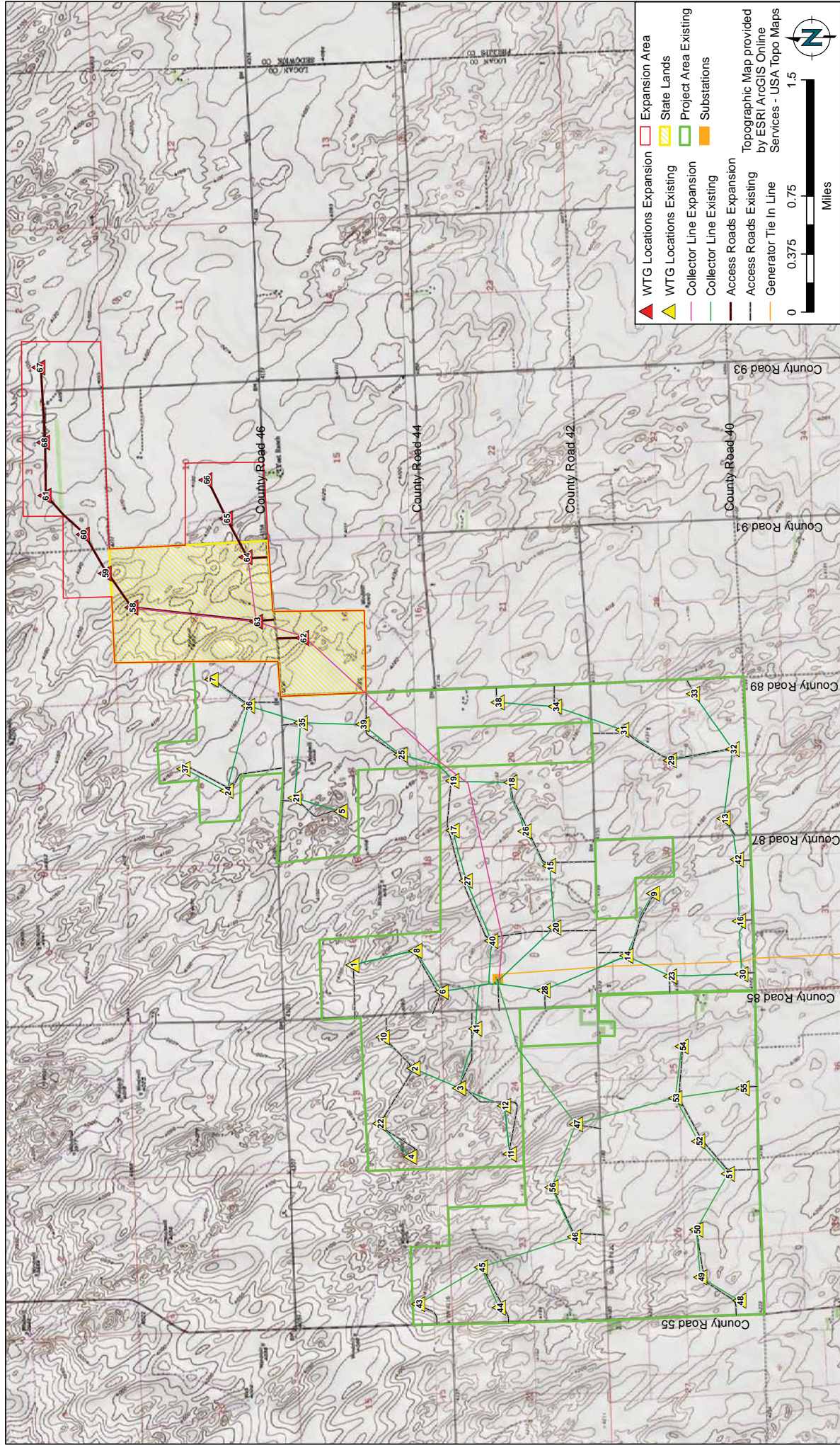


Figure 3.7

HIGHWAYS
 COLORADO HIGHLANDS WIND SITE, LOGAN COUNTY, COLORADO



U.S. Highway 6 is a regionally significant highway that carries commercial and private traffic into and through the area. This section of U.S. Hwy 6 is not a designated scenic highway. This Highway has a moderate to low viewer sensitivity due to the moderate user attitude and short duration of view. The turbines themselves would be located at least 4 miles north of the highway, which generally runs east and west, so the proposed Project is not expected to dominate the views of travelers. Public outreach opportunities for the proposed Project did not result in adverse comments on the potential visual impacts of the Project. General attitudes of those participating in Logan County public meetings in October 2014 and other comment opportunities are supportive of the proposed Project.

Visual impacts would also include short term direct effects from ground disturbances and the visibility of construction crews, equipment and vehicles working in the proposed Project area and access roads. Short term visual impacts during Project construction would be adverse, but minor since these visual changes would be temporary and CHW would implement standard practices to reclaim disturbed landscapes to pre-disturbance conditions.

The access roads, vehicles and dust during construction would impact visual resources. The proposed Project area already contains several County roads that bisect the proposed Project area and a number of private roads; construction of approximately 5.7 more kilometers (3.5 miles) would constitute a minor increase in the number of roads in the proposed Project area. During construction, vehicles and dust would be a fairly constant presence in the proposed Project area; during O&M, vehicle traffic would be only slightly more than current traffic levels.

Overall visual impacts would be long term and moderate.

3.7.2.3 Impacts of the No Action Alternative

Under the No Action Alternative, the area's visual resources would not change due to the proposed Project.

3.7.2.4 Mitigation Measures

No additional mitigation is proposed.

4 CUMULATIVE IMPACTS

Cumulative impacts are the impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor to collectively significant actions taking place over a period of time (C.F.R. 1508.7).

The natural, human, and cultural environment within the proposed Project area and in the general region has been substantially altered by long-practiced agricultural activities, particularly grazing and, along the transmission line, crop production. Both of these activities are widespread in the proposed Project area. Major agricultural activities have resulted in widespread conversion of shortgrass prairie to farmland and rural residential development. Other developments that have affected the proposed Project area and the region include additional wind energy facilities; transportation (roads, highways, railroads, pipelines, and transmission lines); small towns with businesses to provide goods and services to the rural communities; and water development (e.g., irrigation ditches, wind mills, and stock ponds).

One of the main developments in Logan County is wind facilities with the associated infrastructure of utility lines, roads, turbines, substations, and transmission lines; and the increase in population, housing, and services to maintain the facilities. In addition to the wind farm development in Logan County, there are numerous wind facilities developed or being developed in the region. Wind projects in the foreseeable future are difficult to assess. The wind resource appears good, and it seems very likely that additional wind farms are being planned.

In general, the cumulative impacts of the wind farm described in the original EA will not change significantly with the additional 11 towers included in this proposed Project. The changes in cumulative effects relative to the original EA are described below.

As previously discussed, there are several environmental factors for which the effects of the proposed Project are expected to be similar in extent or magnitude to those of the existing wind farm and cumulative impacts are not anticipated for these factors.

- Climate and Air Quality;
- Geology, Paleontology and Soils;
- Water Resources;
- Floodplains and Wetlands;
- Land Use, Transportation and Recreation;
- Public Health and Safety; and
- Socioeconomics and Environmental Justice

Only those factors with the potential for cumulative impacts from the proposed Project are discussed below.

4.1 Vegetation

Vegetation within the proposed Project area comprises grassland (314.8 hectares [787 acres]), CRP lands (1.8 hectares [4.4 acres]) and shelterbelts (6.8 hectares [17 acres]), for a total of 323.4 hectares (808 acres) for the proposed Project area. The proposed Project would create 2.8 hectares (6.8 acres) of permanent disturbance and 29.7 hectares (73.5 acres) of temporary disturbance for turbine pads and string corridors, access roads and collection line trenches. This incremental increase in vegetation disturbance represents a permanent disturbance on less than 1 percent of the existing project area. These footprints represent a minor reduction in vegetation in the proposed Project area and do not significantly affect existing cumulative impacts on vegetation.

4.2 Wildlife

Cumulative impacts to wildlife would be similar to those described for the proposed Project because land use within and adjacent to the Project area is subject to the same regular human activity from farming and ranching activities as has been occurring for some time. Large tracts of native habitat have been replaced with pasture land which provides non-native habitat for some species while displacing other species. The CRP land, grasslands, and shelterbelts in the region provide habitat for a wide number of species; however, existing human disturbance and activity adversely impact some species. Black-tailed prairie dog, burrowing owl, mountain plover, ferruginous hawk, and swift fox are shortgrass prairie species that are now state-listed species because of widespread loss of shortgrass prairie habitat. The proposed Project boundary encompasses 486 hectares (1,200 acres) and would cause temporary disturbance to 29.7 hectares (73.5 acres) and a permanent loss of 2.8 hectares (6.8 acres). The proposed Project does not affect shortgrass prairie and will not contribute to the widespread cumulative loss of that habitat. The proposed Project would contribute minimally to habitat loss and would have minor impacts on terrestrial wildlife.

Direct cumulative impacts to bats and birds (i.e., collision-related mortality) would result from the presence of above-ground features such as communications towers, grain elevators, transmission lines, vehicles on highways, windows, and the wind Project, as well as mortality caused by other factors (e.g., house cats) (NWCC 2001). However, bat and bird mortalities at wind projects have been documented to be low compared with other sources of mortality (NWCC 2001). While the proposed Project would cause some mortality, collisions are anticipated to be low for the proposed Project. When combined with other proposed development and wind projects in the county, however, these fatalities become a potentially larger issue. The proposed Project would add 11 towers to the existing 600 towers in Logan County.

A post-construction bird and bat fatality study was performed for the existing project in 2013 (Walsh, 2013). The objective of this study was to estimate the potential operational fatality impacts of the existing project on birds and bats. A total of eight (8) bird and 31 bat fatalities were found during carcass searches. Of the eight avian fatalities, two were raptors, and six were songbirds. All the bat fatalities were tree-roosting migratory bats. A ferruginous hawk was the only Special Status Species fatality. The total calculated estimate of bird and bat fatalities from the study period (summer and fall 2013) for the project was 514, with an estimated 7.64 fatalities per MW. The projected bird fatalities for the entire site was 111, with an estimated 1.65 bird

fatalities per MW. The projected bat fatalities estimate for the entire site was 404, with an estimated 6.01 fatalities per MW.

The bird fatality estimate was well below what was predicted for the proposed Project (Walsh 2013). The bat fatality estimate was higher than predicted. An expanded dataset of all available regional studies with similar vegetation community types shows the Project to be entirely within the ranges presented for the region. Bird fatalities ranged from 0.6 to 3.0 per MW and there were 1.65 birds per MW in the present study. Bat fatalities ranged from 0.8 to 8.9 per MW and there were 6.01 bats per MW in the present study.

A summary of the cumulative wildlife impacts is provided below.

Table 4.1 Cumulative Wildlife Impacts

Attributes	Units	Existing Project	Proposed Project
Number of Turbines		56	11
Nameplate Capacity	MW	90	19.7
Turbine Model		42 - GE 1.6-100 14 - GE 1.7-100	GE 1.7 MW-100
Rotor Diameter	M	100	100
Rotor Rotation Speed	RPM	9.75 - 16.18	9.65 - 17.9
Tip Speed	m/s	84.7	84.2 – 86.0
Turbine Swept Area	m ²	7,854	7,854
Total Swept Area	m ²	439,824	86,394
WTG Noise Emissions (max)	dB	105	105
Predicted Noise Emissions at Closest Receptor	dB	43	43
Hub Height	M	80	80
Tip Blade Height	M	130	130
Initial Surface Disturbance	Acre	446	73.5
Agricultural Land		0.9	16.6
CRP Land		143.9	0
Grassland	Acre	298.4	5.5
Shelterbelt		2.55	0
Shrub/Scrub		0	14.4
Life of Project Disturbance	Acre	47	6.8
Agricultural Land		0.1	3.02
CRP Land		10.8	0
Grassland	Acre	34.3	0.7
Shelterbelt		1.04	0
Shrub/Scrub		0	2.9

Attributes	Units	Existing Project	Proposed Project
Projected Bat Fatalities, per study period	Fatalities per MW	6.01	6.01
Projected Bird Fatalities, per study period	Fatalities per MW	1.65	1.65

4.3 Special Status and Sensitive Species

Species listed under the Federal Endangered Species List will not be impacted by the proposed Project; hence, the proposed Project will not contribute to the existing cumulative impacts of development on these species. By avoiding black-tailed prairie dog colonies, the Project would have minimal to no impacts on state-listed species and would not increase the existing cumulative effects of development on those species. Cumulatively, the region's agricultural activities have had greater impact on habitat than other developments. Most of the Project's disturbance would occur on previously disturbed land; therefore the proposed Project would not result in an additional species listing under the ESA. Increases in cumulative impacts to special status and sensitive species would be low.

Raptor mortalities associated with wind farms have been reported in western states (excluding California) ranging from 0.000 to 0.065 mortalities per year per turbine and mortalities in upper mid-western states range from 0.000 to 0.022 per year per turbine (Erikson et al. 2005). The wind farm at Ponnequin, CO reported 0.00 raptor mortalities at that facility (Erikson et al. 2002). The rate of mortality is directly related to the density of raptors in the affected area. While raptors utilize the Project area, their density tends to be low, due in part to the lack of perching habitat. Surveying at the existing CHW wind farm to date has revealed only one raptor mortality. No bald or golden eagle nests have been observed within 10 miles of the proposed Project area. However, a juvenile golden eagle fatality was discovered near one of the existing wind turbines in April 2014. CHW personnel continue to coordinate with the USFWS on this issue.

4.4 Cultural Resources

The Class III cultural resources inventory for the Site identified one homestead (5LO877) recommended to be eligible, under Criterion D, for inclusion on the National Register. CHW plans to avoid this site. The net change in cumulative impacts to cultural resources is expected to be low since impacts on properties eligible for the NRHP are typically mitigated either through avoidance or through data recovery. The proposed Project proposes to avoid impacting eligible sites so additional cumulative impacts are not expected.

4.5 Noise

Noise impacts are anticipated to be negligible, such that at distances of approximately 305 m (1,000 feet) or more from the turbines, the area would not experience an increase in noise relative to current conditions. The change in cumulative impacts on noise due to the proposed Project would be minor.

4.6 Visual Resources

The proposed Project would contribute to regional changes in land use character and related visual quality. The area is characterized by a typical rural setting with both occupied and abandoned farmsteads scattered along gravel roads throughout the landscape, which is a mixture of tilled and CRP agricultural fields and native grassland used for grazing. The landscape is flat to rolling, with the green and brown colors of the agricultural fields, and linear features such as roads and transmission lines. The proposed Project would not impact any National or state parks or designated scenic areas with recognized regionally important viewsheds. U.S. Highway 6 is located approximately 4 miles south of the proposed Project wind site and runs just north of the Wildhorse Creek Switchyard. Several county roads traverse the area generally on section lines. This area of eastern Colorado is home to numerous wind turbines and the sight of wind farms in the area is common. At the present time, there are over 600 wind turbines in the county (Logan County). The visual elements of the proposed Project area are quite common in northeastern Colorado. Construction of an additional 11 towers is expected to have a small and minor increase the cumulative visual effects of wind development in the area.

U.S. Highway 6 is a regionally significant highway that carries commercial and private traffic into and through the area. This section of U.S. Hwy 6 is not a designated scenic highway. This Highway has a moderate to low viewer sensitivity due to the moderate user attitude and short duration of view. Due to the distance of the turbines from the highway, the proposed Project is not expected to dominate the views of travelers, nor is the resulting view expected to be noticeably different from the existing condition. Generally attitudes of those participating in public meetings and comment opportunities are supportive of the proposed Project. Cumulative visual impacts would be moderate, but there would be no increases in cumulative impacts on highly sensitive or visually unique areas in proximity to high sensitivity viewers.

4.7 Unavoidable Adverse Effects

Mitigation measures would be used on the proposed Project to avoid or minimize many of the potential adverse effects from the proposed Project. However, unavoidable adverse effects, residual impacts that would likely remain after mitigation, would include the following:

- The consumption of fossil fuels and water and labor and materials would be expended during construction and to a much lesser extent, during operation (e.g., fuel for O&M vehicles, energy to heat O&M building). This would be offset by renewable energy produced through wind rather than consumption of fossil fuel. The proposed Project would result in a net cumulative reduction in the consumption of fossil fuels
- Some damage to, or illegal collection of, paleontological or cultural resources may occur. Procedures will be implemented during construction to minimize the potential for additional cumulative effects on paleontological or cultural resources. With these procedures in place, the net cumulative effects are expected to be negligible.
- Up to 29.7 hectares (73.5 acres) of soil and vegetation disturbance would occur during construction, resulting in some soil loss and some stream sedimentation, until surface disturbed areas are successfully reclaimed. BMPs will be implemented to minimize proposed Project effects. Cumulative effects of the proposed Project on soil erosion and stream sedimentation are expected to be negligible. Up to 2.8 hectares (6.8 acres) of

vegetation would be lost for the life of the Project. The proposed Project will not contribute to the net loss of native prairie communities.

- Some additional emissions of fugitive dust, sulfur dioxide, nitrogen oxides, carbon monoxide, carbon dioxide and volatile organic compounds would occur, mostly during construction of the proposed Project. The impacts will be temporary and will cause a minor increase the net cumulative effects of development in the proposed Project area.
- Some wildlife mortality could occur.

4.8 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources have on future generations.

Irreversible effects primarily result from use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. An irreversible commitment of resources represents a loss of future options. It applies primarily to non-renewable resources, such as minerals or cultural resources, and to those factors that are renewable only over long time spans, such as soil productivity.

Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., extinction of a threatened or endangered species or the disturbance of a cultural site). Irretrievable commitments represent the loss of production, harvest, or use of renewable resources. These opportunities are foregone for the period of the proposed action, during which other resource utilization cannot be realized. These commitments may be reversible, but the foregone utilization opportunities are irretrievable. The following is a summary of potential irreversible and irretrievable commitments of resources.

Table 4.2 Potential irreversible and irretrievable commitments of resources

Resource	Commitment Description	Irreversible	Irretrievable
Land Use	Exclusion of future land uses in proposed Project area	No. Land uses can be fully restored following decommissioning.	Project Life (6.8 acres)
Visual Resources	Impacts to local scenic quality during construction and operations	No. Note that turbines would be removed following decommissioning	Project Life
Biological Resources: Habitat and Wildlife	Habitat fragmentation, disturbance or loss of vegetation and impacts to habitats and wildlife during construction and operations	No. Short-term effects can be minimized during construction and operations through mitigation; can be fully restored following decommissioning.	No, impact to habitats and wildlife can be fully restored following decommissioning
Water Resources	Water consumptive Use during construction	Yes	Yes
Wetlands	None expected, no wetlands on proposed Project site	No	No
Geology and Geohazards	Possible slope failure	No	No

Resource	Commitment Description	Irreversible	Irretrievable
Soils	Soil loss and erosion during construction and operations. BMPs and mitigation would reduce.	Yes, minor	Yes, minor
Paleontology	None Identified	No	No
Cultural Resources	Disturbance of eligible properties during construction and operations	None expected due to avoidance and mitigation.	No, if mitigated
Air Quality	None, if BMPs implemented during construction and operations	No	No
Construction Materials and Fuels	Use of materials and fuels during construction and operations	Most uses would be irreversible; recycling could mitigate some resources impacts.	Yes

4.9 Intentional Destructive Acts

Wind projects may be the subject of intentional destructive acts ranging from vandalism and theft to sabotage and acts of terrorism intended to disable a line or project. The former, more minor, type of act is far more likely for such types of projects in general and particularly for those like the proposed Project, which are in relatively remote areas and serve relatively small populations. Intentional sabotage or terrorist acts would be expected to target much larger electrical facilities, where a loss of service would have substantial regional impacts.

Protections against theft and vandalism include fencing around substations and the use of locks and alarm systems where expensive or dangerous equipment is housed. The presence of high voltage would also discourage theft and vandalism. The relatively remote location of the proposed Project would tend to reduce theft and vandalism on the whole, because of the small number of people who would be expected to encounter the facilities. However, this same remoteness might encourage a rare act of opportunistic vandalism.

The effects of intentional destructive acts could be wide ranging or more localized, depending on the nature and location of the acts and the size of the proposed Project, and would be similar to outages caused by natural phenomena such as storms and ice buildup. While a transmission line is out of service, residences may lose electrical service. Effects on commercial and industrial electricity users would similarly include loss of lighting and ventilation but could also include the shutdown of office equipment, computers, cash registers, elevators, heavy machinery, food preparation equipment, and refrigeration. Municipalities could be affected by loss of traffic signals, while city offices might have to close temporarily. Police and fire services could be affected if communication systems shut down. City services, such as sewer and water systems, might be affected by extended outages. Loss of electrical service at hospitals would be of special concern as it could be life threatening. Such effects might be mitigated at hospitals and for other

critical uses through the use of temporary backup power (e.g., from a diesel or gas-powered generator).

In addition to the effects from loss of service, destructive acts could cause environmental effects as a result of damage to the facilities. Two such possible effects are fire, should conductors be brought down, and oil spills from equipment (e.g., mineral oil in transformers) in the substations, should some of that equipment be damaged or breached. Fires would be fought in the same manner at those caused by, for example, an electrical storm. Any spills would be treated by removing and properly disposing of contaminated soil and replacing it with clean soil.

5 CONSULTATION AND COORDINATION

Table 5.1 presents a list of individuals and organizations that were contacted during preparation of this Supplemental EA.

Table 5.1 Consultation and Coordination

Contact	Affiliation, Location	Date	Purpose of Contact
Federal			
Tim Snowden	Western Area Power	September 30, 2013	CHW Project Expansion
Sandy Vana-Miller	USFWS, Lakewood	October 4, 2013	CHW Project Expansion
Gene Iley	Western Area Power	November 5, 2013	Letter to CHW requesting a Supplemental EA be completed for the Expansion Project
USFWS Region VIII	USFWS Region VIII	April 23, 2014	Project Notification and Request for Comment
Susan Linner	USFWS	April 23, 2014	Project Notification and Request for Comment
USACE	Omaha, NE	April 23, 2014	Project Notification and Request for Comment
USACE	Littleton, CO	April 23, 2014	Project Notification and Request for Comment
USDA	NRCS	April 23, 2014	Project Notification and Request for Comment
USDOT	Federal Aviation Administration	April 23, 2014	Project Notification and Request for Comment
Federal Highway Administration	Colorado Division	April 23, 2014	Project Notification and Request for Comment
Sandy Vana-Miller, Kevin Kritz, Curtis Graves	USFWS	June 26, 2014	Meeting to review wildlife findings in Supplemental EA
State			
Tom Kroening	CPW, Brush	October 4, 2013	CHW Project Expansion
Wendy Figueroa	CPW, Brush	October 28, 2013	Email that CHW Expansion proposed studies and activities are consistent with CPW recommendations
Wendy Figueroa	CPW, Brush	January 24, 2014	Meeting to review Expansion
Edward Nichols	SHPO	December 13, 2013	Letter to Tim Snowden (Western) regarding Phase III Cultural Resources Inventory for the Expansion Project
Edward Nichols	SHPO	April 23, 2014	Project Notification and Request for Comment
CPW	Denver Office	April 23, 2014	Project Notification and Request for Comment
CPW	Brush Office	April 23, 2014	Project Notification and Request for

Table 5.1 Consultation and Coordination

Contact	Affiliation, Location	Date	Purpose of Contact
CDOT	Denver Office	April 23, 2014	Comment Project Notification and Request for Comment
John W. Hickenlooper	Governor, Colorado	April 23, 2014	Project Notification and Request for Comment
Colorado Energy Office		April 23, 2014	Project Notification and Request for Comment
Colorado State Lands Board		April 23, 2014	Project Notification and Request for Comment
County			
Rob Quint	Logan County Planning	September 11, 2013	Conditional Use Permit application submittal
		October 15, 2013	Planning Commission meeting
		October 22, 2013	County Commissioner meeting
Logan County Commissioners		April 23, 2014	Project Notification and Request for Comment
Logan County Planning		April 23, 2014	Project Notification and Request for Comment
Native American Tribes			
Gary Hayes	Ute Mountain Ute Tribe	April 22, 2014	Project Notification and Request for Comment
Terry Knight, Sr.	NAGPRA Representative/THPO, Ute Mountain Ute Tribe	April 22, 2014	Project Notification and Request for Comment
Ivan Posey	Shoshone Business Council	April 22, 2014	Project Notification and Request for Comment
Arlen Shoyo	Shoshone Business Council	April 22, 2014	Project Notification and Request for Comment
Reed Tidzump	Eastern Shoshone THPO	April 22, 2014	Project Notification and Request for Comment
Reba Tehran	Shoshone Cultural Office	April 22, 2014	Project Notification and Request for Comment
Richard Brannan	Arapahoe Business Council	April 22, 2014	Project Notification and Request for Comment
JoAnn White	Northern Arapahoe Tribe	April 22, 2014	Project Notification and Request for Comment
Maxine Natchees	Ute Tribal Council	April 22, 2014	Project Notification and Request for Comment
Betsy Chapoose	Ute Indian Tribe	April 22, 2014	Project Notification and Request for Comment

Table 5.1 Consultation and Coordination

Contact	Affiliation, Location	Date	Purpose of Contact
Cecelia Firethunder	Oglala Sioux Tribal Council	April 22, 2014	Project Notification and Request for Comment
Jimmy Newton Jr.	Southern Ute Indian Tribe	April 22, 2014	Project Notification and Request for Comment
Alden B. Naranjo	Southern Ute Indian Tribe	April 22, 2014	Project Notification and Request for Comment
Other			
Town of Fleming, CO		April 23, 2014	Project Notification and Request for Comment
The Wildlife Society	Bethesda, MD	April 23, 2014	Project Notification and Request for Comment
Kevin Urie	SPWRAP	May 14, 2014	SPWRAP Confirmation of CHW's payment for one-time water use for Project expansion

6 REFERENCES

- American Wind Energy Association. 2004a. Wind Energy Fact Sheet: Wind Turbine Lighting.
- American Wind Energy Association. 2004b. Wind Energy Fact Sheet: Facts About Wind Energy and Noise.
- Anderson, Cody, Gibson, Bonnie, Zier, Christian. October 2008. A Class III Cultural Resource Inventory of the Proposed Colorado Highlands Wind Project, Logan County, Colorado. Centennial Archaeology, Inc.
- Arnett, E.B., et al. 2008. Patterns of bat fatalities at wind energy facilities in North America. *Journal of Wildlife Management* 72(1):61-78.
- Athearn, Robert G. 1971. *Union Pacific Country*. Rand McNally, Chicago.
- Athearn, Robert G. 1976. *The Coloradans*. University of New Mexico Press, Albuquerque.
- Avian Power Line Interaction Committee (APLIC). 2006. Suggested practices for avian protection on power lines: the state of the art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA. [http://www.aplic.org/SuggestedPractices2006\(LR-2watermark\)](http://www.aplic.org/SuggestedPractices2006(LR-2watermark)).
- Baerwald, E.F., G.H. D'Amours, B.J. Klug, and R.M.R. Barclay. August, 2008. Barotrauma is a significant cause of bat fatalities at wind turbines. *Current Biology* 18 (16):R695-R696.
- Brown, Kenneth L. 1987. Section XIX: High Plains. In *Kansas Prehistoric Archaeological Preservation Plan*, edited by K.L. Brown and A.H. Simmons. Office of Archaeological Research, Museum of Anthropology and the Center for Public Affairs, Lawrence, Kansas.
- Cartensen, Vernon (editor). 1963. *The Public Lands: Studies in the History of the Public Domain*. University of Wisconsin Press, Madison.
- Centennial Archaeology, Inc. 2008. A Class III Cultural Resource Inventory of the Proposed Colorado Highlands Wind Project; Logan County Colorado.
- Chenault, Mark L. 1999. Chapter 4 - Paleoindian Stage. In *Colorado Prehistory: A Context for the Platte River Basin*, by Kevin P. Gilmore, Marcia Tate, Mark L. Chenault, Bonnie Clark, Terri McBride, and Margaret Wood. Colorado Council of Professional Archaeologists, Denver.
- Chronic, Halka, and Felicie Williams. 2002. *Roadside Geology of Colorado*. Second Edition. Mountain Press Publishing Company, Missoula.

- Clark, Bonnie. 1999. Chapter 7 - Protohistoric Period. In *Colorado Prehistory: A Context for the Platte River Basin*, by Kevin P. Gilmore, Marcia Tate, Mark L. Chenault, Bonnie Clark, Terri McBride, and Margaret Wood. Colorado Council of Professional Archaeologists, Denver.
- Clark, Bonnie, and Kathleen Corbett. 2007. Settlements. In *Colorado History: A Context for Historical Archaeology*, by Minette C. Church, Steven G. Baker, Bonnie J. Clark, Richard F. Carrillo, Jonathon C. Horn, Carl D. Späth, David R. Guilfoyle, and E. Steve Cassells, pp. 107-151. Colorado Council of Professional Archaeologists, Denver.
- Colorado Division of Wildlife. May 9, 2008. Letter to Mr. Jim Hartman of the Western Area Power Administration regarding recommendations from local biologists and wildlife managers.
- Colorado Division of Wildlife. Undated. Map showing Yellow Mud Turtle County occurrence. Accessed via the internet at: http://ndis.nrel.colostate.edu/plugins/co_maps/030998.jpg.
- Colorado State Business Directory. 1911. Sterling. IN *37th Annual Volume, The Colorado State Business Directory WITH A Complete Classified Directory of the Entire State, Including Mines, Reduction Works, Etc.* Transcribed by Joy Fisher, 2004. The Gazateer Publishing Company, Denver. Electronic document, <http://files.usgarchives.net/co/logan/history/directories/1911/1911-sterling.txt>, accessed 12/03/2013.
- Craig, G. February, 2008. Recommended buffer zones and seasonal restrictions for Colorado raptors. Colorado Division of Wildlife. 7 pp.
- Dick, Everett N. 1970. *The Lure of the Land: A Social History of the Public Lands from the Articles of Confederation to the New Deal*. University of Nebraska Press, Lincoln.
- Dorsett, Lyle W. 1977. *The Queen City: A History of Denver*. Pruett Publishing, Boulder, Colorado.
- Energetics, Inc. 2004. Proceedings: Bat and wind power generation technical workshop. Sponsored by Bat Conservation International, U.S. Fish and Wildlife Service, National Renewable Energy Laboratory, and the American Wind Energy Association. February 19 and 20, 2004.
- ENVIRON International Corporation. 2008. Cadna/A noise model used to predict wind farm noise at three potentially-affected residential receptors in the project vicinity.
- Erikson, W., G. Johnson, D. Young, D. Strickland, R. Good, M. Bourassa, K. Bay, and K. Sernka. Synthesis and Comparison of Baseline Avian and Bat Use, Raptor Nesting and Mortality Information from Proposed and Existing Wind Developments. Prepared for Bonneville Power Administration, Portland, OR.

Erikson, W.P., G.D. Johnson, and D.P. Young Jr. 2005. A Summary and Comparison of Bird Mortality from Anthropogenic Causes with an Emphasis on Collisions. USDA Forest Service Gen. Tech. Rep. PSW-GTR-191.

Fenneman, Nevin. 1946. *Physical Divisions of the United States*. United States Geological Survey, Reston, Virginia.

Fitzgerald, J.P., C.A. Meaney, and D.M. Armstrong. 1994. *Mammals of Colorado*. University Press of Colorado and Denver Museum of Natural History. 467 pp.

Gates, Paul W. 1968. *History of Public Land Law Development*. U.S. Government Printing Office, Washington, D.C.

Gilmore, Kevin P. 1999. Chapter 6 - Late Prehistoric Stage. In *Colorado Prehistory: A Context for the Platte River Basin*, by Kevin P. Gilmore, Marcia Tate, Mark L. Chenault, Bonnie Clark, Terri McBride, and Margaret Wood. Colorado Council of Professional Archaeologists, Denver.

Gilmore, Kevin P., Marcia Tate, Mark L. Chenault, Bonnie Clark, Terri McBride, and Margaret Wood. 1999. *Colorado Prehistory: A Context for the Platte River Basin*. Colorado Council of Professional Archaeologists, Denver.

Goff, Richard, and Robert H. McCaffree. 1967. *Century in the Saddle*. Colorado Cattlemen's Centennial Commission, Denver.

Hammerson, G.A. 1999. *Amphibians and reptiles in Colorado*. Second Edition. University Press of Colorado and Colorado Division of Wildlife. Niwot, Colorado.

Irby, L.R., R.J. Mackie, H.I. Pac, and W.F. Kasworm. 1988. Management of mule deer in relation to oil and gas development in Montana's overthrust belt. Pages 113-121 In J. Emerick, S.Q. Foster, L. Hayden-Wing, J. Hodgson, J.W. Monarch, A. Smith, O. Thorne, II, and J. Todd (eds). *Proceedings III: Issues and technology in the management of impacted wildlife*. Thorne Ecological Institute, Boulder, Colorado. 177 pp.

John Deere. 2013. Timeline. Electronic document, www.deere.com/wps/dcom/en_US/corporate/our_company/about_us/history/timeline/timeline.page, accessed November 1, 2013.

Johnson, G.D., D.P. Young, Jr., W.P. Erickson, C.E. Derby, M.D. Strickland, and R.E. Good. 2000. *Wildlife monitoring studies, SeaWest Windpower Project, Carbon County, Wyoming, 1995-1000*. Final Report. Prepared for SeaWest Energy Corporation, San Diego, California and the U.S. Department of the Interior, Bureau of Land Management, Rawlins District Office, Rawlins, Wyoming. 195 pp.

- Keith, D.W., J.F. DeCarolis, C.C. Denkenberger, D.H. Lenschow, S.L. Malyshev, S. Pacala, and P.J. Rasch. 2004. The influence of large-scale wind power on global climate. *Publication of the National Academy of Sciences* 101(46):16115-16120.
- Kingery, H.E. 1998. Colorado breeding bird atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife.
- Koenig, N. V. 2002, Evaluation of Mineral and Mineral Fuel Potential of Logan County State Mineral Lands Administered by the Colorado State Land Board, Colorado Geological Survey, Division of Minerals and Geology, Department of Natural Resources, Denver, CO, CD-ROM.
- Kunz, T.H., E.B. Arnett, W. P. Erickson, A.R. Hoar, G.D. Johnson, R.P. Larkin, M.D. Strickland, R.W. Thresher, and M.D. Tuttle. 2007. Ecological impacts of wind energy development on bats: questions, research needs, and hypotheses. *Frontiers in Ecology and the Environment* 5(6):315-324.
- Leffingwell, Randy. 1993. *Classic Farm Tractors: History of the Farm Tractor*. Motorbook International, Osceola, Florida.
- Logan, Brad. 1996. Protohistoric Period Research. In *The Archaeology of Kansas: A Research Guide*, edited by B. Logan, pp. 164-208. Office of Archaeological Research,
- Madole, Richard F. 1995. Spatial and Temporal Patterns of Late Quaternary Eolian Deposition, Eastern Colorado, U.S.A. *Quaternary Science Reviews* 14:155-177.
- Martin, J.D., G.C. White, and F.M. Pusateri. 2007. Occupancy rates by swift foxes (*Vulpes velox*) in eastern Colorado. *Southwestern Naturalist* 52:541-551.
- Mehls, Steven F. 1984. *Colorado Plains Historic Context*. Office of Archaeology and Historic Preservation, Colorado Historical Society, Denver.
- Mehls, Steven F. 1984. *The New Empire of the Rockies, A History of Northeastern Colorado*. Cultural Resources Series, vol. 16. U.S. Department of the Interior, Bureau of Land Management, Denver.
- Mehls, Carol D., and Steven F. Mehls. 1989. *Weld County, Colorado Historic Agricultural Context*. Colorado Historical Society, Denver.
- Logan County Chamber of Commerce. 2008a. Tourism Information: Frequently Asked Questions about Enjoying the Great Outdoors in Sterling and Logan County: Access via the internet at: <http://www.logancountychamber.com/toursimoutdoors.html>.
- Logan County Chamber of Commerce. 2008b. Tourism Information: Lodging Information for Sterling and Logan County. Accessed via the internet at: <http://www.logancountychamber.com/tourismlodging.html>.

- Logan County Chamber of Commerce. 2008. Tourism Information: Community Parks in Sterling and Logan County Colorado. Accessed via the internet at: <http://www.logancountychamber.com/tourismparks.html>.
- National Energy Policy Development Group. 2001. National Energy Policy: Reliable, Affordable, and Environmentally Sound Energy for America's Future. Prepared by National Energy Policy Development Group for the President of the United States of America.
- National Research Council. 2007. Environmental Impacts of Wind Energy Projects. Committee on Environmental Impacts of Wind Energy Projects, Board on Environmental Studies and Toxicology, Division on Earth and Life Studies. The National Academy Press, Washington, D.C.
- National Wind Coordinating Committee. 2001. Avian collisions with wind turbines: a summary of existing studies and comparisons to other sources of avian mortality in the United States.
- National Wind Coordinating Committee. 2002. Permitting of Wind Energy Facilities, A Handbook Revised 2002.
- Peake, Ora B. 1937. *The Colorado Range Cattle Industry*. The Arthur N. Clark Co., Glendale, California.
- Scott, G.R., 1978, Map showing geology, structure, and oil and gas fields in the Sterling 1 degree x 2 degrees quadrangle, Colorado, Nebraska, and Kansas: U.S. Geological Survey, Miscellaneous Investigations Series Map I-1092, scale 1:250000.
- Scott, G.R., 1982, Paleovalley and geologic map of northeastern Colorado: U.S. Geological Survey, Miscellaneous Investigations Series Map I-1378, scale 1:250000.
- Scott, Glenn R. 1989. Historic Trail Maps of the Sterling 1° x 2° Quadrangle, Northeastern Colorado. *U.S. Geological Survey Miscellaneous Investigations Series*, Map I-1894. Denver, Colorado.
- Steinel, Alvin T. 1926. *History of Agriculture in Colorado*. State Board of Agriculture, Denver.
- Tate, Marcia J. 1999. Chapter 5 - Archaic Stage. In *Colorado Prehistory: A Context for the Platte River Basin*, by Kevin P. Gilmore, Marcia Tate, Mark L. Chenault, Bonnie Clark, Terri McBride, and Margaret Wood. Colorado Council of Professional Archaeologists, Denver.
- Toepler, J.E. and R.A. Crete. 1978. Migration of radio-tagged great sandhill cranes for Minnesota and Wisconsin. Pages 159-173 In J.C. Lewis, (ed.) *Proceedings: 1978 Crane*

- Workshop. National Audubon Society, Colorado State University Printing Service. April 1979.
- Tweto, Ogden. 1979. *Geologic Map of Colorado*. U.S. Geological Survey, Denver.
- TRC Environmental Corporation. 2008. Post-construction avian and bat fatality monitoring at the Spring Canyon Wind Project, Logan County, Colorado. TRC Environmental Corporation, Laramie, Wyoming.
- United States Department of Agriculture, Soil Conservation Service, in cooperation with the Colorado Agricultural Experiment Station. July 1977. Soil Survey of Logan County, Colorado.
- U.S. Department of Energy, Western Area Power Administration. 2009. Environmental Assessment DOE/EA-1611, Interconnection Request for the Colorado Highlands Wind Project, Logan County, Colorado. January.
- U.S. Department of the Interior, Fish and Wildlife Service. May 7, 2008. Letter to Mr. James Hartman with comments regarding the Endangered Species Act of 1973, the Bald and Golden Eagle Protection Act of 1940, the Migratory Bird Treaty Act of 1918 and the National Environmental Policy Act of 1969.
- U.S. Department of the Interior, Fish and Wildlife Service. 1975. National Wetland Inventory Maps: Fleming, Haxtun West, Crook and Tamarack Ranch, Colorado.
- U.S. Fish and Wildlife Service. 2012. Land-Based Wind Energy Guidelines.
- Walsh Environmental Scientists and Engineers, LLC. (Walsh). September 2008. Habitat and wildlife assessment: Fleming wind energy Project, Logan County, Colorado.
- Walsh. 2008. Addendum to Habitat and Wildlife Assessment and Habitat Mapping Reports, Colorado Highlands Wind Energy Project, Logan County, Colorado. November 11.
- Walsh. 2009. Fall 2008 Baseline Acoustic Monitoring of Bat Populations, Colorado Highlands Wind Project, Logan County, Colorado. January 14.
- Walsh. 2009. Winter Raptor Survey, Colorado Highlands Wind Project, Logan County, Colorado. May 26.
- Walsh. 2009. Avian Spring Surveys for Colorado Highlands Wind Farm, Logan County, Colorado. October 16.
- Walsh. 2010. Avian Fall Surveys for Colorado Highlands Wind Farm, Logan County, Colorado. April 8.
- Walsh. 2010. Winter Raptor Surveys for Colorado Highlands Wind Farm, Winter 2009-2010, Logan County, Colorado. May 19.

- Walsh. 2012. Habitat Assessment and Avian Spring Surveys for Expansion at Colorado Highlands Wind Farm, Logan County, Colorado, Spring 2011. January 11.
- Walsh. April 2012. Bat Acoustical Surveys, Colorado Highlands Wind Farm, Logan County, Colorado.
- Walsh. August 2012. Avian Surveys, Spring and Summer 2012, Colorado Highlands Wind Farm, Logan County, Colorado.
- Walsh. December 2013. Post-Construction Bird and Bat Fatality Study, Phase I, Colorado Highlands Wind Project, Logan County, Colorado.
- Wedel, Waldo. 1986. *Central Plains Prehistory: Holocene Environments and Culture Change in the Republican River Basin*. University of Nebraska Press, Lincoln
- Western Area Power Administration. 2009. Mitigation Action Plan, Colorado Highlands Wind Project, Logan County, Colorado. January 9.
- Western Area Power Administration. 2013.
<http://ww2.wapa.gov/sites/western/newsroom/FactSheets/Pages/factsabout.aspx>.
- Western Area Power Administration, Rocky Mountain Region. General Statement of Work for the Preparation of an Environmental Assessment and Related Studies and Documents for Applications Related to Transmission and Interconnection Requests Including: Appendix A: Biological Assessment, Appendix B: Cultural Resources Surveys, Appendix C: Paleontology.
- Western Regional Climate Center. 2013. *Climate of Colorado*. Desert Research Institute, <http://www.wrcc.dri.edu/narratives/colorado/>, accessed December 2, 2013.
- Wheeler, B.K. 2003. *Raptors of western North America*. Princeton University Press. Princeton, New Jersey.
- Zornow, William F. 1957. *Kansas: A History of the Jayhawk State*. University of Oklahoma Press, Norman.

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