Environmental Assessment

for the

Caney River Wind Project
Power Purchase Agreement

Elk County,
Kansas

Tennessee Valley Authority

May 2011

CANEY RIVER WIND PROJECT

Power Purchase Agreement
Elk County, Kansas

Prepared By:
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Submitted to:

TENNESSEE VALLEY AUTHORITY

May 2011

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LIST OF ABBREVIATIONS AND ACRONYMS

AECI	Associated Electric Cooperative Inc.
AGL	above ground level
AMSL	above mean sea level
ANSI	American National Standards Institute
APLIC	Avian Power Line Interaction Committee
ASTM	American Society for Testing and Materials
AWEA	American Wind Energy Association
BEPA	Bald and Golden Eagle Protection Act
BMPs	best management practices
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
Caney River	Caney River Wind Project, LLC
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLCE	Caney Legacy Conservation Easement
CR	County Road
CWA	Clean Water Act
dBA	A-weighted decibels
EPA	U.S. Environmental Protection Agency
ER	environmental report
ESA	Endangered Species Act
FAA	U.S. Federal Aviation Administration
FERC	U.S. Federal Energy Regulatory Commission
FHLCA	Flint Hills Legacy Conservation Area
USFWS	U.S. Fish and Wildlife Service
GE	General Electric
GIS	geographic information system
GPC	greater prairie chicken
HOFH	Heart Of the Flint Hills
IEEE	Institute for Electrical and Electronic Engineers
IP	individual permit
IPCEA	Insulated Power Cables Engineers Association
K.A.R.	Kansas Administrative Regulations
KDA	Kansas Department of Agriculture
KDHE	Kansas Department of Health and Environment
KDOT	Kansas Department of Transportation
KDWP	Kansas Department of Wildlife and Parks
KEC	Kansas Energy Council
KGS	Kansas Geological Survey
K.S.A.	Kansas Statutes Annotated
KREWG	Kansas Renewable Energy Working Group
KSHS	Kansas State Historical Society
kV	kilovolt
LGIA	Large Generator Interconnection Agreement
LOP	life-of-project
MBTA	Migratory Bird Treaty Act
Met	meteorological
MSDS	Material Safety Data Sheet
MW	megawatt

LIST OF ABBREVIATIONS AND ACRONYMS (Cont.)

NAAQS	National Ambient Air Quality Standards
NECP	Native Environment Conservation Plan
NEPA	National Environmental Policy Act
NFWF	National Fish and Wildlife Foundation
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollution Discharge Elimination System
NEMA	National Electrical Manufacturer's Association
NESC	National Electrical Safety Code
NETA	National Electrical Testing Association
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWCC	National Wind Coordinating Collaborative
NWP	Nationwide Permit
OSHA	Occupational Safety and Health Administration
O&M	operation and maintenance
PPA	Power Purchase Agreement
Project	Caney River Wind Project, LLC
ROW	right-of-way
SARA	Superfund Amendments and Reauthorization Act
SHPO	State Historic Preservation Office
SPCC Plan	Spill Prevention, Control, and Countermeasures Plan
SPP	Southwest Power Pool
Stilla5	Stilla5 Iron Works, LLC
SWPPP	Storm Water Pollution Prevention Plan
T&E	threatened and endangered
TPI	Total personal income
TSR	Transmission Service Request
TVA	Tennessee Valley Authority
U.S.	United States
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
WQC	Section 401 Water Quality Certification
WTG	Wind Turbine Generator

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1.0 PURPOSE AND NEED FOR ACTION

1.1 The Decision

The Tennessee Valley Authority (TVA) addresses the power supply needs of the region through a broad portfolio of energy resources including energy conservation; renewables such as wind, solar and biofuel; hydropower; nuclear; and coal- and natural gas-fired generation. Providing reliable power requires the use of all of these resources. Consistent with its 2007 Strategic Plan, Tennessee Valley Authority's (TVA's) objectives include increasing the amount of clean and renewable energy resources within its generation portfolio. In support of this effort, the TVA Board recently authorized the purchase of as much as 2,000 megawatts (MW) of renewable energy. The purchase of 2,000 MW is part of TVA's goal to meet one-half of its power supply needs from clean and renewable energy resources by 2020. Increasing the amount of renewable energy resources would also assist TVA in meeting potential renewable portfolio standards, utilizing more renewable electricity in its own facilities, broadening its generation mix, improving grid reliability, and meeting future consumer demand for electricity through low carbon-emitting facilities.

TVA sought proposals in December 2008 from renewable and/or clean energy providers in order to support the increase of renewable energy resources. TVA entertained proposals for such power supply of 1 to 20 years in duration.

Many of the proposals received were for wind energy outside the TVA region due to the limited wind resources available in the TVA Power Service Area (PSA). The purpose of the proposed action of this environmental review is to evaluate the effects of:

1. Acquiring approximately 200 MW of renewable energy generated from the Caney River Wind Project (Tradewind Energy) in support of meeting these goals.

2. Creating profitable, economically viable wind-powered energy facilities that would provide a significant source of clean, reliable, renewable energy to TVA consumers.

The Project as proposed would meet both of these objectives. TVA must decide whether, in support of the above goals, to commit to the 20-year power purchase agreement (PPA) for the purchase of up to 200 MW of renewable energy from Caney River. The execution of the PPA is contingent upon meeting applicable environmental review requirements, making a determination

of environmental acceptability, and securing a firm transmission path for delivery of the power to TVA.

This environmental document was prepared under the guidance of TVA, with assistance from Tradewind Energy and Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell). According to 40 *Code of Federal Regulations* (CFR) 1506.5(b), "If an agency permits an applicant to prepare an environmental assessment, the agency…shall make its own evaluation of the environmental issues and take responsibility for the scope and content of the environmental assessment." TVA staff has independently evaluated the environmental issues and directed revisions to the EA to respond to public and agency comments. Field surveys of wetlands, endangered species, greater prairie chicken (*Tympanuchus cupido*) (GPC) leks, raptor stick nests, and cultural resources were conducted by Burns & McDonnell.

1.2 Other Pertinent Environmental Reviews or Documentation

TVA completed an environmental impact statement (EIS) on its integrated resources plan (TVA 1995) titled *Energy Vision 2020* that identified and evaluated a suite of generating options for the agency. Wind power was among the suite of renewable energy source options selected for implementation. In 2011, TVA has issued a Final Environmental Impact Statement for TVA's Integrated Resource Plan, TVA's Environmental and Energy Future (TVA 2011), which updates TVA's energy planning for the future. This new EIS considers renewable energy including wind as a component of TVA's future energy generating portfolio on a programmatic basis.

1.3 Permits and Consultations

On March 2, 2011, TVA issued its final Integrated Resource Plan and the associated Environmental Impact Statement which update TVA's energy planning future. On April 14, 2011, the TVA Board of Dicrectors accepted the Integrated Resource Plan and authorized the Chief Executive Office to use its recommended planning direction as guide in energy resource planning and selection. On a programmatic basis this EIS considered renewable energy including wind as an important component of TVA's future energy generating portfolio. This review supercedes TVA's earlier energy planning documents, i.e., Integrated Resource Plan and EIS (TVA 1995), termed "Energy Vision 2020."

1.3.1 Clean Water Act Section 404 Permit

Since the Wind Turbine Generators (WTGs) and associated facilities would mostly be located in upland portions of the Project area, the access roads, other road improvements, and the

electrical line corridors appear to be the only Project features that may potentially impact wetlands or other waters of the U.S. County road improvements are planned at a low-water crossing and a number of additional culvert replacements and improvements are anticipated. These crossings are authorized under Nationwide Permit (NWP) 14, “Linear Transportation Projects”. While additional work is not anticipated outside of these areas in waters of the U.S., in the event a road improvement or transmission line crosses a stream, these actions are anticipated to be authorized under a NWP 12 (for utility corridors) and a NWP 14 (for access roads); a Section 404 individual permit (IP) would not be required.

1.3.2 Objects Affecting Navigable Airspace - Notice of Construction or Alteration

Under 49 United States Code (USC) Section 44718, “the Secretary of Transportation shall require a person to give adequate public notice…of the construction or alteration, establishment or extension, or the proposed construction, alteration, establishment, or expansion, of any structure…when the notice will promote (1) Safety in air commerce and (2) The efficient use and preservation of the navigable airspace and of airport traffic capacity at public-use airports.” According to 14 CFR Part 77, the notice is required to be provided to the administrator of the Federal Aviation Administration (FAA). Caney River provided the FAA with Notices of Proposed Construction or Alteration for representative WTG locations. “Determination of No Hazard to Air Navigation” certificates are in place for all WTG locations.

1.3.3 Section 401 Water Quality Certification

The Kansas Department of Health and Environment (KDHE), Bureau of Water, would issue a Water Quality Certification under Section 401 of the Clean Water Act (CWA), which certifies that the proposed Project would meet applicable water quality standards, if an individual Section 404 permit is required from the United States Army Corps of Engineers (USACE). However, as indicated above, it is anticipated that the Project would qualify for NWPs, which have already been certified by the State of Kansas.

1.3.4 Clean Water Act Section 402 National Pollution Discharge Elimination System Permit

The KDHE, Bureau of Water implements Section 402 of the CWA. National Pollution Discharge Elimination System (NPDES) regulations require compliance with Kansas’s Construction Stormwater General Permit (KSR100000) for stormwater discharge associated with construction activities. To comply with the General Permit, Caney River prepared and submitted a

Stormwater Pollution Prevention Plan (SWPPP) and would submit a Notice of Intent (NOI) to KDHE, Bureau of Water, at least 60 days prior to the start of construction. KDHE would authorize the NOI, assign a Kansas permit number and federal permit number, and provide a signed and dated copy of the authorized NOI to Caney River. Caney River would comply with all of the applicable requirements listed in the General Permit. When soil disturbing activities were complete and the site reached final stabilization, Caney River would submit a Notice of Termination (NOT) to the KDHE.

1.3.5 Endangered Species Consultation

Under Section 7 of the Endangered Species Act and applicable regulations (50 CFR Part 402), federal agencies must determine whether a proposed action may affect federally listed species and if so, initiate consultation with the U.S. Fish and Wildlife Service (USFWS). The Project would not result in adverse impacts to any federally listed or proposed species, based upon the completed biological surveys and coordination with the USFWS (Appendix A). The data support a no effects determination by TVA.

Under the Nongame and Endangered Species Conservation Act (Kansas Statutes Annotated [K.S.A.] 32-957 through 32-963, 32-1009 through 32-1012, and 32-960(a) and (b)), any action which is totally or partially funded with public money or requires a permit from a state or federal agency that may affect a state-listed threatened or endangered species or its designated critical habitat will require an Action Permit from the Kansas Department of Wildlife and Parks (KDWP) (Kansas Administrative Regulations [K.A.R.] 115-15-3). Based on coordination and correspondence with KDWP, an Action Permit would not be required for the Project (Appendix A).

1.3.6 Kansas Department of Agriculture

A Stream Obstruction Permit under the Levee Law (K.S.A. 24-126) is required for the placement of fill or obstruction (such as a culvert) in any stream (e.g., Elk River, Clear Creek, or tributaries). In addition, a Floodplain Fill Permit is required if fill material is placed in a designated floodplain. Any necessary permits for bridge and culvert improvements on access roads will be obtained if needed, once the final design is determined.

1.3.7 Historic Preservation Law

Under Section 106 of the National Historic Preservation Act and applicable regulations (36 CFR Part 800) and Kansas Historic Preservation Law (K.S.A. 75-2715 through 75-2726), all federal

and state agencies and entities are required to take into account the effects of their undertakings on cultural resources that are eligible for, or listed on, the National Register of Historic Places (NRHP). Section 106 regulations (36 CFR § 800.16(y)) define an undertaking as "a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval." Kansas Historic Preservation law (K.S.A. 75-2716) defines a project to include "(1) Activities directly undertaken by the state or any political subdivision of the state, or any instrumentality thereof; (2) activities undertaken by a person which are supported in whole or in part through grants, subsidies, loans or other forms of financial assistance from the state or any political subdivision of the state, or any instrumentality thereof; and (3) activities involving the issuance of a lease, permit, license, certificate or other entitlement for use, to any person by the state or any political subdivision of the state, or any instrumentality thereof." Since TVA is a federal agency and the KDHE, Bureau of Water, would authorize stormwater discharges, the Project would be subject to review for cultural resources by the Kansas State Historic Preservation Office (SHPO).

1.3.8 State Public Service Commission Certification

Kansas does not have a PSC Certification requirement.

1.3.9 Executive Orders

Executive Order (EO) 11988 on Floodplain Management requires each agency to provide leadership and to take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities. Before taking an action, each agency determines whether the proposed action would occur in a floodplain and considers alternatives to avoid adverse effects to floodplains. If an agency finds that the only practicable alternative requires siting in a floodplain, the agency prepares and circulates a notice containing an explanation of why the action is proposed to be located in a floodplain. Consistent with EO 11988 and TVA implementing procedures, this EA contains the required floodplain evaluation and finding of no practicable alternative and will serve as the public notice required by the EO.

EO 11990, Protection of Wetlands requires each agency to provide leadership and to take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out its responsibilities. The

order does not apply to the issuance of federal permits or licenses. Each agency is to avoid undertaking or providing assistance for new construction located in wetlands unless the agency finds that there is no practicable alternative to such construction and that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use. Consistent with EO 11990 and TVA implementing procedures, this EA contains the required wetlands findings and will serve as the public notice required.

1.4 Project Description

The Project would be constructed on 13,618 acres of private land approximately 40 miles east to southeast of Wichita, in Elk County, Kansas (Figure 1-1). The Project would involve the construction of 111 WTGs and associated facilities. The associated permanent facilities would include inverted-tee octagonal foundations having a surface footprint of approximately 36 feet in diameter for each individual WTG, up to 33 miles of new or improved access and service roads and various public infrastructure improvements, up to 56 miles of trenching for new buried electrical circuits and communication wires, up to three meteorological towers, 1.1 miles of new overhead transmission line and associated support structures, an operation and maintenance facility covering about 5 acres, a project substation covering about 5 acres, and an interconnect facility covering about 5 acres.

1.5 Public and Agency Involvement and Scope of the Environmental Review

Prior to TVA involvement, as described in Section 1.3 and Appendix A of this EA, Caney River has had numerous contacts and discussions with local, state, and federal organizations and agencies regarding their permitting or other interests in this project. Subsequently, TVA has considered the available information and correspondence in its determination of scope for the environmental review. TVA has initiated formal consultation with the Kansas SHPO regarding cultural resources and received concurrence on October 28, 2010, that the proposed project will have no effect on historic properties as defined in 36 CFR 800.

TVA made this EA available to the public and agencies for review and comment from October 11 to November 26, 2010. In addition, TVA revised the EA and provided a second opportunity for public comment from April 1 to April 15, 2011. In order to make the document accessible, TVA each time has:

- Made this document available for comment on its external website at http://www.tva.com/environment/reports/index.htm

- Placed copies in local libraries in Elk and Shawnee Counties, Kansas and Knox County, Tennessee

- Placed ads in local news media in the same counties noted above, announcing the availability of the review and informing the public how to access or obtain copies of the review

- Provided copies to more than 20 local, state, and federal agencies and Native American tribes

TVA received a number of comments about the Project's potential contribution to fragmentation of tallgrass prairie habitat. In response to these comments, TVA conducted additional analyses and reopened the draft EA for additional public input to give interested members of the public and other agencies an opportunity to comment on those analyses.

Figure 1-1: Project Location

Based on internal and external scoping and experience with similar projects, the following resources and issues have been evaluated in this report. Based on extensive consultation with state and federal agencies, and review of comments received from the public on this and other wind farms in the area, the priority issues with a wind farm development in Kansas involve effects on the tallgrass prairie, the Greater Prairie Chicken, the viewshed, and endangered species. These issues are evaluated first in the EA, followed by effects on other natural, social, and cultural features.

- Tallgrass Prairie Vegetation (including fragmentation) —Section 3.1
- Greater Prairie Chicken—Section 3.2
- Visual Resources—Section 3.3
- Threatened and Endangered Species and Section 7 of the Endangered Species Act—Section 3.4
- Geology, Geologic Hazards, and Mineral Resources—Section 3.5
- Paleontology—Section 3.6
- Soils and Farmland Protection Policy Act—Section 3.7
- Surface and Groundwater—Section 3.8
- Floodplains and EO11988—Section 3.9
- Wetlands, Streams, and EO 11990—Section 3.10
- Other Wildlife and Fisheries (including migratory and other avian species)—Section 3.11
- Air Quality—Section 3.12
- Noise—Section 3.13
- Shadow Flicker – Section 3.14
- Cultural Resources and Section 106 of the National Historic Preservation Act— Section 3.15
- Land Use—Section 3.16
- Transportation—Section 3.17
- Socioeconomics—Section 3.18
- Environmental Justice and EO 12898—Section 3.19
- Managed Areas, Ecologically Significant Areas, and Section 5(d), Wild and Scenic Rivers Act—Section 3.20
- Hazardous Materials—Section 3.21
- Cumulative Effects – Section 3.22

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2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Overview

Because of the national demand for renewable power such as wind energy, it is possible that the Project would be completed regardless of whether TVA decides to progress with the PPA. However, because of TVA's participation in the Project at this particular stage of its development, TVA has considered the environmental impacts that would occur. Because Caney River is being developed independent of TVA's decision to purchase power, TVA has no control over the location and configuration of Project facilities. However, TVA has reviewed Caney River's siting process and configuration alternatives, as listed below, and has found them acceptable.

2.1.1 Siting Alternatives and Transmission Considerations

Caney River's siting process included considerations of the wind resource, land use, land ownership, transmission access, constructability, local support, and environmental impact. Locations that were in more populated areas, nearer to, or in environmentally sensitive areas such as large wetland complexes or wildlife refuges, within property containing highly erodible soils, containing threatened or endangered species, or with no public support were eliminated from consideration for a wind energy project due to these constraints. Sites ranging from eastern Missouri to western Kansas were evaluated. Western Kansas sites were considered due to excellent wind resources; however, those locations were eliminated as they lacked the available transmission capacity to carry the electricity to markets in eastern Kansas and to higher load centers in the eastern United States.

In developing its Project, Caney River considered and, where feasible, incorporated the recommendations of the following guidance and policy documents during planning and evaluation of potential impacts and proposed mitigation. It should be noted that these guidelines are voluntary. The approach of Caney River was to comply with as many of the voluntary guidelines as possible, and to recommend mitigation when compliance with a guideline was uncertain or ambiguous. The incorporated guidelines include:

- Wind Energy Siting Handbook: Guideline Options for Kansas Cities and Towns (Kansas Energy Council [KEC] 2005)

- Siting Guidelines for Windpower Projects in Kansas (Kansas Renewable Energy Working Group [KREWG] 2003).

The above two documents recommend guidelines for land use; noise; natural and biological resources; visual impact; soil erosion and water quality; safety; cultural, archaeological, and paleontological resources; socioeconomic, public service, and infrastructure; and public interaction. Caney River has involved appropriate agencies, located the Project with setbacks from rural residences, utilized biological and environmental experts to conduct a reconnaissance of the area, involved local officials, developed visual representations of the project, avoided steep slopes, evaluated cultural resources, and considered community infrastructure. Because the Project would be located in a tallgrass prairie area, Caney River has developed a mitigation plan including ecological restoration, long-term management agreements, and conservation easements as recommended by these guidelines. Additional details on the impacts of the Project on the resources covered by these guidelines are included in the EA.

- Wind and Prairie Task Force Final Report (Kansas State Energy Resources Coordinating Council 2004)

This document was developed by the Kansas State Energy Resources Coordinating Council at the request of the Governor. The Task Force considered but did not reach consensus on a moratorium on wind development in the Flint Hills. Instead, two options were presented to the Governor, one which would restrict all development in the Flint Hills and another which would seek to achieve balance between preservation and development. After receiving the report, the Governor chose the one which sought balance. As a result of the Task Force, a “Heart of the Flint Hills” region was designated by the state where wind development would be strongly discouraged. The Caney River site is outside the area that was so designated.

- Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines (USFWS 2003)

This document suggests a site evaluation, studies to assess and monitor wildlife impacts, and site development recommendations. Caney River has attempted to follow the site development recommendations of this document. Site development recommendations were:

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

- Avoid locating turbines in known local bird migration pathways.

- Avoid placing turbines near known bat hibernation, breeding, and maternity/nursery colonies.

- Configure turbine locations to avoid areas or features of the landscape known to attract raptors.

- Configure turbine arrays to avoid potential avian mortality where feasible.

- 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..

- Avoid placing turbines in habitat known to be occupied by prairie grouse or other species that exhibit extreme avoidance of vertical features and/or structural habitat fragmentation. In known prairie grouse habitat, avoid placing turbines within 5 miles of known leks..

- Minimize roads, fences, and other infrastructure. All infrastructures should be capable of withstanding periodic burning of vegetation, as natural fires or controlled burns are necessary for maintaining most prairie habitats.

- 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.

- Reduce availability of carrion by practicing responsible animal husbandry.

- National Bald Eagle Management Guidelines (USFWS 2007).

These guidelines recommend that to avoid collisions, wind turbines, communication towers, and high voltage transmission power lines should be sited away from nests, foraging areas, and communal roost sites. The Caney River site is not in a nesting, foraging, roosting, or wintering area for Bald or Golden Eagles.

- Wind Turbine Guidelines Advisory Committee Recommendations.

While the proposed Project was under development, the USFWS Wind Turbine Guidelines Advisory Committee (USFWS 2010) released their report. These guidelines were submitted to the Secretary of the Interior and have not to date been adopted. The proposed guidelines utilize a “tiered approach” for assessing potential impacts to wildlife and their habitats. The tiered approach is an iterative decision-making process for collecting information in increasing detail, quantifying the possible risks of proposed wind energy projects to wildlife and habitats, and evaluating those risks to make siting, construction, and operation decisions. Subsequent tiers refine and build upon issues raised and efforts undertaken in previous tiers. At each tier, a set of questions is provided to help the developer identify potential problems associated with each phase of a project, and to guide its decision process. The tiered approach is designed to assess the risks of project development by formulating questions that relate to site-specific conditions regarding potential species and habitat impacts. The document creates three pre-construction tiers.

In the first tier, the project is screened for potential wildlife, habitat issues, and species of concern, in consultation with wildlife agencies. In the second tier, the site is characterized for known species of concern, sensitive habitats, congregations of species of concern, and bird and bat issues. In the third tier, there are field studies to determine the distribution, relative abundance, behavior, and site use of species of concern identified in Tiers 1 or 2.

Through the NEPA process, Caney River has complied with the basic structure of these recommendations. The Caney River site was not identified to have endangered species concerns, but there was still concern because of the location in the Flint Hills, which is a priority for landscape conservation. Caney River also conducted an analysis of the project site for landscape fragmentation and determined that there was substantial human intrusion. In the field studies phase, the main species of concern identified by Caney River was the GPC. Although GPC is not a listed species, Caney River voluntarily completed five years (2007-2011) of GPC lek surveys as well as a habitat assessment. No GPCs were found during the

lek surveys within the Project boundary. Out of abundance of caution and because of the landscape conservation issues, Caney River then proposed management improvements and a mitigation site to offset some of the identified impacts to tallgrass prairie habitats.

Consistent with the processes of the various guideline documents described above, the Caney River site was found to have the optimal combination of wind resources and transmission access while lacking in threatened or endangered species impacts. Table 2-1 outlines the criteria considered for development of wind energy projects and the Project's suitability according to each of these criteria. During the siting and development process, Caney River consulted with USFWS and KDWP to consider federally and state-listed threatened and endangered species. The location of the Project outside of the federally endangered whooping crane (*Grus americana*) migratory corridor was important in the siting considerations (Figure 3-17). Caney River completed a survey for the federally endangered American burying beetle (*Nicrophorus americanus*), as this was the only listed species USFWS considered to potentially be impacted by the Project. No American burying beetles were found during the survey (The Watershed Institute 2008) and USFWS concurred the Project was unlikely to impact the species or any other federally listed species.

Sites further to the west in Kansas do not have sufficient transmission capacity to readily wheel (e.g., transfer) wind-generated power to eastern U.S. markets. In addition, development constraints in western Kansas include the presence of playa lakes, whooping cranes, and the lesser prairie chicken (*Tympanuchus pallidicinctus*) (a candidate species for listing under the Endangered Species Act). Because of the extensive use of center pivot irrigation in western Kansas, wind development interferes with agricultural use of the property in many areas. Construction of a new transmission line from western Kansas to serve eastern markets would likely have extensive environmental issues and would represent a new above-ground utility corridor across the Flint Hills. These factors made western Kansas less desirable when a site was available that avoided these particular issues.

Sites further to the east in Missouri, Bowling Green in Pike County and Possum Hollow in Wright County, have less suitable wind resources, making them economically infeasible. The Missouri sites would have required more wind turbines and more acreage to get the same amount of electricity. In addition the Missouri sites had a greater potential to impact the federally listed endangered Indiana bat (*Myotis sodalis*). The Project presented to TVA by Caney River

for consideration had potentially limited onsite impacts as well as available transmission capacity to carry the product to the TVA transmission system.

If TVA purchases power generated from the Project, Caney River would require long-term firm transmission service across two transmission systems: the Southwest Power Pool (SPP) system where the Project is to be interconnected, and the Associated Electric Cooperative Inc. (AECI) system that interconnects with TVA at the Mississippi River in southeast Missouri. Caney River has a firm transmission path on the AECI system to TVA without network upgrades and firm service is also available on the SPP system with some network upgrades. None of these upgrades is caused by Caney River, nor are any of the construction costs assigned to the Project (i.e., the SPP network upgrades would be made with or without the Caney River request).

Table 2-1: Wind Siting Criteria

Wind Resource	Resources in the Flint Hills are desirable for wind development; Project has high quality wind resource well documented with over 6 years of data logged at 50/60/80 meters
Real Estate	All of the necessary real estate is privately owned and is under long term lease by Caney River
Landowner and Community Support	The Project enjoys strong support from landowners, the local community, and local and state representatives of Elk County
Economics	Substantial positive economic development impacts for southeast Kansas communities including over $2 million in annual payments to landowners and Elk County
Feasible Permitting	Area is outside of "Heart Of the Flint Hills", ridge top location avoids most streams and wetlands
Compatible Land Use	Existing grazing and oil field land uses can continue
Access to Electrical Interconnection	Transmission to TVA system with no modifications to existing lines is available on site; Westar's existing 345-kV transmission system bisects the Project; Large Generator Interconnection Agreement (LGIA) is executed with Westar and SPP
Site Conditions for Access During Construction and Operation	US 160 (3 miles south) and US 99 (9 miles east) of the Project provides excellent access for heavy equipment deliveries for construction and operations, Other ancillary resources such as fiber optic lines, water, aggregate, and power are within close proximity to or on the Project site
Environmentally Suitable	Site is not near waterfowl refuges and outside of Whooping Crane migratory corridor, no federally or state threatened or endangered species or habitat, no Greater Prairie Chicken on site; Decades of ranching and oil and gas development have created an intact, partially degraded prairie habitat
Viewshed	Viewshed impacts to the "Heart Of the Flint Hills" are expected to be negligible and further minimized within the surrounding area by the regional topography and pre-existing impacts of the Elk River Wind Project; no scenic byways would be impacted by the Project
Favorable Electricity Market	Site is closer than other Great Plains sites to eastern electrical demand

2.1.2 Site Configuration and Actions Taken to Minimize Surface Disturbances

The proposed Project would include the construction of 111 WTGs and associated facilities for a 200 MW wind project. The total Project size is 13,618 acres. To minimize surface disturbances, the Project design follows existing county and private roads where possible. Additionally underground collection lines are routed alongside road improvements and the power collection system is buried unless physically or technologically limited. Specific facilities, estimated construction disturbances and life-of-project (LOP) footprint are listed in Table 2.2.

Table 2-2: Estimated Disturbance Calculations

Facility	Type	Estimated Constr. Disturbance Area (%)	Construction Disturbance Assumptions	Life of Plant Footprint (%)	Life of Plant Footprint Assumptions
Permanent Met Towers	Point	0.2%	Two (2) met towers and a stand-alone power performance testing mast. Each facility would require up to six (6) concrete guy anchors (2'x8' each) and one (1) concrete base support (6'x6'). Assumed 40' by 235' corridors of impacts for each guy direction.	0.1%	A 6'x6' concrete base supporting a 100-meter tower along with six (6) guy wires with an inner anchor at 125' and an outer anchor at 264' for each location.
Turbines	Point	37.8%	111 turbines - 2 acres per turbine.	3.1%	36' diameter pedestal and gravel ring (16' pedestal and 10' gravel ring)
Substation	Polygon	1.0%	Assumed footprint in lieu of final design.	6.0%	Gravel pad and facility to remain. All other areas to be decompacted, restored and seeded.
Laydown Yard	Polygon	1.7%	Assumes two laydown yards up to 5 acres each.	0.0%	Area to be decompacted and restored with native seeding.
Batch Plant	Polygon	0.9%	Assumed total footprint area required for batch plant operations.	0.0%	Area to be decompacted and restored with native seeding.

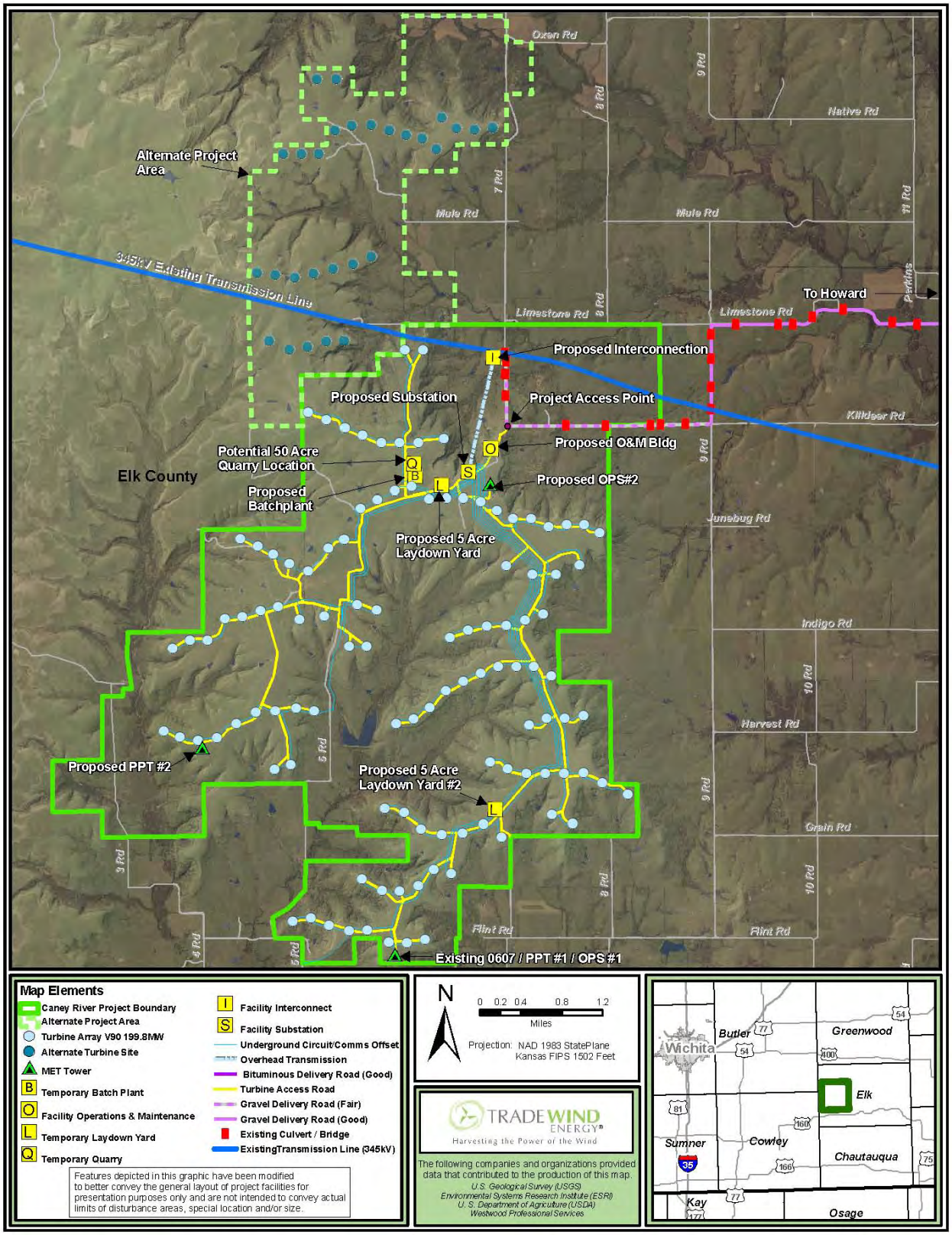
Facility	Type	Estimated Constr. Disturbance Area (%)	Construction Disturbance Assumptions	Life of Plant Footprint (%)	Life of Plant Footprint Assumptions
Interconnect switchyard	Polygon	1.3%	Assumed footprint to accommodate existing T-line work.	6.7%	Gravel pad, facility, and service road to remain. All other areas to be decompacted, restored and seeded.
Quarry	Polygon	6.8%	Assumed footprint in lieu of geotechnical investigation.	0.0%	To be backfilled with remaining unsuitable soil, topsoiled and seeded.
O&M facility	Polygon	0.9%	Assumed footprint in lieu of final design.	6.0%	Gravel pad and facility to remain. All other areas to be decompacted, restored and seeded.
Overhead Transmission line Corridor	Line	3.4%	Assumed 150' corridor of clearing and grubbing over 1.1 miles of terrain.	0.1%	Approximately eight (8) H-frame structures, assuming 200 sq ft disturbance per structure.
Underground power collection and communication system	Line	11.6%	Assumes 10' of disturbance over 297,180 LF of trench.	0.1%	Approximately 23 junction boxes, assuming 25 sq ft required per above ground junction box.
Access Roads	Line	34.0%	Assumes 33 miles of 50' crane/road corridor.	75.3%	Approximately 33 miles of 16' permanent disturbance to remain.
Public Improvements	Polygon	0.4%	Various disturbances outside of existing impervious (gravel/asphalt) surfaces to accommodate culvert replacement, bridge improvements, and road widenings.	2.4%	Assumes most improvements will remain in-place over LOP. All areas not converted to gravel shall be decompacted, restored and seeded.
TOTAL		**542.48 acres**		**82.65 acres**	

Temporary facilities may include an aggregate quarry, a concrete batch plant, and laydown yards (Figure 2-1). The aggregate quarry, if economically viable for construction and use in association with the Project, is estimated to be about 50 acres in total size. A concrete batch plant operation would be co-located at the aggregate quarry or separately as a temporary 5-acre facility near a laydown yard. The Project may utilize up to two laydown yards covering about 5 acres each.

The land disturbances associated with permanent LOP facilities, as well as with temporary facilities, are greater than the facilities themselves as a result of their associated construction activities (Table 2-2). In regards to the turbine foundations, it is assumed that there would be approximately 2 acres of temporary disturbance at each turbine resulting from foundation excavation, soil stockpiling, turbine component staging, as well as from crane and various construction vehicle operations. In areas where soil stabilization measures were required to support tower erection, these temporary impacts would be mitigated by use of soil decompaction and reseeding efforts.

Subsurface facility installations (e.g., electrical collection system, communications) may result in temporary impacts up to 10 feet wide to accommodate construction vehicle movements, and trench excavations up to 2 feet wide. Impacts outside of the trench excavation limits would largely be self-mitigating in that little soil compaction would occur as these facilities are being installed. The trench itself would be backfilled with either native soils or an engineered aggregate. The trench would be capped with up to 6 inches of topsoil and reseeded with native plants as necessary. Construction corridors would be designated to keep all construction activity surface disturbances minimized. Existing roads within the Project were incorporated into the design to the extent practicable. After construction, two-track roads that are not used for continued wind project, cattle, or petroleum operations would be allowed to revert to natural conditions.

Figure 2-1: Project Facility Map



The proposed overhead transmission line route between the Project substation and the interconnect facility would require several monopole or H-style structures to carry the new conductor line. The transmission line route would also require clearing and grubbing of an area approximately 150 feet wide and 1.1 miles long in support of construction activities and long-term operation and maintenance. Approximately 5 miles of gravel roads within the Project limits would be upgraded and used to support both the construction effort and the long-term operation and maintenance of the wind Project. In addition, much of the route of the new access roads would follow existing two-track roads that support the historic use of the land for ranching and petroleum operations. Nearly all of the new 16-foot wide access roads would require weight-bearing strengths sufficient to support the delivery of wind turbine equipment. In some (and potentially all) cases, native soil must be compacted in place in support of crane walk activity. These “compacted shoulders” would extend approximately 10 feet from both sides of the edge of the gravel for a combined total disturbance width of approximately 36 feet. For calculation of construction impacts, a 50 foot wide corridor was assumed. Topsoil under the roads would be wind-rowed for use in restoration. Any notable impacts resulting from crane travel on these temporary shoulders would be mitigated with decompaction and reseeding to native plants. In addition, landowners would be requested to refrain from using temporary roads and paths during their normal operations until construction is complete.

It is likely that there would be 7.5 acres of disturbance associated with the construction of the interconnection switchyard facility, 6 acres for the substation, and 5 acres of disturbance for the operation and maintenance facility. Upon completion of the construction of these facilities, the temporary disturbed areas would be reclaimed or decompacted, and seeded with native plants as part of the reclamation and restoration activities. The permanent disturbance areas would be 5 acres each for the interconnection facility, substation, and operation and maintenance facility, for a total of 15 acres.

Materials used to construct WTGs and associated facilities would be delivered via one primary access (i.e., haul) route. The route could require road improvements such as repair, replacement, or protection of culverts and bridges; specifically three bridges along Killdeer Road. In lieu of repair or replacement, infrastructure protection measures could be utilized by placing steel plates or concrete slabs over roadway bridges and culverts as their condition requires in support of heavy-haul vehicular traffic. In addition, road grading and road expansion would likely be needed around corners, in sections of narrow travel way, and at road intersections. If available by way of county and landowner approval, any road or intersection

expansions needed to accommodate heavy-haul vehicular traffic would potentially remain in-place during the life of the Project.

The access point originates from K-99 in Howard and follows Washington Street through town until it meets Cherry Street. The route then continues north on Cherry until it meets the intersection of County Road (CR) 116 (Limestone Road). From this intersection the route continues west all the way to Road 9. The route then follows south along Road 9 until it reaches Killdeer Road. From Killdeer Road, the route follows west until it reaches the access point at the intersection of Road 7 and Killdeer Road.

The layout of the proposed Project is designed to take advantage of strong winds within the proposed Project area. WTGs, associated facilities, and access roads are situated on ridge tops. The layout of the proposed Project has been revised to avoid existing environmental conditions such as wetlands and stream crossings, and to utilize existing infrastructure, such as county and landowner roads.

In order to minimize surface disturbance, Caney River considered and utilized existing roads to the maximum extent possible in the Project design. Remaining two-track roads not converted to Project roads would be allowed to revert back to natural conditions to the extent landowners are able to utilize Project roads for existing operations. Caney River would also utilize compacted native soil road shoulders and would rock pick, decompact, recontour and reseed (with Natural Resource Conservation Service [NRCS]-approved seed mixture) upon completion of construction. During construction, corridors would be specified for vehicle and construction traffic to keep impact to a minimum and avoid off-road travel. Silt fencing would be utilized in areas under construction as needed to control erosion and runoff.

2.2 Alternatives Considered in Detail

TVA considered two alternatives in detail No Action and the Proposed Action. Caney River's siting process is a reasonable one. Other sites (e.g., Missouri sites Bowling Green, Possum Hollow) either had less wind resource, less transmission availability, or greater environmental impacts. On the site itself, TVA has evaluated the facility configuration to determine whether Caney River has made efforts to avoid adverse environmental impacts and minimize the environmental footprint of its facilities. The results of that evaluation are described in the remainder of this document. The purchase of power through a PPA from the Caney River site is the Preferred Action Alternative considered in this EA.

2.2.1 Alternative 1 - No Action Alternative

Under No Action, TVA would not enter into a final PPA with Caney River. The Project may not be built in the near future without TVA involvement. On a longer term basis, however, the Project may be built at some future time to provide power to other utilities. Thus for some period of time, existing conditions and resource trends likely would not change from construction and operation of the Project.

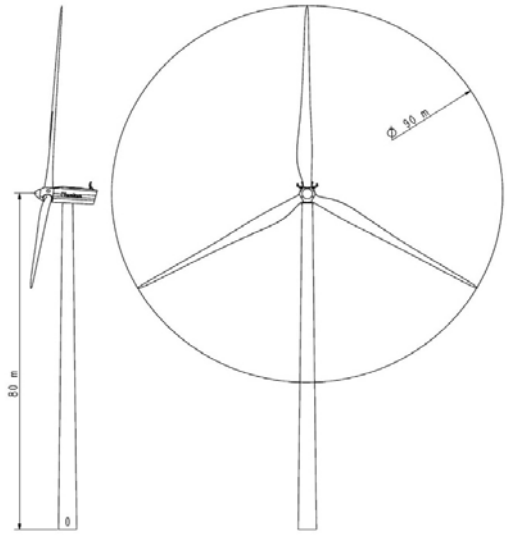
2.2.2 Alternative 2 - Proposed Action Alternative – Purchase Power from Caney River

Under the Proposed Action Alternative, TVA would purchase power from Caney River through a PPA. Caney River would consequently construct and operate up to 200-MW of WTGs (Figure 2-1) on privately owned land that is approximately 40 miles east to southeast of Wichita in Elk County, Kansas. Caney River has obtained wind lease agreements with private landowners to construct and operate the Project.

The Project would contain 111, 1.8-MW Vestas V90 WTGs. As currently designed, the WTGs would be supported by 80-meter tall tubular towers; the total height of the structure to the tip of the rotor would be about 125 meters (Figure 2.2). A schematic of an individual tower site is provided in Figure 2.3.

Figure 2-2: Typical WTG

(Not to Scale)



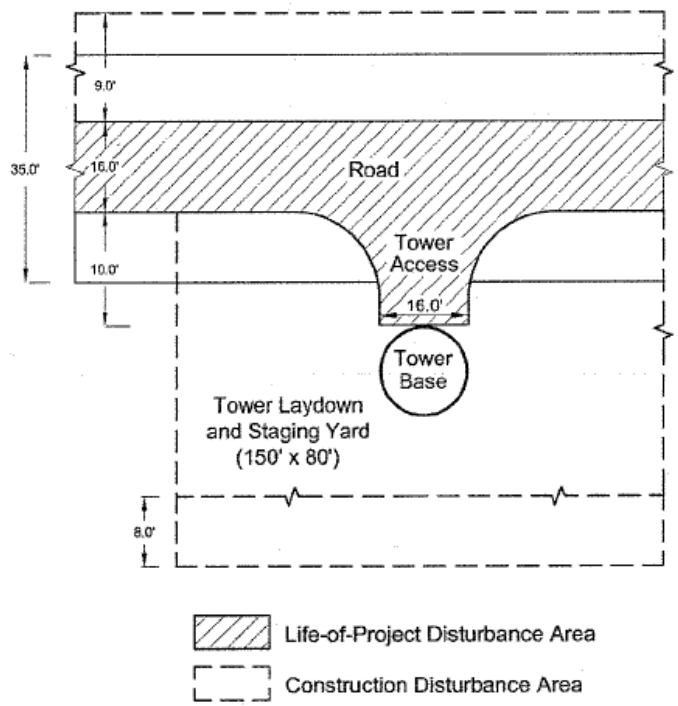
Source: Vestas Class I Document no.: 000-6153 V00, General Specification for the V90 – 1.8 MW VCUS

2.2.2.1 Construction

Under the Proposed Action Alternative, the Project would be constructed in accordance with industry standards for developing, constructing, and operating wind energy facilities in the United States. For the purpose of this report, the term construction includes all construction activities (e.g., WTGs, access roads, overhead and underground power lines, substations, operation and maintenance [O&M] facility), plus the movement of large equipment (e.g., cranes). These procedures, with minor modifications to allow for site-specific circumstances, are summarized below. A typical WTG site schematic is provided in Figure 2.3.

Figure 2-3: Typical WTG Site Schematic

(Not to Scale)



Source: Environmental Report for the Smoky Hills Project 2005

Project construction would entail the following activities, listed in order of occurrence:

- Implementation of erosion control best management practices (BMPs)
- Interconnect facility construction
- Off site improvements if necessary
- Road and crane pad construction
- Excavating for foundation footings for WTGs

- Pouring concrete foundations for WTGs, meteorological (Met) towers, transformer pads, and substations
- Trenching for and installing underground electrical and communications cables
- Overhead electrical power system construction
- Substation construction
- WTG assembly, erection, and equipment installation
- Electrical connection to tower
- Final testing
- Final road grading, erosion control, reclamation, and site clean-up

As described in Section 2.1.2 access to the Project would be obtained by using the network of existing county roads bordering the Project area. Access to Project facilities, including individual WTGs for construction and operation, would be provided by a combination of improved existing and new private access roads. Approximately 267 workers would be required for an estimated 275 days during Project construction.

Construction equipment would include standard earth-moving equipment, cranes, trucks, and forklifts (Table 2-3).

Table 2-3: Typical Equipment for Wind Project Construction

Equipment	Use
D7 bulldozer	Road and pad construction
Grader	Road and pad construction
Water trucks	Compaction, erosion, and dust control
Roller/compactor	Road and pad construction
Backhoe/trenching machine/rock hammer	Digging trenches for underground utilities/foundations
Truck-mounted drill rig	Drilling tower foundations and water wells
Concrete trucks and pumps	Pouring tower and other structure foundations
Cranes	WTG erection
Dump trucks	Hauling road and pad material
Flatbed trucks	Hauling towers and other equipment
Pickup trucks	General use and hauling small equipment
Small hydraulic cranes and fork lifts	Loading and unloading equipment
Four-wheel drive all terrain vehicles	Road grade access and underground cable installation
Rough terrain fork lifts	Lifting equipment

2.2.2.2 Road and Pad Construction

Access roads would be constructed in accordance with landowner agreements using standard engineering design and practices. Roads have been located to minimize disturbance, maximize transportation efficiency, and avoid sensitive resources such as wetlands, streams, steep slopes with highly erodible soils, large blocks of forests, and unsuitable topography. To minimize land disturbance, Caney River would use existing private roads where possible for part of the WTG access road system. Roads would be constructed, surfaced, and maintained to provide safe operating conditions at all times. The minimum full-surfaced travel way width is estimated to be 16 feet for LOP; initial surface disturbance width may be up to 50 feet wide. Disturbance width may increase in steeper areas due to cuts and fills necessary to construct and stabilize roads on slopes or decrease as design needs vary across the site.

The drainage conveyances accompanying many of the existing steep county roads to be used for access (those with 10 percent slopes or greater) can be characterized as being deep eroded gulleys within the travel ways themselves. This is often the result of the roads being historically cut into the existing topography, leaving little room for a separate defined drainage conveyance system. In discussing the issue of drainage with the Elk County road superintendent, a constructed V-type ditch system with side slopes no steeper than 3:1 would be more functional from a drainage standpoint, in addition to being easier to regularly maintain. As a result, where necessary for heavy-haul vehicular traffic considerations, Caney River would reconstruct roads that are in this condition. This reconstruction effort would improve the road and drainage systems and reduce the risk of erosion and sediment transport by lowering the existing road grades to a more moderate 7 to 10 percent grade and constructing ditches armored with energy dissipation and filtration media and possibly an underlying geotechnical fabric.

Similarly, in areas outside of the public right-of-way, the ditch system would be constructed in a manner that reduces runoff velocity by benching shallow grade swales along the roads. These swales could potentially be constructed such that they would have a shallower longitudinal grade, energy dissipation and filtration media, and possibly an underlying geotechnical fabric. Other areas disturbed in or around the new road and drainage systems would be reseeded with vegetation equal or similar to native flora. Topsoil removed during road construction would be stockpiled in elongated rows within road corridors. Topsoil would be respread on areas with cut-and-fill slopes and be reclaimed in accordance with landowner agreements and BMPs.

During construction and operation of the Project, onsite traffic would be restricted to the roads developed for the Project. Use of unimproved roads would be restricted to emergency situations. Speed limits would be set to ensure safe and efficient traffic flow. Signs would be placed along the roads, as necessary, to identify speed limits, travel restrictions, and other standard traffic control information.

WTG pads would be constructed using standard cut-and-fill procedures. Topsoil would be scraped and set aside for restoration. Two low-water crossing bridges exist on the north end of the Project (north of Killdeer Road and CR 7). The southerly of the two low-water crossings currently has one concrete culvert conveying the watershed's base flow. Precipitation events contributing approximately 1 inch or more of surface runoff cause the bridge to be submerged. Due to the anticipated loads this bridge may have to endure during construction of the interconnect facility, this bridge may require reconstruction. Elk County and KDWP are supportive of reconstruction efforts to low-water crossings and culverts which would allow the unobstructed passage of aquatic species as well as allow for the loads expected during and after construction. The reconstructed bridge could include additional conveyance capacity by way of adding culverts or building a multi-span bridge deck. Selection of either one of these two options would increase the runoff conveyance capacity while decreasing the runoff velocity at the culvert outlet. Lower velocities would reduce the risk of erosion near the outlet and along the banks of the creek. The northerly of the two low-water crossings is unlikely to be used by the Project as it is entirely submerged and could require extensive grading and reconstruction efforts.

Any newly installed culverts in or around the Project site that are required as part of the road construction would be fitted with energy dissipation and filtration media and possibly an underlying geotechnical fabric barrier at the downstream end of the outlet. Energy dissipation not only reduces erosive discharge velocities in streams or swales, but it also works to preserve the underlying soils at the base of the outlets. The end result is less sediment transport and erosion resulting from base flow or significant precipitation events.

2.2.2.3 Foundations and Tower Erection

The WTG towers would be anchor-bolted to concrete foundations. Caney River would likely use an inverted T-spread footing foundation, which would consist of a steel-reinforced concrete mat with a steel-reinforced concrete pedestal. Foundations may be up to 10 feet deep; shallower foundations may be used if practicable, depending on the results of the detailed geotechnical

study. Foundations would typically be excavated using a backhoe; however, a rock hammer or controlled blasting would likely be needed in some areas where rock is close to the surface. Concrete forms would be used to form and pour the mat and pedestal. Steel anchor bolts would be embedded in the concrete pedestal. The foundations would be allowed to cure and then backfilled.

The WTG tower assembly and erection would occur within the designated staging areas and corridors; this would generally take place in an area encompassing 2 acres at each WTG location. Much of these soil and vegetation impacts would be temporary in nature in that much of the impacts would be from vehicular traffic and equipment staging rather than excavation and/or compaction efforts. In addition to staging at turbines, it is anticipated that up to two 5-acre laydown yards would be required during Project construction.

Following construction, portions of the pads, tower assembly areas, and all trenched areas would be restored. Permanent WTG pad areas would be reduced to an 8- to 10-foot wide gravel ring circling the turbine pedestal. The turbine pedestal itself would be approximately 16 feet in diameter. The access road widths would be reduced from 50 feet to 16 feet, and the excess pad areas and road corridors would be restored.

Other facilities requiring foundations would include various equipment located at the substation, interconnect point, and O&M facility. Foundations constructed in support of these structures would likely include poured concrete trench footings, poured slab-on-grade concrete systems, pre-cast concrete footings set in compacted structural fill, and steel/concrete piers (hammered or augured).

2.2.2.4 Trenching and Placement of Underground Electrical and Communications Cables

Underground electrical and communications cables would interconnect the WTGs to one another. The cables would be placed in trenches (typically no greater than 24-inches wide and one trench per three-phase circuit). Trenches would be generally located adjacent to the private access roads and/or county roads. Trenches would be excavated approximately 4 feet deep for a minimum cable burial depth of 3 feet. Electric distribution and communications cables would be placed in the trench using vehicle-based equipment. Electrical cables would be installed first, followed by partial back-fill, then placement of the communications cables. Trenches

would be completely backfilled and revegetated concurrently with the other construction areas. One transformer per WTG would be used to step-up low voltage power to 34.5-kilovolts (kV).

2.2.2.5 Overhead Electrical Power and Communications System

Most of the Project's electrical and communications systems would be installed underground; however, about 1.1 miles of 345-kV transmission line would interconnect the Project to the electric grid. This line would extend from the proposed on-site collection substation to the existing Westar 345-kV overhead line that crosses through the Project area (Figure 2-1). The overhead line would terminate at the interconnection point to the existing 345-kV line and would require a switchyard substation located adjacent to the existing 345-kV line (Figure 2-1). All overhead power lines would be installed in conformance with the National Electric Safety Code, the American National Standards Institute (ANSI), and *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (APLIC 2006). Maximum distance between structures is estimated to be between 400 feet and 500 feet. Temporary disturbances could be as much as 150 feet in width but would likely average 50 to 75 feet; the LOP disturbance would be limited to the area occupied by structures and approximately a 50-foot-wide corridor between structures for power line maintenance.

2.2.2.6 Substation Construction

The substation would be constructed on private land within the Project area and would connect the Project to the existing electric power grid. The substation would be similar to those typically used on transmission systems in the region. During construction of the substation, about 6 acres of land would be temporarily disturbed. The substation would occupy about 5 acres when construction is complete. Small concrete foundations would be constructed for transformers and other components within the substation; however, the majority of the substation yard would be covered with crushed rock. The yard would be fenced with a 7-foot high chain-link fence topped with three strands of barbed wire; the total fence height would be 8 feet. Access gates would be locked at all times for public safety and warning signs would be posted.

2.2.2.7 Final Testing

Final testing would include mechanical, electrical, and communications inspections. Performance testing would be conducted by qualified wind power technicians for each WTG and the control system prior to final WTG tower commissioning. Electrical tests of the Project (e.g., WTGs, transformers, collection systems, substations) would be performed by qualified electricians. All electrical equipment would be operational within industry and manufacturer's

requirements and would be installed in accordance with design specifications. All installations and inspections would be in compliance with the following codes and standards:

- ANSI
- American Society for Testing and Materials (ASTM)
- Institute for Electrical and Electronic Engineers (IEEE)
- Insulated Power Cables Engineers Association (IPCEA)
- National Electrical Manufacturer's Association (NEMA)
- National Electrical Safety Code (NESC)
- National Electrical Testing Association (NETA)
- Occupational Safety and Health Administration (OSHA)
- State and local codes and ordinances

2.2.2.8 Final Road Grading, Erosion Control, and Site Clean-up

A SWPPP has been prepared and a permit for the Project has been received. The stormwater permit and SWPPP are available upon request. The SWPPP contains BMPs for erosion and sedimentation control. The BMPs are designed to minimize soil erosion during and after construction and would include the use of standard sediment control devices (e.g., silt fences, straw bales, netting, soil stabilizers, check dams). Surface flows would be directed away from cut-and-fill slopes and into ditches that discharge to natural drainages. Following construction, all unused construction materials and wastes would be collected and removed from the Project area by Caney River. A contractor would be hired to provide an adequate number of portable sanitary facilities during construction; all sanitary wastes would be removed and disposed of at an approved facility in accordance with state and local laws.

Contractors would provide trash barrels or dumpsters to collect construction related wastes, which would be routinely removed and disposed of at an approved facility. Clean-up crews would routinely inspect construction sites to remove litter. Caney River would inspect and clean up the Project area following construction and prior to shifting responsibilities to O&M crews. The O&M crews would continue to use dumpsters for waste collection for the LOP. A final site clean-up would be made in conjunction with construction site reclamation.

2.2.2.9 Public Access and Safety

Public access would be restricted in accordance with landownership agreements. The substation and interconnection switchyard would be fenced; no other fencing is proposed.

The FAA would require obstruction lighting or marking of structures over 200 feet above ground surface because they may be considered obstructions to air navigation (U.S. Department of Transportation (DOT) FAA Advisory Circular 70/7460-IJ dated 11/29/95). The FAA recently released guidance (DOT/FAA/AC 70/7460-1K Chg2 dated 02/07) on standards for obstruction lighting of WTGs for wind energy facilities. The FAA now requires synchronized red strobe lights on approximately one third of the turbines.

Ground elevations in the Project area range from about 1,130 feet to 1,540 feet above mean sea level (AMSL) (Howard and Cambridge NE U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle maps). With a proposed WTG height of 394 feet above ground level (AGL) and assuming a WTG would be located at the highest elevation, the highest point of the Project would be 1,934 feet AMSL. The Elk County Airport is the only FAA-regulated airport located in the Project vicinity (http://www.aviationdirectory.com), which is approximately 6 miles east to southeast of the Project area. The elevation of the airport is approximately 1,063 feet AMSL. Even though Project facilities are beyond the 20,000 feet from an FAA regulated airport, information for every WTG has been provided to the FAA as required, since they would be over 200 feet in height. Caney River provided the FAA with Notices of Proposed Construction or Alteration for representative WTG locations. “Determination of No Hazard to Air Navigation” certificates are in place for all WTG locations. A lighting plan following FAA guidelines has been developed for the Project in compliance with the FAA Advisory Circular (AC) 70/7460-1K, Change 2 and based on discussions with FAA wind turbine obstruction specialists. Caney River would light the Project as one large obstruction, thus reducing the number of WTGs that need to be equipped with obstruction lighting. The lighting plan calls for lighting a total of 63 out of 111 wind turbines, the equivalent of 57 percent. The transmission line structures should not require FAA Notifications, or be subject to lighting or marking requirements.

Safety signage would be posted around WTGs, other high voltage facilities (e.g., substations, transformers), and along roads in conformance with applicable local, state, and federal regulations.

Any wildfires that occur would be extinguished immediately by Caney River personnel, if possible, and the appropriate landowner. The Elk County Sheriff's Department would also be notified immediately. Some fire-fighting equipment would be located in vehicles and in the O&M facility. If a fire cannot be extinguished by Caney River personnel, the landowner and sheriff would be so advised. Fire deterrents within the Project area would include access roads, which

may serve as fire breaks, and regular clearing of vegetation from areas around transformers, riser poles, and the O&M facility.

The safety risk of injury from ice being thrown by the WTG blades is dependent on the probability of ice build-up on the blades, the likelihood of ice fragments detaching from the blades, the distance the ice is thrown, and the probability of a person being within a certain proximity of the WTG. Rotation speed of the blades, blade pitch, profile, and flexibility, size and geometry of the ice fragment, and wind speed are all contributing factors. Larger pieces of ice tend to fragment in flight. Ice fragments reaching the ground from the WTG are estimated to range between 0.2 pounds and 2.2 pounds. Fragments tend to be cast downwind, and larger fragments of ice generally travel shorter distances than smaller fragments. Observations have also shown that there is a greater tendency for ice to fall from the rotors rather than to be thrown. The maximum throwing distance of ice from a WTG has been estimated to be 1.5 times the sum of the rotor diameter and the hub height (Morgan et al. 1998; Seifert et al. 2003). Though specific data has not been gathered regarding the Project, injury from icing is not likely to be a major concern for most of the year because of the temperate climate. The risk of injury from ice throw is very low due to the lack of public roads and occupied residences within the wind turbine array.

2.2.2.10 Operation and Maintenance

Caney River or a qualified O&M contractor would operate and maintain the Project. All WTGs, collection lines, communication lines, substations, and transmission lines would be operated in a safe manner according to standard industry procedures. Routine maintenance of the WTGs would maximize performance and detect potential deficiencies. Each WTG would be remotely monitored daily. Any problems would be promptly reported to onsite O&M personnel, who would perform both routine maintenance and most major repairs. Most servicing would be performed up-tower, without using a crane to remove the WTG from the tower. Additionally, all roads, pads, and trenched areas would be regularly inspected and maintained to minimize erosion. Between 8 and 20 O&M workers would typically be on site.

Access roads would be maintained to prevent off-road detours due to ruts, mud holes, slumps, etc. All fuels and hazardous materials would be properly stored during transportation to and at the Project site and O&M facility. Workers would be instructed to keep all Project sites in a sanitary and safe condition. Workers would be expected to respect the property and rights of landowners and the environment.

2.2.2.11 Reclamation and Abandonment

The long-term reclamation goal would be to return the land as closely as possible to preconstruction conditions. Reclamation would also be conducted on specific disturbed areas to comply with landowner agreements. The short-term goal of reclamation would be to stabilize disturbed areas as rapidly as possible, thereby protecting sites and adjacent undisturbed areas from degradation.

After construction is complete, temporary work areas would be restored to pre-construction conditions. The temporary work areas would also be revegetated with seed mixtures specifically defined within landowner agreements, after consultation with a qualified biologist (e.g. KDWP, NRCS) and with landowner approval. Postconstruction reclamation would include the stabilization of slopes, decompaction of crane paths, and the reseeding of unused disturbed areas. Land areas reclaimed would include portions of WTG pads not required for O&M, road cuts and fills, underground electrical line and communication cable trenches, and overhead power line routes. All temporary land disturbances due to construction would be reclaimed.

At the end of the Project's useful life, WTGs, met towers, and transformers would be removed, recycled, or disposed of at approved facilities. Foundation pedestals would be removed to 4 feet below grade and backfilled with the remainder of the foundation abandoned in place. All Project roads would revert to individual landowner control or would be removed and reclaimed if so desired by the current landowner. Underground electrical lines would be removed and recycled or abandoned in place, while overhead electrical lines and structures owned by the Project would be removed. Reclamation procedures would be based on site-specific requirements using techniques commonly employed at the time the area is to be reclaimed, and would include regrading, adding topsoil, and revegetation of all disturbed areas as specified in individual landownership agreements.

2.2.2.12 Native Environment Conservation Plan

In response to input from Project stakeholders, the Native Environment Conservation Plan (NECP) (Appendix E) was developed by Caney River and TradeWind, the developer of the Project. Tradewind consulted with key Project federal and state stakeholders (e.g., KDWP, USFWS, and Kansas State University) to identify and develop an approach to mitigate for impacts of the Project while enhancing the Project’s conservation and mitigation measures to avoid or minimize impacts and provide the most environmental and conservation benefits. The NECP is comprised of three primary components: (1) perpetual conservation easements, (2)

wind and wildlife research (not considered mitigation, but is an element of the NECP), and (3) other related grant offerings to restore tallgrass prairie habitat and promote implementation of important conservation practices. Caney River has entered into an agreement with the National Fish and Wildlife Foundation (NFWF) to manage and implement the NECP which is to be the funded primarily by Caney River. The NECP in its entirety can be found in Appendix E. The NECP includes but is not limited to the following objectives:

- *Conservation of Tallgrass Habitat:* Protect and enhance tallgrass prairies while promoting vegetative resilience, and restore habitats to benefit the greater prairie chicken, grassland birds, migrating and nesting birds, and other grassland dependent wild-life, using experimental and traditional restoration and conservation strategies most notably the purchase of approximately 18,164 acres of perpetual conservation easements within the Flint Hills Legacy Conservation Area (FHLCA). More specifically: (1) a perpetual conservation easement on approximately 8,164 acres of the Red Buffalo Ranch near Sedan, Kansas, and (2) an additional 10,000 acres of perpetual conservation easements to be located on the largest, highest quality tallgrass prairie tracts possible within the LCA. All 18,164 acres of conservation easement are to be held by a Kansas land trust or other suitable third party and will be obtained using funds from the NECP. Specific conservation easement covenants that uphold the goals of the NECP in both the Red Buffalo conservation easement and the Caney Legacy Conservation Easements (CLCEs) include but are not limited to: No new structures, property cannot be subdivided or partitioned, other than in tracts of a minimum of 1,000 acres, no exploration or extraction of minerals, except those already occurring under existing leases, no plowing or removal of topsoil, no use of pesticides, limitations on controlled burning and early intensive stocking, and the development of and participation in a grassland management plan.

- *Wind and Wildlife Research:* Identify and study the conservation impact on greater prairie chickens and other grassland birds from development activities such as power generation projects (including conventional and renewable), ranch management practices, oil and gas operations, and other commercial and agricultural activities. In addition, study the effect of wind energy development on native prairie and prairie species including GPC, lesser prairie chicken, grassland birds, migrating and nesting birds, and other grassland dependent wildlife and identify and monitor activities

benefitting the wind energy industry and natural resource agencies. The primary research opportunities currently identified are as follows:

- Rangeland Management Research: Engage Kansas State University or another qualified research institution to conduct a study of the conservation impact of wind energy development and ranch management practices on tallgrass prairie and grassland birds including the GPC. As currently contemplated this would be a four year project that would provide important insights into the potential impacts of wind power development in native prairie habitats in addition to the impacts of annual burning and very intensive early season cattle stocking on GPCs.

- Existing Smoky Hills Wind Project GPC Research: Caney River would assist Smoky Hills Wind Farm, LLC (Smoky Hills) with funding required to continue the ongoing GPC lek studies at the Smoky Hills site in Lincoln and Ellsworth Counties in Kansas. To date Smoky Hills has collected six years of pre- and post-construction lek monitoring with the seventh year occurring spring of 2011.

- Lesser Prairie Chicken Research: Lesser Prairie Chicken are a species of concern both to the environmental community and the wind industry. By leveraging research referenced above and NECP funding research programming could be developed that would increase environmental resource agencies, policy makers, academia and industry understanding of the issue.

- *Funding of Conservation Grants:* Partner with appropriate federal and state agencies and private contributors to obtain additional or matching funding as appropriate for the NECP for purposes of providing additional research grants to qualified NECP research grantees. Grants would likely focus on both greater and lesser prairie chicken with an emphasis on restoration grants to be used to improve grassland and restore degraded prairie habitat within the FHLCA and in the general vicinity of the Project. More specifically, as mitigation for direct and indirect impacts of the project, $800,000 in grants, from the funds provided by Caney River, will be issued for the intended purpose of restoring approximately 6,000 acres of degraded prairie habitat within the FHLCA, 3,000 of which will be within the Red Buffalo conservation easement and/or the Project with the remaining 3,000 acres to be located on priority properties selected by the

Committee, back to at least the pre-construction (baseline) habitat condition of the project site. For the purpose of clarifying the target for post restoration habitat quality, acreages targeted for restoration as selected by the Committee, will be cleared of encroaching woody species such that the tall grass prairie content is 80 percent or greater.

As previously mentioned, Caney River has entered into an agreement with NFWF to manage all aspects of the NECP including, but not limited to, the assembly of an advisory committee of experts on native prairie and prairie chickens to provide guidance (the "NECP Advisory Committee" or "Committee"). The sole purpose of the NECP Advisory Committee, which its charter will reflect, is to offer guidance to NFWF. The Committee will be organized and administered to allow maximum participation of the members by reasonably attempting to conduct its business in accordance with the governance related participation constraints of members. The Committee is expected to comprise approximately seven members including a single representative from each of the following entities (as allowed by each entities' governance rules and interest in participation): (1) Kansas Department of Wildlife and Parks, (2) United States Fish and Wildlife Service, (3) TradeWind Energy, (4) Caney River, (5) NFWF, (6) NRCS and,(7) A representative from a research institution, possibly Kansas State University or the University of Kansas.

The funding sources of the NECP elements described above (totaling $9,400,000) are broken down as follows: (1) $8,500,000 from Caney River, (2) $500,000 from NFWF, and (3) $400,000 from TradeWind, all of which will occur within 1 year of the commencement of construction of the Project. For more detail and the NECP in its entirety see Appendix E.

2.3 Comparison of Alternatives

Under the No Action Alternative, TVA would not implement a PPA for the wind-generated electricity from Caney River. However, Caney River may still be constructed because other customers may purchase the wind-generated electricity. Under the No Action Alternative, TVA would not have the ability to implement mitigation measures to reduce environmental impacts. Under the Proposed Action Alternative, TVA would execute an agreement for the purchase of wind-generated electricity from the Caney River. The impacts described and evaluated in Chapter 3 and presented in Table 2-4 would occur. TVA would require that Caney River implement its conservation and mitigation plan as indicated in Chapter 4 of this document.

Table 2-4: Comparison of Impact of the Alternatives

Resource	Proposed Action	No Action
Tallgrass Prairie Vegetation	The Project site contains 7,466 acres of tallgrass prairie and 4,994 acres of tallgrass prairie with woody encroachment; construction impacts 481 acres of tallgrass prairie, with 70 acres of permanent Project impact to tallgrass prairie. Minor fragmentation of tallgrass prairie habitat is offset by mitigation and conservation measures. Mitigation of impacts is accomplished in the NECP including but not limited to 6,000 acres of restoration (3,000 on-site and or Red Buffalo Ranch and 3,000 within the FHLCA), and 18,164 acres of perpetual conservation easements: 8,164 acres on Red Buffalo Ranch, and10,000 acres located within the FHLCA.	Continuation of current trends and conditions
Greater Prairie Chicken and Grassland Birds	No leks or individual GPC were found in Project area; area is of moderate habitat quality using the Robel habitat index. Anecdotal information indicates they are on better habitat of nearby properties outside the Project area. Potential impact to grassland bird habitat warrants mitigation as described in the NECP, including but not limited to: 6,000 acres of prairie restoration and the 18,164 acres of perpetual conservation easements described above. Potential for grassland bird mortality is low; minor loss of habitat is mitigated by restoration and conservation efforts.	Continuation of current trends and conditions
Visual	Wind turbines would be visible from points to the southwest; the Project is not visible from nearby towns, from the “Heart Of the Flint Hills,” or US 400; ridges block views from the west and from Flint Oak Hunting Resort; the Project is minimally visible from K-99 and US 160	Continuation of current trends and conditions
Threatened and Endangered Species	No impacts to state- or federally-listed species; no American burying beetles present; the Project is outside of the migratory corridor of the federally endangered whooping crane	Continuation of current trends and conditions
Geology, Geologic Hazards, and Mineral Resources	No effects to existing oil production; area is in a low earthquake hazard area	Continuation of current trends and conditions
Paleontology	No important fossil beds known in area	Continuation of current trends and conditions
Soils and Prime Farmland	Prime farmland soils located on ridge tops and much of the Project would be constructed on farmland of statewide importance; this area of prairie vegetation is now used for grazing; there are impacts to 65 acres of Prime Farmland	Continuation of current trends and conditions

Resource	Proposed Action	No Action
Surface and Groundwater	Road and turbine construction would utilize BMPs to control erosion; some ground disturbance in watershed of Elk River, which is an impaired stream for fecal coliform bacteria and dissolved oxygen; Project would not contribute to the impairment; no groundwater impacts	Continuation of current trends and conditions
Floodplains	Access roads would cross floodplains; crossings are perpendicular to floodplain and replace existing crossings; floodplain footprint and impacts have been minimized. Efforts described in Section 3.9 have avoided and minimized potential effects such that remaining actions have no practicable alternative and so comply with the Floodplain Executive Order.	Continuation of current trends and conditions
Wetlands and Streams	Impacts to delineated wetlands and other waters of the U.S. would qualify the Project for NWPs; improvements to culverts and a low-water crossing would allow for aquatic life passage	Continuation of current trends and conditions
Noxious Weeds	Field bindweed and bull thistle are found in Project area; noxious weeds would be controlled by using material free of noxious seeds and cleaning of equipment prior to entering and leaving the Project area	Continuation of current trends and conditions
Non-Game Birds	Few raptor stick nests in area; risk of avian collisions minimized by slow rotation and unguyed tubular towers; risk of mortality is low.	Continuation of current trends and conditions
Migratory Game Birds	Minimal to no impacts; Project is not near major waterfowl gathering areas such as large reservoirs or national wildlife refuges. Potential for mortality is low.	Continuation of current trends and conditions
Bats	Little bat foraging and roosting habitat in area; risk of bat mortality is low	Continuation of current trends and conditions
Air Quality	Short-term particulates and exhaust emissions during construction; beneficial effects during operation in offsetting air impacts from other energy sources	Continuation of current trends and conditions
Noise	Construction noise impacts due to equipment; during operation no residences would experience noise levels greater than 55 A-weighted decibels (dBA); most locations would experience long term levels below 40 dBA	Continuation of current trends and conditions
Shadow Flicker	Minimal impact to residences in the vicinity of the Project	Continuation of current trends and conditions
Cultural Resources	No historic properties affected; one rock cairn outside of the Project impact area would be avoided.	Continuation of current trends and conditions

Resource	Proposed Action	No Action
Land Use	Minimal disruption of existing ranching and oil production land uses	Continuation of current trends and conditions
Transportation	Improvements of culverts and short sections of existing county roads to facilitate equipment movement; construction traffic of 114 vehicles per day; operational traffic of one or two vehicles per day; no hazard to air navigation	Continuation of current trends and conditions
Socioeconomics	Project in “Frontier County” with less than six residences per square mile; the Project would add over $1 million to existing county budget of $2 to $2.5 million per year; landowner lease payments of over $1 million per year; minimal impact on home sales values; employment of 267 during construction and 8-20 during operation	Continuation of current trends and conditions
Environmental Justice	No minority or low income communities adversely affected; however, economic development would add additional jobs and income to the area	No effects
Managed Areas and Ecologically Significant Areas	No effects to public lands. Minor effects to tallgrass prairie habitats offset by identified conservation and mitigation measures. No effects to Nationwide Rivers Inventory rivers.	No effects
Hazardous Materials	No hazardous waste generated; hazardous chemicals associated with vehicles and equipment would be managed in compliance with all applicable laws and regulations	Continuation of current trends and conditions

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3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Based upon existing and available information,this section describes the existing physical, biological, and human resources in teh region, as well as within and adjacent to the Project area. The Project's anticipated impacts on such potentially affected resources are also assessed. The Project site is located approximately seven miles east to southeast of the existing Elk River wind energy facility in Butler County, Kansas. The Project and surrounding areas contain rolling hills and ridges that are dissected by intermittent drainages. Project area elevations range from approximately 1,130 feet to 1,540 feet AMSL.

Climate in the area is sub-humid, with hot, moist summers and cold, dry winters. The average temperature in Wichita (located about 40 miles to the northwest of the Project area) is 56 degrees Fahrenheit (°F). Precipitation annually averages 35.25 inches (http://www.crh.noaa.gov/ict/?n=climate) in Howard, which is located approximately six miles east of the Project area. For assessing the affected environment and environmental consequences, the Project's regions of influence are defined as follows, based on the resources assessed and their characteristics. For air resources and socioeconomic resources, the area assessed includes the county affected, Elk County. For aquatic resources, the area assessed includes the subbasins of the Caney River and Elk River in the vicinity of the Project site. This includes Caney River downstream to Hulah Lake and Elk River downstream to Elk City Lake. For terrestrial resources, the area assessed includes the site itself as well as the ecoregion where the facilities are to be located. Ecoregions denote areas of general similarity in the type, quality, and quantity of environmental resources. The Project is situated within the Flint Hills ecoregion (Chapman et al. 2001).

The Flint Hills is the largest remaining relatively intact tallgrass prairie in North America. The region is characterized by rolling hills composed of shale and cherty limestone, rocky soils, and by humid, wet summers. Erosion of the limestone has left the more resistant chert (or flint) deposits, producing the hilly topography and rocky soils of the area. The rocky surface is difficult to plow; consequently, the region has historically supported little cropland agriculture. Because this ecoregion covers a large land area extending through parts of Kansas and Oklahoma, the condition of terrestrial resources in the southern Flint Hills is emphasized.

Past, present, and reasonably foreseeable future actions (RFFAs) that have affected the resources of the Elk County area include:

- Elk River Wind Project in Butler County three miles to the northwest
- Private agricultural management of grasslands through burning and pasture
- Oil production

Based on consultation with state and federal agencies and issues raised by the public, the priority issues with a wind development in the Flint Hills Ecoregion involve effects on and potential fragmentation of tallgrass prairie habitat, the GPC and other grassland birds, the viewshed, and endangered species. These issues are evaluated first in the EA, followed by effects on other natural, social, and cultural features.

3.1 Tallgrass Prairie Vegetation

This section describes the existing conditions of tallgrass prairie in the region and the potentail effects of the Project .

3.1.1 Affected Environment

Grasslands make up the largest vegetative province in North America. The most productive grassland ecosystem is the tallgrass prairie, which lies to the east of the shortgrass and mixed grass prairies. Tallgrass prairie once covered 223,000 square miles, but an estimated 88 to 99 percent of this habitat has been plowed for agriculture. In Kansas, tallgrass prairie once covered 17 million acres, but today is estimated to cover 3+ million acres. Much of the remaining unplowed tallgrass prairie is found in the Flint Hills. Tallgrass prairie receives summer rainfall but is subject to droughts. Frequent fires have played a major role in creating and maintaining tallgrass prairie habitat, but the fire intervals, time of year, and scale that led to the current mix of animals and plants were different in the past than the prairie experiences today. Tallgrass prairie is the dominant type of vegetation in the Flint Hills and on the Project site. Dispersed within the tallgrass prairie are patches of wooded habitat. Common tallgrass prairie grasses include big bluestem, yellow Indiangrass, little bluestem, switchgrass , and prairie dropseed. Oak and hickory are the dominant tree species in forested areas (Wasson et al. 2005).

Quality and, perhaps more importantly, total acreage of tallgrass prairies are diminishing throughout Kansas. Fragmentation, land management practices, encroachment, and subsequent conversion into cultivated land and/or housing are the primary causes. The natural quality of prairie has also been degraded by annual burning, as compared to a more natural irregular cycle of every few years.

Annual burning is widely used to support a grazing management system called early intensive stocking. Under this system, prairie is burned in the spring. The lush regrowth of warm season grasses such as big bluestem and Indiangrass allows more intensive grazing in the spring. Cattle are then removed in July, allowing the grass to recover from grazing and go to seed before winter. In the historical burning regimes to which most tallgrass prairie plants and animals are adapted, burns are typically in the late summer and occur every three to ten years (Reinking 2005).

Frequently burned grasslands are structurally simpler than unburned grasslands, and as a result support fewer species. From studies in Kansas, Zimmerman (1992) stated “Fire has a direct structural impact on the community and eliminates certain species by affecting critical dimensions of their niches, not as a result of competitive resource partitioning, but rather by obliterating species-appropriate resource space.” In addition, Powell (2008) stated “annual burning limits the potential of much of the Flint Hills prairie to harbor high breeding densities of many grassland birds.”

Rohrbaugh et al (1999) found that nesting success was lowered for eastern meadowlarks, grasshopper sparrows, and dickcissels in grazed prairies, even though it was difficult to isolate the effects of grazing from burning. They also found that 13.5 percent of eastern meadowlark nests failed because of trampling from cattle.

Shaffer et al. (2003) found that the presence of cattle greatly attracts cowbirds, which parasitize songbird nests. Klute (1994) and Klute et al. (1997), in a Kansas study, found that cowbirds were significantly more abundant in moderately grazed, annually spring-burned tallgrass prairie than in ungrazed, annually spring-burned CRP fields planted to native grasses. Cowbirds need perches on which to view bird activity; fences and livestock act as perches. The short-grazed fields also create a microhabitat favored for foraging by cowbirds. Cattle flush insects as they move and graze, which also favors cowbirds.

The outcome of development and past land management practices is a partial fragmentation of the tallgrass prairie landscape in the Flint Hills. This process has generally resulted in grassland being gradually converted to shrubland. As the gradual conversion to shrubland proceeds, the patches of contiguous tallgrass prairie become smaller and more fragmented. Associated with fragmentation is increased edge length, or increased boundaries between habitats. Woody plant expansion is the greatest current threat to grasslands such as the Flint

Hills. Once established, shrubs tend to be resistant to annual spring fires and other frequently burned areas. Shrub islands are created, which are able to persist and resist fire in their interior (Briggs et al. 2005). These trends would be expected to continue unless state and federal policy and private land use practices were to change.

3.1.2 Fragmentation of Tallgrass Prairie at the Landscape Level

Based upon the Kansas Applied Remote Sensing multitemporal Landsat satellite imagery from 1991-1997 data (KARS 2009), the status of existing tallgrass prairie in the Flint Hills Ecoregion (USFWS focus area) is shown in Figure 3-1. The figure and its associated inset table of tallgrass prairie content for each two by two mile block of data, represents the current (KARS 2009) status of tallgrass prairie in the Flint Hills region. The overall picture is one in which:

- The tallgrass prairie of the Flint Hills region is oriented along an elongated North-South corridor

- There remains a substantial acreage of tallgrass prairie habitat throughout the Flint Hills region (approximately 3+ million acres)

- There is an axis within the corridor comprised of 1.4 million acres of Intact Tallgrass Prairie, as defined in Section 3.1.3.1.1

- The percent of tallgrass prairie in each block generally represents (shown as varying color intensity), the cumulative impacts of direct and indirect effects and conditions resulting from human and natural processes occurring within that individual block

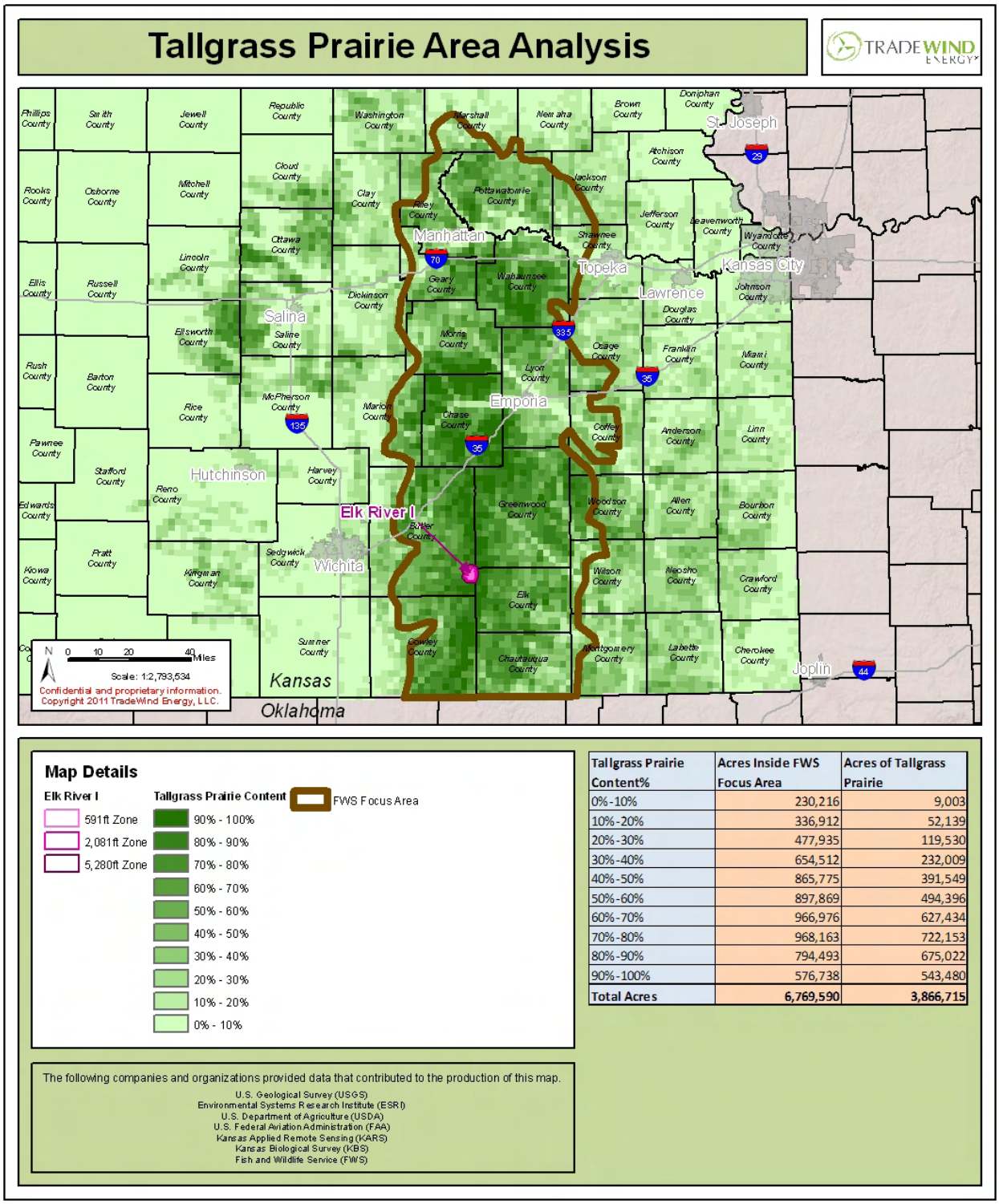
- At the overall landscape level, the extent, variation and pattern of remaining tallgrass prairie generally indicates cumulative effects of human intrusions (most of the activities mentioned in the introduction to this chapter) and natural factors on the amount and distribution of tallgrass prairie remaining in the region

- Some fragmentation of tallgrass prairie within the Flint Hills region has occurred (i.e., a degree of discontinuities have been introduced) from the noted sources, as evidenced by the individual blocks and contiguous areas in which lesser or greater amounts of tallgrass

prairie remain (most evident to the eastern side of the north-south axis and in proximity to urban centers)

- Within the region there remains a core concentration of high percentage tallgrass prairie that runs primarily slightly skewed to the western edge of the north-south axis of the Flint Hills region and most strongly in the north within the state-designated “Heart of the Flint Hills” area.

Figure 3.1: Flint Hills Ecoregion before Caney River



Tallgrass Prairie Content%	Acres Inside FWS Focus Area	Acres of Tallgrass Prairie
0%-10%	230,216	9,003
10%-20%	336,912	52,139
20%-30%	477,935	119,530
30%-40%	654,512	232,009
40%-50%	865,775	391,549
50%-60%	897,869	494,396
60%-70%	966,976	627,434
70%-80%	968,163	722,153
80%-90%	794,493	675,022
90%-100%	576,738	543,480
Total Acres	**6,769,590**	**3,866,715**

An additional factor partially captured and overlaying this depiction which differentially affects the quality or value of tallgrass habitat to other species is the effect of varying land management practices (i.e., burning and grazing) on the remaining tallgrass prairie. The effects of the variation in land management practices are partially captured by the variation in acreages of remaining prairie within blocks (e.g., it can encourage woody growth that would reduce acreages). This factor is discussed more fully in the context of effects on prairie-dependent avian and terrestrial species (e.g., Section 3.2. Greater Prairie Chickens and Grassland Birds).

3.1.2.1 Conditions at the Project Site

Based on Kansas Applied Remote Sensing data (KARS 2009), land cover within the Project is about 55 percent warm-season grassland and 37 percent mixed grassland and shrubland with voluntary tree saplings and woodlands (Figure 3-2). The latter category is tallgrass prairie impaired by woody plant encroachment and was derived from interpretation of aerial photos and KARS data. It is a combination of the woodland data derived from KARS data and additional interpretation of recent aerial photo evidence of woody plant encroachment. The analysis used topography, visible vegetation, and project site knowledge. The mixed grassland and woody vegetation (e.g., oaks, ash, elm, dogwoods, eastern red cedars, hedge, cottonwood) is found in ravines, in areas with increased slope, and along fence rows. There is a small area (0.005 percent) of cool-season grassland. Cultivated land, water, and cattail marsh together account for about 0.02 percent of land cover. All of the cultivated land is in the northeastern part of the project area. As indicated in the aerial photo over which the KARS data is overlaid on Figure 3-2, there is woody encroachment in nearly half the tallgrass prairie on the project site, especially along drainages.

The KARS data can be further delineated based on the tallgrass prairie content. This is an indication of the current quantity of the tallgrass prairie, which on the Caney River site is 60 percent or higher.

Many of the physical features of human intrusion into the site are shown in Figure 3-3. These include a network of high and low voltage electrical transmission lines, radio towers, gas pipelines, oil wells and tanks, fences, public and private roads and other man made infrastructure throughout the property supporting current uses for oil and gas production or agriculture and ranching purposes. These facilities result in considerable fragmentation of the onsite tallgrass prairie habitat.

Plants inventoried during the field investigation conducted within a 500-foot corridor (250 ft on either side) along and around proposed Project facilities are listed in Table 3-1. Dominant plant species varied throughout the Project area due to cattle grazing and the use of fire to clear residual grasses and forb biomass. The southern portion of the Project area, for example, was dominated by native prairie grasses such as little bluestem, big bluestem, and Indiangrass. Other areas included a greater abundance of cool season grasses (e.g., brome, noxious weeds (e.g., Sericea lespedeza), and shrubby thickets of dogwood, sumac, and poison oak. Scattered woody vegetation, found throughout the Project area, includes eastern red cedar and Osage orange.

Frequent burning in early spring promotes maintenance of cool season grasses such as brome and fescue, limiting available habitat for nesting bird populations. In areas burned less frequently, native grass populations of Indiangrass, little bluestem, and big bluestem are more dominant, providing habitat to a greater diversity of bird species.

Forbs and broadleaf plants found throughout the Project area include, but are not limited to, daisy fleabane, goldenrod, pale purple coneflower, spiderwort, white wild indigo (*Baptisia alba*), purple prairie clover, and common ragweed. A noxious weed that is common but not abundant throughout the area is sericea lespedeza, which is stimulated by spring burns.

Figure 3-2: Land Cover Map

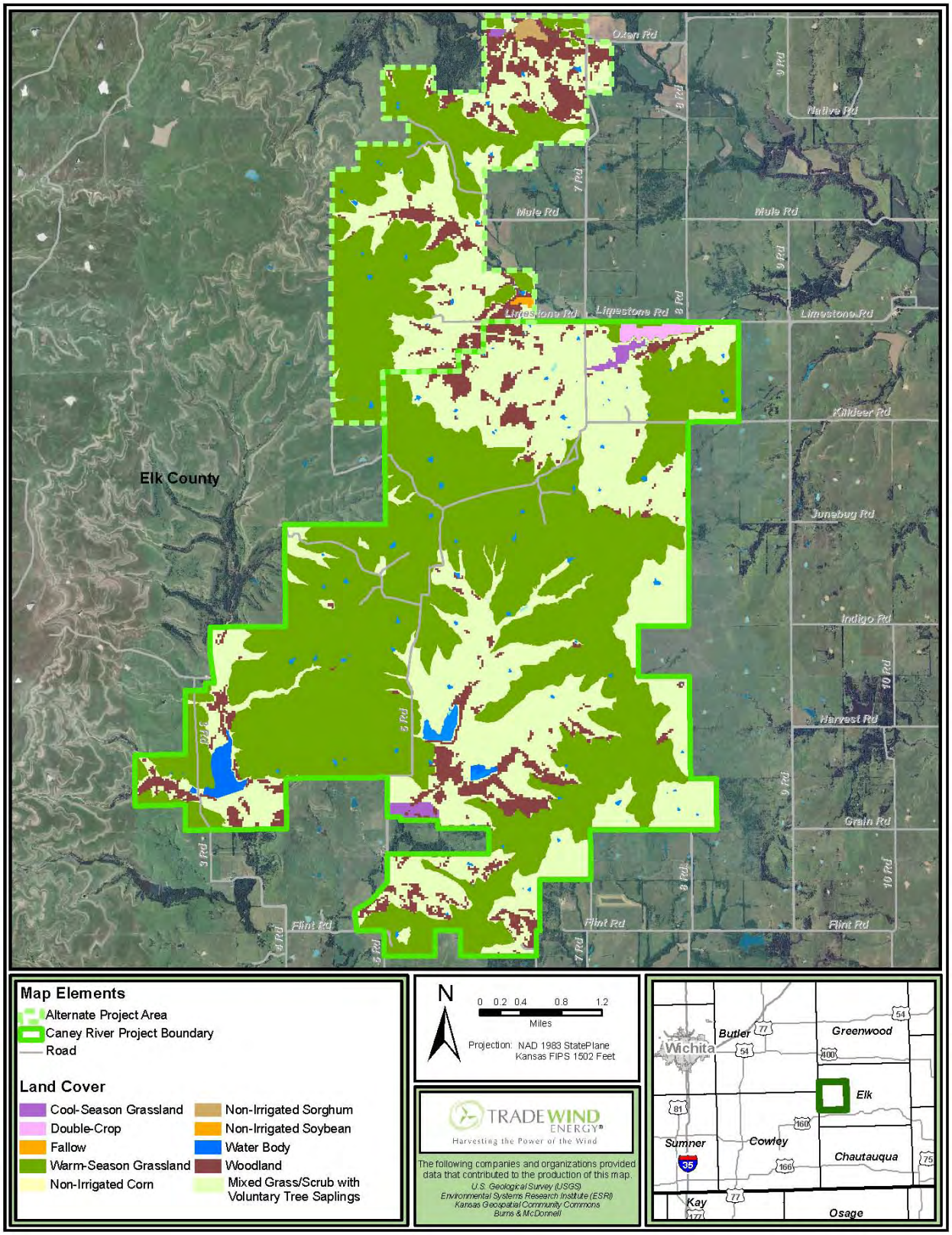


Figure 3-3: Human Intrusion Map

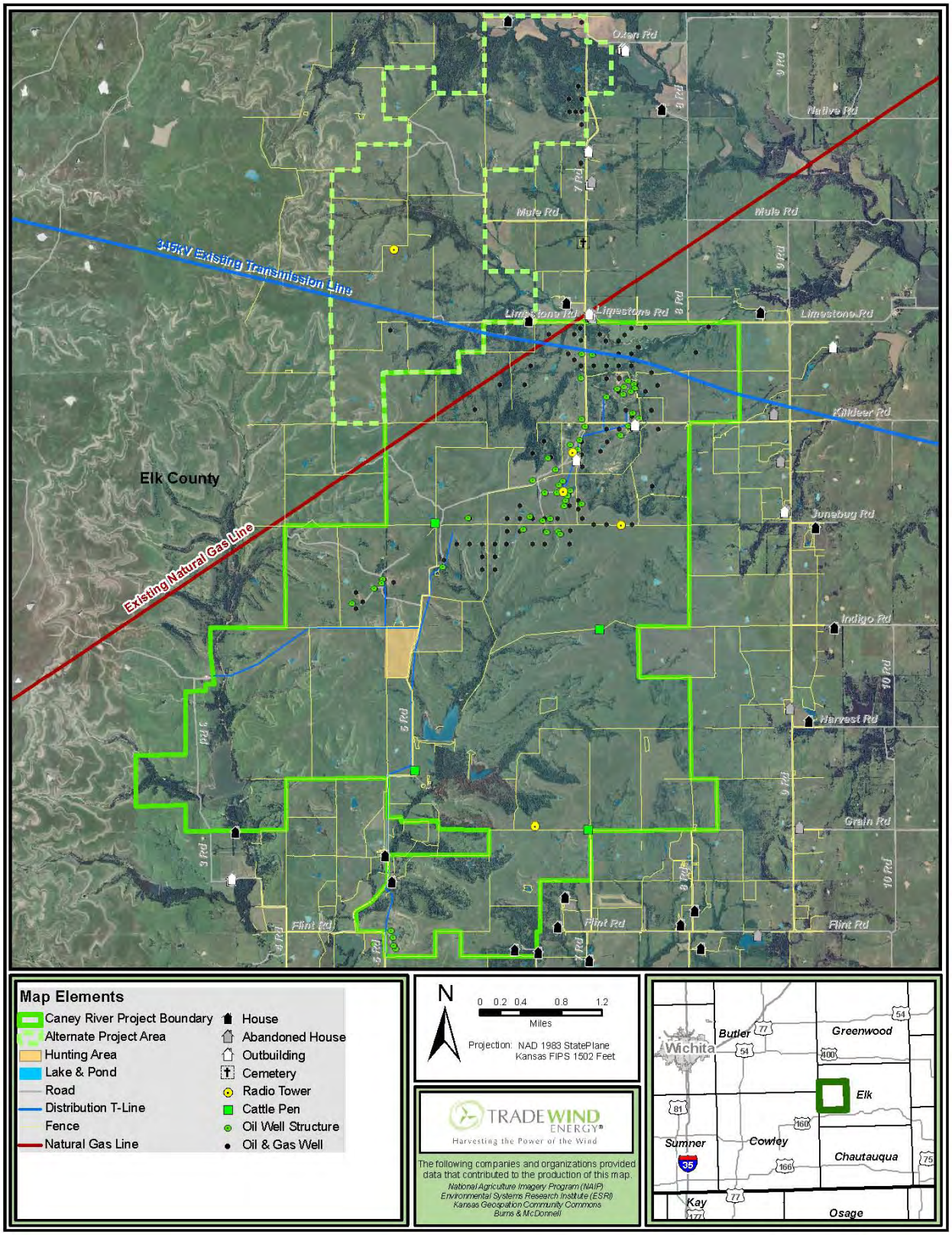


Table 3-1: Species Composition of Vegetation Found in Proposed Project Area

Common Name	Scientific Name	Also Known As
Alfalfa	*Medicago sativa*	
American elm	*Ulmus Americana*	
Ash	*Fraxinus* spp.	
Beard Tongue	*Penstemon digitatis*	
Big Bluestem	*Andropogon gerardii*	
Black-eyed Susan	*Rudbeckia hirta*	
Blackjack oak	*Quercus marilandica*	
Brome	*Bromus catharticus*	Rescuegrass
Buck Brush	*Symphoricarpos orbiculatus*	Coral-berry
Bull Thistle	*Cirsium vulgare*	
Burr oak	*Quercus macrocarpa*	
Butterfly-weed	*Asclepias tuberosa*	
Canada Wildrye	*Elymus canadensis*	
Common Milkweed	*Asclepias syriaca*	
Common Ragweed	*Ambrosia artemisiifolia*	
Compassplant	*Silphium laciniatum*	
Daisy Fleabane	*Erigeron annuus*	Prairie Fleabane, Fleabane, Daisy
Deptford Pink	*Dianthus armeria*	
Dropseed species	*Sporobolus* spp.	
Eastern cottonwood	*Populus deltoids*	
Eastern Red-cedar	*Juniperus virginiana*	
Fescue species	*Festuca* spp.	
Field Bindweed	*Convolvulus arvensis*	
Field Brome	*Bromus japonicus*	Japanese Brome
Field Pennycress	*Thlaspi arvense*	
Goat's Beard	*Tragopogon dubius*	
Goldenrod	*Solidago speciosa*	
Hackberry	*Celtis* spp.	
Honey Locust	*Gleditsia triacanthos*	
Indiangrass	*Sorghastrum nutas*	
Ironweed	*Vernonia baldwinii*	
Korean Lespedeza	*Lespedeza stipulacea*	Common Lespedeza
Lead Plant	*Amorpha canescens*	
Little Bluestem	*Schizachyrium scoparium*	
Multiflora Rose	*Rosa multiflora*	

Common Name	Scientific Name	Also Known As
Osage Orange	*Maclura pomifera*	Hedge, Hedge Apple, Bois d'arc
Pale Purple Coneflower	*Echinacea pallida*	
Partridge Pea	*Cassia fasciculata*	
Pecan	*Carya illinoinensis*	
Poison Oak	*Toxicodendron pubescens*	
Post oak	*Quercus stellata*	
Purple Prairie Clover	*Petalostemon purpureum*	
Rough-leaf Dogwood	*Cornus drummondii*	
Sensititve Briar	*Schrankia uncinata*	
Sericea Lespedeza	*Lespedeza cuneata*	
Silver Bluestem	*Bothriochioa laguroides*	Bearded Bluestem
Smooth Sumac	*Rhus glabra*	
Spiderwort	*Tradescantia ohiensis*	
Strawberry	*Fragaria virginiana*	Wild Strawberry
Upright Prairie Coneflower	*Ratibida columnifera*	Mexican Hat
White Prairie Clover	*Petalostemon candidum*	
White Wild Indigo	*Baptisia alba*	Plains Wild Indigo
Wild Bergamont	*Monorda fistulosa*	Horsemint, Beebalm
Wild Plum	*Prunus americana*	American Plum
Yarrow	*Achillea millefolium*	
Yellow Sweet Clover	*Melilotus officinalis*	

3.1.3 Environmental Consequences

Under the No Action Alternative, impacts that are occurring to plant communities of the tallgrass prairie and other identified habitats, both on the Project and within other areas such as the perpetual conservation easement acreage contemplated in the NECP (Appendix E), would continue. State and federal programs exist which provide opportunities to participate in land management programs which could improve the prairie quality. Such programs would continue at their current rate of effectiveness under the No Action Alternative. These include ongoing impacts from broad-scale artificial annual burns, early intensive cattle stocking regimes, and oil production.

Under the Proposed Action Alternative, direct impacts to vegetation would occur during construction. As indicated in Table 3-2, there are 13,618 acres in the Project area; however, only a small fraction of that would actually be occupied by project facilities. Vegetation types

present include tallgrass prairie, and mixed grassland with shrubland, woodland areas, and cropland. The Project area is 55 percent warm-season grasses and 37 percent mixed grassland and shrubland with voluntary tree saplings. Both of these areas are primarily used for livestock grazing and for oil production. The remainder of the site is cultivated land and water (ponds). The site contains county roads, private roads, service roads, high-voltage and low-voltage electrical transmission lines, gas pipelines, radio towers, oil wells, oil tanks, fence lines, and other human intrusions and features (Figure 3-3).

Table 3-2: Vegetation Types and Impacts

Vegetation Type	Area (acres)	Temporary Impact (acres)	Permanent Impact (acres)
Warm-Season Grasses	7,466	481	70
Mixed Grassland and Shrubland with Voluntary Tree Saplings	4,994	60	13
Cool Season Grassland	82	0	0
Woodland	823	1	0
Cropland	66	0	0
Water	187	0	0
Total	**13,618**	**542**	**83**

The overall post-construction operational footprint of the Project, calculated to be 83 acres, is less than one percent of the overall property being leased for the Project. However, the ecological footprint would be greater due to temporary disturbances (542 acres). Although this temporary impact would affect native grassland and regeneration to original prairie habitat would likely be slow, the property would quickly be available for continued incidental use by grassland animals within a year, and would improve in quality each year that it is undisturbed and properly managed.

Tallgrass prairie habitat is concentrated along the ridges where the majority of the Project would be constructed. The vast majority of the remaining acres are now occupied by cool-season grassland vegetation (82 acres) and Mixed Grassland and Shrubland with Voluntary Tree Saplings (4,994 acres) but were formerly tallgrass prairie; 3000 acres of such degraded prairie on the Project or Red Buffalo Ranch would be restored back to prairie vegetation as part of the NECP. Cropland on the leased property is now 66 acres. The temporary disturbance to tallgrass prairie would be 481 acres, leaving only a small portion (70 acres) of the tallgrass prairie permanently occupied by roads, WTG foundations, and other Project facilities. The

temporarily impacted areas would be revegetated with native plants and would eventually be reclaimed to habitats similar to those provided by native prairie.

Under the Proposed Action Alternative, efforts will be made through the NECP to substitute rotational or patch burning for the current practice of annual burning, with likely positive changes on tallgrass habitat. These habitat changes would be an increase in native forb species diversity and a reduction in noxious weeds. Since the total area of the Project footprint (83 acres) would be relatively small compared with the overall size of the Project area (13,618 acres), direct impacts to vegetation would be minimal. Furthermore, as NECP funds are available and landowners choose to participate and as approved by the NECP Advisory Committee, efforts would be made to (1) maintain and improve the remaining tallgrass prairie on the property, and (2) reclaim much of the property that is currently mixed grassland, shrubland, voluntary tree saplings, and woodland back to tallgrass prairie. The NFWF is a partner to the NECP and will assist Caney River in implementing the NECP as well as provide matching funding for the components of the plan. The NFWF is a 501(c)(3) nonprofit that preserves and restores native wildlife species and habitats in the United States. Created by Congress in 1984, NFWF directs public conservation dollars to the most pressing environmental needs and matches those investments with private funds.

3.1.3.1 Fragmentation

Despite decades of attention in the scientific literature and widespread application in conservation biology and resource management, there is still no consensus on the definition and somewhat ambiguous concepts of habitat fragmentation. However, habitat fragmentation is a feature that:

- Is a “process” of landscape change (i.e., involves consideration of both spatial factors and trends, i.e., cumulative effects accrued over time)

- Occurs at the landscape-level, not the patch-level (e.g., a consideration of effects at the scale of the Flint Hills ecoregion or of actions that could produce impacts at that scale such as potentially isolating portions of the region)

- Is a habitat-specific process relevant to types of organisms under consideration (e.g., tallgrass prairie and grassland birds, respectively)

- Is a scale-dependent process (the scale of fragmentation is at a scale that is relevant to the potentially impacted resource, e.g., habitat considered in blocks that can reasonably represent how organisms relate to that habitat)

- Results from both natural and anthropogenic causes

Assessing habitat fragmentation involves evaluating the potential for the subdivision of contiguous habitat into several pieces. Habitat fragmentation in landscapes, such as the tallgrass prairie of the Flint Hills, generally occurs through the inextricably linked process of habitat loss, as well as mechanisms, such as increase in woody encroachment in grasslands leading to the degradation of remaining habitat. Both the project considerations and features of landscape fragmentation are qualitatively or quantitatively discussed herein.

As identified in internal scoping and comments from agencies, non-governmental organizations and the public, relevant concerns in regard to the Caney River Wind Energy project and fragmentation of landscape within tallgrass prairie habitat of the Flint Hills region include:

- Direct loss of habitat (extent) and how that is characterized

- The general nature and degree of potential contribution of the Project to fragmentation of tallgrass prairie habitat occurring at the regional landscape scale in the Flint Hills ecoregion

- The degree to which the Project could substantively dissect, subdivide, reduce connectivity, or isolate the north-south axis of the tallgrass prairie habitat of the Flint Hills region into two patches; and the degree of “viscosity” of the remaining landscape (i.e., the relative resistance to, or facilitation of, movement of organisms through the landscape in which connectivity is a property of the landscape resulting from the interaction of organisms and their habitat, e.g., movement of grassland birds through the tallgrass prairie landscape). For the purpose of this assessment, this effect has been termed “traversability”

- The linkages between anticipated impacts, and proposed restoration, mitigation and conservation measures that not only are habitat losses offset, but areas are identified such that they are well-placed and could potentially address fragmentation issues as well. Even in situations producing “no net loss” of habitat, projects with restoration and mitigation

measures may yet induce fragmentation, or with well-targeted efforts at the appropriate scale may actually offset or decrease fragmentation.

3.1.3.1.1 Potential Effects on the Flint Hills Ecoregion

As identified above, the analysis focused upon potential effects on habitat fragmentation at the ecosystem level. Using data from KARS depicting tallgrass prairie content within two by two square mile grids for the state of Kansas, the area of analysis was the Focus Area as defined in the Partners for Fish and Wildlife Strategic Habitat Plan (USFWS FHLCA LPP 2010). This area, which corresponds well with the Flint Hills ecoregion, was selected following conversations with federal and state resource agencies. To determine the potential effect of the Caney River and existing Elk River projects on habitat loss, fragmentation and landscape continuity in the context of the Flint Hills ecoregion, the following analyses were conducted (1) an evaluation of the potential loss (mitigated and unmitigated) of particular densities of tallgrass prairie in relation to the amount and distribution of that habitat in the ecoregion in the context of potential to affect core tallgrass prairie area, and (2) an evaluation of the potential Project effects on connectivity of tallgrass prairie habitat along the north-south axis of the ecoregion and on traversability, i.e., ability of representative organisms of concern (predominantly birds) to move through a key portion of the landscape surrounding and including the Project site.

With regard to these analyses (except traversability discussed later), three metrics were considered representative of the potential for impacts to important resources identified in comments from resource agencies and the public:

1. Wind Turbine Generator Influence on Grassland Birds (591ft) (Leddy et al. 1999)

   The metric basis is a best available study specific to WTGs indicating impacts to grassland nesting birds was attenuated at this distance.

2. LPC Avoidance of Tall Structures (2081ft) (Robel et al. 2004 and FWS Flint Hills LCA EA 2010)

   The metric is based on Lesser Prairie Chicken (LPC) impacts (avoidance indicating creation of a discontinuity in usable habitat) due to other obstructions like buildings and power lines.

3. LPC Avoidance of Power Plant (5280ft) (Robel 2002)

The metric is based on LPC impacts (avoidance indicating creation of a discontinuity in usable habitat) due to other forms of generation like coal-fired power plants.

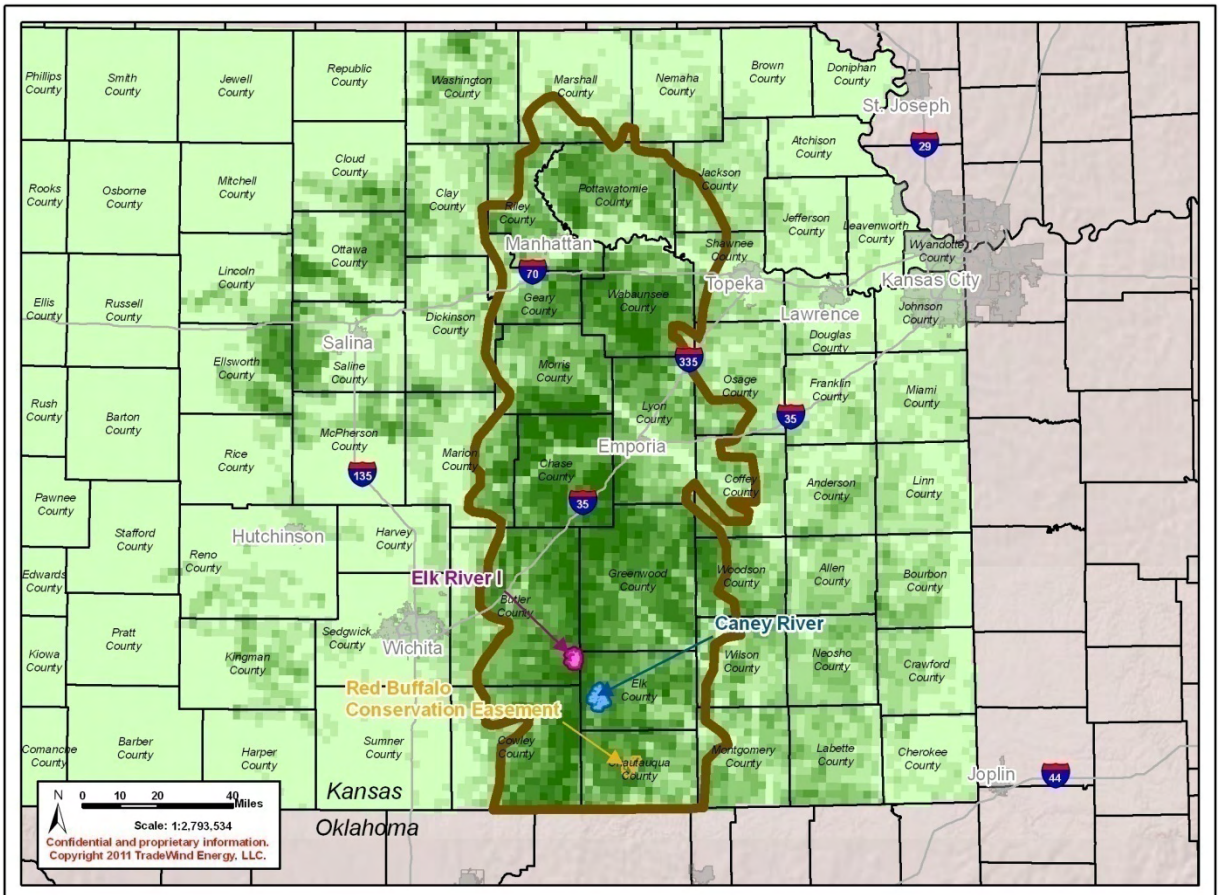
The current state of knowledge supported by well-delineated studies and results on the habitat effects of wind turbines in grasslands is limited. An underlying assumption of this evaluation is that for most grassland species, more intact prairie habitat is "better." These three metrics represent best available information from published sources and were selected to examine the range of potential impacts, primarily to grassland bird species at the ecosystem level that arguably exhibit differing levels of sensitivity to loss and fragmentation of tallgrass prairie habitat. Several grassland bird species of the Leddy et al. (1999) study do occur in the Project area and that metric is considered representative of potential effects to habitat of most grassland bird species. The other two metrics noted above represent potential for effects to possibly sensitive and important grassland birds of the grouse family. However, the most notably-sensitive species, the LPC, does not occur in the Flint Hills ecoregion of eastern Kansas and the GPC which was not found within the Project boundary during five years of lek surveys to identify the presence of that species. However, the Nature Conservancy reports by letter of April 15, 2011 (Appendix A), that GPC are present on the property of a neighboring landowner. Over five years of third party contractor field studies, only once was presence detected (i.e., four GPC) to the north of the proposed Project boundary in April 2011. At this time there is also conflicting information accruing from both formal studies and anecdotal evidence as to the true level of sensitivity of the GPC to wind turbine developments. For this reason the most conservative analysis (metric 3) was included in the analysis of impacted acreages.

As depicted in Figure 3-4, KARS data was parsed into 10 percent bins by percent of remaining tallgrass prairie within the particular two by two mile areas. The areas potentially experiencing direct or indirect effects from the Project were identified and quantified using the above defined metrics. The definition of Intact Tallgrass Prairie was selected to be acres of 80 percent or greater KARS-based rating, and Degraded Tallgrass Prairie defined as acres of less than 80 percent KARS-based rating. The 80 percent prairie habitat figure is supported by habitat suitability index values developed by the U. S. Fish and Wildlife Service, which indicate that populations of GPC become increasingly larger as the proportion of permanent grassland increases to about 80 percent (Prose 1985).

Within the Focus Area, the percentage of impacted grassland from the Project on the total tallgrass prairie habitat available is relatively small at less than 1 percent, both overall and within

core areas of intact prairie (i.e., > 80 KARS-based rating). If unmitigated, the Project would also cumulatively contribute a minor additional amount to degraded tallgrass prairie within the Flint Hills ecoregion. This minor level of effect is true for even the most sensitive representative metric (LPC avoidance of power plant). However, as can be ascertained visually in Figure 3-4 (and associated inset summary tables) and in Table 3-3, the majority of Project impacts (before application of mitigation and conservation measures) albeit minor, particularly for most grassland species, would occur to an area of 80 percent or better tallgrass prairie. This information indicates that although impacts to the primary axis of tallgrass prairie would be minor, that implementation of mitigation and conservation measures would be appropriate to reduce even that effect. This effort is in alignment with the goals set out the NECP (Appendix E) and Tradewind - NFWF conservation and mitigation agreement for this Project.

Figure 3-4: Tallgrass Prairie Analysis on the Ecoregion Landscape



Map Details

Turbine Zones of Influence

Caney River
- 591ft Zone
- 2,081ft Zone
- 5,280ft Zone

Elk River I
- 591ft Zone
- 2,081ft Zone
- 5,280ft Zone

Red Buffalo
- Conservation Easement

Tallgrass Prairie Content
- 90% - 100%
- 80% - 90%
- 70% - 80%
- 60% - 70%
- 50% - 60%
- 40% - 50%
- 30% - 40%
- 20% - 30%
- 10% - 20%
- 0% - 10%

FWS Focus Area

The following companies and organizations provided data that contributed to the production of this map.

U.S. Geological Survey (USGS)
Environmental Systems Research Institute (ESRI)
U.S. Department of Agriculture (USDA)
U.S. Federal Aviation Administration (FAA)
Kansas Applied Remote Sensing (KARS)
Kansas Biological Survey (KBS)
Fish and Wildlife Service (FWS)

WTG Influence on Grassland Birds (591ft)

	Intact (80%+) Acres	Degraded (0%-80%) Acres	Total Acres
Pre Caney	1,366,953	1,933,086	3,300,039
Caney Impact	(1,649)	(978)	(2,627)
Restored	6,000	0	6,000
Net Restoration	4,351	(978)	3,373
Conservation Easements	12,068	6,096	18,164
Net Mitigation	16,419	5,118	21,537

LPC Avoidance of Tall Structures (2081ft)

	Intact (80%+) Acres	Degraded (0%-80%) Acres	Total Acres
Pre Caney	1,360,526	1,933,077	3,293,603
Caney Impact	(6,910)	(4,901)	(11,812)
Restored	6,000	0	6,000
Net Restoration	(910)	(4,901)	(5,811)
Conservation Easements	12,068	6,096	18,164
Net Mitigation	11,158	1,195	12,353

LPC Avoidance of Power Plant (5280ft)

	Intact (80%+) Acres	Degraded (0%-80%) Acres	Total Acres
Pre Caney	1,353,938	3,695,282	5,049,220
Caney Impact	(11,932)	(10,106)	(22,038)
Restored	6,000	0	6,000
Net Restoration	(5,932)	(10,106)	(16,038)
Conservation Easements	12,068	6,096	18,164
Net Mitigation	6,136	(4,010)	2,126

In the NECP the Project has committed to 6,000 acres of restoration in the ecoregion, 3,000 of these acres will be within the Project area or within Red Buffalo Ranch. Per the NECP acres which are currently degraded will be converted to Intact Tallgrass Prairie, and have been accounted for as a net increase to the overall total of Intact Tallgrass Prairie. Acres will be restored of a size and at locations selected by the NECP Advisory Committee. When available and practicable, contiguous tracts would be restored. According to the FHLCA Land Protection Plan (2010):

"Intact open landscapes are essential habitat components for the Greater Prairie Chicken and other grassland birds that are the priority species for conservation management in the tallgrass prairie habitat guild."

Proposed restoration alone nearly fully offsets potential impacts to Intact (core) acres for the 591ft and 2081ft scenarios, but does not for the most conservative one-mile zone of influence (Figure 3-4 inset tables). In order to further ameliorate the potential effects, another commitment of the project is to purchase permanent conservation easements on 10,000 acres (CLCE) in the FHLCA and preferably in the Heart Of the Flint Hills, in addition to the perpetual easement on Red Buffalo Ranch of 8,164 acres. This additional 10,000 acres of easements are to be secured entirely from Intact Tallgrass Prairie within the FHLCA and preferably within the Heart Of the Flint Hills. Because the project impacts are measured by the underlying quality of prairie which it impacts, one can also measure the underlying quality of the Red Buffalo Ranch. Specific accounting of such is reflected in the tables; 8,164 acres are divided as 2,068 Intact and 6,096 Degraded. Cumulatively, net mitigation for the project in all evaluated scenarios (Figure 3-4 inset tables) results in a net positive impact to tallgrass prairie and grassland bird habitat through a combination of restoration and conservation efforts.

Table 3-3: Acreages Affecting Potential for Fragmentation in the Flint Hills Ecosystem

WTG INFLUENCE ON HABITAT OF GRASSLAND BIRDS (591FT)					
% Intact Tallgrass	**Acreage Pre Caney**	**Acreage Post Caney**	**Unmitigated Impact**	**% of Acres Impacted**	**% of Total Impact**
0%-10%	230,362	230,362	0	0.00%	0.00%
10%-20%	336,743	336,743	0	0.00%	0.00%
20%-30%	478,067	478,067	0	0.00%	0.00%
30%-40%	655,010	655,010	0	0.00%	0.00%
40%-50%	864,944	864,944	0	0.00%	0.00%
50%-60%	897,912	897,912	0	0.00%	0.00%
60%-70%	966,940	966,471	469	-0.05%	17.85%
70%-80%	966,147	965,637	509	-0.05%	19.39%
0%-80%	1,933,086	1,932,108	978	-0.05%	37.24%
80%-90%	792,298	791,150	1,148	-0.14%	43.72%
90%-100%	574,655	574,154	500	-0.09%	19.05%
80%100%	1,366,953	1,365,304	1,649	-0.12%	62.76%
Total Impact	3,300,039	3,297,412	2,627	-0.08%	100.00%
LPC AVOIDANCE OF TALL STRUCTURES (2081FT)					
% Intact Tallgrass	**Acreage Pre Caney**	**Acreage Post Caney**	**Unmitigated Impact**	**% of Acres Impacted**	**% of Total Impact**
0%-10%	230,362	230,362	0	0.00%	0.00%
10%-20%	336,743	336,743	0	0.00%	0.00%
20%-30%	478,067	478,067	0	0.00%	0.00%
30%-40%	655,010	655,010	0	0.00%	0.00%
40%-50%	864,944	864,944	0	0.00%	0.00%
50%-60%	897,912	897,912	0	0.00%	0.00%
60%-70%	966,940	964,698	2,241	-0.23%	18.98%
70%-80%	966,138	963,478	2,660	-0.28%	22.52%
0%-80%	1,933,077	1,928,176	4,901	-0.25%	41.50%
80%-90%	789,222	784,148	5,074	-0.64%	42.95%
90%-100%	571,304	569,467	1,837	-0.32%	15.55%
80%-100%	1,360,526	1,353,616	6,910	-0.51%	58.50%
Total Impact	3,293,603	3,281,792	11,812	-0.36%	100.00%

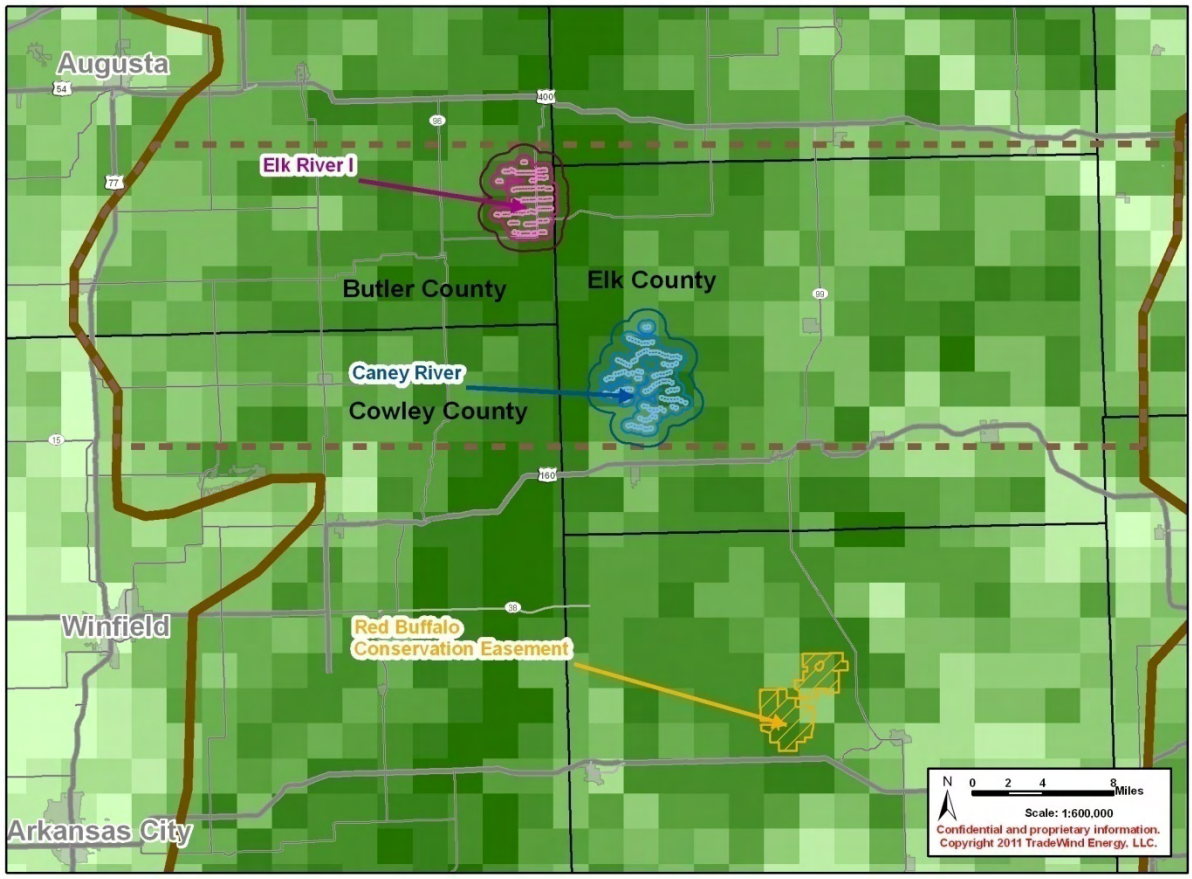
LPC AVOIDANCE OF POWER PLANT (5280FT)					
% Intact Tallgrass	Acreage Pre Caney	Acreage Post Caney	Unmitigated Impact	% of Acres Impacted	% of Total Impact
0%-10%	230,362	230,362	0	0.00%	0.00%
10%-20%	336,743	336,743	0	0.00%	0.00%
20%-30%	478,067	478,067	0	0.00%	0.00%
30%-40%	655,010	655,010	0	0.00%	0.00%
40%-50%	864,944	864,943	1	0.00%	0.00%
50%-60%	897,912	897,706	206	-0.02%	0.93%
60%-70%	966,875	961,654	5,221	-0.54%	23.69%
70%-80%	965,551	960,873	4,678	-0.48%	21.23%
0%-80%	3,695,282	3,685,176	10,106	-0.27%	45.86%
80%-90%	786,692	777,536	9,155	-1.16%	41.54%
90%-100%	567,246	564,469	2,777	-0.49%	12.60%
80%100%	1,353,938	1,342,006	11,932	-0.88%	54.14%
Total Impact	5,049,220	5,027,182	22,038	-0.44%	100.00%

3.1.3.1.2 Potential to Fragment, Reduce Connectivity or to Isolate Portions of the North-South Axis of the Tallgrass Prairie Habitat of the Flint Hills Region

As mentioned earlier, concerns were expressed regarding potential for effects of the Project on the connectivity of a north-south vegetation corridor, important for use by and movement of grassland birds and other grassland terrestrial species through the Flint Hills ecoregion.

Again, using data from KARS depicting tallgrass prairie content within two by two square mile grids for the state of Kansas, an assessment was performed to discern the potential effects on tallgrass prairie within a defined cross-sectional segment (analysis band) perpendicular to the north-south axis of the Flint Hills ecoregion (Figure 3-5). This analysis band encompassed both the proposed Caney River Project area and the existing Elk River Project. An evaluation of (1) amounts of habitat, and (2) the traversability of the existing and remaining habitat was performed for before and after construction of the Project (Figure 3-5 inset tables; Table 3-4). Consistent with the ecoregion-wide analysis, the band is bounded to the east and west by the Focus Area, as defined in the Partners for Fish and Wildlife Strategic Habitat Plan (USFWS FHLCA LPP 2010), and to the north and south using a one mile offset of the northernmost turbine in the Elk River Project and the southernmost turbine in the proposed Caney River Wind Project.

Figure 3-5: Tallgrass Prairie Analysis Band



Map Details

Turbine Zones of Influence

Caney River
- 591ft Zone
- 2,081ft Zone
- 5,280ft Zone

Elk River I
- 591ft Zone
- 2,081ft Zone
- 5,280ft Zone

Red Buffalo
- Conservation Easement

Tallgrass Prairie Content
- 90% - 100%
- 80% - 90%
- 70% - 80%
- 60% - 70%
- 50% - 60%
- 40% - 50%
- 30% - 40%
- 20% - 30%
- 10% - 20%
- 0% - 10%

- FWS Focus Area
- Analysis Band

The following companies and organizations provided data that contributed to the production of this map.

U.S. Geological Survey (USGS)
Environmental Systems Research Institute (ESRI)
U.S. Department of Agriculture (USDA)
U.S. Federal Aviation Administration (FAA)
Kansas Applied Remote Sensing (KARS)
Kansas Biological Survey (KBS)
Fish and Wildlife Service (FWS)

WTG Influence on Grassland Birds (591ft)

	Intact (80%+) Acres	Degraded (0%-80%) Acres	Total Acres
Pre Caney	145,688	243,707	389,395
Caney Impact	(1,649)	(978)	(2,627)
Restored	6,000	0	6,000
Net Restoration	4,351	(978)	3,373
Conservation Easements	12,068	6,096	18,164
Net Mitigation	16,419	5,118	21,537

LPC Avoidance of Tall Structures (2081ft)

	Intact (80%+) Acres	Degraded (0%-80%) Acres	Total Acres
Pre Caney	139,261	243,698	382,959
Caney Impact	(6,910)	(4,901)	(11,812)
Restored	6,000	0	6,000
Net Restoration	(910)	(4,901)	(5,812)
Conservation Easements	12,068	6,096	18,164
Net Mitigation	11,158	1,195	12,352

LPC Avoidance of Power Plant (5280ft)

	Intact (80%+) Acres	Degraded (0%-80%) Acres	Total Acres
Pre Caney	132,674	440,785	573,459
Caney Impact	(11,932)	(10,105)	(22,037)
Restored	6,000	0	6,000
Net Restoration	(5,932)	(10,105)	(16,037)
Conservation Easements	12,068	6,096	18,164
Net Mitigation	6,136	(4,009)	2,127

The most pertinent metric was the 591-ft zone (Leddy et al. 1999) representing the area of influence identified in the ecosystem-wide analysis for most grassland bird species. Use of this zone of influence for other grassland birds results in a Project impact to 1,649 acres of Intact Tallgrass Prairie (blocks with > 80 percent tallgrass prairie) within the Analysis Band. This acreage constitutes a reduction of approximately 1 percent of the Intact Tallgrass Prairie in the cross section of the ecoregion. Less than 0.5 percent of the less intact (degraded) portion of the regional cross section is potentially affected.

Since surveys indicate the site is not currently suitable for GPC, nor used for reproduction, as discussed in Section 3.2, the “delta” effect of wind turbines on the site to GPC would essentially be nil to very minor. However, for discussion purposes regarding more sensitive grouse species, the potentially affected acreages (if they were there) were also calculated. As noted earlier there are few studies of the impacts of wind turbines on GPC. However, studies on both GPC and LPC, a related species, have indicated avoidance behavior of tall structures such as power lines. GPC were found to avoid foraging within 100 m of power lines. It is thought that tall structures would serve as barriers to movement and that nesting and lekking behavior would be reduced in these avoidance areas (Pruett et al. 2009).

In order to account for potential GPC avoidance behavior, two buffer distances were used for analysis. Based on radio telemetry studies of LPC, Robel et al. (2004) observed avoidance of up to 2,081 feet for transmission lines. In addition, Robel (2002) averred that GPC would avoid wind turbines by up to one mile (based on studies of LPC near a coal-fired power plant in western Kansas). Therefore, these two values, 2,081 feet and 5,280 feet, were used to determine direct and indirect effect and avoidance zones for GPC. It is possible that the actual avoidance distance for wind turbines would be substantially less because of different characteristics of a wind turbine when compared with a coal-fired power plant (such plants produce substantial intermittent loud noise associated with train traffic, coal handling equipment and general operations).

Table 3-4: Acreages within the Analysis Band Potentially Affecting Connectivity of the North-South Axis of the Flint Hills Region

WTG INFLUENCE ON HABITAT OF GRASSLAND BIRDS (591FT)					
% Intact Tallgrass	**Acreage Pre Caney**	**Acreage Post Caney**	**Unmitigated Impact**	**% of Acres Impacted**	**% of Total Impact**
0%-10%	6,657	6,657	0	0.00%	0.00%
10%-20%	7,518	7,518	0	0.00%	0.00%
20%-30%	19,629	19,629	0	0.00%	0.00%
30%-40%	36,886	36,886	0	0.00%	0.00%
40%-50%	93,582	93,582	0	0.00%	0.00%
50%-60%	104,156	104,156	0	0.00%	0.00%
60%-70%	127,011	126,542	469	-0.37%	17.85%
70%-80%	116,695	116,186	509	-0.44%	19.39%
0%-80%	243,707	242,729	978	-0.40%	37.24%
80%-90%	92,993	91,844	1,148	-1.23%	43.72%
90%-100%	52,695	52,195	500	-0.95%	19.05%
80%100%	145,688	144,039	1,649	-1.13%	62.76%
Total Impact	389,395	386,768	2,627	-0.67%	100.00%
LPC AVOIDANCE OF TALL STRUCTURES (2081FT)					
% Intact Tallgrass	**Acreage Pre Caney**	**Acreage Post Caney**	**Unmitigated Caney River Impact**	**% of Acres Impacted**	**% of Total Impact**
0%-10%	6,657	6,657	0	0.00%	0.00%
10%-20%	7,518	7,518	0	0.00%	0.00%
20%-30%	19,629	19,629	0	0.00%	0.00%
30%-40%	36,886	36,886	0	0.00%	0.00%
40%-50%	93,582	93,582	0	0.00%	0.00%
50%-60%	104,156	104,156	0	0.00%	0.00%
60%-70%	127,011	124,770	2,241	-1.76%	18.98%
70%-80%	116,687	114,027	2,660	-2.28%	22.52%
0%-80%	243,698	238,797	4,901	-2.01%	41.50%
80%-90%	89,917	84,843	5,074	-5.64%	42.95%
90%-100%	49,345	47,508	1,837	-3.72%	15.55%
80%-100%	139,261	132,351	6,910	-4.96%	58.50%
Total Impact	382,959	371,148	11,812	-3.08%	100.00%

LPC AVOIDANCE OF POWER PLANT (5280FT)					
% Intact Tallgrass	**Acreage Pre Caney**	**Acreage Post Caney**	**Unmitigated Impact**	**% of Acres Impacted**	**% of Total Impact**
0%-10%	6,657	6,657	0	0.00%	0.00%
10%-20%	7,518	7,518	0	0.00%	0.00%
20%-30%	19,629	19,629	0	0.00%	0.00%
30%-40%	36,886	36,886	0	0.00%	0.00%
40%-50%	93,582	93,581	1	0.00%	0.00%
50%-60%	104,156	103,951	205	-0.20%	0.93%
60%-70%	126,947	121,726	5,221	-4.11%	23.69%
70%-80%	116,100	111,422	4,678	-4.03%	21.23%
0%-80%	440,785	430,680	10,105	-2.29%	45.85%
80%-90%	87,387	78,232	9,155	-10.48%	41.54%
90%-100%	45,287	42,510	2,777	-6.13%	12.60%
80%100%	132,674	120,742	11,932	-8.99%	54.15%
Total Impact	573,459	551,421	22,037	-3.84%	100.00%

If the suitable GPC habitat were present on-site and being used, these numbers would represent a minor to moderate potential loss of usable habitat. The 80 to 100 percent tallgrass prairie category is assumed to represent good GPC habitat and is the restoration goal for mitigation by the Project. As indicated in Section 3.1.2, the potential habitat impacts from the 591-ft and 2081-foot buffers would be completely offset by restoration to Intact Tallgrass Prairie on 6,000 acres proposed by the Project. Potential impacts from the conservative one-mile buffer would be more than fully offset (Figure 3-5 inset table).

One potential indirect impact is a decrease in regional traversability due to fragmentation. To assess impacts to traversability of the ecoregion (primarily for grassland bird species, but the general principals also hold for many terrestrial species), two methods were used. As discussed earlier, traversability means: the degree of “viscosity” of the landscape (i.e., the relative resistance to, or facilitation of, movement of organisms through the landscape in which connectivity is a property of the landscape resulting from the interaction of organisms and their habitat, e.g., movement of grassland birds through the usable tallgrass prairie landscape).

The first and most straightforward method to measure traversability relies on only one assumption: that movement through usable habitat by grassland birds will be impeded exponentially more as the percentage of tallgrass prairie decreases (i.e., that at the landscape scale, larger blocks of higher percentage, and therefore more intact habitat, is the feature of

general importance to grassland birds) (Figure 3-6). Using the same data set as the above analysis, each 2 mile square within the analysis band was given a resistance rating.

$$Resistance = \frac{1}{PercentTallgrass}$$

The resultant values of resistance were then summed up across the entirety of the band, and that number represents the traversability of the band. Direction of travel is not a variable in the equation; therefore, the index number is the same regardless of the direction. The north-south limitation placed by defining the band likely makes the method overestimate east-west traversability and underestimate north-south, which tends to make the results a conservative basis for analysis (i.e., is a reasonable approximation of traversability through the area, but predicts more effect than actually occurs). The percentage change in traversability across the analysis band between pre- and post- construction conditions is 0.23 percent, indicating a minor decrease in traversability (ability of organisms to move through usable habitat in the analysis band prior to implementation of mitigation (Figure 3-7 inset table).

Figure 3-6: Resistance Scale

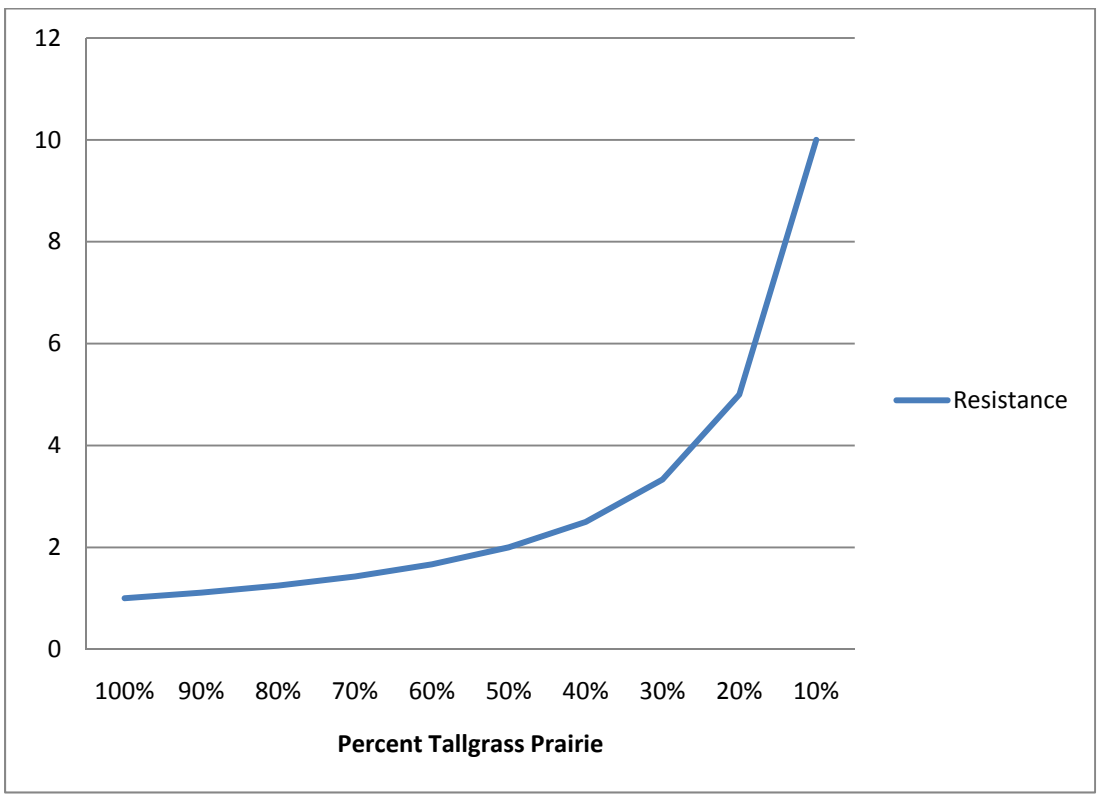
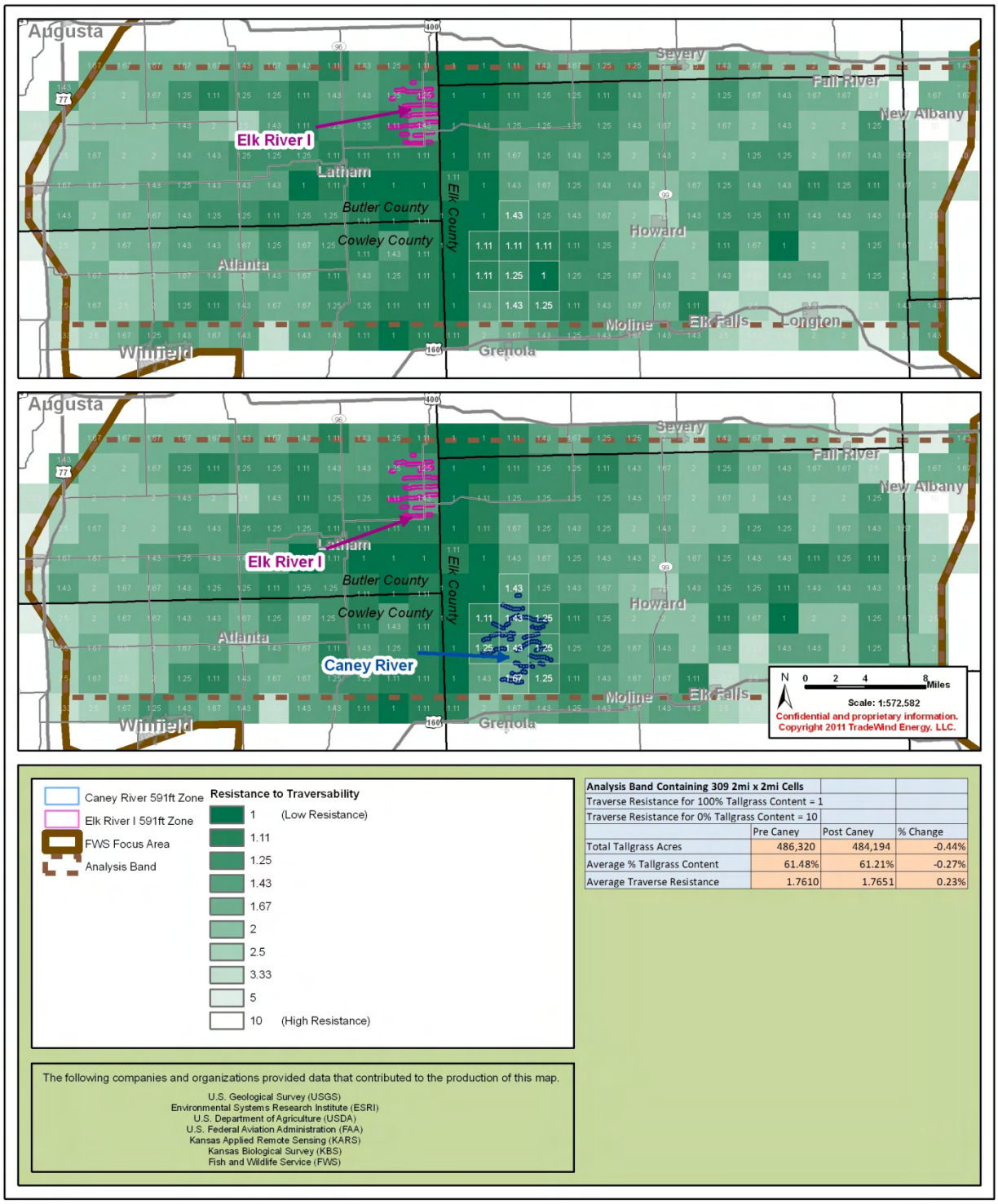


Figure 3-7: Traversability – Before and After Caney River



Analysis Band Containing 309 2mi x 2mi Cells			
Traverse Resistance for 100% Tallgrass Content = 1			
Traverse Resistance for 0% Tallgrass Content = 10			
	Pre Caney	Post Caney	% Change
Total Tallgrass Acres	486,320	484,194	-0.44%
Average % Tallgrass Content	61.48%	61.21%	-0.27%
Average Traverse Resistance	1.7610	1.7651	0.23%

More complex analytical methods exist, however all methods suffer from similar, inherent weaknesses, i.e., all require input assumptions that in most cases are often untested or based upon very limited biological data, may require extensive long-term (potentially decades) intensive field studies to produce information of limited application, and may not yield any better accuracy in ability to predict change or effect. However, to address the issue that some organisms may respond to more "fine-grained" features of the environment, a more detailed analysis was conducted using Arcinfo GIS software (ESRI, Redland, CA 92373). As described in greater detail in Appendix F, the analysis solved an equation for a traversability index developed by (McGarigal et al. 2002, Table L123):

$$\text{TRAVERSE}=\left[\frac{\left(\frac{\sum_{r=1}^{z} t_r}{z}\right)}{t_{max}}\right]100$$

A more detailed explanation of the assumptions and how the methodology was applied is presented in Appendix F.

The results for this more fine grained and detailed analysis show that the impact of the Project to traversability in the analysis band is equal to 0.38 percent decrease in traversability (prior to application of mitigation and conservation measures), a value consistent with the more simple method and providing a similar basis for conclusions.

The conclusions of the analysis of traversability are that a north-south vegetation corridor, important for maintenance of the ability of organisms to move through usable habitat, would be maintained. The contribution of this project to the existing cumulative fragmentation in the Flint Hills region would be minor and would not substantively impede movement through, or utility of, tallgrass prairie habitat in the primary intact north-south corridor.

3.1.3.1.3 Onsite Impacts to Tallgrass Prairie

As noted in Section 3.1.3, a total of 70 acres of tallgrass prairie (of the total project physical footprint of 83 acres) would be permanently affected and a total of about 481 acres of tallgrass prairie (of the total project physical footprint of 542 acres) woudl be temporarily affected. Constructing and operating the Project would result in the consolidation and/or removal of some of the aforementioned infrastructure (e.g., power lines serving pump jacks can be buried and redundant roads can be abandoned and reclaimed) in an attempt to reduce the on-site

fragmentation. The following Project design characteristics would reduce the potential for additional on-site disturbance of tallgrass prairie:

- The Project roads would be constructed without fences or ditches, unlike county roads; this eliminates the potential for tree encroachment, a significant contributor to tallgrass prairie loss and habitat quality decline

- All power lines within the power collection system would be buried

- The collection substation is located in such a manner as to allow the majority of the short overhead transmission line to be constructed within the woodland/shrubland habitats and off the ridge top

- The interconnection facility would be constructed on shrubland in the lowland portion of the Project directly adjacent to the existing Westar 345-kV transmission line

- Wind turbines would be installed without fencing and with a generous spacing of approximately one-fifth mile by one-half mile (i.e. the vast majority of the Project would remain open space).

In addition to past human intrusions, the decline of tallgrass habitat quality on-site is due to (1) woody encroachment, (2) annual burning, and (3) early intensive stocking regimes. All of these factors are currently present on the property and may well be the reason for the lack of GPC within the Project boundary, a key indicator species on the health of tallgrass. If improvements can be made to the existing land management practices, it may be possible to improve the overall habitat quality of the tallgrass prairie within the Project boundary.

Outside of the prairie areas, tree removal is anticipated to be limited to those trees that impede safe and efficient Project operation, are within the 34.5-kV and 345-kV electrical line easements, or are in an area where access roads would be constructed. Tree removal from electrical line corridors is a requirement of the National Electric Safety Code Standards for all overhead electrical lines to protect public health and safety. Wind turbine access roads in the current Project configuration do not cross wooded areas. The proposed short transmission line would impact a small wooded area on a north-facing slope. Caney River would strive to route the transmission lines to avoid wooded areas where possible to minimize impacts.

The USFWS has completed a NEPA review for the proposed Flint Hills Legacy Conservation Area (FHLCA). Caney River is physically located within the FHLCA although it was sited and developed prior to the public announcement of the FHLCA initiative. This proposed action would establish a voluntary conservation easement program within the FHLCA which is an easement purchase area encompassing approximately 3.3 million acres. Within this 3.3 million-acre FHLCA, USFWS would, subject to acceptance by landowners, adequate funding etc; attempt to purchase conservation easements on up to 1.1 million acres of private land. The easements would be on a voluntary basis and all land within the easement would remain in private ownership. Generally speaking, grazing and ranchland management practices would remain at the discretion of the landowner. Per the USFWS Environmental Assessment and Land Protection Plan for the FHLCA, no changes to management practices for any land under the FHLCA will be required for participation. The landowners within the Caney River project area have already committed to the Caney River project and would therefore not necessarily be a part of the 1.1 million-acre effort sought by USFWS as wind development is prohibited by the FHLCA conservation easement. The 18,164 of conservation easements contemplated in the NECP are consistent with the goals of the FHLCA in that they preserve tallgrass prairie habitat for GPC and other grassland birds within the FHLCA.

3.2 Greater Prairie Chicken and Grassland Birds

The landscape changes in tallgrass prairie discussed above, such as the decline (loss) in acreage from 17 million to 3 million acres in Kansas, are reflected in the overall decline of grassland birds. Species such as grasshopper sparrow, horned lark, and Henslow's sparrow are believed to be declining (Helzer and Jelinski 1999; Herkert 1994). Additionally, current management practices involving annual burning in the Flint Hills create a monoculture of species habitat that is not supportive of naturally occurring tallgrass prairie species diversity (Reinking 2005; With et al. 2008). Frequent fires in tallgrass prairie have been shown to reduce the number of birds and bird species partially by removing woody vegetation used for sheltering and nesting (Zimmerman 1992; Zimmerman 1997). Frequently burned grasslands are structurally simpler than infrequently burned grasslands, and as a result support fewer species. From studies in Kansas, Zimmerman (1992) stated "Fire has a direct structural impact on the community and eliminates certain species by affecting critical dimensions of their niches, not as a result of competitive resource partitioning, but rather by obliterating species-appropriate resource space." In addition, Powell (2008) stated "annual burning limits the potential of much of the Flint Hills prairie to harbor high breeding densities of many grassland birds."

3.2.1 Existing Conditions

To address the suitability of the Project area for grassland birds, GPC surveys were conducted. It was expected that GPC presence or absence would be an indicator for the suitability of the Project area for other grassland birds. The management regime, including the timing of burning and grazing, is widely believed to influence the nesting success of grassland birds such as the dickcissel, grasshopper sparrow, and eastern meadowlark (Wirth et al. 2008). The following sections discuss habitat fragmentation as it affects grassland birds and the results of the GPC surveys.

3.2.1.1 Project Site Disturbance

As indicated in Figure 3-3 (Human Intrusion Map), the site is heavily disturbed, which from a breeding bird standpoint means that the site is already broken up into small patches. Large patches provide higher rates of breeding success than small patches, but patch shape and core area are also important. Patch sizes of less than 250 acres, such as exist on the Caney River site, are an indication that the property is not currently optimum for grassland bird breeding success (Helzer and Jelinski 1999). However, not all intrusions result in barriers and not all intrusions create edge habitats which are a barrier to movement or a conduit for predators to access breeding areas. For example, in grasslands, internal or two-lane roads without a disturbed roadside do not create the edge of a fragment. Edges are created by roads with manipulated or disturbed roadsides or wooded strips. Thus, the habitat that exists on the site, while disturbed, may not have as much edge as would be created by state highways or maintained county roads with extensive grassy shoulders (Herkert et al. 2003).

3.2.1.2 GPC Habitat Quality Assessment

The GPC historical range included tallgrass prairies from eastern Texas to Michigan in the U.S. and Alberta and Ontario in Canada. Conversion of tallgrass prairies to agriculture reduced or degraded nesting habitat, causing a decline in populations. Hunting in the late 1800's and early 1900's was the primary activity that nearly drove the GPC to local extinctions. Traditional tallgrass prairie management involved a mosaic of fall and spring burns with a rotation of two to three years. In recent years, annual spring burning regimes and associated early intensive cattle stocking in remaining areas of habitat such as the Flint Hills are implicated in the decline of the species. A decline in the GPC population in Kansas of approximately 65 percent in the last 20 years, roughly correlating with the implementation of the intensive stocking regime in the

early 1980s, has been noted (Robbins et al. 2002). In contrast, Robbins et al. state that the three largest tracts of tallgrass prairie in the Flint Hills region that are not subjected to intensive early stocking (the Konza Prairie and Fort Riley Military Reservation in Kansas and the Tallgrass Prairie Preserve in Oklahoma) also support the largest populations of GPC. Other factors affecting the decline of GPC populations include a reduction in nesting cover which promotes predation, and a reduction of insect populations due to pesticide use. Some estimates suggest that populations have been reduced by 60 to 70 percent (Robel 2002). Management, protection, and educational programs completed by the State of Kansas have restored some of the GPC populations; these populations are mainly in the tallgrass prairies of the Flint Hills and Smoky Hills (Thompson and Ely 1998). GPC populations are, however, numerous enough today to be legally hunted in Kansas, Colorado, Nebraska, and South Dakota.

While the Project area is mostly tallgrass prairie that is used for livestock grazing and for oil production, the site also contains county roads, private roads, service roads, high-voltage and low voltage electrical transmission lines, gas pipelines, cell towers, oil wells, oil tanks, fence lines, and other human intrusions. Each of these contributes to habitat fragmentation, as do the frequent and sometimes noisy human activities, ranging from ranching to oil well operations and maintenance. The Project area is also burned annually with multiple landowners combining to burn their properties in a collaborative effort over the course of one to two weeks. Annual burning has occurred since the 1980s and has contributed to the decline in the quality and quantity of the tallgrass prairie and its species.

To determine if the Project area contains high quality habitat for the GPC and to determine potential effects that the Project may have on GPCs, a habitat quality assessment was performed using the 10 GPC habitat quality criteria listed in Table 3-5 (Robel 2002). Each of the 10 criteria was evaluated on a scale of 1 to 10. The scores were then added together, determining an overall site score. Site scores can range from 10 to 100, with 100 being excellent GPC habitat.

Table 3-5: Suggested Criteria Used to Evaluate GPC Habitat Quality

Habitat Component	Range	Score[1]
Habitat continuity (patch contiguous with adjoining tallgrass prairie)	0-25% contiguous	1
	25-50% contiguous	4
	50-75% contiguous	7

Habitat Component	Range	Score[1]
	>75% contiguous	10
Proportion of patch composed of native tallgrass prairie	0-25%	1
	25-50%	4
	50-75%	7
	>75%	10
Proportion of patch composed of woodlands	0-15%	10
	15-30%	7
	30-50%	4
	>50%	1
Proportion of row crop in patch	0-25%	10
	25-50%	7
	50-75%	4
	>75%	1
Proportion of patch consisting of road and transmission line edges	0-5%	10
	5-10%	7
	10-15%	4
	>15%	1
Proportion of human intrusion in patch	0-10%	10
	10-20%	7
	20-30%	4
	>30%	1
GPC presence in patch	Leks or flocks present and bird numbers stable or increasing	10
	Leks or flocks present but bird numbers decreasing	7
	Leks or flocks present historically but not currently active	4
	No historic record of leks or flocks	1
Spring burning at patch	No burning	10
	Burn frequency commonly 4 to 5 years	7
	Burn frequency commonly 2 to 3 years	4
	Annual burning	1
Woody vegetation invasion	No woody plant seedlings (<3 ft tall) present	10
	Scattered woody plant saplings (3 to 6 ft tall) present	7

Habitat Component	Range	Score[1]
	Woody plant seedlings and saplings common	4
	Woody plants >6 ft tall common	1
Relative human activity on patch	Little (no wells, trails, or access roads)	10
	Low moderate (<1/section)	7
	Moderate (1 to 4/section)	5
	High moderate (5 to 8/section)	3
	High (>8/section)	1

Source: Expected Impacts on Greater Prairie Chickens of Establishing a Wind Turbine Facility near Rosalia, Kansas (Robel 2002).

[1] Scale is 1 through 10, with 1 being lowest-quality habitat and 10 being highest-quality habitat.

The 10 GPC habitat quality criteria, along with pertinent Project area information, were collected and evaluated by using aerial photography, geographic information system (GIS) data, and an on-site reconnaissance. The GPC habitat quality assessment resulted in a score of 47 out of a possible 100 points. This score represents a moderate habitat quality and indicates that GPCs could inhabit portions of the Project area. The results and assumptions for each of the 10 evaluated components are summarized in Table 3-6.

Table 3-6: GPC Habitat Quality Assessment for the Caney River Wind Project Area

Habitat Component	Proportion/ Attribute	Score
Habitat continuity (proportion of patch contiguous with adjoining tallgrass prairie)	25% to 50%	4
Proportion of patch composed of native tallgrass prairie	25% to 50%	4
Proportion of patch composed of woodlands	0% to 15%	10
Proportion of row crop in patch	0% to 25%	10
Proportion of patch consisting of road and transmission line edges	>15%	1
Proportion of human intrusion in patch (0.5-mi radius around human features)	>30%	1
GPC presence in patch	None	4
Spring burning at patch	Every 2 to 3 years	4
Woody vegetation invasion	woody plant seedlings and saplings common	4

Habitat Component	Proportion/ Attribute	Score
Relative human activity on patch	moderate	5
	Total	**47**

3.2.1.3 GPC Lek Surveys

In 2007, 2008, 2009, 2010 and 2011, Caney River conducted GPC lek surveys in the Project area. A lek is a communal breeding ground where male GPCs perform their spring mating ritual. The surveys followed the KDWP *Instructions for Prairie Chicken Lek Survey* to determine the quantity and location of leks within the Project area. The GPC is not protected by the Migratory Bird Treaty Act (MBTA) or any other federal laws; however, they are managed by the State of Kansas as a game bird. Lek surveys for the GPC were conducted on the following dates:

- April 3 - April 20, 2007 by Stilla5,
- March 20 - 21, March 25 - 27, April 1, 2008 by Burns & McDonnell,
- March 24 - 25, April 14 - 15, 2009 by Burns & McDonnell,
- April 7 - 9, and April 13 - 15, 2010 by Burns & McDonnell.
- March 29 - 30, and April 12 – 14, 2011 by Burns & McDonnell.

Surveys were conducted in accordance with the KDWP Instructions for Prairie Chicken Lek Surveys. The surveys were conducted within the Project areas that appeared to contain the most suitable habitat for GPCs (Figure 3-8). The surveys started 40 minutes before sunrise and concluded 90 minutes after sunrise. Surveys were not conducted if it was raining, foggy, or if sustained winds exceeded 12 miles per hour. No leks or individual GPCs were identified within the Project boundary during the 2007, 2008, 2009, 2010, and 2011 surveys. However, the Nature Conservancy reports by letter of April 15, 2011 (Appendix A), that GPC are present on the property of a neighboring landowner. Over five years of third party contractor field studies, only once was presence detected (i.e., four GPC) outside and to the north of the proposed Project boundary in April 2011.

3.2.2 Environmental Consequences

Under the No Action Alternative, existing conditions and trends potentially impacting GPC habitat, such as annual burning and associated early intensive stocking, would continue. For the purposes of the EA, although the current habitat quality is moderate as discussed previously

in Section 3.2.1.2, no GPC or leks were found on-site during the five years of surveys. It is acknowledged that GPC could potentially make minimal or transient use of the proposed Project area. Under the Proposed Action Alternative, there would be minimal direct impact possible to GPC because the species is either not found within the Project boundary (as indicated by the lek surveys), or there is only aextermely low number as compared to those found in habitat occupied off-site.

Commenters on the draft EA anecdotally report that GPC have been observed on adjoining areas and assert that the presence of wind turbines would drive these populations away. As noted in Section 3.1 Tallgrass Prairie, to date, the literature is inconclusive on the issue, and results are confounded by changes in spring burning regimes. The metrics and discussion of potential habitat fragmentation discussed for tallgrass prairie {Section 3.1.3.1} includes a conservative consideration of potential impacts to GPC habitat that indicates only minor potential for off-site impacts that wouldl be further reduced by the proposed mitigation and conservation measures.

There is considerable speculation of the extent to which GPCs would avoid wind turbines, but this assumption has not as yet been verified in appropriately focused, peer reviewed field studies. Recent work on the potential impacts of wind development on GPCs (Robel 2002) was considered. At the Elk River wind facility just to the northwest of the Caney River site, GPC leks declined following the construction of the facility. However, county-level data from Flint Hills area GPC survey routes ranging between approximately 10 and 80 miles from the turbines also indicate similar declines during the same timeframe. In addition, within the Elk River project area itself, annual spring burning was instituted in 2008 in areas where it had not been done before. As noted in the previously cited literature, this change in annual spring burning practices likely contributed to the decline of prairie chickens in the project area. Thus, the decline of prairie chickens on the Elk River site is not directly attributable to the presence of wind turbines. At the Smoky Hill wind development, located on mixed grass prairie in central Kansas, GPC leks have been observed under WTG structures up to 2 years after erection of WTG. If these observations continue to occur at Smoky Hills and perhaps at other wind power facilities, habitat degradation or loss may be minimal. Information about habitat use by GPCs at a Minnesota wind project also did not document a decline in GPC nests or lek behavior (Toepfer and Vodehnal 2009). There, it was concluded that the distribution and location of leks and especially nests was determined by the presence of adequate habitat in the form of residual grass cover, not the presence of vertical structures such as trees, woodlots, power lines, and

wind turbines. This information indicates that even on-site, the extent of effects on GPC habitat may be limited and much less in extent than the conservative assumptions made in the analysis of this EA.

Potential effects of the proposed Project on other grassland birds on adjacent property were also raised as an issue by some commenters on the draft EA. For a discussion of potential fragmentation effects on tallgrass prairie habitat (for birds) in the Flint Hills ecoregion landscape, or off-site near the Project, see Section 3.1.2. That analysis concludes that off-site effects to grassland birds in minor.

Using an equivalent acreage for comparison, a high-level aerial analysis of the adjacent land located to the west of the Project area indicates the proposed Caney River site is considerably more fragmented and impacted under current conditions than the reference area. The Caney River site is crossed by 22.7 miles of county roads whereas the reference area is crossed by only 11.3 miles of county roads, based on use of available GIS data from the Kansas Data Access and Support Center. Also present on the Caney River site are more oil and gas wells (111 compared to 19 at the reference area according to Kansas Geological Survey (KGS) GIS data). The vegetative community is substantively different between the two areas as well. Vegetative cover was over 55.4 percent warm and cool season grasslands at the Caney River site compared to 88 percent at the reference site, according to Kansas Applied Remote Sensing land cover data, recent (2010) aerial photography, and field reconnaissance. This information suggests less fragmented, less impacted environmental conditions to the west of the Project site (see Figure 3-2), an area which would would be expected to have greater potential to support a robust grassland bird population. This high-quality acreage to the west is beyond distances of even the most conservative analysis identified for consideration of sensitive bird species in Section 3.1.2. Per discussion of potential fragmentation effects in the Tallgrass Prairie section, distance alone would indicate that if either high densities of grassland birds or GPC exist offsite to the west of the Project area, they would likely be unaffected by the Project.

As designed, the construction of the Project has incorporated a number of characteristics which could be neutral towards and not degrade efforts to restore GPC habitat onsite or affect the breeding success of other grassland birds. These characteristics would reduce the direct impacts of the project to grassland and those that may have already taken place on parts of the property:

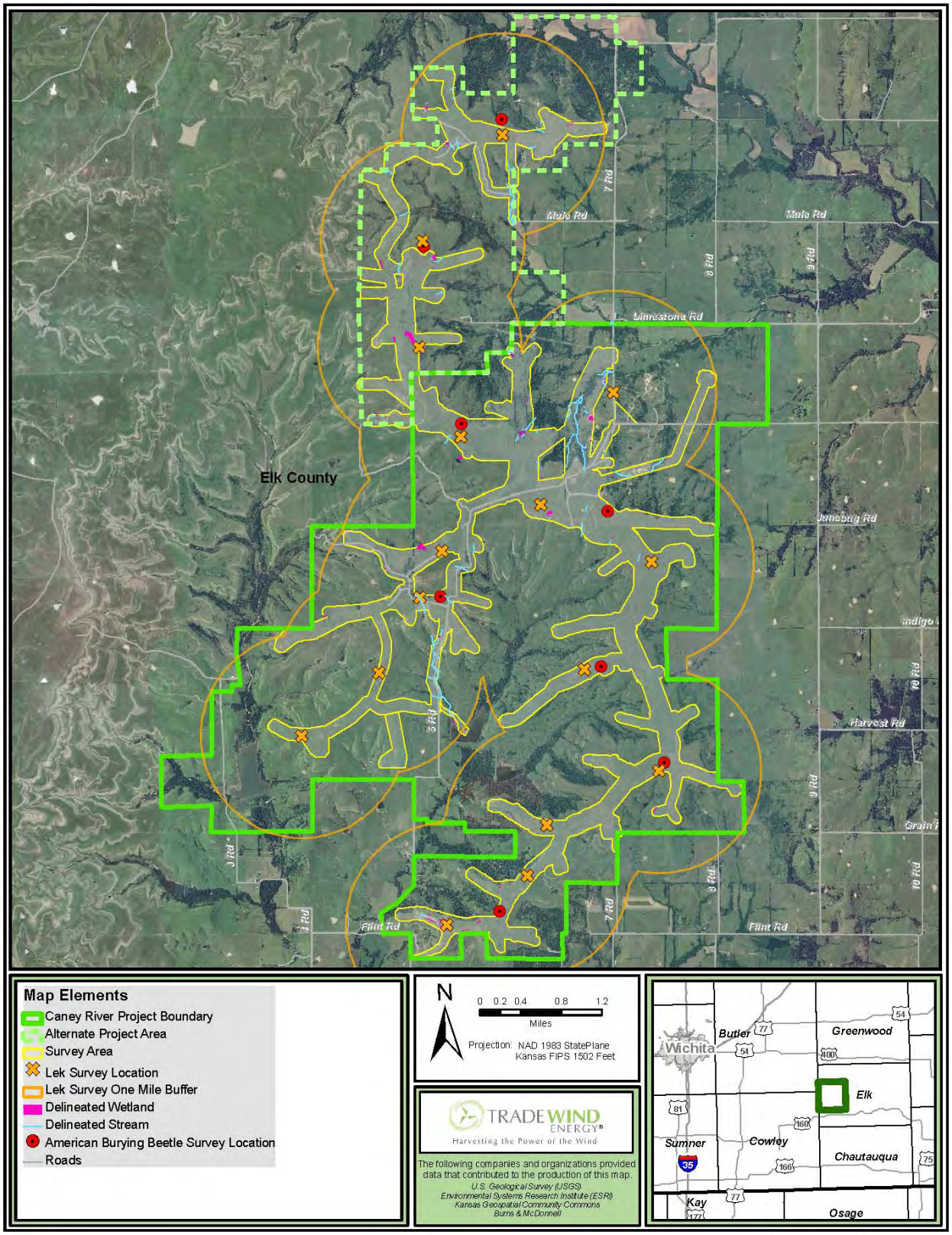
- The Project roads would be constructed without fences or ditches, unlike county roads; this eliminates the potential for tree encroachment and reduces the potential that Project roads would contribute to fragmentation because they would not have a wide grassy mowed shoulder (Herkert et al. 2003)

- All power lines within the power collection system would be buried

- The collection substation is located in such a manner as to allow the majority of the overhead transmission line to be constructed within the woodland/shrubland habitats and off the ridge top

- The interconnection facility would be constructed on shrubland in the lowland portion of the Project directly adjacent to the existing Westar 345-kV transmission line
- Wind turbines would be installed without fencing and with a spacing of approximately one-fifth mile by one-half mile (i.e., the vast majority of the Project would remain open space)

Figure 3-8: Environmental Survey



As an additional habitat restoration measure under the Proposed Action Alternative, Caney River would implement its proposed NECP. Under this plan, Caney River would acquire 18,164-acres of perpetual conservation easements, and restore 6000 acres of tallgrass prairie habitats 3,000 of which would be on-site, and the remainder elsewhere in the FHLCA. Caney River has also designed the Project for minimization of impacts by utilizing existing infrastructure to the extent possible, burying power lines, and reseeding with native plants. By restoring tallgrass prairie habitats on-site, this could improve habitat for GPC as well as other tallgrass prairie species. Under the Proposed Action Alternative, it is likely that there would be neutral to positive impacts to the GPC up to and including additional habitat creation, lessons learned from the research funded, and the species reestablishing active breeding, feeding, and sheltering within areas protected and or restored by the NECP. Details of the NECP are provided in Appendix E.

3.3 Visual Resources

3.3.1 Existing Environmental Conditions

The landscape consists of rolling hills with primarily agricultural lands and tallgrass prairie dominating the view. Other landscape features include residences, outbuildings, US 160 and K-99, county roads, service roads, electrical transmission lines, radio towers, oil wells and tanks, fence lines, and ponds. The landscape is scenic because of its rural pastoral qualities, but is frequently disrupted by human intrusions (Figure 3-3), all of which are quite common to southeastern Kansas. To the northwest, the Elk River Wind Project is visible from the proposed Project site. The existing visual impacts of the Elk River Wind Project are provided in Figure 3-10. An actual photo (Figure 3-11) provides the current vista of the Elk River Wind Project as viewed from the Caney River Project.

A portion of the Flint Hills to the north of the Project site has been designated by the State of Kansas as an area temporarily restricted for developing wind energy projects and is known as the “Heart Of the Flint Hills” (Figure 3-9). The temporary moratorium is meant to allow counties in the area time to develop local guidelines for wind energy development and to evaluate the role of wind energy development in the Flint Hills. The Project area is located south of the moratorium area (Figure 3-9).

3.3.2 Environmental Consequences

Under No Action, existing trends and conditions for visual resources would continue. The existing visual impacts of the Elk River Wind Project are provided in Figure 3-10.

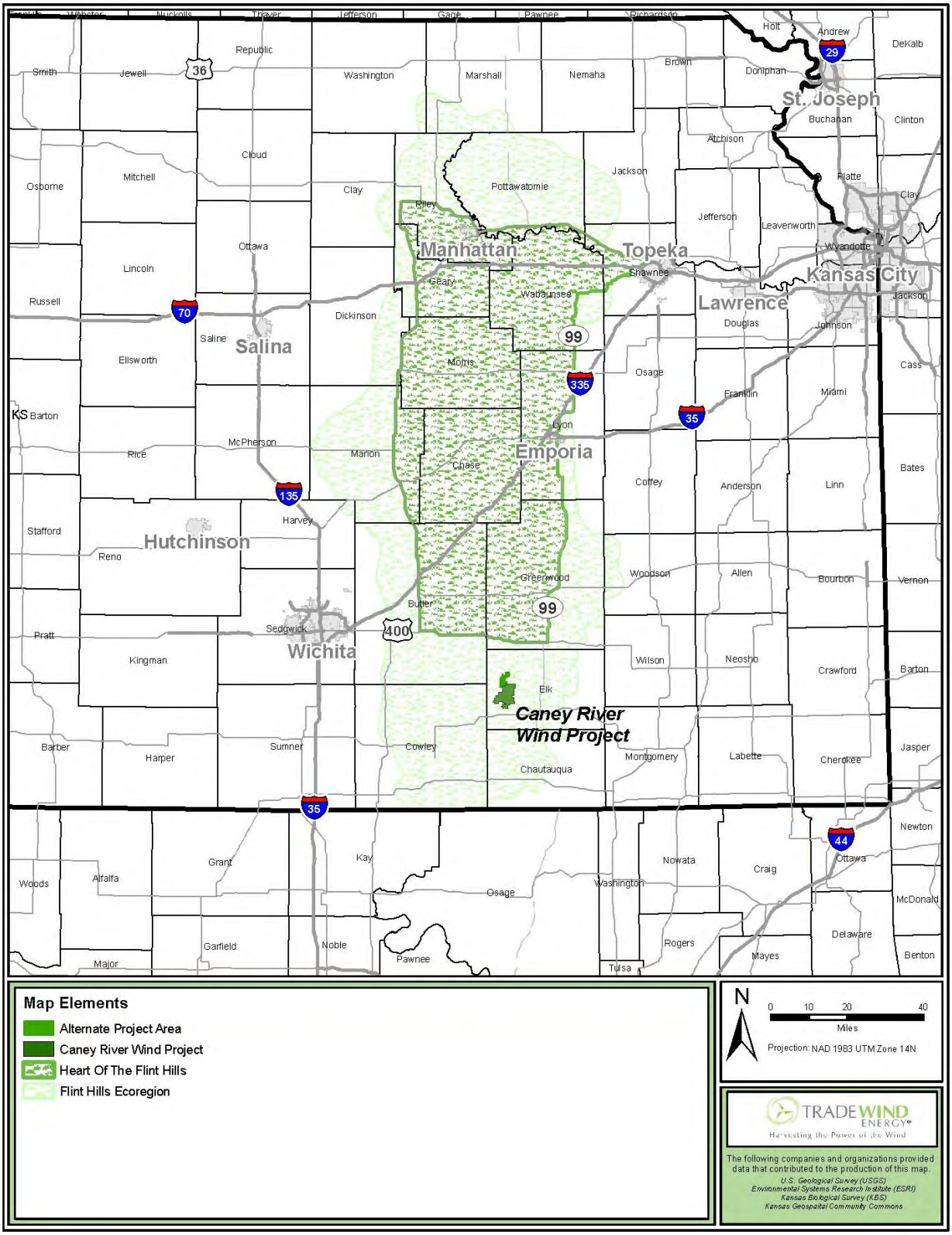
Under the Proposed Action Alternative, visual impacts during construction would include intrusions from the presence of construction equipment, large trucks hauling WTG components, and dust from traffic on gravel roads. Caney River would limit traffic to that which is required for construction and would implement dust control procedures.

During operations, the WTGs would change the aesthetics of the landscape with the addition of tall towers and rotating blades; whether this affect is deemed beneficial or adverse depends on viewer perspective and sensitivity. WTG visibility would be affected by time of day, weather conditions, location of the viewer, and other visual aspects of the viewshed (e.g. highways, trees, billboards, communications towers).

A detailed analysis has been performed to determine the visual impact of the Caney River on the surrounding areas. This analysis was performed using the “Zones of Visual Impact” (ZVI) module in WindPRO, an industry-standard wind park design and assessment software. Inputs to the analysis include a digital elevation model and a detailed representation of the location and height of clusters of vegetation and buildings. Using these inputs, the ZVI module determines the number of wind turbines that are visible at least at hub height (80m) from any point 5 feet AGL in space. This viewing height is between the average person’s eye levels when standing and when riding in a vehicle. In determining the visual impact from any point in space, the ZVI module accounts for view blockage by trees, buildings, and terrain and conservatively assumes perfect atmospheric viewing conditions (i.e., no clouds, rain, smoke, fog, or haze). The program also includes a distance weighting algorithm to decrease the calculated visual impact with distance away from the Project as the turbines become smaller on the horizon.

The first step in the analysis determines the existing visual impact in the region due to the existing Elk River Wind Project near Beaumont, Kansas. This analysis, shown in Figure 3-10, illustrates a fairly substantive existing visual impact to the area, including the southern portion of the “Heart Of the Flint Hills” and US 400. The visual model is partially validated with an actual photo from the Caney River site (Figure 3-11 Photo 1) which shows that Elk River is visible from that location, although with only a minor visual impact, as seen in the photo and calculated by the model.

Figure 3-9 "Heart Of the Flint Hills" and Project Location



Source: http://www.kars.ku.edu/maps/naturalresourceplanner/

Figure 3.10: Existing Visual Impacts of the Elk River Wind Project

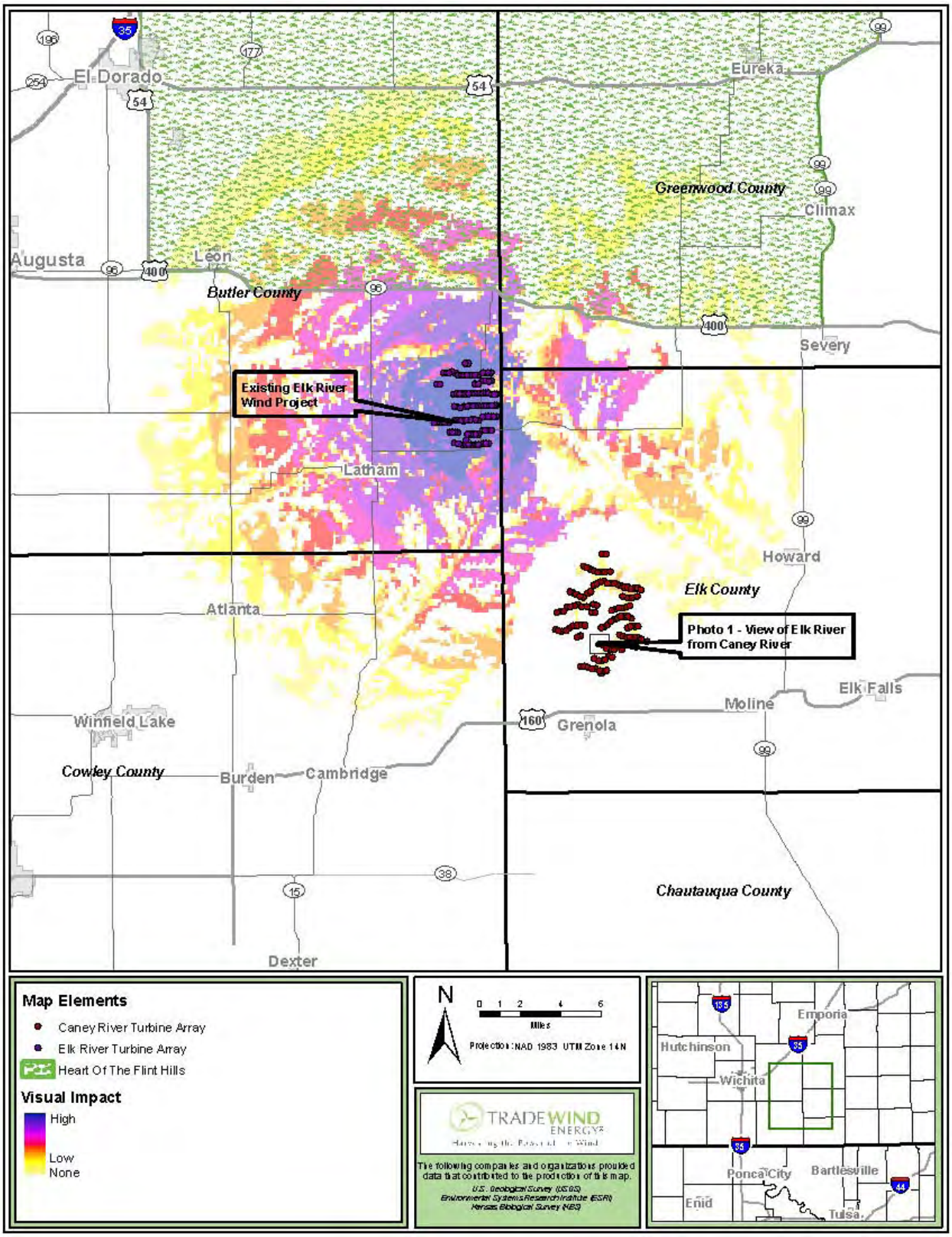


Figure 3-11: View of the Elk River Wind Project from the Caney River Project

Next, the visual impact of the proposed Caney River is evaluated. This analysis, shown in Figure 3-12, illustrates that:

- The Project would not be visible from virtually any location in the “Heart Of the Flint Hills”
- The Project would not be visible from virtually all locations on US 400
- The Project would be only minimally visible from K-99
- The Project would be minimally visible from US 160 due to substantive tree and terrain blockage
- Neither US 400, K-99, nor US 160 are designated as Scenic Byways, so there are no visual impacts to Scenic Byways from the Project
- The Project would not be visible from the west further than 3 miles away due to the presence of a higher-elevation ridge

- The Project would not be visible from the majority of vantage points within the towns nearest to the Project (Grenola, Moline, Howard, Severy, Piedmont, Latham, Beaumont, Cambridge, and Elk Falls), or any towns more distant from the Project

Where the visual impact is projected to be highest (e.g., on the Project and on the ridge to the west), there are no occupied residences or public roads to be impacted.

The ZVI model is further validated with photomontages of the proposed Caney River site. A photomontage is a digital rendering of a proposed wind project in a preconstruction photo. Here, three representative photomontages have been performed.

- Figure 3-13 – Photo 2: from US 400 looking south
- Figure 3-14 – Photo 3: from K-99 south of Howard looking west
- Figure 3-15 – Photo 4: from US 160 looking north

Figure 3-13 – Photo 2 shows that from one of the few locations on US 400 where the wind park may be visible, the visual impact is very low. In fact on many days due to clouds, haze, rain, or smoke, the wind park would likely not be visible. Figure 3-14 – Photo 3 shows the typical visual impact that can be expected from the locations on K-99 where the Project is visible. Though the turbines are distant, the number of visible turbines attributes to a moderate visual impact from this location. Finally, Figure 3-15 – Photo 4 shows the view of the Project from the closest possible vantage point on a paved road, US 160 due south of the Project. In this image, though the turbines are relatively close to the observer, the vast majority of the wind turbines in the Project are not visible since the view is blocked by the Project ridge itself. This results in a low visual impact from this location.

Figure 3-12: Visual Impacts of the Proposed Action Alternative

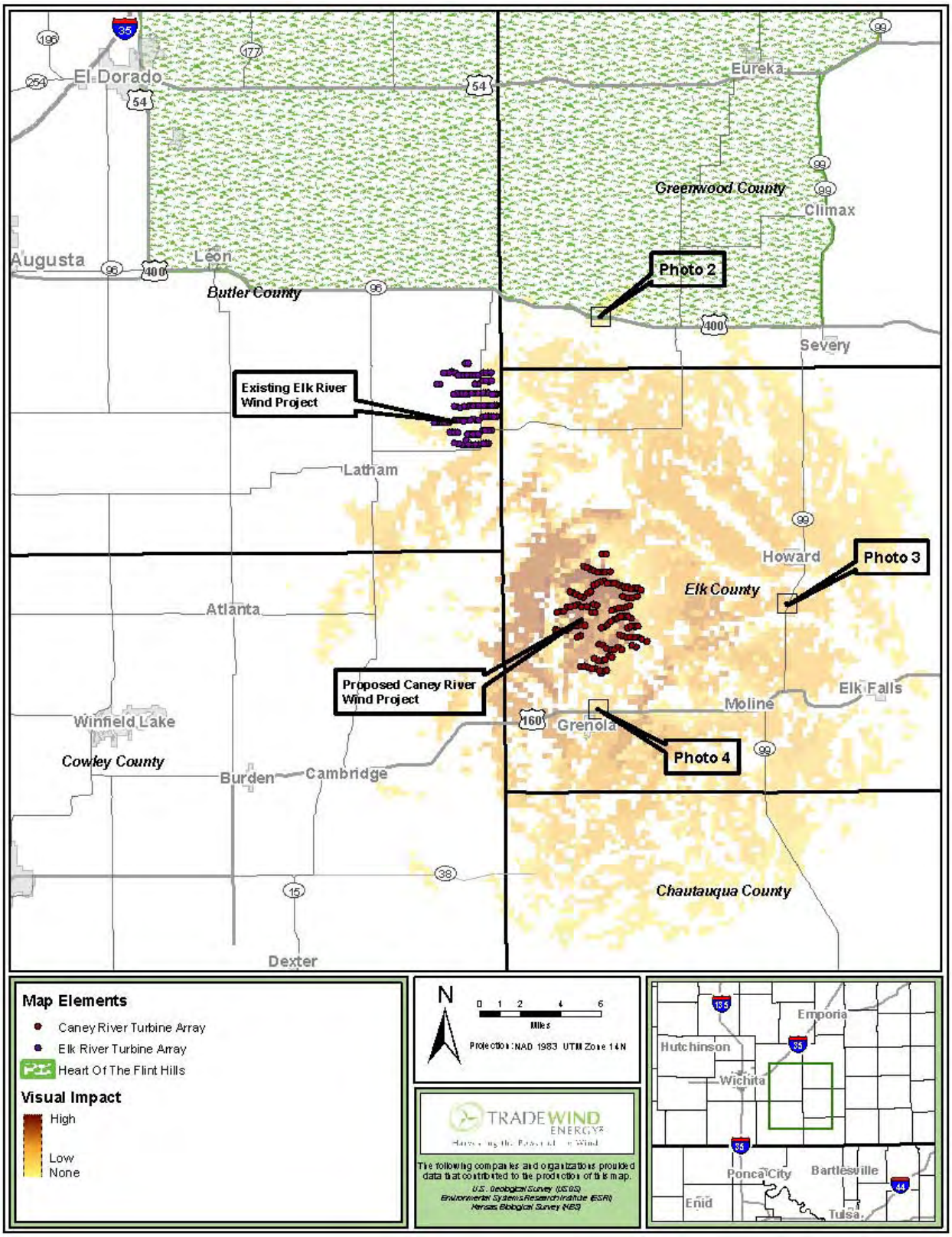


Figure 3-13: The Caney River Project as Viewed from US 400

Figure 3-14: The Caney River Project as Viewed from K-99 South of Howard

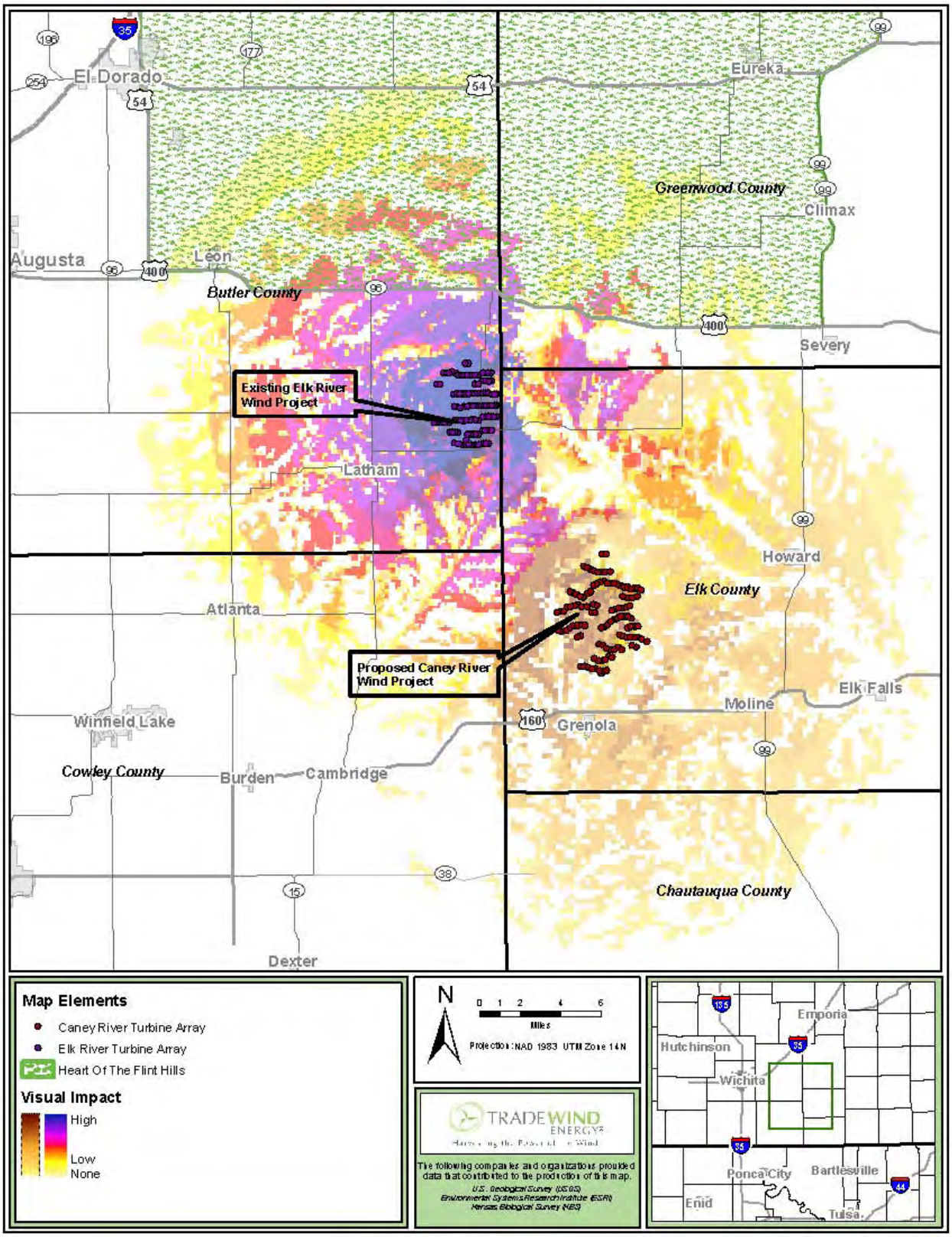
Figure 3-15: The Caney River Project as Viewed from US 160

For comparison, the visual impact of both Elk River and Caney River Projects are overlaid in Figure 3-16. This figure underscores the conclusion that the proposed Caney River Project would have far less of a visual impact on local paved roads and highways and the ”Heart Of the Flint Hills” than the existing Elk River Wind Project.

For aviation safety, either white paint or white lights are required for daytime wind turbine operation. The utilization of white paint for the proposed wind turbines at Caney River would reduce the visual impact of the Project. The visual impact would be further minimized by utilizing red lights with slow synchronized flash on 57 percent of the turbines to comply with FAA marking guidelines. This would likely be the primary nighttime impact of the Project. Red lights would be visible from the same distances as during the daytime, but would make the Project more noticeable at night. Only specific turbines required by the FAA would be lit at night for aviation safety and visibility.

The conclusion from this analysis is that the proposed Caney River Project would have minimal visual impact on the surrounding area, especially from populated areas and local paved roads and highways and would have virtually no visual impact on the “Heart Of the Flint Hills”.

Figure 3-16: Elk River and Caney River Visual Impact



3.4 Threatened and Endangered Species

3.4.1 Existing Conditions

Species for Elk County that are considered threatened or endangered (T&E), or are species of concern by either the federal government or the State of Kansas in Elk County (USFWS 2008; KDWP 2008) are listed in Table 3-7.

Table 3.7: Threatened and Endangered Species and Species of Concern Potentially Occurring in Elk County

Common Name	Scientific Name	Federal Status	State Status	State-Designated Critical Habitat
American burying beetle	*Nicrophorus americanus*	Endangered	Endangered	Yes
Bald eagle	*Haliaeetus leucocephalus*	None	Threatened	No
Eastern spotted skunk	*Spilogale putorius*	None	Threatened	No
Eskimo curlew	*Numenius borealis*	Endangered	Endangered	No
Flutedshell mussel	*Lasmigona costata*	None	Threatened	No
Least tern	*Sterna antillarum*	Endangered	Endangered	No
Neosho mucket mussel	*Lampsilis rafinesqueana*	None	Endangered	Yes
Ouachita kidneyshell mussel	*Ptychobranchus occidentalis*	None	Threatened	No
Peregrine falcon	*Falco peregrinus*	None	Endangered	No
Piping plover	*Charadrius melodus*	Threatened	Threatened	No
Snowy plover	*Charadrius alexandrinus*	None	Threatened	No
Western fanshell mussel	*Cyprogenia aberti*	None	Endangered	Yes
Bobolink	*Dolichonyx oryzivorus*	None	Sp. of Concern	No
Crawfish frog	*Rana areolata*	None	Sp. of Concern	No
Creeper mussel	*Strophitus undulates*	None	Sp. of Concern	No
Fat mucket mussel	*Lampsilis radiate*	None	Sp. of Concern	No
Ferruginous hawk	*Buteo regalis*	None	Sp. of Concern	No
Short-eared owl	*Asio flammeus*	None	Sp. of Concern	No
Spotted sucker	*Minytrema melanops*	None	Sp. of Concern	No
Timber rattlesnake	*Crotalus horridus*	None	Sp. of Concern	No
Wabash pigtoe mussel	*Fusconaia flava*	None	Sp. of Concern	No
Western hognose snake	*Heterdon nasicus*	None	Sp. of Concern	No

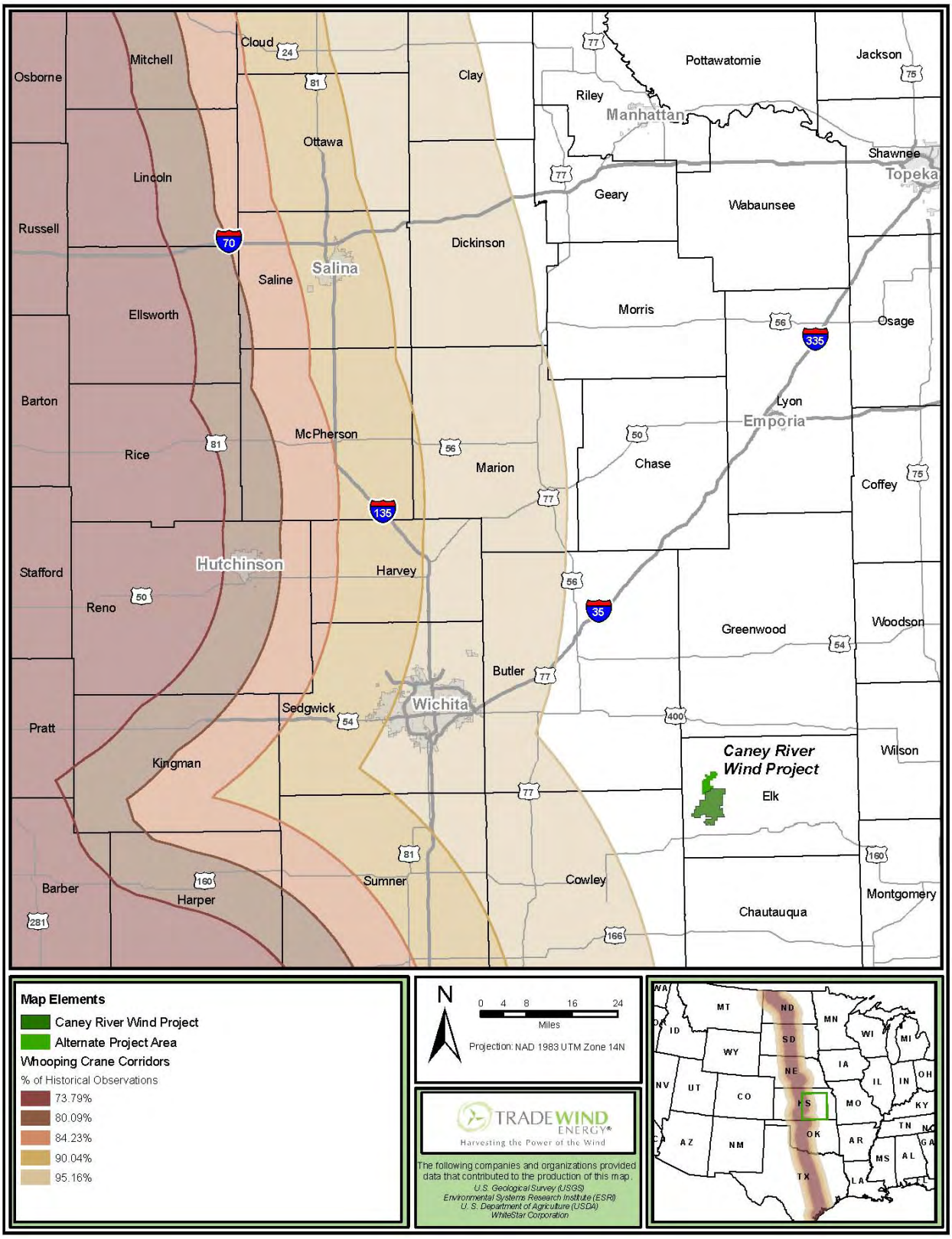
Source: USFWS 2008 and KDWP 2008.

Three species are federally listed as endangered and one is federally threatened. Twelve species in Elk County are listed as endangered or threatened by the State of Kansas; of these, six are endangered and six are threatened (Table 3-7) (KDWP 2008). Ten species are considered species of concern. Elk County contains areas designated as critical habitat by the state for the American burying beetle, Neosho mucket mussel and the Western fanshell mussel; however, for the latter two species, areas of state-designated critical habitat are located in the northeast portion of Elk County, well outside of the Project area. No other species have federally or state-designated critical habitat in Elk County. The proposed Project is outside of the migratory corridor of the federally endangered whooping crane; the whooping crane migration corridor is further to the west in Kansas (Figure 3-17).

3.4.2 Environmental Consequences

Under both the No Action Alternative and the Proposed Action Alternative, no impacts to endangered or threatened species would be likely to occur. Review of available information from the KDWP, USFWS, and geospatial data from the Kansas Geospatial Community Commons, found no federally or state-listed T&E species occurring within the Project area. An on-site habitat assessment (June 18 and 19, 2008 and June 1, 2009) and an American burying beetle survey (June 23 through July 3, 2008) (Figure 3-8) were conducted for the Project. Both the onsite habitat assessment and the American burying beetle survey were conducted for the proposed Project area. The habitat assessment did not identify any preferred habitats for any of the species listed in Table 3-7, nor were any listed species observed during the field reconnaissance. In addition, no American burying beetles were captured or observed during the survey, indicating that they are not currently present in the Project area. Based on the results of the studies, it is anticipated that there would be no adverse impacts to federally or state-listed threatened or endangered species, species in need of conservation, or any of their preferred habitat. By letters dated May 5, 2009 and October 20, 2009 (Appendix A), the KDWP concurred that this Project is unlikely to negatively affect state-listed species. By letters dated April 15, 2009 and August 11, 2009 (Appendix A), the USFWS concurred that the Project is not likely to result in adverse impacts to any federally listed or candidate species.

Figure 3-17: Whooping Crane Migration Corridor



3.5 Geology, Geologic Hazards, and Mineral Resources

3.5.1 Existing Conditions

Underlying geology in the Project area is composed of alternating layers of shale and limestone near the surface. These rocks are sedimentary, and were formed at a time when the area was under a shallow sea. The layers are of Permian and Pennsylvanian age and consist of two rock groups, the Council Grove Group and the Admire Group. The Council Grove Group is found in the uplands, while the Admire Group is found on the slopes of the uplands. The bluffs along the Caney River and its tributaries are capped by the Council Grove Group, which consists generally of cherty limestone with some interbedded calcareous shale. The potential is low for a major earthquake to occur in Kansas; however, limited potential does exists throughout Kansas, including the Project area. An earthquake with a magnitude of 6.0 (Richter scale) may occur in Kansas about every 2,000 years (Kansas Geological Survey 1998).

The mineral resources found in the Project area include oil, gas, limestone, shale, clay, sandstone, and gravel. Oil was discovered in 1902 and production peaked in 1927 in Elk County. Oil production is still active today.

3.5.2 Environmental Consequences

Under the No Action Alternative, existing trends and conditions for geological or mineral resources would continue. Ongoing impacts from the oil industry would continue.

Under the Action Alternative, minor impacts to topography and geology would include temporary or permanent changes in the land surface and slope due to cut-and-fill activities required to excavate foundations, construct access, or construct the quarry for gravel. The quarry would be constructed on a ridge top at a site in the central portion of the proposed Project area, to the south of the 345-kV transmission line. A substation and one of two laydown yards would also be constructed on a ridge top, south of the quarry adjacent to an existing road. The other laydown yard would be located further south and also located on a ridge top. An operations and maintenance building would be constructed in the northern part of the proposed Project Area. Any cut-and-fill areas that are not needed for operations would be regraded to the approximate original contour and reclaimed in accordance with landownership agreements. The crossing of streams may also have the potential to impact surface drainages. During construction and O&M, temporary drainage structures such as ditches, culverts, waterbars, and/or check dams would be used, as needed, to divert runoff around Project facilities; however, overall drainage

patterns would be preserved. As a result, impacts to stream channel morphology due to changes in runoff are not anticipated to occur for the life of the Project.

Based on preliminary research, no geologic features such as sinkholes that could cause foundation problems are known to occur in the Project area; however, an on-site geotechnical investigation would be completed as part of the final design process. There are no known sand dunes in the Project area; as a result, the on-site soils do not appear to be prone to liquefaction. In addition, the area's geology is not prone to developing sinkholes or subsurface channels. The potential for impacts from geologic hazards would be very low.

Kansas is not in an earthquake hazard area, and is located about 350 miles west of the high-hazard New Madrid fault (Peterson et al. 2008). However, low-magnitude earthquakes are known to occur, and the Project would be designed to withstand earthquakes in accordance with the WTG manufacturer standards. No landslides are known to occur in the Project area, although small slides may occur on the steeper slopes. The Project would be designed to ensure that the facilities would not be damaged by landslides or cause landslides to occur.

The Project is not expected to impact the production of oil and gas as the Project has been designed around known facilities and resources. In addition, foundations and other underground facilities are not expected to impact existing or unexplored mineral resources. Caney River has secured accommodation agreements with existing landowners, mineral rights owners, and mineral lease operators.

3.6 Paleontology

3.6.1 Existing Conditions

As discussed earlier, the near surface underlying geology consists of alternating layers of shale and limestone. These rocks are sedimentary and were formed at a time when the area was under a shallow sea.

Invertebrate fossils are common in the sedimentary rocks of eastern Kansas. Among the types of fossils that might be found include ammonoids, bivalves, brachiopods, bryozoans, corals, crinoids, fossil insects, fusulinids, gastropods, sponges, and trilobites. All of these common fossil types are known to occur in the Council Grove and Admire geologic groups. Vertebrate fossils are much less common in eastern Kansas than invertebrate fossils; however, there is the possibility that marine vertebrates could be present. No important fossil finds are known from the immediate vicinity.

3.6.2 Environmental Consequences

Under the No Action Alternative, existing conditions and trends for paleontological resources would continue.

Under the Proposed Action Alternative, any part of the Project that disturbs bedrock has the potential to negatively impact paleontological resources. Direct impacts to fossils may include the inadvertent destruction of scientifically important fossils during excavation. The only part of Project construction that could impact bedrock, and thus potentially destroy fossils, is the WTG foundation excavation. The loss of scientifically important fossils would be considered an adverse affect; however, because the fossils found in the geologic strata are common, the likelihood of destruction of important fossils is low. Overall, the construction footprint is relatively small (about 83 acres of permanent Project footprint). Indirect but minor impacts to paleontological resources could occur from the loss of important fossil materials due to private collection or vandalism of newly exposed areas.

3.7 Soils

3.7.1 Existing Conditions

There are 31 soil types that occur within the proposed Project site (Figure 3-18). Four soils are dominant; their characteristics are provided in Table 3-8. The four dominant soils, the Clime-Sogn complex, Labette-Sogn silty clay loam, Clime stony silty clay loam and Florence-Martin complex account for 76 percent of the total Project area. Soils that are composed of complexes have characteristics of both soils; the first name in the complex contains the dominant characteristics. A small area of prime farmland soils is located on ridge tops in the center of the Project area, and much of the proposed Project would be constructed on farmland considered to be of statewide importance. Prime farmland, as a designation assigned by U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses.

Fifteen different soil types are considered of statewide importance. Twelve different soil types are considered prime farmland. Collectively, total acreage for soils of statewide importance and prime farmland is 88 percent (12,038 acres) of the Project area. The major soils within the dominant complexes are described below.

Table 3-8: Dominant Soil Types in the Project Area

Mapping Unit/ Soil Type	Approximate Acres of the Project Area	Topographic Position	Surface Water Runoff Rate	Depth, Slope, Drainage Class
4590/Clime-Sogn complex	2,957	upland that have a plane or convex surface	medium to very high	deep, strong sloping, well-drained
4746/Labette-Sogn silty clay loam	2,904	nearly level to sloping uplands	medium or rapid	moderately deep, moderately sloping, well-drained
4580/Clime stony silty clay loam	2,988	upland that have a plane or convex surface	medium to very high	deep, strong sloping, well-drained
4660/Florence-Martin complex	1,446	erosional uplands	medium to very high	moderately deep, moderately sloping, well-drained

Source: http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdname.cgi

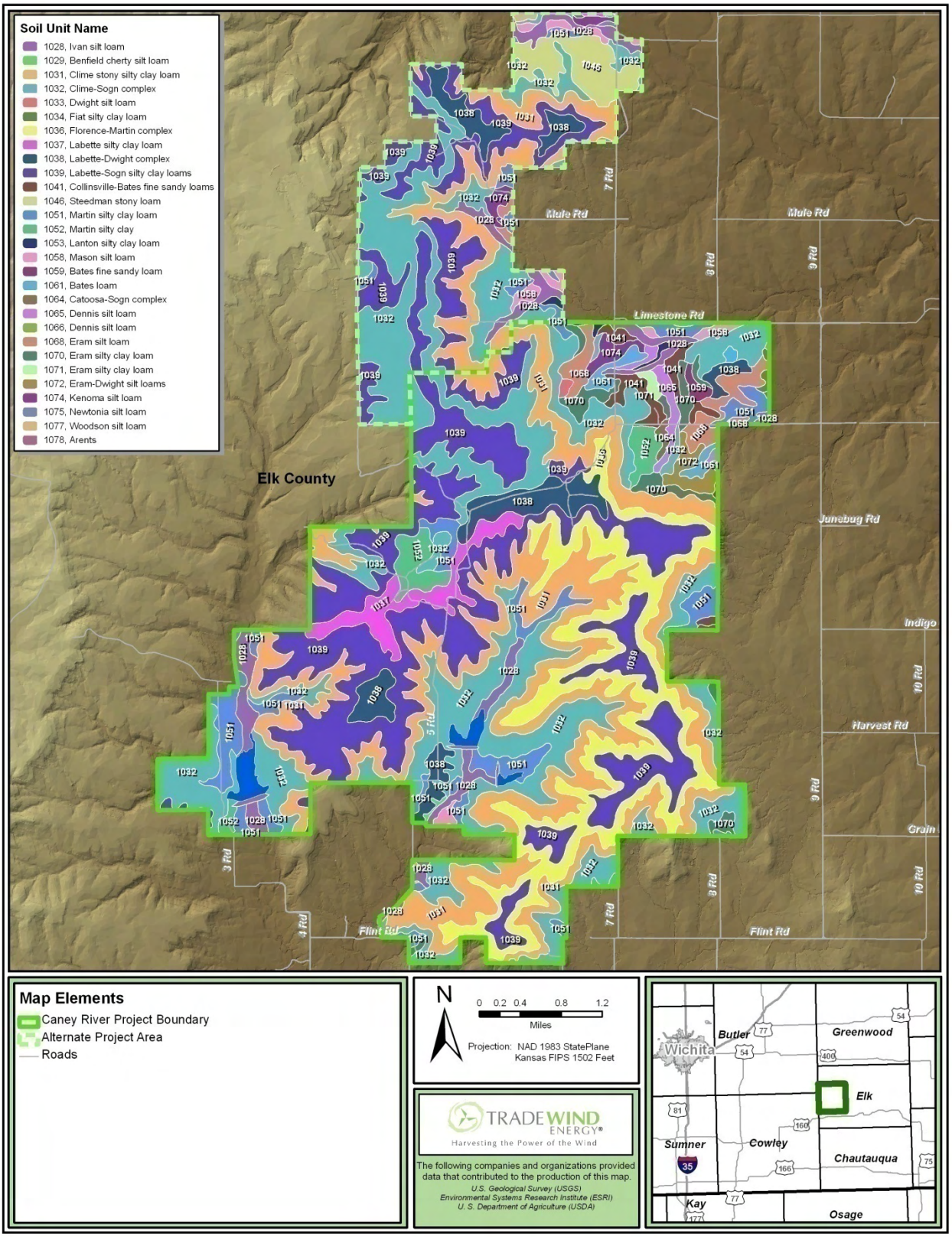
The Clime soil series is moderately deep with soft bedrock (Cr) of consolidated calcareous clay shales found at 33 inches. The soil is well-drained, has slow permeability, and is found on uplands. The parent material is residuum from calcareous clayey shale that leaves fragments throughout the profile. The Clime soil series has strong effervescence throughout the profile.

The Sogn series has a shallow and very shallow profile formed in residuum weathered from limestone. The series are found on uplands that are typically used for rangeland. There is a restrictive layer of parent material starting at 9 inches. The soil is somewhat excessively drained down throughout the depth of the profile and exhibits a medium to high runoff rate.

The Labette series consists of a moderately deep profile found on uplands. The soil is formed in residuum from interbedded limestone and clayey shale that becomes restrictive at a 36-inch depth. The native vegetation is tallgrass, which slows the runoff that is usually medium to rapid.

The Florence series consists of a deep profile formed in residuum from cherty limestone. The cherty limestone has a few vertical and lateral fractures at the restrictive layer depth of 44 inches. The Florence series is well-drained with moderately slow permeability. It has coarse fragments making up 35 to 80 percent of the profile, with medium to very high runoff potential.

Figure 3-18: Soils Map



The Martin series has a deep and very deep profile with a typical pedon found in cultivated fields on upland areas. The soil is moderately well-drained, with slow permeability. It is formed in colluvium and/or residuum from interbedded silty and clayey shales, limestone, and clay beds with medium to rapid runoff potential.

3.7.2 Environmental Consequences

Under the No Action Alternative, existing conditions and trends for soils and prime or important farmland would continue. Under the Proposed Action Alternative, construction of the proposed wind Project would include grading for access roads and excavation for the foundation of WTGs, operation and maintenance facilities, substation, interconnection, and quarry within the Project area. The total permanent Project footprint, including turbine foundations and roads, would be 83 acres. Permanent impacts to prime farmland and soils of statewide importance would be 65 acres, and temporary impacts would be 445 acres. Less than one percent of the total acreage of soils of statewide importance and prime farmland in the proposed Project area would be permanently impacted by construction activities. Although this temporary impact would affect native grassland and regeneration of original habitat would likely be slow, the property would quickly be available for continued use by grazing animals within one year following construction. For compliance with the Farmland Protection Policy Act, Caney River has completed Form AD-1006 and submitted it to the NRCS.

Caney River would use BMPs and construction site management procedures to limit soil disturbance and compaction to that which is necessary for Project construction. All disturbed or compacted areas not needed for operation would be regraded, loosened, and revegetated according to good management practices or and ownership agreements. Long-term impacts would occur where facilities are installed (e.g., along new roads and at tower sites). Total soil impacts would be minor since the overall disturbance area of the Project is small relative to the total size of the Project.

3.8 Surface and Groundwater

3.8.1 Existing Conditions

The Project is located within the Elk and Caney River sub-basins, which are part of the Verdigris River Basin. Surface water may sheet flow from the Project area, especially during heavy rain events. In Elk County, virtually all the fresh water used by the County comes from surface waters. In 2005, more than one-half (about 68 percent) of the total freshwater was used for livestock and the remainder was used for public supply (USGS 2005). In the area of the

proposed Project, the Elk River is listed on the 2008 Kansas list of impaired waters (Section 303(d) list), for lead, but this impairment is proposed for delisting in the 2010 list. The Elk River near Howard is proposed for listing as impaired for fecal coliform bacteria and dissolved oxygen.

The Big Caney Joint Watershed District Pond is located in the southern portion of the Project site. The current use of the Big Caney Joint Watershed District Pond is flood control for the region and recreational for the landowner.

In Elk County, the source of groundwater is precipitation that falls as rain or snow. Smaller amounts are contributed by infiltration from streams, ponds, and by subsurface inflow from adjacent areas. A part of the precipitation percolates downward to the zone of saturation and into aquifers of the area. The Project is located in three Regions of Aquifers, which are the Region WA, Region HD, and Region DB. Region WA includes aquifers mainly in Wreford limestone and the limestone of the Council Groves Group. Water can be obtained at a depth of 10 feet to as much as 120 feet. The second is Region HD; it is composed of sandstones and sandy shales of the Admire and upper Wabaunsee groups, which can be 10 feet to 35 feet deep. The last is aquifer Region DB; it is composed of thin limestone of the middle Wabaunsee group. This Region has the widest range of depth extending from 20 feet to 150 feet (Verville et al. 1958). Although rocks in the area are limestone, no karst features such as caves or sinkholes are known to be present.

3.8.2 Environmental Consequences

Under the No Action Alternative, ongoing impacts to water quality from agricultural and oil field activities would continue. Under the Proposed Action Alternative, potential impacts to surface water quality include temporarily increased turbidity and sedimentation in surface waters due to runoff and erosion from disturbed areas. No project activities would directly impact Clear Creek, or the Elk River, but some construction of the transmission line would occur within the watershed of this stream. In addition, the low-water crossing and culverts to be improved on Killdeer Road are located on tributaries to Clear Creek. Accidental spills of petroleum products or other pollutants also could impact water quality. The construction general contractor of Caney River would complete a Spill Prevention Control and Countermeasure (SPCC) Plan if required in accordance with 40 CFR 112 and implemented by the United States Environmental Protection Agency (USEPA). Erosion control measures or BMPs including diversions, riprap, matting, sediment traps, and timely revegetation of all disturbed areas would be implemented to minimize runoff-related sedimentation impacts. Erosion-prone areas (e.g., steeper slopes) would be

avoided where possible. Caney River has received a Construction Stormwater Permit from the Kansas Department of Health and Environment. Caney River has completed a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP requires the implementation of BMPs including reseeding with a native seed mix of big bluestem, Indiangrass, western wheatgrass, side-oats grama, switchgrass, and little bluestem. For road and tower construction, Caney River would use structural control practices to limit runoff and divert flows from exposed areas of the site, including silt fences to capture suspended sediments. At culverts, riprap would be used to prevent scour erosion. Rock construction entrances would be installed where pavement ends to minimize sediment tracking. Temporary sediment basins would also be installed where areas of 10 acres or more are exposed.

Turbine construction would involve excavation up to 10 feet deep. Prior to construction, geotechnical investigations would confirm the potential for karst features and groundwater. Potential impacts that could result from blasting would be avoided through adjustments to the specific affected foundation design. If the issue is unavoidable, the array would be changed to avoid the impact completely.

Soils would be stabilized by seeding the area with grass, and using mulch, straw, and erosion control blanket until the area is no longer erosion-prone. Sediment control devices would be maintained and cleaned out within seven days or prior to the next 0.5-inch or greater rainfall event. After grading is complete, disturbed areas that do not contain riprap would be permanently stabilized. Disturbed soils would be covered with grass, bark, mulch, straw, or geotextiles within 14 days of the final grade, or if the activity would be temporarily ceased for 21 days. Trapped sediment resulting from the disposition of temporary measures would be permanently stabilized to prevent further erosion and sedimentation. During construction, materials such as petroleum products and solvents would be managed to minimize exposure to stormwater. Materials would be kept in secure containers and be properly labeled. Wastes would be collected and removed from the Project site for proper disposal. Sanitary waste facilities would be provided by Caney River during construction activities and serviced regularly. If vehicle washing is needed, a designated area would be selected where runoff can be contained and properly disposed. Any concrete trucks on site would not be allowed to wash out or discharge surplus concrete or drum wash to waters of the state of Kansas.

In order to minimize the potential for spills and impacts from spills, hazardous materials, chemicals, fuels, and oils would be stored in an area with secure secondary containment.

Products would be kept in original containers with the original manufacturer's label. Substances would not be mixed with one another unless recommended by the manufacturer. Whenever possible, the product would be used before disposing of the container. All personnel on site would be made aware of cleanup procedures and the location of spill cleanup equipment.

Spills would be contained and cleaned up immediately after discovery, using methods described on the Material Safety Data Sheet (MSDS). Materials and equipment to be kept on site for spill cleanup includes brooms, dust pans, shovels, granular absorbents, sand, sawdust, absorbent pads and booms, plastic and metal trash containers, gloves, and goggles. If a spill is reportable, the construction supervisor would contact the USEPA National Response Center, the Kansas Department of Health and Environment, and Kansas Division of Emergency Management.

Water for concrete foundations would come from offsite existing municipal sources from the surrounding area. Water for dust control would likely come from on-site surface water and is designed to be sourced from Big Caney Joint Watershed District Pond located in the southern portion of the Project site. If this pond is utilized in support of construction efforts, approval for such use would be contingent upon approval of the landowner and the state regulatory agency. The potential drawdown depth could be in the range of 2 to 3 ft to support approximately 20 acre-ft of construction water usage. The current use of the Big Caney Joint Watershed District Pond is flood control for the region and recreational for the landowner. Even though the Project would consume surface and/or groundwater, it is not expected to infringe on existing water rights or to cause major depletion of these resources. As a result of these considerations, impacts to surface water are expected to be minimal during Project construction and operation.

Once construction of the culverts is complete, aquatic life conditions in the tributaries to the Elk River would be improved because of improved aquatic life passage conditions. In comparison to other energy sources, water usage from wind development would be expected to be minimal because no cooling water is needed. In addition, wind avoids emissions of water pollutants generated from combustion.

3.9 Floodplains

3.9.1 Existing Conditions

Federal Emergency Management Agency floodplain maps do not exist for unincorporated parts of Elk County, Kansas. However, based on local topography, floodplains would be expected to

exist along the larger streams such as the Elk River to the northeast and Caney River to the south.

3.9.2 Environmental Consequences

Under the No Action Alternative, existing conditions and trends for floodplains would continue. Under the Proposed Action Alternative, no wind turbines or transmission facilities would be sited in floodplains. Some access roads would cross floodplains; construction or road improvements would occur at three locations on one access road, Killdeer Road. These existing crossings are perpendicular to stream flow and the footprint in the floodplain has been minimized. As a result, there is no practicable alternative to construction in the floodplain and the culverts would be designed to enhance floodplain values by providing for floodwater and aquatic species passage. Consistent with EO 11988 and TVA implementing procedures, this EA contains the required floodplain evaluation and finding of no practicable alternative and will serve as the public notice required by the EO.

3.10 Wetlands and Streams

3.10.1 Existing Conditions

Wetlands are typically located along the low lying watercourses and adjacent to stock ponds or small reservoirs within the general Project area. According to National Wetland Inventory maps for the USGS topographic quadrangles Howard NW (1997) and Piedmont (1997), wetlands occurring in the area include emergent, scrub-shrub, and forested wetlands. Intermittent watercourses that drain the uplands are numerous within the Project area. Riparian areas are often associated with these watercourses. Manmade stock ponds and reservoirs are also very common within the Project area.

A wetland delineation within the original 150-MW proposed Project footprint, including a 500-foot corridor along proposed facilities, was conducted May 13 through 15, 2008, in accordance with the 1987 USACE Manual (USACE 1987) (Figure 3-8). The delineation process is based on vegetation, soils, and hydrologic characteristics observed in the field. A follow-up wetland delineation of the area proposed for the remaining 50 MWs was conducted October 20 and 21, 2009. Based on the results, additional delineation of the adjustments to the design and the haul route was conducted in April 2010 and August 2010.

3.10.2 Environmental Consequences

Under No Action, existing conditions and trends for wetlands would continue. Under the Proposed Action Alternative, a total of approximately 0.1 acres of wetlands would be permanently impacted in three sites and a total of 94 linear feet of streams would be permanently impacted in five different sites (Appendix D Table D.1). The USACE considers each crossing as an individual "project" and authorized under a NWP if impacts are less than 0.5 acre; impacts at crossings of less than 0.1 acre do not require pre-construction notification to the USACE. In addition, potential impacts would occur as a result of replacements or upgrades to various culverts and bridges in and around the Project in support of heavy vehicle traffic. The anticipated impacts to wetlands and other waters of the U.S. due to these potential upgrades and replacements outside of the Project site are shown in Appendix D, Table D.2. Anticipated wetland and/or stream impacts from culvert and bridge upgrades were calculated at 0.06 acres (Appendix D Table D.2). Figures depicting the wetland and stream impacts are in the Wetland Delineation Report prepared by Burns & McDonnell. It should be noted that both haul routes are viable, but only one is likely to be used for Project construction; both routes are evaluated for the purposes of this EA. The anticipated permits required at each crossing location are shown in Appendix D, Table D.2. The new facilities would be designed to maintain perennial and seasonal flows and allow passage of aquatic species.

Direct impacts to wetlands and other waters of the U.S. would depend on final engineering, but could include temporary disturbance or permanent loss during site preparation or excavation for Project facilities, especially construction of access roads, trenching of the underground collection system, other road improvements, or the transmission line. Temporary impacts due to trenching of the underground collection system would occur adjacent to the access roads; therefore, these temporary impacts are quantified with the road impacts in Appendix D, Table D.1. Since low lying wetland areas and watercourses within the Project area are undesirable for WTGs and access roads, they have been avoided where possible during Project design and construction. Indirect impacts to wetlands and other waters of the U.S. would be similar to those described for surface water. When a potential exists for sedimentation, impacts to wetlands and other waters of the U.S. would be avoided and mitigated using standard BMPs for erosion and sediment control.

Based on the delineation and review performed to date, impacts to delineated wetlands and other waters of the U.S., when considered individually rather than cumulatively, should be less than the preconstruction notification threshold of 0.1 acres. Further minimization and avoidance

would be evaluated at each impact site, and all practicable measures to minimize impacts would be taken during final design. The Project would comply with conditions of the appropriate NWP; likely NWP 12. As a result of these anticipated insignificant impacts, construction activities in wetlands or other waters of the U.S. should not cause significant changes to the hydraulic flow characteristics of the wetland or stream, increase flooding, or cause more than minor, temporary degradation of water quality of any waterbody. If impacts due to any project redesign greater than the threshold of 0.1 acres are identified, an application would be prepared and submitted to the USACE to obtain the appropriate permit; a Section 404 IP should not be required. In addition, consistent with its practice for compliance with EO11988, TVA would require mitigation if cumulative wetland impacts exceed one-half acre.

EO 11990, Protection of Wetlands, requires that the TVA consioder factors relevant to the Project's effects on the survival adn quality of wetlands affected byt he action. The project has been carefully designed to avoid and minimize impacts on wetlands adn waters of the U. S. to the extent practicable. The turbine layout takes advantage of higher eleveations and avaoids low lying areas, which are more likely to contain wetland areas. By avoidign to teh extent practicable and minimizing impacst on wetlands through design and use of protective measures durign construction, the Project would have only minor effects and be consistent with EO 11990. No mitigation is required or planned, however, the acquisiton of conservation easements under the NECP should beneficially afford some degree of protection to those wetlands occurring on properties for which such easements are established.

In addition to the USACE permit, state and local permits may be required for impacts to wetlands and streams. These permits include a stream obstruction permit and/or a floodplain fill permit each issued by KDA. A Permit to Appropriate Water for Beneficial Use, also issued by KDA, would be required at the Big Caney Joint Watershed District Pond located in the southern portion of the Project site if this pond is utilized in support of construction efforts. Approval for such use would be contingent upon approval of the landowner and the state regulatory agency. The potential drawdown depth could be in the range of 2 to 3 ft to support approximately 20 acre-ft of construction water usage. Construction of an access road to this pond would likely result in an impact to Stream 223 (Appendix D Table D.1).

3.11 Other Vegetation, Wildlife and Fisheries

3.11.1 Existing Conditions

A partial list of potential wildlife that may inhabit or temporarily use the Project area is provided in Table 3-9. To get a better understanding of what species could inhabit the area, as well as for other Project related purposes, an on-site habitat assessment was completed for the Project area and sent to USFWS and KDWP on February 18, 2009. During the onsite habitat assessment, wildlife that was observed was recorded. Extensive management such as early intensive cattle stocking affects grassland birds found on the site, such as dickcissel and meadowlark. This leaves little residual vegetative cover during the early summer, and leads to high rates of predation on ground-nesting birds that require vegetative cover for concealment (Rahmig et al. 2008).

3.11.1.1 Noxious Weeds

Noxious weeds reportedly occurring in Elk County include field bindweed , bull thistle , musk thistle, and Johnsongrass (NRCS 2007). Field bindweed and bull thistle were observed in the proposed Project area. Field bindweed is common due to its ability to spread by both seed and root. Seeds are often distributed by birds, the feet of animals, and on the wheels of motorized equipment, cars, trucks, etc. Musk thistle occurs throughout Elk County; however, it was not observed in the proposed Project area. Johnsongrass is also found throughout Elk County, particularly in fields of cultivated crops and pastures for grazing livestock, but was also not observed in the proposed Project area.

3.11.1.2 Migratory Birds

The impacts of the Project on the GPC, grassland birds, and on endangered and threatened species are discussed in earlier sections. Many bird species that occur in the U.S. are protected under the MBTA, which prohibits the "take" of any migratory bird. It is unlikely that any migrating birds would be affected by the wind turbine array as most migrating birds fly at a height of approximately 600 ft, well above the rotor-swept height of approximately 400 ft. Most birds in Elk County are protected under the MBTA, except for introduced species, such as the house sparrow, starling, and feral pigeons, and State of Kansas game species, such as GPC, ring-necked pheasant, bobwhite quail, and turkey. In addition to the MBTA, bald and golden eagles are protected under the BGEPA. It appears that the Project area could contain potential breeding and nesting habitat for several species of raptors, such as, but not limited to, the red-tailed hawk, Coopers hawk, or American kestrel. An avian stick nest survey was conducted

within an 800-foot buffer area around the 150-MW facility locations (March 20-21, 25-27, April 1, and June 18-19, 2008); however, no stick nests were found during the survey period. Additionally, the currently-proposed 200-MW Project area was surveyed on March 24-25 and April 14-15, 2009 and March 29 – 30 and April 12 – 14 2011.No stick nests were found in the 2009 study event, but ten nests were found in the 2011 survey. Four species of raptors, including turkey vulture (*Cathartes aura*), northern harrier (*Circus cyaneaus*), red-tailed hawk, and American kestrel were identified within the proposed Project Area. The Kansas Ornithological Society for Elk County lists 229 species of birds. Species of birds observed during other field surveys or most likely to be found in the proposed Project area are listed in Table 3-9 alongside other types of animals.

3.11.1.3 Other Animals

Big game and other mammals, reptiles, amphibians and fish are known to occur in Elk County, such as, but not limited to, the species listed in Table 3-9. The Project area appears to provide habitat for many of these species.

Table 3-9: Potential and Observed* Species of Elk County and the Proposed Project Area

Common Name	Scientific Name	Common Name	Scientific Name
Birds			
American coot	*Fulica americana*	Blue-winged teal	*Anas discors*
American crow*	*Corvus brachyrhynchos*	Brown-headed cowbird*	*Molothrus alter*
American kestrel*	*Falco sparverius*	Brown thrasher*	*Toxostoma rufum*
American robin	*Turdus migratorius*	Canada goose	*Branta canadensis*
American widgeon	*Anas americana*	Cliff swallow	*Petrochelidon pyrrhonota*
Baltimore oriole	*Icterus galbula*	Common goldeneye	*Bucephala clangula*
Barn swallow*	*Hirundo rustica*	Common grackle	*Quiscalus quiscula*
Barred owl	*Strix varia*	Common nighthawk*	*Chordeiles minor*
Belted kingfisher	*Ceryle alcyon*	Cooper's hawk	*Accipiter cooperii*
Black capped chickadee*	*Poecile atricapillus*	Dark-eyed junco*	*Junco hyemalis*
Blue jay*	*Cyanocitta cristata*	Dickcissel*	*Spiza americana*
Double-crested cormorant	*Phalacrocorax auritus*	Northern harrier*	*Circus cyaneus*
Eastern bluebird*	*Sialia sialis*	Northern mockingbird*	*Mimus polyglottos*
Eastern kingbird*	*Tyrannus tyrannus*	Northern oriole*	*Icterus galbula*

Common Name	Scientific Name	Common Name	Scientific Name
Eastern meadow lark*	*Sturnella magna*	Northern rough-winged	*Stelgidopteryx serripennis*
Eastern wild turkey*	*Meleagris gallopavo*	Northern shoveler	*Anas clypeata*
Eastern wood peewee*	*Contopus sordidulus*	Prairie falcon	*Falco mexicanus*
European starling	*Sturnus vulgaris*	Red-eyed vireo*	*Vireo olivaceus*
Field sparrow*	*Spizella pusilla*	Red-bellied woodpecker	*Melanerpes carolinus*
Great blue heron	*Ardea herodias*	Red-headed woodpecker	*Melanerpes rythrocephalus*
Great horned owl	*Bubo virginianus*	Red-tailed hawk*	*Buteo jamaicensis*
Greater prairie-chicken	*Tympanuchus cupido*	Red-winged blackbird*	*Agelaius phoeniceus*
Greater yellowlegs	*Tringa melanoleuca*	Ring-billed gull	*Larus delawarensis*
Green-winged teal	*Anas crecca*	Ringnecked pheasant	*Phasianus colchicus*
Grey catbird	*Dumetella carolinensis*	Savannah sparrow*	*Passerculus sandwichensis*
Hairy woodpecker*	*Picoides villosus*	Scissor-tailed flycatcher*	*Tyrannus forficatus*
Killdeer*	*Charadrius vociferus*	Sharp-shinned hawk	*Accipiter striatus*
Lark sparrow*	*Chondestes grammacus*	Swainson's hawk	*Buteo swainsoni*
Lesser scaup	*Aythya affinis*	Tufted titmouse*	*Baeolophus bicolor*
Loggerhead shrike	*Lanius ludovicianus*	Turkey vulture*	*Cathartes aura*
Mallard	*Anas platyrhynchos*	Upland sandpiper*	*Bartramia longicauda*
Mourning dove*	*Zenaida macroura*	Western kingbird	*Tyrannus verticalis*
Northern bobwhite quail	*Colinus virginianus*	White-breasted nuthatch	*Sitta carolinensis*
Northern cardinal*	*Cardinalis cardinalis*	White eyed vireo*	*Vireo griseus*
Northern flicker	*Colaptes auratus*	Yellow warbler*	*Dendroica petechia*
Mammals			
Black-tailed jack rabbit	*Lepus californicus*	Fox squirrel	*Sciurus niger*
Coyote	*Canis latrans*	Striped skunk	*Mephitis mephitis*
Eastern cottontail	*Sylvilagus floridanus*	White-tailed deer	*Odocoileus virginianus*

Reptiles & Amphibians			
Black rat snake	*Elaphe obsoleta obsoleta*	Northern cricket frog	*Acris crepitans crepitans*
Eastern collared lizard	*Crotaphytus collaris*	Ornate box turtle	*Terrapene ornata*

Eastern yellowbelly racer	*Coluber constrictor*	Plains leopard frog	*Rana blairi*
Gopher snake	*Pituophis catenifer*	Prairie ringneck snake	*Diadophis punctatus arnyi*
Great plains skink	*Eumeces obsoletus*	Red-sided garter snake	*Thamnophis sirtalis infernalis*
Massasauga*	*Sisturus catenatus*		

Source: Kansas Ornithological Society 2007, KDWP 2007.
*Observed during habitat assessments in proposed Project area

3.11.2 Environmental Consequences

3.11.2.1 Noxious Weeds

Under the No Action Alternative, noxious weeds that are already introduced would continue to exist. Methods used to control the spread and distribution of noxious weeds include the use of herbicides, use of material (livestock feed and planting seeds) free of noxious seeds, cleaning of equipment prior to entry into the Project area and before leaving the Project area, and mowing. Under the Proposed Action Alternative, Caney River would take similar actions to control noxious weeds which tend to colonize disturbed soils. As part of its noxious weed management efforts, Caney River would follow manufacturer's specifications and BMPs in the use of any herbicides. All equipment driven in off-road conditions would be required to be washed prior to accessing the site. All pesticide and herbicide application would be conducted by a Kansas-licensed applicator and in conjunction with landowner agreements. With these efforts, no additional substantive impacts of noxious weeds are expected. In addition, Caney River would fund research as part of the NECP (Appendix E) to further address noxious weed control in tallgrass prairie ecosystems.

3.11.2.2 Migratory and Wintering Birds

The impacts of the Project on the GPC, grassland birds, and on endangered and threatened species are discussed in earlier sections. This section discusses the impacts on migratory and wintering birds not listed as endangered or threatened. Many of these birds are listed in Table 3-9. Under the No Action Alternative, existing conditions and trends for migratory and wintering birds would continue. Under the Proposed Action Alternative, WTG-related bird mortality would be expected to be low. The potential impacts of wind power development on migratory and wintering bird mortality are low compared with other sources of bird mortality (Table 3-10).

Recent literature on avian and bat mortality was summarized in 2010 (National Wind Coordinating Collaborative 2010). It is clear that birds and bats are sometimes killed in collisions with wind turbines. The fatality rates are highly variable, depending on the location and types of turbines used. Newer turbines have been designed to reduce the likelihood of collisions. Songbird collisions primarily occur during spring and fall migration. Waterbirds and waterfowl risk of collision is low. The rates of bird fatality at Buffalo Mountain in Tennessee was 14 fatalities per MW per year, but most facilities report less than 4 fatalities per MW per year (Nicholson 2003; Nicholson 2005; Fiedler 2007). These rates are lower than other manmade causes of mortality, including collisions with vehicles, buildings and windows, transmission lines, communication towers, toxic chemicals, and domestic cats (Table 3-10). Additionally, there are no topographic features which would cause large populations of migrating avian species to funnel through the area.

Table 3-10: Avian Collision Mortality Estimates

Source of Mortality	Estimated No. of Annual U.S. Mortalities (millions)
Vehicles	60-80
Buildings and windows	98-980
Power lines	0.01-174
Communication towers	4-50
Wind generation facilities	0.01-0.04

Source: Sagrillo 2003 and NWCC 2001.

Under the Proposed Action Alternative, direct impacts to birds during construction could include mortality due to collisions with WTGs or other facilities; mortality of eggs or chicks due to nest abandonment could be caused by increased human activity during construction. Of specific concern are impacts to raptors. An avian stick nest survey was conducted within an 800-foot buffer area around the initially proposed 150-MW turbine locations (March 20-21, 25-27, April 1, and June 18-19, 2008 and the proposed 200-MW turbine locations on March 24-25 and April 14-15, 2009. No stick nests were found. An additional stick nest survey was conducted on March 29-30 and April 12-14, 2011. The 2011 stick nest survey again included an 800-foot buffer, but also included all proposed Project facilities rather than just turbine locations because specific facility locations were known. Ten stick nests were identified during the 2011 survey. Of the 10 stick nests identified, two have the potential to fall within 660 feet of construction areas (the buffer distance from construction recommended by the USFWS in the National Bald

Eagle Management Guidelines) (USFWS 2007). Caney River will conduct additional raptor nest surveys prior to construction to determine if these two stick nests are currently actively used and would avoid all active raptor nests by an appropriate buffer based on site-specific characteristics until the chicks have fledged or the nest fails and becomes inactive. The raptor breeding/nesting season varies in Kansas, typically December 1 through August 31 for eagles. Potential indirect impacts during construction could include loss of foraging habitat due to surface disturbances or displacement from habitat due to human activity. Since the Project disturbance would be small relative to the amount of foraging habitat that appears to exist within and adjacent to the Project area, impacts are anticipated to be minimal.
The buffer distance and restriction dates may vary on a case-by-case basis as determined by federal or state agencies, or by Caney River; factors considered will include the activity status of the nest, species involved, natural topographic barriers, line-of-sight distances, the presence of existing disturbances that the birds are habituated to, and other site-specific characteristics. If construction within the protective buffer of an active raptor nest becomes necessary, it will be delayed until as late in the nesting season as possible (bigger chicks are less susceptible to long-term absences by an adult). Active nests near construction areas may be monitored, and, if the adults leave the nest for an extended period, Caney River will stop construction in the vicinity so as to allow them to return. Caney River will avoid cutting trees with raptor nests.

During operation, potential direct affects to raptors and other birds could include mortality due to collisions with WTGs and other Project facilities. Caney River would use state-of-the-art WTGs with slow-rotating upwind rotors and unguyed tubular towers to minimize potential for raptor and other bird collisions. Impacts to raptors and other birds are anticipated to be low because the Project is not sited in a key migratory corridor or feeding ground. The Project is located to the east of the main Central Flyway used by migratory waterfowl (http://www.pacificflyway.gov/Documents/Central_map.pdf) and is not near any large lakes or wetlands that host migratory ducks, geese, or cranes during migration (See Figure 3-19).

Migratory shorebirds such as sandpipers use the grasslands of the Flint Hills as foraging areas. Individuals would likely avoid the immediate construction footprint of the proposed Project while construction was underway. It is unclear if sandpipers would avoid the area following construction. However, analysis of ecoregion fragmentation in Section 3.1.3.1.2 shows that a corridor of traversability is maintained. Large amounts of habitat remains available to migrating birds.

Studies have indicated that relatively low raptor fatality rates exist at wind energy developments in the United States with the exception of some facilities in parts of California. Reported fatalities are highly variable among facilities and regions of the country. Altamont Pass, which has over 5,000 older and smaller turbines and a larger raptor use, kills more raptors than any other developments where fatality studies have been conducted (GAO 2005; Kingsley and Whittam 007; Kuntz et al. 2007a; Kuvlesky et al. 2007; NAS 2007; Arnett et al. 2008). Most of North America's birds are songbirds, most of these are migratory, and most of the migratory species migrate during the night at altitudes generally above rotor swept areas when weather conditions are favorable. Risk may be greatest during take-off and landing where wind facilities abut stopover sites.

Songbirds are vulnerable to colliding with man-made structures such as buildings, communication towers, power lines, or wind turbines during poor weather conditions that force them to lower altitudes (Winkelman 1995; Gill et al. 1996; Erickson et al. 2001; Johnson et al. 2002; Robbins 2002; Kerlinger 2003; Manville 2009). Songbird collisions typically account for roughly three quarters of bird casualties at U.S. wind facilities (Erickson et al. 2001; Johnson et al. 2002) and result in spring and fall peaks of bird casualty rates at most wind facilities (Johnson et al. 2002; Erickson et al. 2004). However, current turbine-related fatalities are unlikely to affect population trends of most North American songbirds (NAS 2007; Kingsley and Whittam 2007; Kuvlesky et al. 2007; Manville 2009).

The FAA regulates the lighting required on structures of over 199 feet in height above ground level to ensure safe air traffic. The FAA currently recommends strobe or strobe-like lights that produce momentary flashes interspersed with dark periods up to 3 seconds in duration as lighting for commercial wind turbines, and they allow commercial wind facilities to light a proportion of the turbines in a facility, firing all lights synchronously (FAA 2007). Red strobe or strobe-like lights are frequently used. Such lighting does not appear to influence bat and songbird fatalities (Avery et al. 1976; Arnett et al. 2008; Longcore et al. 2008; Gehring et al. 2009; Manville 2009).

Changes to the migratory pathways of waterfowl, raptors, and grassland birds are not expected to occur as a result of the proposed Project. Prairie restoration projects within the FHLCA, such as the proposed Red Buffalo Ranch restoration under the NECP, could produce an improved Flint Hills corridor for migration. Additionally, unrelated to the Project, actions of the U.S. Fish and Wildlife Service to obtain conservation easements on up to 1.1. million acres of tallgrass

prairie in the Flint Hills Legacy Conservation Area would also protect potential habitat for grassland species in the surrounding areas.

3.11.2.3 Other Animals

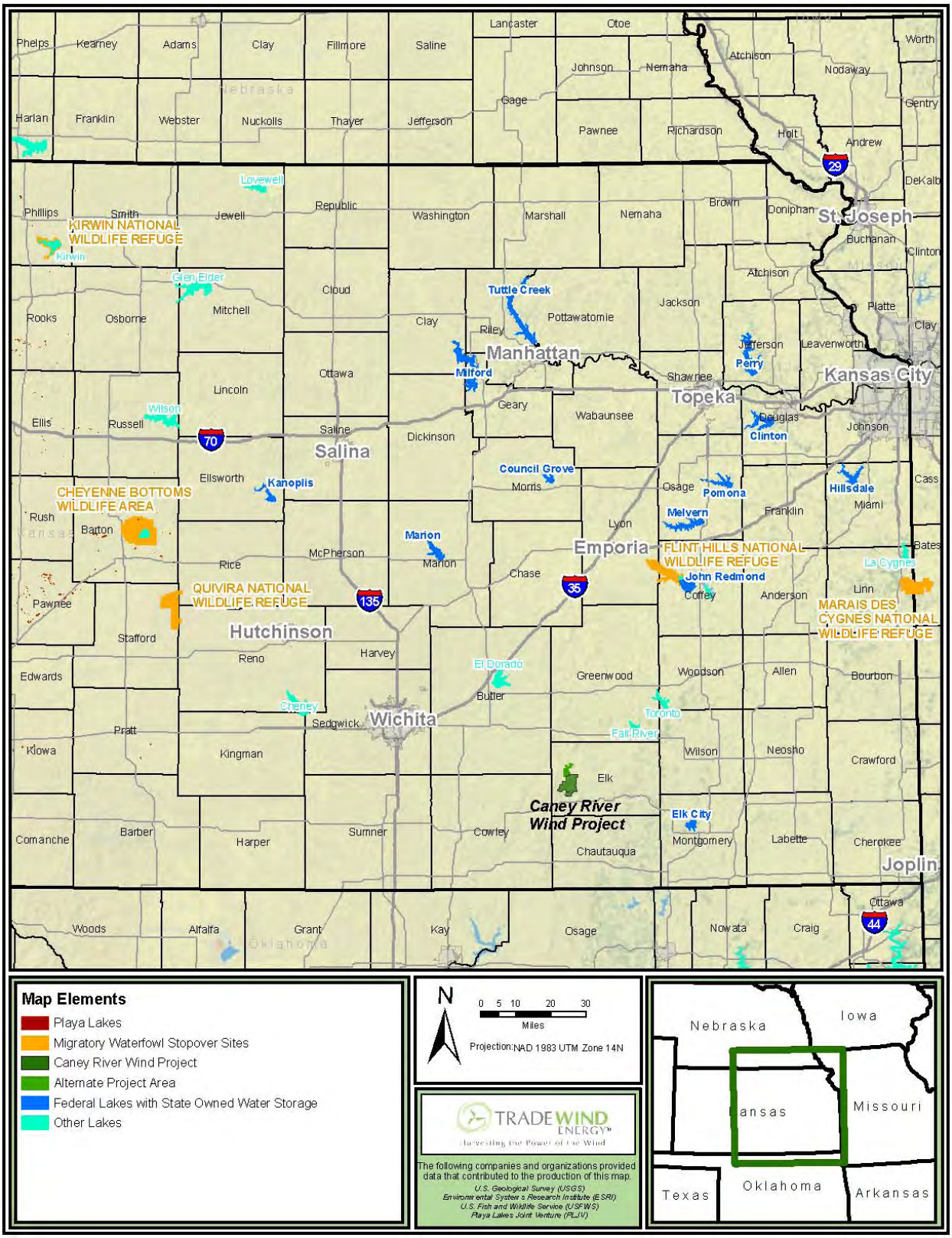
Under the No Action Alternative, existing conditions and trends for animal populations would continue. Under the Proposed Action Alternative, impacts to big game such as deer are expected to be minimal because the land is primarily agricultural and subject to regular human activity from ranching and oil production activities. Impacts to big game could include direct mortality due to collisions with vehicles and loss of habitat as a result of the Project, which is minimal when comparing it to the overall size of the Project.

Impacts to other mammals, reptiles, and amphibians are also expected to be minimal, with the possible exception of bats. Mammals are relatively mobile, reptiles and amphibians are a little less so, but while mortality due to collisions with vehicles or during excavation are possible, it should rarely occur. As with big game, the overall agricultural management system within the Project area strongly influences forage/prey availability, so that the loss of habitat from the Project footprint should have minimal affects on other mammals, reptiles, or amphibians.

Bats may be impacted due to collision-related mortality. Other wind energy projects in areas of high bat use are known to cause substantial bat mortality (USFWS 2003); the causes of which are being investigated (Energetics, Inc. 2004; American Wind Energy Association [AWEA] 2004). Overall bat mortality rates in the U.S. average 3.4 fatalities per WTG per year (AWEA 2004). The highest rates occurred in the eastern U.S., with 46.3 fatalities per WTG per year. Average mortality rates in the upper Midwest, Rocky Mountains, and Northwest are much lower at 1.7, 1.2, and 1.2 fatalities per WTG per year, respectively. Bat fatalities are believed to happen both because of direct collision and barotrauma, which is internal organ damage caused by rapid air-pressure reduction near moving turbine blades (Baerwald et al 2008). Bat fatalities were highest at Buffalo Mountain, where the rate is almost 40 per MW per year; however, most facilities reported fatality rates of less than 10 per MW per year (National Wind Coordinating Collaborative 2010). An on-site habitat assessment was completed while conducting other related field studies to determine if suitable bat habitat exists within the Project area (Burns & McDonnell 2009). Based on the limited forested habitat and rock outcroppings suitable for roosting observed during the habitat assessment and described by KDWP and Timm et al. (2008) as important habitat, the risk of mortality to bat populations in the Project area appears low. No locally found species of bats are listed on the federally or state-listed endangered

species list. An Avian and Bat Risk Assessment was prepared for the Project on March 6, 2009.

Figure 3-19: Migratory Waterfowl Stopover Points

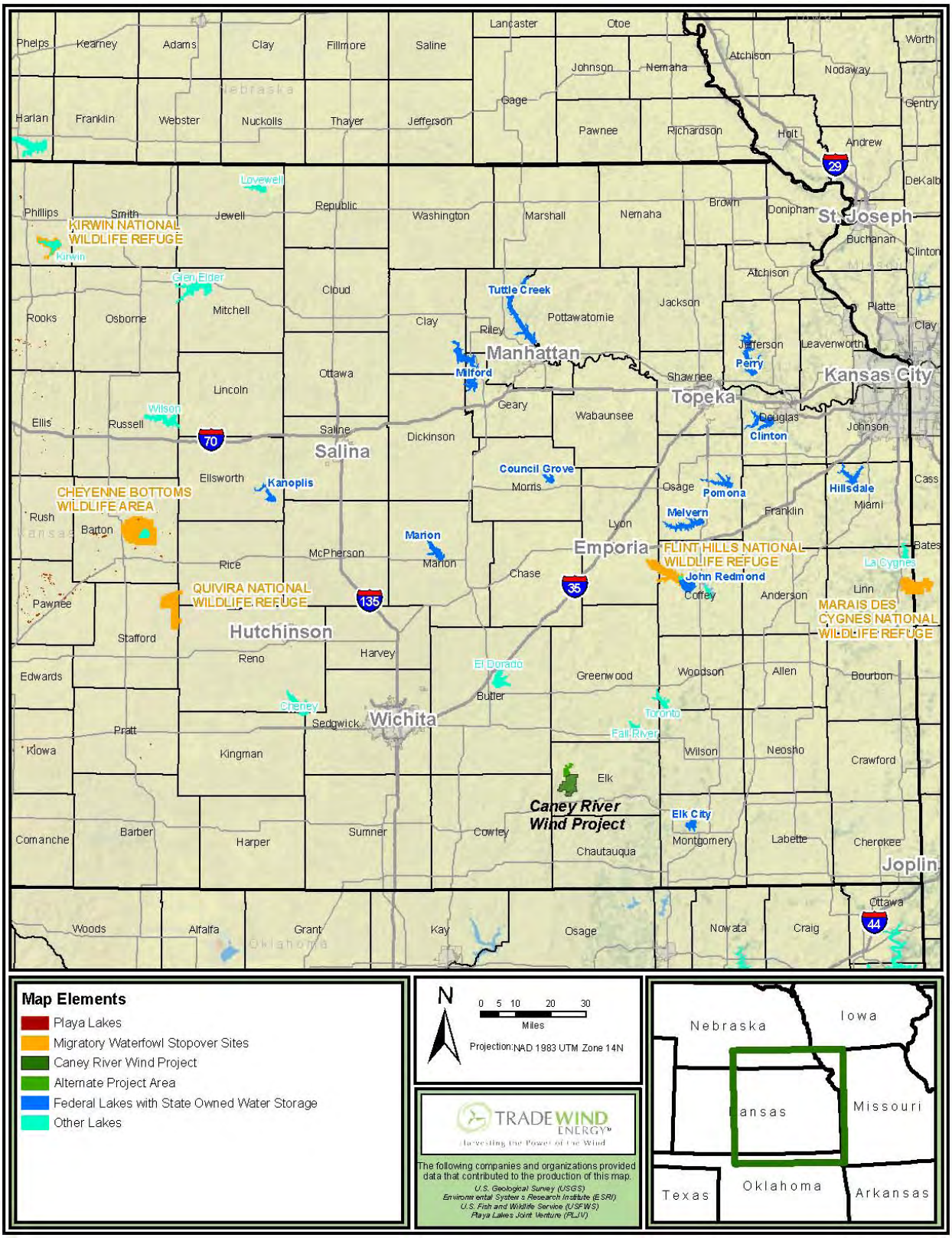


Hoary bats (*Lasiurus cinereus*) are one of the more common migratory bat fatalities due to wind farms (Erickson et al. 2002). In Kansas, hoary bats migrate from southern coastal states in the latter part of March with larger populations passing through in April and May. Populations begin migrating south in late September. Hoary bats, however, are considered uncommon in Kansas (Timm et al. 2008).

Other migratory species include: silver-haired bats, red bats , and evening bats. Silver-haired bats migrate through Kansas in summer to the more northern parts of its range where they roost in hollow trees and under bark. In the fall, populations return to the warmer climates passing south across the state. Red bats typically begin arriving in mid-March and are found throughout Kansas. They are common in deciduous forests along riparian corridors, where they hang from sheltered tree limbs and low shrubs. Evening bats arrive in late April, roosting in hollow trees and buildings throughout the eastern two-thirds of Kansas. Migration south begins around October.

Mortality rates for resident bat populations are much lower than migrant species (Erickson et al. 2002). Foraging habitats within forest, along riparian corridors, and forest edge limit interaction with WTGs. Resident bat populations which may be found at the Caney River site include big brown, little brown myotis , and eastern pipistrelle. Big brown bats are the most common in Kansas. They can be found in a variety of structures and locations such as chimneys, buildings, and exfoliating tree bark. Big brown bats forage regularly around city lights and over water in search of insects. Eastern pipistrelle bats roost in rocky areas, buildings, and in trees. Foraging habitats include searching for small insects near bodies of water, open woodlands, and along forest edges. Rarely do they hunt in dense forest or over open fields (Timm et al. 2008). Little brown myotis bats are found throughout the eastern two-thirds of Kansas. They roost in buildings, under exfoliating tree bark, hollow trees, and in shallow crevices in cliffs. Of the resident bat species in Kansas, little brown myotis bats are perhaps at greatest risk of being struck by a WTG. Foraging habitats include searching for insects in field, water, and among trees.

Figure 3-20: Migratory Waterfowl Stopover Points



Fisheries - Other than road crossings for access roads, no work is planned within stream channels. However, impacts to fisheries could include surface water pollution from sedimentation or spills. Caney River would comply with conditions of the NWPs in the event that there is unanticipated work within waterways and would use BMPs to minimize erosion from all disturbed areas, as well as commit to promptly cleaning-up spills in accordance with spill prevention plans. Therefore, adverse impacts to fisheries are not anticipated.

3.11.2.4 Wildlife and Habitat Mitigation

Caney River has committed $8.5 million to a wildlife and habitat conservation plan, called the NECP. The NECP Advisory Committee will provide NFWF guidance as to (1) the implementation of the NECP, (2) selection of the Caney Legacy Conservation Easement ("CLCE") properties as described in Amendment 1 to the NECP, (3) selection of the 3,000 acres of prairie to be located within the Flint Hills Legacy Conservation Area for restoration as described in Amendment 2 to the NECP and (4) the specifics of the research and grants contemplated herein. This committee is expected to be comprised of approximately seven members including a single representative from each of the following entities (as allowed by each entities' governance rules and interest in participation) (1) Kansas Department of Wildlife and Parks, (2) USFWS, (3) TradeWind, (4) Caney River, (5) NFWF, (6) NRCS, and (7) A representative from a research institution, possibly Kansas State University or the University of Kansas. Depending upon decisions of that committee, activities that may be funded include purchase of conservation easements, wind and wildlife research, ecological restoration of native prairie, grassland improvement through fire management practices, and improvement of current grazing practices.

3.12 Air Quality

3.12.1 Existing Conditions

Air quality in the region is generally good and is in attainment with National Ambient Air Quality Standards (NAAQS) for all criteria pollutants: nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), particulate matter with an aerodynamic diameter less than 10 micrometers (PM_{10}), PM with an aerodynamic diameter less than 2.5 micrometers ($PM_{2.5}$), and lead (Pb). Pollutant sources in the region could include oil and gas development (in Elk and surrounding counties), municipal development, agricultural activities, prescribed burning, dust and particulate emissions from paved and unpaved roads, tailpipe emissions, and off-road

vehicle traffic (e.g., tractors). The closest Class I Air Quality area is Hercules-Glades Wilderness Area in Mark Twain National Forest, more than 200 miles to the east in Missouri.

In 2007, the Intergovernmental Panel on Climate Change (IPCC) concluded that "most of the observed increase in globally-averaged temperatures since the mid-20th century is very likely due to the observed increased in anthropogenic greenhouse gas (GHG) concentrations. The observed widespread warming of the atmosphere and ocean, together with ice mass loss, support the conclusion that it is extremely unlikely that global climate change of the past 50 years can be explained without external forcing, and very likely that it is not due to known natural causes alone." According to the IPCC, "very likely" indicates that there is a 90 percent chance that this is the case. On December 7, 2009, the Administrator of the USEPA signed a finding stating that the current and projected concentrations of six greenhouse gases--carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6)--in the atmosphere threaten the public health and welfare of current and future generations. The findings by themselves do not impose any emission reduction requirements, but are an indication that additional regulations of greenhouse gas emissions may be anticipated in the future.

The Project is located in the Great Plains, a region which is already characterized by climate extremes of extended drought alternating with wetter conditions. Temperatures are also subject to extreme variations in the Great Plains, with cold winters and hot summers being a common occurrence. With global climate change, more frequent extreme events such as heat waves, droughts, and heavy rainfall can be expected in the region (Karl et al. 2009). Temperatures are projected to increase during the 21st century, with larger changes expected under high-emissions scenarios. Summer changes are projected to be larger than those in winter in the southern and central Great Plains, including the area of the proposed Project. Northern areas of the Great Plains are projected to experience a wetter climate by the end of the 21st century, while southern areas are projected to experience a drier climate (Karl et al. 2009). Southeastern Kansas is in between these two extremes; therefore, it is unclear whether average precipitation would increase or decrease in the area of the proposed Project. However, as noted above, the region is already noted for extreme weather events.

3.12.2 Environmental Consequences

Under the No Action Alternative, existing conditions and trends for air quality would continue. For example, air quality would be impacted during annual burning. Under the Proposed Action

Alternative, possible minor, temporary impacts to air quality would occur during construction and operation due to short-term increases in particulates (e.g., dust from excavation and vehicle traffic) and exhaust emissions from construction and operations vehicles. In order to minimize dust from Project activities, Caney River would limit vehicle speeds on Project roads. During dry and wind periods during construction, Caney River would apply nonpotable water to the Project roads and haul routes to limit dust created by vehicle traffic.

During operation, use of wind power instead of burning fossil fuels to generate electricity would have beneficial impacts on air quality, because criteria pollutants and other regulated pollutants emitted by conventional fossil fuel combustion would not be produced. In addition, greenhouse gases would not be produced during generation.

No state or federal air quality standards would be exceeded due to the construction or operation of the Project; any impacts to air quality would be minor. The Project would be in compliance with NAAQS, and the additional minor emissions would not put the Project area into a non-attainment category. Compared to fossil fuels, the Project would have beneficial air quality impacts because pollutants such as NO_x, SO_2, particulates, mercury, and CO_2 would not be produced during generation, and only minimal quantities of such pollutants would be produced by construction and maintenance vehicles and equipment.

There are substantial uncertainties associated with climate change issues. However, climate change in the region could affect agricultural and natural communities in the region of the proposed Project. Water supplies could be expected to be more limited in some years due to more frequent and stronger droughts. As a region of weather extremes, it is unclear whether potential changes in global climate would be outside the range of variability that has historically been experienced for the region. No Project impacts have been identified that would be worsened by climate change. However, some of the mitigation measures, such as the proposed NECP, may be needed more urgently due to stresses on natural tallgrass prairie communities. The Great Plains are currently a windy area. It is unclear whether potential climate changes would increase or decrease the wind resources of southeastern Kansas, and data is not currently specific to a regional area. The limited research to date on these important issues does not support firm conclusions about where such impacts would occur and how significant they would be (Karl et al. 2009). The US Global Change Research Program stated that

> "Increased extremes of summer dryness and winter wetness are projected for much of the globe, meaning a generally greater risk of droughts and floods…in a warmer world, precipitation tends to be concentrated into heavier events, with longer dry periods in between. Models project a general tendency for more intense but fewer storms overall outside the tropics, with more extreme wind events" (Karl, Melillo, and Peterson 2009).

However, another study suggested that the U.S. as a whole could see a minor reduction in wind speeds of 1.0 to 3.2 percent in the next 50 years (Breslow and Sailor 2002).

Greenhouse gases would be generated during construction. The energy requirements for wind farm construction include turbine manufacture, transportation of turbines to the site, and actual construction. Minor amounts of carbon dioxide emissions would also occur during operation and maintenance, and during decommissioning. Based on studies of other wind turbines, on a life cycle basis the estimated carbon dioxide emissions range from 14 to 33 tonnes per GWh (White 2006). This compares to 974 tonnes per GWh for coal (White and Kulcinski 1998). Thus, wind energy carbon dioxide emissions are on the order of 1 percent of coal and 2 percent of natural gas per unit of electricity generated. The carbon dioxide emissions from wind farms are offset over the life cycle of the project by the energy generated. The net energy return (ratio of energy delivered to energy used in manufacture, transport, construction, operation, and decommissioning) is as high as 20-25 for wind energy systems compared to a ratio of 8 for fossil fuel systems (Kubiszewski et al. 2010). During generation, a MWh of wind reduces carbon dioxide emissions by the amount of carbon dioxide that would be generated from the burning of fossil fuel to generate the same MWh.

3.13 Noise

3.13.1 Existing Conditions

The dBA scale measures sound levels over the entire range of audible frequencies, weighted to accommodate the fact that humans hear middle range frequencies better than high or low frequencies. The sound pressure levels (in dBA) of common noise sources are presented in Table 3-11.

Table 3-11 Typical Sound Pressure Levels Associated with Common Noise Sources

Sound Pressure Level (dBA)	Subjective Evaluation	Environment	
		Outdoor	Indoor
140	Deafening	Jet aircraft at 75 feet	
130	Threshold of pain	Jet aircraft during takeoff at a distance of 300 feet	
120	Threshold of feeling	Elevated train	Hard rock band
110		Jet flyover at 1000 feet	Inside propeller plane
100	Very loud	Power mower, motorcycle at 25 feet, auto horn at 10 feet, crowd noise at football game	
90		Propeller plane flyover at 1000 feet, noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately loud	Diesel truck (40 miles per hour) at 50 feet	Inside auto at high speed, garbage disposal, dishwasher
70	Loud	B-757 cabin during flight	Close conversation, vacuum cleaner, electric typewriter
60	Moderate	Air-conditioner condenser at 15 feet, near highway traffic	General office
50	Quiet		Private office
40		Farm field with light breeze, birdcalls	Soft stereo music in residence
30	Very quiet	Quiet residential neighborhood	Bedroom, average residence (without TV. and stereo)
20		Rustling leaves	Quiet theater, whisper
10	Just audible		Human breathing
0	Threshold of hearing		

Source: Adapted from Architectural Acoustics, M. David Egan, 1988 and Architectural Graphic Standards, Ramsey and Sleeper, 1994.

The Project area is rural farmland and native prairie, with homesteads, agricultural activities, oil production equipment, use of state and county roads, and wind as the major contributors to ambient noise levels. Ambient noise levels are likely in the range between 35 to 65 dBA; this range is based on Burns & McDonnell experience measuring background noise levels in agricultural areas, depending on time of day and proximity to human activities or active highways or roadways. Noise levels within the Project area are likely lowest during the morning

and at night (e.g., 35 to 45 dBA) when surface wind speeds are lower and human activity is at a minimum; noise levels would be highest (e.g., 45 to 65 dBA) in the afternoon when surface wind speeds and human activity are typically the greatest.

Proximity to roadways can increase the noise levels in an area. Measurements taken within 300 feet of a 2-lane highway or roadway would be near 65 dBA when traffic is high. Without traffic, noise measurements would be closer to 40 dBA during the daytime.

3.13.2 Environmental Consequences

Under the No Action Alterantive, existing noise conditions and trends would continue. Under the Proposed Action Alternative, construction noise would exceed ambient noise levels and may be heard for some distance within the Project area. Truck traffic and heavy equipment would cause elevated noise levels at and near construction sites. These impacts would also be temporary and similar to noise presently occurring from agricultural equipment operated throughout the Project area. Caney River 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, whenever feasible, limiting construction activities to daytime hours.

Modern WTGs emit a swishing or whooshing noise that is caused as rotors encounter turbulent air; however, most of the hum or whine and the thumping noises generated by older model WTGs have been eliminated in modern WTGs. Most new WTG manufacturers have identified noise issues associated with wind energy and have updated the wind turbines with noise attenuation. Rotors are now located upwind and the rotor blades have minimized noise levels. The nacelle of most units has been equipped with noise reduction and sound-proofing, and gearboxes are now specifically designed for quiet operation with added insulation.

Noise impacts associated with operations are expected to be minimal to humans. At the base of a WTG, it should be possible to have a conversation without raising one's voice (AWEA 2004b). At the nacelle, typical WTGs generate about 100 dBA (Danish Wind Industry Association 2004). At one rotor distance (150 feet) from a typical WTG, noise levels are 55 to 60 dBA; at four rotor distances (about 600 feet), noise levels are about 44 dBA. At six rotor distances (900 feet), WTG noise is about 40 dBA. At 750 to 1,000 feet, an operating Project is no noisier than a kitchen refrigerator or a moderately quiet room (AWEA 2004b). Generally, the sound of the wind would mask WTG noise when wind speeds reach 18 miles per hour (mph).

These values were confirmed by a detailed noise analysis using the “decibel” module of the WindPRO software program, an industry-standard wind project assessment and analysis program. The modeled values indicate that the noise level at the base of the turbines would be approximately 55 dBA. As a result, no residences near the proposed Project would experience noise levels that exceed 55 dBA and most would experience levels below 40 dBA. The proposed Project is consistent with the voluntary Kansas wind siting guidelines.

Because WTGs are relatively quiet (Table 3-11), it is anticipated that noise impacts to residents would be minimal. As indicated in Figure 3-20, the closest residences are about 600 feet from any wind turbines. The only issue may be residences that are sheltered from the wind. In a rolling landscape with WTGs on the ridges and residences in the valleys, WTG noise may carry farther than in a flat landscape (AWEA 2004b).

A detailed analysis has been performed to determine the noise impact of Caney River on surrounding areas. The Decibel module uses acoustic data from the wind turbine manufacturer to determine the noise impact at ground level in and around the Project. The noise calculation is based on the Danish rules for wind turbine noise calculation "Bekendtgørelse nr. 304 af 14. maj 91" from the Danish Environmental Agency. The calculations are performed at a hub-height wind speed of 8 m/s, which is approximately the average wind speed of the site.

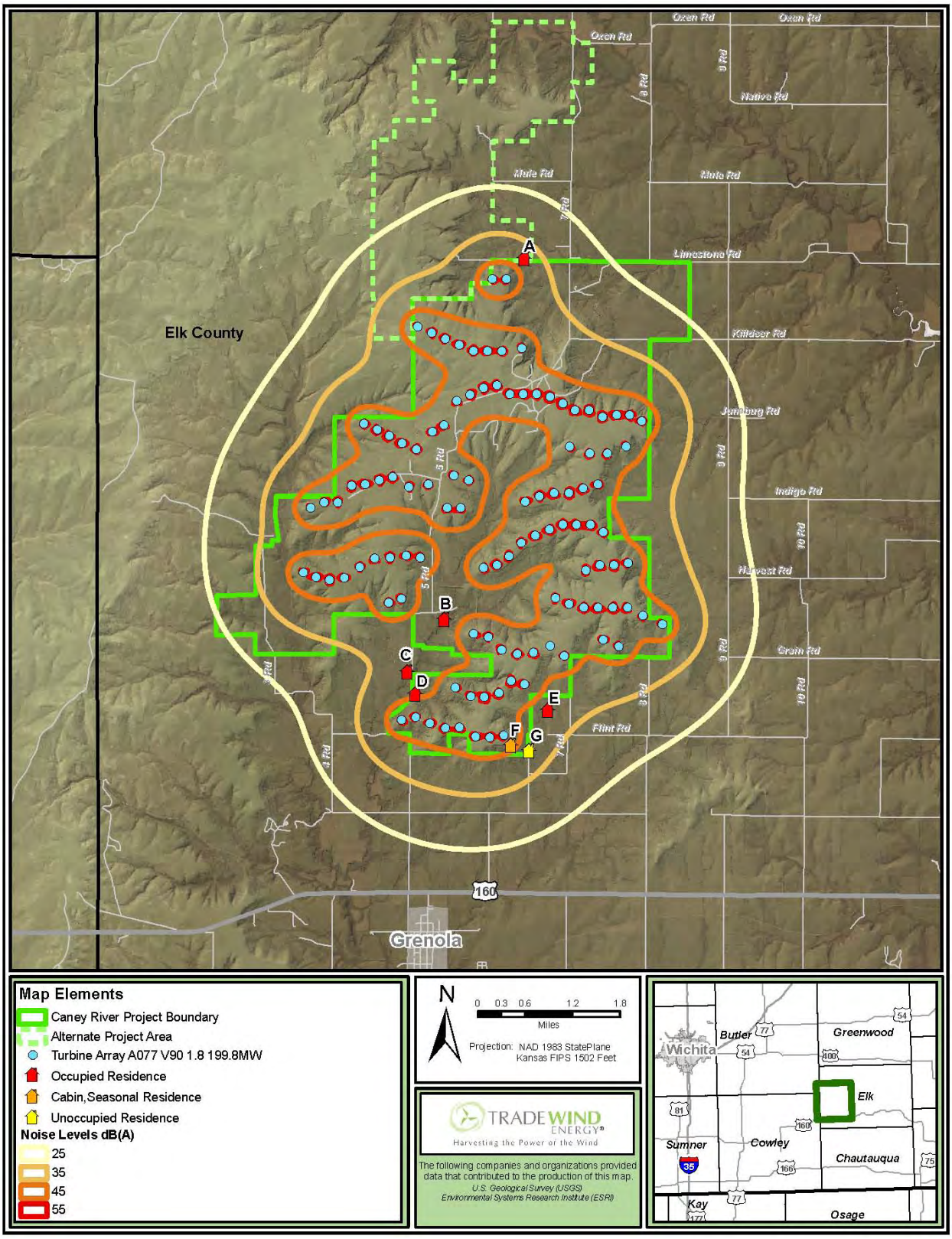
The analysis, shown in Figure 3-20 below, finds that the noise impact of the Project is greatest at the base of each turbine, is moderate within the wind park, and decreases with distance from the wind park. At greatest impact (the base of each turbine), the noise level is approximately 55 dBA at a hub-height wind speed of 8 m/s, which is equivalent to the noise from a refrigerator. Inside the Project away from the turbine bases, the noise is calculated at 45 dBA, which is equivalent to the noise in a library (note that in the portion of the Project that contains active oil development, the current ambient noise levels are expected to be in excess of that of the wind turbines installed within the vicinity of the oil field). Away from the Project, the noise levels decrease further. At the distance of nearby highways and towns, there is no expected noise impact.

The KDHE defines Elk County as a “Frontier County” which by definition means that there are less than 6 residences per square mile as compared to “Rural Counties” that have between 6 and 20 residences per square mile. Of the 105 Kansas counties 38 are Rural and 31 are Frontier. There are very few residences within close enough proximity to the Project to

experience noise levels in excess of the night-time background noise in a typical rural setting (20-40 db). Of the residences that may be able to hear the Project none should experience noise levels greater than that of a refrigerator (55 db). It is important to note that many of the homes shown on Figure 3.20 are participants in the Project. The conclusion from this analysis is that the proposed Project would have very minimal noise impact on residences, the surrounding area and towns.

Impacts of Project noise are also anticipated to be minimal during construction and operation on wildlife. During construction, temporary noise would be emitted, but it would be similar in nature to noise presently occurring throughout the Project area, such as agricultural equipment and oil production activities.

Figure 3-21: Noise Impacts of Project



3.14 Shadow Flicker

3.14.1 Existing Conditions

Shadow flicker occurs when the rotating blades of a wind turbine pass through the disk of the sun as viewed from a given vantage point. It is more problematic in close proximity to turbines, where the turbine blade blocks a larger fraction of the sun's disk and causes a more coherent shadow, and in northern latitudes where the sun spends more time at low altitude angles.

3.14.2 Environmental Consequences

The industry-standard calculation for determining the impact of shadow flicker is a "worst case" scenario which assumes that the sun is shining all day from sunrise to sunset, the rotor plane of the wind turbine is always perpendicular to the sun, and the turbine is always operating. Shadow flicker does not occur when the sun is obscured by clouds or fog, or when wind speeds are such that the wind turbine rotor is not rotating. Also, in reality the orientation of the turbine rotor is dependent upon the wind climate at the site and thus will not always be perpendicular to the sun. For these reasons, the real shadow flicker experienced at any location will be greatly less than the magnitudes returned by the worst case scenario.

The SHADOW module of the industry-standard WindPRO 2.7 wind project simulation model was used to calculate shadow flicker for the Caney River Wind Project. WindPRO simulates shadow flicker by calculating the position of the sun relative to each turbine for each minute of the year. The shadows cast by this simulation are then coupled with shadow receptors placed at the location of occupied residences or other vantage points to determine the number of hours per year and maximum minutes per day of shadow flicker that are experienced. The simulation model includes trees and obstacles, and treats each shadow receptor as a "greenhouse" meaning that the observer is looking in all directions simultaneously. Per the German guidelines, the model does not calculate flicker if the sun is three degrees or less above the horizon due to atmospheric diffusion.

Given its rural location, there are few occupied or able-to-be-occupied residences in the vicinity of the project. For accuracy the location, ownership, and occupancy of these residences have been field-verified. The results of the worst case shadow flicker analysis at these locations appear in Table 3-12.

Table 3-12: Shadow Flicker Analysis – Worst Case

ID	Description	Project Participation	Hours/Year	Max Minutes/ Day
A	Residence	Yes	33.3	28
B	Residence	Yes	10.5	20
C	Residence	No	7.3	21
D	Residence (Rental)	Yes	0	0
E	Residence	No	35.1	32
F	Seasonal Cabin	Yes	89.6	50
G	Residence (unoccupied)	No	0	0

Treating each house as a greenhouse is a conservative assumption, as actual shadow flicker impacts will depend on the presence and/or size of windows facing the wind project, and the amount of time building occupants spend adjacent to those windows at various times of day. Further, the assumptions of the worst case model make these results materially more severe than what will actually be experienced. For example, according to the National Climatic Data Center (NCDC), a division of US Department of Commerce, the sun is actually shining in this region only an average of 65 percent of all possible sunshine hours, which is based on 55 years of climate data from the nearby Wichita, Kansas surface observing station. Since the worst case assumption is that the sun is always shining, and the real shadow flicker will be zero when clouds are present, the worst case results can be estimated to overpredict the magnitude of shadow flicker by approximately 35 percent. Also the assumption that the rotor disk is always perpendicular to the sun will be a significant overestimation of actual flicker impacts. The largest flicker impacts are east and west of turbines, yet the predominant wind direction in this region of the country is southerly and northerly, causing rotors to most commonly be facing south or north, rather than east and west. To quantify a more realistic shadow flicker impact, the model is reinitialized with the exact same setup, except that 35 percent of sunshine hours are set to be cloudy and the wind direction rose measured on site is allowed to impact the calculation through the rotor orientation. These results are shown in Table 3-13.

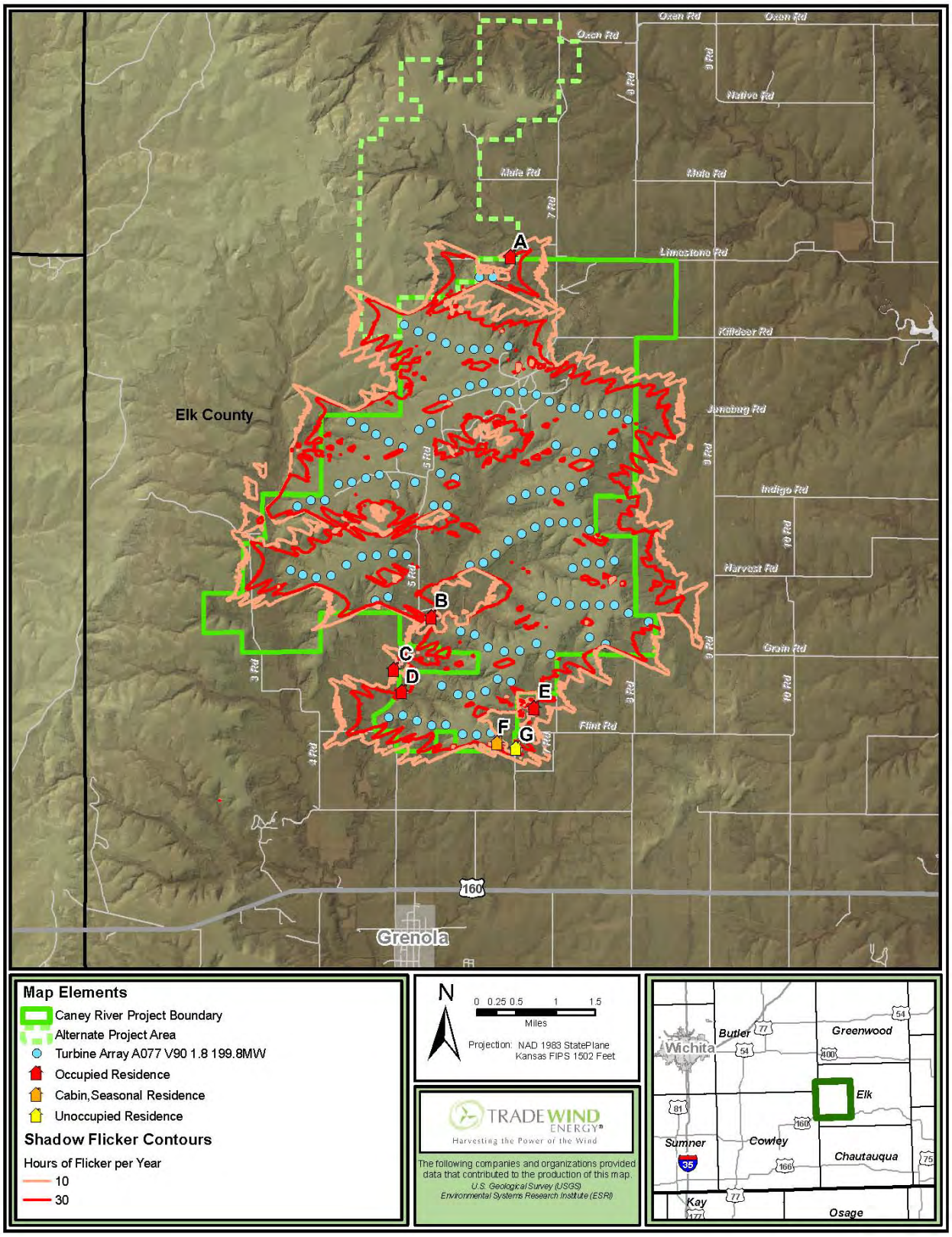
Table 3-13: Shadow Flicker Results – Real Case

ID	Description	Project Participation	Hours/Year Worst Case	Hours/Year Real Case
A	Residence	Yes	33.3	11.3
B	Residence	Yes	10.5	3.7
C	Residence	No	7.3	2.3
D	Residence (Rental)	Yes	0	0
E	Residence	No	35.1	11.6
F	Seasonal Cabin	Yes	89.6	31.7
G	Residence (unoccupied)	No	0	0

Considering these results, the real impacts of shadow flicker on the surrounding area are expected to be very low, and far less substantial than the worst case magnitudes. The reader should be mindful that these real case results still include some conservative assumptions in that they treat each house as a greenhouse (i.e. the house is all glass and the observer is always present and looking in all directions), whereas actual observed shadow flicker impacts will depend on the presence and/or size of windows in any given residence facing the wind project, and the amount of time building occupants spend adjacent to those windows at various times of day.

Currently, there are no shadow flicker standards at the United States, State of Kansas, or Elk County level. Shadow flicker is expected to have minimal impact to residences in the vicinity of the project. In the event that shadow flicker levels become a concern, simple and effective mitigation techniques are available in the strategic placement of newly planted vegetation or the installation of shutters or curtains on windows. Figure 3-21 shows the shadow flicker impact over the entire project.

Figure 3-22: Shadow Flicker Analysis



3.15 Cultural Resources

3.15.1 Existing Conditions

Prehistoric manifestations have traditionally been divided into time periods roughly based on technology and subsistence. In the eastern woodlands and Midwestern U.S., these periods are traditionally named, from oldest to youngest, Paleoindian, Archaic, Woodland, and Mississippian. However, this system is less useful on the Great Plains, and often different nomenclature is used. For example, in the most recent synthesis of Kansas archaeology, archaeologists have chosen to label the earliest period of human occupation in Kansas as the Paleoarchaic (Blackmar and Hoffman 2006), as opposed to the more commonly used separate Paleoindian and Archaic periods. This decision was made to enable "an integrated presentation that makes no prior assumptions as to whether they represent specialized big game hunters, localized foragers, or some combination of both" (Blackmar and Hoffman 2006). Additionally, the terms Woodland and Mississippian are often replaced with a "Ceramic period" subdivided, as usual, into Early, Middle and Late.

3.15.1.1 Paleoarchaic Period (ca. 10,000 BC to ca. 500 BC).

During this time period, the general subsistence pattern was that of hunting and gathering; however, within this broad characterization, there are many variations. For many years the earliest inhabitants of North America were considered to be focused on the specialized hunting of large megafauna, such as the mammoth. While this was clearly the focus of some groups, "others had much more generalized economic pursuits for part of all of their seasonal economic cycles" (Blackman and Hoffman 2006). Later cultures during this period are characterized by generalized hunting and gathering focused on locally available resources.

Kansas has great diversity in ecology from west to east, and this is reflected in the archaeological record. For example, many groups in western Kansas never adopted agriculture, while many eastern Kansas groups had economic strategies similar to those in the eastern woodlands. Currently, Elk County has no listed Paleo-Indian sites or recorded Paleo-Indian points. This is likely due to the lack of archaeological investigation in Elk County more than a true lack of points. Such sites almost certainly exist within Elk County.

The later part of the Paleoarchaic, traditionally called the Archaic, is better represented in Elk County. The Durbin site, located 6 miles to the east of the proposed Project area, is an NRHP property dating to the Archaic Period.

3.15.1.2 Early Ceramic Period (ca. 500 BC to AD 1000)

This period, also sometimes referred to as the Plains Woodland period, is characterized by the manufacture of ceramic vessels. However, use of these vessels was not adopted over the entire area at the same time. Pottery use in eastern Kansas was not adopted as early as in adjacent portions of the Midwestern U.S., and many sites in eastern Kansas that date to what would be considered the Early Woodland period in the Midwestern U.S. do not contain pottery. Evidence suggests that "the regional Early Woodland adaptation differed little from that of the Late Archaic in eastern Kansas" (Logan 2006).

Recent discoveries have demonstrated that Early Ceramic (also called Early Woodland) sites do exist in Kansas (Johnson 1992); however, few such sites have been investigated. Because of this ambiguity, the dates for the Early Ceramic period in eastern Kansas are very poorly defined, and the period may start as late as AD 1 in some areas.

The primary Early Ceramic cultural manifestation in the area at this time period is the Cuesta phase. This culture is not well defined, and may be the same as the Cooper phase in northeast Oklahoma (Logan 2006). In any case, pottery from this time period shows influence from Kansas City Hopewell cultures, which, in turn, show clear influences from cultures in the lower Illinois River valley (Logan 2006). Other defined phases dating to this period that are present in southeastern Kansas include the Grasshopper Falls and Greenwood phases. As Logan (2006) states, "the Grasshopper Falls phase…was defined without reference to the previously recognized Wakarusa and Deer Creek phases…." Likewise, the Greenwood phase seems to be very similar to the Butler phase (Logan 2006).

3.15.1.3 Middle Ceramic Period (ca. AD 1000 to 1500)

The Middle Ceramic period dates from approximately AD 1000 to AD 1500 in southeastern Kansas. The primary cultural manifestation from this time period in southeastern Kansas is known as the Pomona variant. This culture dates to approximately AD 700 to AD 1500 in calibrated radiocarbon years (Roper 2006). Pomona subsistence is poorly understood due to poor preservation and a lack of data from modern excavations. Existing data indicates the period was characterized by hunting and gathering forms of subsistence, and also some incipient horticulture, possibly including the domestication of some native species, particularly goosefoot. Pomona sites are known to exist in Elk County, although none have been recorded in the current Project area.

3.15.1.4 Late Ceramic Period (ca. AD 1500 to 1800)

The Late Ceramic period in southeastern Kansas is represented primarily by a cultural manifestation known to archaeologists as the Great Bend aspect. This culture has been well studied in Kansas, and Blakeslee and Hawley (2006) note that it is "easily the most studied archaeological complex in Kansas." Blakeslee and Hawley (2006) also report that "the Great Bend aspect began about A.D. 1425 and lasted up to the last quarter of the seventeenth century." Great Bend aspect subsistence was based on a combination of agriculture, hunting, and gathering. These cultures also date into the time of European contact in the Midwestern U.S., and European trade goods are known to occur in some Great Bend aspect sites. It is likely that at least some Great Bend aspect peoples later became one of the components of the Wichita tribe (Vehik 1992).

3.15.1.5 Historic Native American Tribes

Among the Native American tribes known to have historically resided in southeastern Kansas are the Wichita, the Kansa (after whom the State is named), and the Osage. The Wichita are known to have been in the area in historic times, and at least one division of this group seems to have developed out of what archaeologists call the Great Bend aspect (Vehik 1992).

The origins of the Kansa are less well known. As Marshall (2006) states "the archaeological record is obscure for the Kansa." Historic Kansa villages have been identified, but so far their antecedents remain elusive, and "the Kansa appear in history as a culture that had fully adapted to the horse and gun and was reliant on trade" (Marshall 2006). The primary homeland of the Kansa was located north of the current Project area.

The traditional homeland of the Osage was in southwestern Missouri. As such, it is possible that there was some Osage occupation in parts of southeastern Kansas. Additionally, in 1825 the Osage were granted a strip of land in what is now southeastern Kansas.

Several other historic Native American tribes also resided in southeastern Kansas at one time or another, including:

- Shawnee
- Sac and Fox of Mississippi
- Ottawa
- Peoria and Kaskaskia
- Wea and Piankeshaw
- Chippewa
- Potawatomi
- Miami

3.15.1.6 Euro-American History

Most of what is now Kansas was obtained by the U.S. as a part of the Louisiana Purchase in 1803. Present-day Kansas was part of the Missouri Territory from 1812 to 1821. In 1827, Fort Leavenworth became the first permanent Euro-American settlement in the State. Official Euro-American settlement of Kansas began in 1854 with the passage of the *Kansas-Nebraska Act*, although settlement had actually been occurring for some time, and political pressure had been mounting on the U.S. government to force the Native American tribes off their land. The *Kansas-Nebraska Act* established the Kansas Territory. Kansas became a state and was admitted to the Union on January 29, 1861 as a free state.

3.15.1.7 Background Research

A Phase I file search was conducted on March 16, 2007 and April 3, 2008 by Burns & McDonnell for the Project area, including areas within a mile of Project boundary. This file search was conducted electronically by accessing the Kansas SHPO online GIS database as well as visiting the Kansas State Archaeological Office and State Historical Society Library in Topeka Kansas. Seventy-three archaeological sites are registered within Elk County. No registered sites are listed within the Project area, or within one mile of the Project area. Likewise, no archaeological surveys were listed within the Project area; however, two archaeological surveys are shown as being adjacent to the Project area. One of the reports is a 2006 survey by Donna Roper titled *Phase I and II Archaeological Investigations for the Drinking Water Project, Rural Water District #2, Elk County, Kansas*, and submitted to the Midwest Assistance Program. This report was not consulted, but based on map data; it appears to have been a linear study along a road that extends along the northeastern border of the Project area. The second survey near the Project area was conducted in 2006 by David Hughes and Alicia Hughes-Jones and is titled *Archeological Investigations for the Elk River II Wind Generation Facility, Cowley and Elk Counties, Kansas*, and was submitted to Terracon, Inc. and Greenlight Energy, Inc. The report for this survey was not consulted, but appears to have been a linear survey along roads, and terminated at the western boundary of the current Project area.

All four of the NRHP properties listed in Elk County, Kansas are located more than a mile away from the Project area. The Durbin archaeological site is located approximately six miles to the southeast of the eastern boundary of the Project area. The Elk Falls Pratt Truss Bridge is located in Elk Falls and is located approximately 10 miles east to southeast of the eastern boundary of the Project area. The Grenola Mill and Elevator are located in Grenola and are

approximately two miles south of the southern boundary of the Project area. The Elk River Archaeological District is predominantly located in Montgomery County, and only extends into the southeastern corner of Elk County. This district is approximately 19 miles southeast of the eastern border of the Project area.

3.15.1.8 Phase II Cultural Resources Field Survey

In addition to the Phase I file searches that were completed for the Project, Burns & McDonnell conducted a Phase II cultural resources survey for the Project (Figure 3-8) on May 4 - 5, 19 - 20, 2008, October 28 - 29, 2008, March 4, 5, 15 - 16, 2010, April 2 – 4, 2010, and August 2010 for the high probability areas of the proposed 200-MW layout. A total of 2,227 acres near and adjacent to Project facilities was surveyed. All work was conducted in accordance with the Secretary of the Interior's *Standards and Guidelines for Archaeology and Historic Preservation (*48 FR 44716-44742*)* and the *Secretary's Standards for Identification* (48 FR 44720-44723). Intensive visual inspection of the ridges revealed extensive evidence of early twentieth century to current oil field activities and the recently demolished remains of a ranch house and associated complex. Ten archaeological sites consisting of three prehistoric artifact/lithic scatters, two prehistoric secondary quarry and workshops, three historic homesteads (two ranch houses and a dugout), a historic trail/road, and a rock cairn of unknown age or cultural affiliation were recorded during the investigations. In addition, architectural properties within one-half mile of the turbine array were surveyed on March 4, 2010. A total of 10 architectural properties were identified within the one-half mile architectural survey area. Four properties were plotted on the 1964 quadrangle map and three of these were also on old maps dating to 1885 and 1903. Of the four properties, all the structures at two sites were modern construction within the last 15 years. Both of the two remaining properties were farmsteads that had been abandoned for some time and most of the buildings were in a state of disrepair. Neither of these properties met the criteria for inclusion in the NRHP. The three archaeological sites identified during the first three investigations (14EK102, 14EK103, and 14EK104) were all determined to be not eligible for inclusion in the National Register of Historic Places (NRHP) and the SHPO concurred. The remaining seven sites (14EK105, 14EK106, 14EK107, 14EK108, 14EK109, 14EK110, 14EK111) and the documentation of the architectural properties have not been reviewed by the SHPO as of August 5, 2010. It is the opinion of the Principal Investigator that four (14EK106, 14EK108, 14EK110, 14EK111) of the six remaining sites and all ten of the architectural properties are not eligible for the NRHP. The rock cairn (Site 14EK107) and the historic dugout site (Site 14EK109) were recommended to avoid by construction. The rock cairn is outside of

the Project footprint and would be avoided by a 165' buffer. The historic dugout is approximately 300' outside the temporary and permanent construction impact corridors. TVA provided the Cultural Report to SHPO and by letter date October 28, 2010, SHPO found the report to be acceptable and concurred that the archeological sites 14EK106, 14EK108, 14EK110, 14EK111, and 14EK112 along with both architectural properties are not eligible for listing in the National Register of Historic Places. SHPO also noted that all recorded and/or identified cultural resources will be avoided by construction and use of the Project. SHPO concurred that the proposed project will have no effect on historic properties as defined in 36 CFR 800.

3.15.2 Environmental Consequences

Under No Action, existing conditions and trends for cultural resources would continue. Under the Proposed Action Alternative, no recorded, registered, eligible, or potentially eligible sites would be directly impacted by the Project; however, direct impacts to unknown cultural resources that could occur on-site could include the inadvertent destruction or loss of cultural features due to land disturbing activities. The following procedures will be followed should cultural materials be discovered during the course of construction. First, all construction work within 100 feet of the discovery spot will cease. Work on the rest of the project may continue as normal. The artifacts or other materials discovered will not be handled unless absolutely necessary. The area will be fenced or flagged off to protect it from further damage. Within 15 minutes of the discovery, the resident construction manager will be called and informed of the find. The construction crew will provide the construction manager with as detailed a description as possible of what was found, including, most importantly, the presence of bones. If there are bones present, and those bones could potentially be human, the construction manager will call the appropriate county sheriff immediately. The state unmarked burial law (KSA 75-2741 -75-2754) would be applicable. As the area could be the scene of a crime, no one will enter the area unless absolutely necessary. Once the Sheriff has determined that the remains either do not contain human remains, or that said remains are ancient and not the result of a crime, the Kansas State Archaeologist will immediately be called. The State Archaeologist will then convene the Unmarked Burial Sites (UBS) Board who will determine proper disposition of the exposed remains. While this determination is being made the area of the finds will be protected from further disturbance. By letters dated April 3, 2009, and September 1, 2009, the Kansas State Historic Preservation Office informed Caney River LLC that the proposed Project would have no effect on historic properties. TVA subsequently conducted consultation with the

Kansas SHPO and additional information gathered during the 2010 field surveys was submitted to SHPO for concurrence. By letter dated October 28, 2010, the Kansas State Historic Preservation Office informed TVA that the proposed Project would have no effect on historic properties.

3.16 Land Use

3.16.1 Existing Conditions

All land within the Project area is privately owned. Elk County is not zoned and does not have a land use plan. The principal land uses within the Project area are rangeland, oil production, and hunting. Hunting on the private land of the area occurs occasionally, but the area is not used by the general public as a recreational area. The Project site is pasture used for cattle grazing. Scattered oil pump jacks and oil storage tanks are in the central and northeastern part of the property. A network of unpaved oil field access roads and private farm roads traverse the proposed Project site. These connect to county roads off of the property. Recreational use of the proposed Project area and adjacent areas is limited to hunting. A 345-kV electric transmission line operated by Westar extends from northwest to southeast across the northern portion of the proposed Project area. A natural gas line extends from southwest to northeast across the central portion of the proposed Project area.

3.16.2 Environmental Consequences

Under the No Action Alternative, existing land uses would remain the same. Under the Proposed Action Alternative, landownership would not change as a result of the Project, with the exception of a small amount of land needed for the interconnection switchyard (7.5 acres), which would be purchased by Caney River.

Electric power generation would be added as an additional land use. The Project would result in the loss of a minor acreage (83 acres) of rangeland and wildlife habitat. However, all other existing land uses would continue as they are prior to development including ranching (cattle, horses, etc), grazing, hunting, oil and gas production, and other uses consistent with the culture in the region.

3.17 Transportation

3.17.1 Existing Conditions

To the south of the proposed Project, US 160 provides east-west access through the region. A network of county roads is adjacent to the Project site, and one county road crosses the Project

site. The only FAA-regulated airport within 10 miles of the Project boundary is the Elk County Airport (2K6), which is approximately 6 miles east to southeast of the Project area.

3.17.2 Environmental Consequences

Under the No Action Alternative, current conditions and trends in existing transportation infrastructure would continue. Under the Proposed Action Alternative, existing roads would be maintained and improved through the implementation of a road maintenance agreement between Caney River and Elk County (Appendix C). Existing roads are rural county roads. The proposed Project would include the construction of 111 WTGs and associated facilities for a 200 MW wind project. The total Project size is 13,618 acres. To minimize surface disturbances, the Project design follows existing county and private roads where possible. Additionally underground collection lines are routed alongside road improvements and the power collection system is buried unless physically or technologically limited. Specific facilities, estimated construction disturbances and LOP footprint are listed in Table 2-2. Using an estimated average vehicle occupancy rate of 1.3 persons, about 114 vehicles would travel to and from the site daily to transport the construction workforce for a period of up to 12 months. The average number of daily vehicle trips to the site for delivery of equipment and materials would be about 60 vehicles, while the number of vehicles actually working on-site would be about 24. During normal O&M activities, one or two four-wheel-drive pickups would travel daily to and from the site. Snow removal equipment (trucks equipped with wing-style blades) would be used as needed.

Construction-related traffic would be restricted to routes approved by Caney River and in agreements with private landowners. Large pieces of equipment such as rotor blades are oversized loads that may temporarily slow traffic as they are moved into the Project area. Materials used to construct WTGs and associated facilities would be delivered via one primary access (i.e., haul) route. The route could require road improvements such as repair, replacement, or protection of culverts and bridges; specifically three bridges along Killdeer Road. In lieu of repair or replacement, infrastructure protection measures could be utilized by placing steel plates or concrete slabs over roadway bridges and culverts as their condition requires in support of heavy-haul vehicular traffic. In addition, road grading and road expansion would likely be needed around corners, in sections of narrow travel way, and at road intersections. If available by way of county and landowner approval, any road or intersection expansions needed to accommodate heavy-haul vehicular traffic would potentially remain in-place during the life of the Project.

The access point originates from K-99 in Howard and follows Washington Street through town until it meets Cherry Street. The route then continues north on Cherry until it meets the intersection of CR 116 (Limestone Road). From this intersection the route continues west all the way to Road 9. The route then follows south along Road 9 until it reaches Killdeer Road. From Killdeer Road, the route follows west until it reaches the access point at the intersection of Road 7 and Killdeer Road.

The layout of the proposed Project is designed to take advantage of strong winds within the proposed Project area. WTGs, associated facilities, and access roads are situated on ridge tops. The layout of the proposed Project has been revised to avoid existing environmental conditions such as wetlands and stream crossings, and to utilize existing infrastructure, such as county and landowner roads.

In order to minimize surface disturbance, Caney River considered and utilized existing roads to the maximum extent possible in the Project design. Remaining two-track roads not converted to Project roads would be allowed to revert back to natural conditions to the extent landowners are able to utilize Project roads for existing operations. Caney River would also utilize compacted native soil road shoulders and would rockpick, decompact, recontour and reseed (with NRCS-approved seed mixture) upon completion of construction. During construction, corridors would be specified for vehicle and construction traffic to keep impact to a minimum and avoid off-road travel. Silt fencing would be utilized in areas under construction as needed to control erosion and runoff.

Temporary facilities may include an aggregate quarry, a concrete batch plant, and laydown yards (Figure 2-1). The aggregate quarry, if economically viable for construction and use in association with the Project, is estimated to be about 50 acres in total size. A concrete batch plant operation would be co-located at the aggregate quarry or separately as a temporary 5-acre facility near a laydown yard. The Project may utilize up to two lay-down yards covering about 5 acres each.

This would be a short-term, direct impact during the construction phase. Large pieces of agricultural equipment and trucks are common in the Project area, and the introduction of additional large equipment associated with the Project would have minor impacts on transportation. Large pieces of equipment may occasionally impact transportation during the O&M phase, but most O&M traffic would consist of pick-up trucks and medium-sized trucks

similar to those presently used for agricultural activities. The increase in traffic would not cause a major change in the transportation network in the Project area. A large equipment haul route for use of County and local roads has been completed and approved by Elk County Commissioners. For haul routes on state or interstate highways, a turbine transport company will make the necessary permit application for use of these routes and consult with state departments of transportation along the delivery route. Wind energy facilities across the country utilize the existing state and federal highway network to transport large pieces of equipment from a variety of locations. As the area is currently utilized for mainly agricultural purposes, large agricultural vehicles such as cattle and horse trailers, tractors, combines, and transport of other large farm machinery are common sites utilizing federal, state, and county roads near the proposed Project.

The land disturbances associated with permanent LOP facilities, as well as with temporary facilities, are greater than the facilities themselves as a result of their associated construction activities (Table 2-2). In regards to the turbine foundations, it is assumed that there would be approximately 2 acres of temporary disturbance at each turbine resulting from foundation excavation, soil stockpiling, turbine component staging, as well as from crane and various construction vehicle operations. In areas where soil stabilization measures were required to support tower erection, these temporary impacts would be mitigated by use of soil decompaction and reseeding efforts.

Subsurface facility installations (e.g., electrical collection system, communications) may result in temporary impacts up to 10 feet wide to accommodate construction vehicle movements, and trench excavations up to 2 feet wide. Impacts outside of the trench excavation limits would largely be self-mitigating in that little soil compaction would occur as these facilities are being installed. The trench itself would be backfilled with either native soils or an engineered aggregate. The trench would be capped with up to 6 inches of topsoil and reseeded with native plants as necessary. Construction corridors would be designated to keep all construction activity surface disturbances minimized. Existing roads within the Project were incorporated into the design to the extent practicable. After construction, two-track roads that are not used for continued wind project, cattle, or petroleum operations would be allowed to revert to natural conditions.

Caney River provided the FAA with Notices of Proposed Construction or Alteration for representative WTG locations. “Determination of No Hazard to Air Navigation” certificates are in place for all WTG locations.

3.18 Socioeconomics

3.18.1 Existing Conditions

The KDHE defines Elk County as a “Frontier County.” This means that there are less than six residences per square mile as compared to “Rural Counties” that have between six and 20 residences per square mile. In 2008, of the 105 Kansas counties, KDHE listed 38 as Rural and 31 as Frontier.

3.18.1.1 Population

In 2009, the estimated human population in Elk County was 3,001 (US Census Bureau 2009). This represents a steady decrease over the last 15 years. The 2000 population estimate was 3,261, as compared to the 1990 estimate of 3,327. In the State of Kansas, there was an estimated population of 2,688,418 in 2000 and an estimated 2,477,574 in 1990. There was an overall increase of about 8 percent in the State of Kansas, whereas in Elk County, there was an overall decrease of 2 percent during the same time period.

3.18.1.2 Economic Characteristics

In the 2000 Census, the median household income earnings were $27,267 for Elk County as compared to the U.S. median of $41,994, a 65 percent difference between the County and the national level. According to the United States Department of Commerce Bureau of Economic Analysis, Elk County had a per capita personal income (PCPI) of $22,163 in 2006. This PCPI ranked 101st in the state out of 105 counties and was 64 percent of the state average, and 60 percent of the national average. The 1996-2006 average annual growth rate of PCPI was 2.8 percent. The average annual growth rate for Kansas and the United States was 4.3 percent. The total personal income (TPI) for Elk County in 2006 ranked 96th in Kansas and accounted for 0.1 percent of Kansas’ state total. The average annual growth rate of TPI from 1996-2006 in Elk County was 1.9 percent. The average annual growth rate for Kansas was 4.8 percent and 5.4 percent for the United States. Earnings of people employed in Elk County decreased from 2005 to 2006 at a rate of 6.5 percent. Elk County is one of the poorest counties in Kansas.

3.18.2 Environmental Consequences

Under the No Action Alternative, existing population and economic conditions in Elk County would remain the same or slowly decline over time, as has been the trend in recent years. Under the Proposed Action Alternative, additional jobs and tax revenue would be provided to Elk County (Table 3.14). Caney River has committed through an agreement signed in December 2008 to provide Elk County with payments in lieu of taxes that would substantially improve county finances, adding in excess of $1 million per year (escalating at 2 percent annually) to the existing county budget of $2 to $2.5 million per year (Appendix B). Substantive improvements and additions to the existing Elk County road network would also occur because of Caney River. Caney River has committed through an agreement signed in December 2008 to a Road Maintenance Agreement with Elk County (Appendix C). Wind power development would offer a new source of short-term employment during construction and long-term employment during operations and maintenance. The Project has the potential to add to the supply of electric power in the area and is anticipated that it would support some expansion of the local economy from the increases in jobs and income. Landowner lease payments are estimated to be in excess of $1 million per year. Recent studies indicate that wind farms appear to have a minimal or at most transitory impact on real estate values. Hoen et al. (2009) found that "neither the view of the wind facilities nor the distance of the home to those facilities is found to have any consistent, measurable, and statistically significant effect on home sales prices."

Table 3-14: Local Economic Benefits to Elk County

Local Economic Benefits ***	200 MW Year 1	200 MW – 20 years Net Present Value
New Direct Jobs Created *	50	50
New Direct Payroll Generated *	$4,200,000	$84,000,000
New Tax Revenue **	$920,000	$22,353,580
New Landowner Payments **	$2,427,400	$33,082,000
Natural Environment Conservation Plan **	$5,000,000	$5,000,000
Indirect Local Impact *	$1,200,000	$24,000,000
Construction Jobs Created *	267	NA
Construction Impact to Local Economy	$37,200,000	$37,200,000
Total	**$50,947,400**	**$205,635,580**

*National Renewable Energy Lab
**TradeWind Energy, LLC

***Does not include economic multiplier

Approximately 267 workers would be required for an estimated 275 days during Project construction (Table 3-15); 150 of these workers would likely be local. . This constitutes a temporary increase of 9.5 percent to employed workers in the county during construction and a 0.3 percent for the long term according to 2008 census data. Specialty Project construction workers would make up about 20 percent of the work force (62 jobs) and would likely come from out-of-state. Substation construction would require approximately 20 people for 150 days. Following construction, about 35 people are estimated to be required for 150 days to complete site reclamation. O&M activities would require eight full-time personnel; two to three of these individuals would be on-site at any given time.

Table 3-15: Estimated Employment Requirements

Labor Category	Estimated Number of Workers
Project Construction	
Carpenter/form setter	15
Cement finisher	15
Cement, rebar	22
Electrician, helper	22
Electrician, industrial	22
Electrician, master	15
Laborer	12
Structural steel worker	50
Equipment operators	12
Substation Construction	
Carpenter/form setter	2
Cement finisher	2
Cement, rebar	2
Electrician, helper	4
Electrician, industrial	8
Electrician, master	2
Reclamation	
Equipment operator	35
Operations and Maintenance	
Technician	8

Residents within 60 or more miles can be expected to take advantage of employment opportunities during construction. Non-local workers needed for construction would use temporary housing. Because of the rural nature of the county, most of these workers would be expected to obtain temporary housing in Wichita, approximately 60 miles to the west of the proposed Project. Approximately 7,000 hotel rooms are available in the Wichita area.

According to the Kansas Travel and Tourism Division website (http://www.travelks.com/), a major tourism attraction in the vicinity of Howard and the proposed Project is Ferrell Ranch, the site of the Elk River Wind Project (See www.ridetheflinthills.com). This business sells riding and hiking passes to a 10,000-acre ranch where wind turbines are located. No other sites are listed near the proposed Project. The economic development agencies in Elk County and Greenwood County both support the proposed Project. As a result of these considerations, it does not appear that there would be an effect on existing tourism and recreation. In 2004, the Kansas Travel and Tourism Division commissioned a report on the economic and tourism effects of siting wind energy developments in natural areas of Kansas. Although the FERMATA report did not include Elk County, it recommended that the Flint Hills be promoted as an icon destination for Kansas. The tourist to be attracted was characterized as the nature tourist. The report recommended the establishment of three classes for tourism development in the Flint Hills. Class I areas were internationally or nationally protected areas. Class II areas were public lands or lands owned by private conservation organizations. The FERMATA recommendations were not implemented. However, the proposed project would be consistent with the FERMATA recommendations. In Classes I and II, wind development would not be allowed within a five-mile buffer of parks and public lands (FERMATA 2004). However, the proposed Project is not near parks and public lands and would be in the Class III area, where wind energy development would be allowed.

Based on the experience of wind farms in other areas, and the nearby Elk River Wind Project, it is possible that the Project would add to tourism in the area, which can be perceived as a beneficial impact. Many rural areas in the U.S. have noted increases in tourism after wind projects have been installed, as have scenic areas in Denmark, the world's leader in percentage of national electricity supplied by wind (http://www.awea.org/faq/wwt_environment.html). Local governments frequently decide to install information stands and signs near wind projects for tourists and wind projects are regularly featured on post cards, magazine covers, and Web pages to promote tourism.

Because the land where the proposed Project is located would continue to be owned by ranchers, traditional activities such as cattle grazing would be allowed to continue. As a result, traditional ranching culture would continue in the area.

3.19 Environmental Justice

Environmental justice concerns may arise from human health or environmental effects of a project on either minority or low-income populations. The need to identify environmental justice issues is stated in EO 12898, entitled "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations." Although this EO does not apply to TVA, it does consider potential environmental justice impacts from its proposed actions as a matter of policy. A Presidential Memorandum accompanying the EO directed agencies to incorporate environmental justice concerns in their NEPA processes and practices.

3.19.1 Existing Conditions

Environmental justice issues are identified by determining whether minority or low-income populations in the Project area are meaningfully greater than for Elk County as a whole. If so, disproportionate effects on these populations would be considered.

For the purposes of analyzing the Project, minority populations are identified by comparing the percent minority residents for the census block group within the Project vicinity to the percent for Elk County as a whole. CEQ guidance (CEQ 1997) states that minority populations should be identified when the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population. If the minority population of the census block group exceeds the county level by more than ten percent, it is considered to be "meaningfully greater" for the purposes of this analysis. Minority residents comprise a smaller percentage of the population in Elk County as compared to the State of Kansas as a whole. The minority population of the Project area census block group is slightly lower than that of the county (Table 3-16).

Table 3-16: Environmental Justice

	Total Population	Minority	Below Poverty, 1999
Kansas	2,688,418	16.9%	9.6%
Elk County	3,261	5.5%	13.4%
Block Group 2, Census Tract 9951	527	4.9%	9.3%

Source: U.S Census Bureau, 2000 Census

Low-income populations are identified by comparing the percent of the population with incomes below established poverty levels for the census block group within the Project vicinity to the percent below poverty for Elk County as a whole. If the low-income population of the census block group exceeds the county level by more than ten percent, it is considered to be an area of environmental justice concern. As indicated in Table 3-16, Elk County has a higher poverty rate than Kansas. The poverty rate for the Project area census block group is similar to that of the state and less than the rate for the county as a whole.

3.19.2 Environmental Consequences

Environmental justice impacts would be considered significant if the Project had a disproportionate impact on minority or low-income residents. Although low income communities are present in the County, they are not present in the immediate Project area, and under the No Action Alternative or the Proposed Action Alternative, no minority or low income communities would be disproportionately adversely affected.

3.20 Managed Areas and Ecologically Significant Areas

3.20.1 Existing Conditions

Walk In Hunting Areas (WIHA) properties are privately owned land made available to the public to hunt upland game birds, deer, waterfowl, and/or furbearers. Two WIHA are located about a mile east of Caney River. One WIHA is located in the southwest corner of the Project area. The closest managed area is the Butler State Fishing Lake about 6 miles northwest of the Project. Other nearby public recreation lands in the Flint Hills ecoregion are Fall River Lake State Park, about 25 miles to the northeast; and El Dorado State Park, about 30 miles to the northwest. Fall River and El Dorado Reservoirs are managed by the USACE, with recreation facilities operated by the state park system.

Adjacent to the southwest corner of the Project is an ecologically important tallgrass prairie as recognized by the state of Kansas. This area is not under lease for a wind farm. Although not state or federally protected, the area supports a high-quality population of big-bluestem grass , Indiangrass, little blue stem, and associated wildlife.

The Caney River headwaters are located in the property proposed for the Project. The Caney River is listed on the Nationwide Rivers Inventory (NRI) because of its scenic, recreational, and geologic features. The river is noted for its traverse of 56 miles from the source to the Kansas/Oklahoma state line through an undisturbed woodland and tallgrass prairie ecosystem, excellent seasonal canoeing, excellent sport fishery, significant limestone outcrops and unusual formations, and old trail crossings. These features are downstream and more than 10 miles to the south of the proposed Project site. The NRI is maintained under Section 5(d) of the Wild and Scenic Rivers Act of 1968 and identifies potential national wild, scenic, and recreational rivers. According to a 1979 Presidential Directive, each federal agency shall, as part of its normal planning and environmental review process, take care to avoid or mitigate adverse effects on rivers identified in the NRI.

3.20.2 Environmental Consequences

Under the No Action Alternative, existing conditions and trends for recreational resources would continue. Under the Proposed Action Alternative, there are no managed areas or ecologically significant sites within the Project area, and no facilities are planned in any of the areas. With implementation of the Project site layout, design features, and BMPs identified in Section 3.8.2, the Project facilities would not affect the Caney River or the values that prompted its inclusion on the NRI. Facilities are located at the upper end of the Caney River watershed and facilities would not cross the Caney River. The access road for equipment is from the east at Howard, meaning that there would be no road crossings or improvements across the Caney River. The wind turbines are located on ridge tops and the substation and transmission facilities would interconnect with the Westar transmission system to the north of the Caney River. Because there would be no potential to impact the Caney River or values that led to its inclusion in the NRI and in accordance with published CEQ guidelines, consultation with the NPS is not needed.

3.21 Hazardous Materials

3.21.1 Existing Conditions

A Phase I Environmental Site Assessment was performed for the proposed Project area in 2009. Oil well operation in the proposed Project area has left a spill on a small portion of one area near an oil well. Oil development dates to at least 1918. Small areas (15 square feet) of stained soil and stressed vegetation are present at one site in the southwestern portion of the Project area (West Eagle Head Ranch).

3.21.2 Environmental Consequences

Under the No Action Alternative, existing hazardous waste issues with the oil industry would remain on the Project site. During construction and operation of the Project under the Proposed Action Alternative, Caney River would maintain files containing current Material Safety Data Sheets (MSDSs) for all chemicals, compounds, and/or substances that would be used during the course of construction and operation. Caney River would review the Consolidated List of Chemicals Subject to Reporting Under Title III of the *Superfund Amendments and Reauthorization Act* of 1986 (SARA), as amended, and the List of Extremely Hazardous Substances as defined in 40 CFR 355, as amended, to identify any hazardous substances proposed for use on this Project. Caney River and its contractors would comply with all applicable hazardous material laws and regulations existing or hereafter enacted or promulgated. Caney River and its contractors would locate, handle, and store hazardous substances in a manner that prevents contamination of soil and water resources or otherwise sensitive environments. Any release of hazardous substances (e.g. leaks, spills, etc.) in excess of the reportable quantity, as established by 40 CFR 117, would be reported as required by the *Comprehensive Environmental Response, Compensation, and Liability Act* of 1980 (CERCLA), as amended. If the release of a hazardous substance in a reportable quantity occurs, a copy of the report would be furnished to appropriate federal and state agencies.

Prior to moving construction vehicles or re-fueling equipment on-site, Caney River would develop and implement a Spill Prevention, Containment, and Countermeasure (SPCC) Plan as warranted. The plan would contain accidental discharge reporting, cleanup, and maintenance procedures. Copies of the plan would be available to all appropriate Caney River personnel, contractors, and field workers. Copies of the plan would also be kept, together with a Hazardous Communication Program at Caney River's Lenexa, Kansas office or the home office of the current owner of the Project. SARA Title III (community right-to-know) information would be submitted annually as

required and copies would be retained in Caney River's office. A waste minimization plan would not be required since Caney River would not generate hazardous waste; however, Caney River would use BMPs to minimize the amount of all wastes generated.

Hazardous chemicals contained in diesel fuel, gasoline, hydraulic fluids, and coolant (ethylene glycol) would not be stored near waterways or wetlands. Vehicle refueling or routine maintenance activities would also not occur near waterways or wetlands. When work is conducted in and adjacent to waterways or wetlands, fuels and coolants would be contained in the fuel tanks and radiators of vehicles or other equipment. Vehicles and equipment would be well maintained, thereby reducing the probability of a leak or spill.

3.22 Cumulative Effects

3.22.1 Area in Which Proposed Project Would Be Felt

For air resources and socioeconomic resources, the area assessed includes the county affected, Elk County. For aquatic resources, the area in which Project impacts would be felt includes the subbasins of the Caney River and Elk River in the vicinity of the Project site. This includes Caney River downstream to Hulah Lake and Elk River downstream to Elk City Lake. For terrestrial resources, the area assessed includes the ecoregion where the facilities are to be located. Ecoregions denote areas of general similarity in the type, quality, and quantity of environmental resources. The Project is within the Flint Hills Ecoregion. Because the Flint Hills is a relatively large area, the southern Flint Hills is emphasized. The Flint Hills ecoregion is noted for its relatively undisturbed tallgrass prairie habitats.

3.22.2 Impacts Expected from the Proposed Project

The proposed Project would be designed to minimize direct and indirect adverse impacts to environmental resources. Specific cumulative impacts are provided in Table 3-17.

Table 3-17: Summary of Potential Cumulative Impacts of Caney River

Resource	Cumulative Impacts of other sources	Contribution of Proposed Action to Cumulative Effects
Tallgrass Prairie Vegetation	Flint Hills Ecoregion contains large acreages of tallgrass prairie; Project site contains heavily grazed, burned, and fragmented, but intact, tallgrass prairie. Foreseeable development impacts in southern Flint Hills from industrial parks and other activities about 2,000 acres	Permanent impacts to tallgrass prairie of 83 acres; minor compared to total tallgrass prairie on Project site and Flint Hills ecoregion. The Caney River Wind Project would not likely cause or contribute to further decline in tallgrass prairie and with implementation of mitigation and conservation measures would have measureable but insignificant direct, indirect, and cumulative effects on the overall ecosystem. Because of the characteristics of a wind facility in comparison to other land uses and the measures that Caney River has proposed, habitat quality could improve on-site over time. By promoting more natural burning regimes and providing incentives for prairie restoration, the Project is intended to promote tallgrass prairie restoration efforts. Mitigation of impacts is accomplished via the NECP including but not limited to 6,000 acres of restoration (3,000 on-site and or Red Buffalo Ranch and 3,000 within the FHLCA), and 18,164 acres of perpetual conservation easements: 8,164 acres on Red Buffalo Ranch, and10,000 acres located within the FHLCA.
Greater Prairie Chicken and Grassland Birds	Conversion of tallgrass prairies to agriculture reduced or degraded nesting habitat, causing a decline in populations. Hunting in the late 1800's and early 1900's was the primary activity that nearly drove the GPC to local extinctions. A decline in the GPC population in Kansas of approximately 65 percent in the last 20 years, roughly correlating with the implementation of intensive stocking regimes for grazing in the early 1980s,	No GPCs located within the Project boundary during lek survey period, however proximity to better off-site habitat means some GPC are likely to occur in the general vicinity. Cumulatively, net mitigation for the project in all evaluated scenarios (Figure 3.4 inset tables) results in a net positive impact to tallgrass prairie and grassland bird habitat through a combination of restoration and conservation efforts.
Visual	Existing Elk River wind farm is visible in the area;	Minor; Wind turbines would be visible from points to the southwest; Project is not visible from nearby towns, from the "Heart Of the Flint Hills," or US 400; ridges block views from the west and from Flint Oak Hunting Resort; Project is minimally visible from K-99 and US 160

Resource	Cumulative Impacts of other sources	Contribution of Proposed Action to Cumulative Effects
Threatened and Endangered Species	Three species are federally listed as endangered and one is federally threatened in county	None. Listed species do not occur on-site.
Geology, Geologic Hazards, and Mineral Resources	Existing oil production; area is in a low earthquake hazard area	None
Paleontology	No important fossil beds known from area	None to minor; there is the possibility that marine vertebrates could be present.
Soils and Prime Farmland	Rural area and frontier county; little pressure to convert prime farmland soils in Flint Hills	Minor; permanent impacts to 65 acres of prime farmland soils.
Surface and Groundwater	Some stream impairment from intensive grazing	Minor temporary effects, none long-term.;
Floodplains	Rural area and frontier county; little pressure for floodplain development or floodplain projects	Access roads would cross floodplains; crossings are perpendicular to floodplain and replace existing crossings; floodplain footprint and impacts have been minimized. Efforts described in Section 3.9 have avoided and minimized potential effects to the point that remaining actions have no practicable alternative and so comply with the Floodplain Executive Order.
Wetlands and Streams	Rural area and frontier county; little pressure to alter wetlands and streams	Minor as a total of approximately 0.1 acres of wetlands would be permanently impacted in three sites and a total of 94 linear feet of streams would be permanently impacted in five different sites
Noxious Weeds	Field bindweed and bull thistle are problems in Kansas	None to minor. Small construction footprint and commitments to use weed control practices
Non-Game Birds	Rural area and frontier county; little pressure on non-game birds other than that provided by intensive grazing and annual burning	Minor; Risk of avian collisions minimized by slow rotation and un-guyed tubular towers; risk of mortality is low. Minor habitat fragmentation offset by mitigation and conservation measures.
Migratory Game Birds	Some waterfowl use on Federal Reservoirs such as Fall River Lake and El Dorado Lake more than 20 miles northeast and northwest of the project, respectively; little cumulative pressure on waterfowl and other migratory birds in area	Minor as there is little cumulative pressure on waterfowl and other migratory birds in area

Resource	Cumulative Impacts of other sources	Contribution of Proposed Action to Cumulative Effects
Bats	Little bat foraging and roosting habitat in area	Risk of bat mortality is low
Air Quality	Rural area and frontier county; few air emissions sources	Beneficial during life of Project due to offsetting of generation from fossil fuels and reduced emissions of greenhouse gases
Noise	Rural area and frontier county; few noise sources in area other than operation of oilfield equipment	Minor; few nearby residential receptors
Cultural Resources	Rural area and frontier county; few ongoing impacts to properties in area	Likely none as all recorded and/or identified cultural resources will be avoided by construction and use of the Project
Land Use	Existing agricultural and oil production continue at low levels	Minor; current land uses would continue
Transportation	Rural area and frontier county; no level of service issues with current activities	Beneficial improvements of culverts and short sections of existing county roads to facilitate equipment movement; no hazard to air navigation
Socioeconomics	Project in “Frontier County” with less than six residences per square mile	Beneficial Project would add in excess of $1 million to existing county budget of $2 to $2.5 million per year; landowner lease payments in excess of $1 million per year
Environmental Justice	No issues identified with other projects in rural area and frontier county	None
Managed Areas and Ecologically Significant Areas	No other projects identified affecting public lands, ecologically significant tallgrass prairie tracts, or Nationwide Rivers Inventory rivers	None to minor with effects offset by conservation and mitigation measures of NECP
Hazardous Materials	Existing oil field issues	Minor. Chemicals associated with vehicles and equipment would be managed in compliance with all applicable laws and regulations

3.22.3 Other Past, Present and Reasonably Foreseeable Future Actions

Past activities have primarily involved agricultural improvements, highway and railroad construction, oil field development, and reservoir construction. In the immediate vicinity of the proposed Project, two small lakes are present on the East Fork Caney River and Caney River, and numerous small ponds dot eastern Butler and Cowley counties to the west. The Elk River Wind Power Project in eastern Butler County is to the northwest of the proposed Project. In

western Butler County near El Dorado and Wichita, several small industrial developments and industrial park sites are located in close proximity to I-35 on the western edge of the Flint Hills. Also, several industrial parks are located near Arkansas City and Winfield in the Flint Hills to the southwest of the proposed Project. These small industrial developments could provide expansion sites for future industrial development. There are several larger federal lakes in the southern Flint Hills that have affected aquatic and terrestrial communities, including El Dorado Lake, Fall River Lake, and Kaw Lake. Oil well development and operation during the 20th century has resulted in a network of roads and wellhead sites in Elk County and other parts of the southern Flint Hills.

3.22.4 Impacts from Other Actions, and Overall Impacts

The Elk River Wind Power Project, as well as the small industrial developments around the peripheries of the southern Flint Hills, has likely cumulatively affected terrestrial habitats of the Flint Hills. The total site size for the Elk River wind project is 7,907 acres, of which about 160 acres are occupied by project facilities. The Elk River project also includes a 4.2-mile transmission line and 20 miles of roads. The magnitude of the small industrial developments, such as business parks, around the periphery of the southern Flint Hills, is probably less than 2,000 acres over the five-county area. There would be some minor cumulative effects to terrestrial habitats from the approximately 200 acres of additional temporary and permanent land disturbance produced by Caney River, when combined with existing land disturbances due to agricultural and oil well development and operation.

More widespread impacts to terrestrial habitats have occurred from agricultural practices. Limited acreage is in row crop production, but extensive acreage is used for grazing. The annual spring burning regimes and associated intensive cattle stocking and grazing have impacted the tallgrass prairie habitat, but because plowing has not taken place, the habitat could be quickly restored. As discussed in Section 3.1.3.1, the overall pattern of cumulative effects to the condition of particular fragmented areas resulting from multiple sources is represented by the condition of two by two mile blocks depicted in Figure 3-4.

Aquatic impacts leading to several impaired stream reaches in the Elk River basin are likely the result of agricultural practices. With the use of appropriate BMPs for erosion and sediment control, the land disturbances caused by the Project, primarily on ridge tops, would not make stream impairment issues worse.

Remaining socioeconomic and aesthetic impacts of the Project would primarily be localized in impact and would not likely produce cumulative effects such as time crowding, space crowding, or synergistic effects.

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4.0 COMMITMENTS, CONSERVATION AND MITIGATION MEASURES

The following commitments, mitigation and conservation measures would be applied to avoid, reduce, or eliminate impacts related to the Project. As appropriate, these measures would be implemented for the Caney River Wind Project under the contingencies identified below.

As has been incorporated into general features, the Project is deigned to withstand earthquakes according to WTG manufacturer standards. Site-specific geotechncial information has been used to avoid potential landslide areas. The WTGs, access roads and utilities, and other major Project facilities will be located on uplands away from flood-prone areas, waterways and wetlands. The developer will avoid construction on steep slopes and will reclaim disturbed areas not required for operation as soons as practical after construction is complete. The developer has entered into a road maintenance agreement with Elk County to ensure that access roads are not degraded.

4.1 Conservation of Tallgrass Prairie Habitat

As described in the Native Environment Conservation Plan (NECP) attached as Appendix E to this EA, the Project developer will implement three primary components:

- Perpetual conservation easements (18, 164 acres) within teh Flint Hills Legace Conservation Area (FHLCA);
- Wind and wildlife research (not considered mitigation, but is a componenet of the NECP)
- Othe related grant offerrings to restore tallgrass prairie habitat (6,000 acres) and promote implementation of important conservation practices.

Tradewind has entered into an agreement with the National Fish and Wildlife Foundation (NFWF) to manage and implement the NECP, the primary mitigation adn conservation components of which are funded by Tradewind and the Caney River Project.

4.2 Greater Prairie Chicken (GPC)

In accordance with the NECP, the developer is committed to habitat restoration that will likely benefit all grassland birds, including GPC. None of the following mitigation measures are required by law, but are practices which will be implemented by the developed for the Caney River Project to the degre practicable while maintaining financial and commercial obligations.

- to limit Project-related disturbance, land disturbance would be imited to that needed for safe and efficient construction and design;
- construction and operations and maintenance (O&M) activities would be scheduled to avoid or minimize impacts to any unanticipated on-site leks that may be identified during the construction phase; tallgrass prairie wil be restored as descussed below for on-site vegetation
- Travel off of planned construction and maintenance routes wil leb prohibited to prevent inadvertent nest/chick destruction should bthere be any in the future.

4.3 Paleontological Resources

Any paleontological resource discovered by Caney River or subcontractor will be immediately reported to the KGS. Caney River will suspend all operations within 100 feet of the paleontological resource until an evaluation has been made to determine the appropriate actions to be used to prevent the loss of scientific values.

Contractors will be instructed about the types of fossils that may be encountered and the steps to take if discovered during construction. Prior to the initiation of earth-disturbing activities, a procedure for handling unanticipated fossil discoveries will be developed, including a provision for a paleontologist to evaluate any unanticipated discoveries.

4.4 Soils

The following measures to minimize impacts to soils will be implemented as part of the Stormwater Pollution Prevention Plan (SWPPP):

- Soils in the path of access roads will be removed and stockpiled for later use in restoration
- Areas with high erosion potential and/or rugged topography (e.g. steep slopes, unstable soils) will be avoided, where possible
- Construction activities will be conducted using designated construction corridors
- O&M activities will be conducted using designated Project access areas and roads
- The developer and owner will design and construct the access roads and maintain the existing county roads to ensure life-of-project (LOP) safety and integrity of all Project roads;
- Certified weed-free straw mulches, certified weed-free straw bale barriers, silt fences, water bars, and other appropriate BMPs will be used to control soil erosion

- Soil erosion control measures will be monitored, especially after storms, and will be repaired or replaced if needed within a timely manner
- Soil disturbance will be limited to that which is necessary for safe and efficient construction
- All disturbed areas will be restored to the approximate original contour and reclaimed as specified in landowner agreements

4.5 Surface and Groundwater

A SWPPP has been prepared and submitted, and a stormwater construction permit has been received for the Project. The permit and SWPPP are available upon request. Erosion control measures including diversions, riprap, matting, sediment traps, and timely revegetation of all disturbed areas will minimize runoff-related sedimentation impacts. Erosion-prone areas (e.g., dissected land, badlands, and steeper slopes) will be avoided, where feasible. If quantities of petroleum products used or stored onsite during construction and/or operation are large enough to necessitate the preparation of a SPCC Plan, Caney River will prepare and implement a SPCC Plan. The plan will reduce the potential for contamination of water and soil resources due to inadvertent spills.

If heavy equipment will be used near surface waters, Caney River will implement the following measures to minimize impacts to surface waters:

- Stream banks that are disturbed will be stabilized to prevent slumping and erosion
- Refueling and staging will occur at least 100 feet from the edge of a stream or stream bank
- Sediment control measures will be used, as needed, at all stream crossings
- Stabilizing vegetation will not be removed unless absolutely necessary, and any vegetation removed will be re-established immediately following completion of the crossing
- Drainages will be crossed at right angles to the channel when possible to minimize the area disturbed

4.6 On-SIte Vegetation

Disturbance within native tallgrass prairie will be minimized by implementing the following measures or BMPs:

- Removal or disturbance of vegetation will be minimized through construction site management (e.g., by utilizing previously disturbed areas, designating limited equipment/materials storage yards and staging areas, windrowing topsoil) and reclaiming disturbed areas

  Except for areas of permanent structures or supporting infrastructure, all disturbed areas will be restored to the approximate original contour and reclaimed in accordance with landowner agreements
- Where native prairie has been disturbed, reclamation procedures to restore native prairie will be implemented
- Topsoil will be removed and stored prior to construction disturbance in native tallgrass prairie; topsoil will be replaced following construction to provide a source of seeds and soil microorganisms to facilitate restoration of tallgrass prairie vegetation
- The NECP will provide research into tallgrass prairie weed control and provide for the restoration of native prairie in the region, resulting in a net gain in tallgrass prairie habitats
- Seed mixtures used for reclamation will be free of noxious weed seeds in accordance with state law. Weeds will be mechanically controlled in all disturbed areas. If herbicides are needed to control weeds, the landowners where herbicides will be used will be notified, and herbicides will be applied by a licensed contractor. Equipment will be washed at a commercial facility prior to any construction and during construction if invasive weeds are encountered in the Project area. Caney River is committed to controlling weed species on all lands disturbed by Project-related activities; this is especially true for native tallgrass prairie and agricultural lands; under these circumstances qualified biologists and landowners will be consulted. Certified weed-free straw mulches and certified weed-free straw bale barriers, silt fences, and water bars along with other BMPs identified within the SWPPP will be used to control soil erosion.

4.7 General Wildlife

In addition to the those above identified aspects of the NECP which not only benefit tallgrass prairie, but wildlife, the following measures will be implemented to minimize impacts to wildlife:

- Caney River will use state-of-the art technology, including tubular unguyed towers, slow rotating rotors, and underground collection lines to minimize the potential for any bird or bat mortality

- Caney River and/or its contractor(s) will prohibit hunting, fishing, dogs, cats, or possession of firearms by its employees in the Project area
- Construction and operation disturbance will be minimized in areas of high wildlife value (e.g., tallgrass prairie, wetlands, and riparian areas) by only allowing vehicles and equipment in designated construction, operations, and maintenance corridors
- Caney River will advise Project personnel regarding appropriate speed limits on roads to minimize wildlife mortality due to vehicle collisions
- Caney River will educate employees and contractors about wildlife laws and permit requirements; wildlife harassment will be prohibited
- To minimize direct impacts to prairie nesting birds, Caney River will mow areas to be disturbed prior to the nesting season, thereby avoiding the taking of active nests
- To protect plant populations and wildlife habitat, Project-related travel will be restricted to designated roads; no off-road travel will be allowed, except in emergencies
- Caney River will minimize human activity to that which is necessary to complete construction and then to operate and maintain the Project

4.7.1 Migratory nad Wintering Birds - Raptors

The following mitigation measures will be implemented to minimize impacts to raptors:

- Raptor/stick nest surveys will be conducted within a 660 feet of proposed construction areas when construction is to occur during the raptor breeding/nesting season (raptor breeding/nesting season varies in Kansas, typically December 1 through August 31 for eagles)

- All surface-disturbing activities will be prohibited between December 1 through August 31 within an appropriate buffer from all occupied raptor nests; the buffer distance and restriction dates may vary on a case-by-case basis as determined by federal or state agencies, or by Caney River; factors considered will include the activity status of the nest, species involved, natural topographic barriers, line-of-sight distances, the presence of existing disturbances that the birds are habituated to, and other site-specific characteristics
- If construction within the protective buffer of an active raptor nest becomes necessary, it will be delayed until as late in the nesting season as possible (bigger chicks are less susceptible to long-term absences by an adult)

- Active nests near construction areas may be monitored, and, if the adults leave the nest for an extended period, Caney River will stop construction in the vicinity so as to allow them to return
- Caney River will avoid cutting trees with raptor nests

4.8 Air Quality and Noise

All vehicles and construction equipment will be well-maintained to minimize exhaust emissions and noise. Disturbed areas will be watered as necessary to suppress dust. Caney River will use state-of-the-art WTGs that have been designed to minimize noise levels (e.g., upwind rotors, thinner blade tips, streamlined towers, and nacelles). If noise, dust, or emissions during construction becomes a concern to landowners or governmental agencies, Caney River will work with the respective landowner or agency to resolve the issue.

4.9 Cultural Resources

Contractor representatives will be instructed about the types of cultural resources that may be encountered and the steps to take if cultural resources are discovered during construction. Any cultural resource (historic or prehistoric site or object) discovered by Caney River or subcontractor will be immediately reported to the SHPO. Caney River will suspend all operations in the immediate area and the site will be inspected and evaluated by a qualified archaeologist. While this determination is being made the area of the finds will be protected from further disturbance. Caney River will not resume construction within the specified site area until the SHPO has made a determination on potential eligibility for the NRHP and/or if mitigation will be required. If there are bones present, and those bones could potentially be human, the construction manager will call the appropriate county sheriff immediately. As the area could be the scene of a crime, no one will enter the area unless absolutely necessary. Once the Sheriff has determined that the remains either do not contain human remains, or that said remains are ancient and not the result of a crime, the Kansas State Archaeologist will immediately be called. The State Archaeologist would then convene the Unmarked Burial Sites (UBS) Board who will determine proper disposition of the exposed remains.

4.10 Solid Waste and Sanitation

Construction sites will be maintained in a sanitary condition at all times. Waste materials, such as human waste, trash, garbage, refuse, etc., will be disposed of promptly at an appropriate off-site waste disposal site (e.g. landfill). Trash receptacles will be located throughout the Project area to encourage proper disposal of trash and prevent littering.

4.11 Land Use and Existing Utilities

Caney River will notify other authorized users within the Project area of any crossings or overlaps. Care will be used, including hand/shovel excavation where appropriate, for all construction work that parallels or crosses existing subsurface ROWs (e.g., pipelines, cables, power lines). Encroachment agreements will be negotiated for crossing existing utility easements.

4.12 Hazardous Materials

The BMPs pertaining to hazardous materials are addressed in the SWPPP. If quantities of certain chemicals or products, such as petroleum products, require a SPCC plan, Caney River will prepare and implement a SPCC plan. Caney River will also educate contractors on all the plans prepared for the Project.

4.13 Public Health and Safety

The following measures will be implemented to protect public health and safety:

- WTGs will be lighted in accordance with FAA requirements. In accordance with the agreement with the FAA, Caney River will light the Project as one large obstruction, thus reducing the number of WTGs that need to be equipped with obstruction lighting. The lighting plan calls for lighting a total of 63 out of 111 wind turbines, the equivalent of 57 percent
- High voltage facilities (excluding transmission lines) will be fenced and warning signs will be posted

  To mitigate potential for injury due to ice throw, all turbines will be located more than 1,000 feet from any occupied residence and the O&M personnel will be trained to recognize icing conditions and risk areas and to take proper precautions for their personal safety
- The Project area will be maintained in clean and sanitary condition at all times
- Littering will be prohibited
- Speed limits will be set and enforced
- Fires will be extinguished immediately by onsite personnel if possible; otherwise, the appropriate emergency departments will be notified

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5.0 LIST OF PREPARERS

5.1 TVA NEPA Project Management

Bruce Yeager, TVA NEPA Program Manager

John Baxter, TVA Heritage Program

5.2 Other Contributors

5.2.1 Burns & McDonnell Engineering Company, Inc.

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Justin Bailey	B.S. Environmental Science and Policy	Project Management, Wetlands
Harold Draper	D.Sc. Engineering and Policy M.S. Engineering and Policy B.S. Botany B.S. Conservation	Document Preparation; NEPA technical review
Joe Werner	B.S. Zoology M.S. Zoology	Avian expert; Fragmentation
Todd McCabe	B.A. Biology M.S. Environmental Studies	Document preparation, greater prairie chicken, stick nest survey
Craig Chatfield	B.S. Agronomy	Farmland
Jennifer Bell	B.S. Environmental Studies M.S. Urban and Regional Planning	Socioeconomics
Mark Latham	B.A. History/Government M.A. Anthropology	Cultural resources
Susan Houghton	M.A. Anthropology	Cultural resources
Bryan Gasper	B.S. Biology	Endangered and threatened species

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Name	Education	Project Role
Matthew Gilhousen	B.S. Civil Engineering	SVP Project Development
Jennifer Dean	B.S. Environmental Biology	Biologist
Dr. Kevin R. Walter	Ph.D. in Wind Science and Engineering	Director of Meteorology
Aaron Weigel	B.S. Mechanical Engineering	Director of Project Development

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6.0 LITERATURE CITED

American Wind Energy Association. 2004. Proceedings of the Wind Energy and Birds/Bats Workshop: Understanding and Resolving Bird and Bat Impacts. American Wind Energy Association and the American Bird Conservancy. May 18-19, 2004. Washington, D.C. 107 pp. + append.

Arnett, E. B., W. K. Brown, W. P. Erickson, J. K. Fiedler, B. I. Hamilton, T. H. Henry, A. Jain, G. D. Johnson, J. Kerns, R. R. Koford, C. P. Nicholson, T. J. O'Connell, M. D. Piorkowski, R. D. Tankersley Jr. 2008. Patterns of Bat Fatalities at Wind Energy Facilities in North America. *Journal of Wildlife Management*. 72: 61-78.

Avery, M. L., P. F. Springer, J. F. Cassel. 1976. The effects of a tall tower on nocturnal bird migration: a portable ceilometers study. *Auk*. 93: 281-291.Avian Power Line Interaction Committee (APLIC). 2006. Suggested Practices for Avian Protection on Power lines: The State of the Art in 2006. PIER Final Report, CEC-500-2006-022. Edison Electric Institute, APLIC, and California Energy Commission. Washington DC and Sacramento CA.

Baerwald, Erin F., Genevieve H. D'Amours, Brandon J. Klug and Robert M.R. Barclay. 2008. Barotrauma is a significant cause of bat fatalities at wind turbines. Current Biology 18:R695-R696.

Blackmar, J.M. and J.L. Hoffman. 2006. The Paleoarchiac of Kansas. In Hoard, R.J. and W.E. Banks. *Kansas Archaeology*. University Press of Kansas. Lawrence, KS, pp. 46-75.

Blakeslee, D.J. and M.F. Hawley 2006. The Great Bend Aspect. In Hoard, R.J. and W.E. Banks. *Kansas Archaeology*. University Press of Kansas. Lawrence, Kansas, pp. 165-179.

Breslow, Paul B. and David J. Sailor. 2002. Vulnerability of Wind Power Resources to Climate Change in the Continental United States. *Renewable Energy* 27:585-598.

Briggs, John M., A. K. Knapp, J. M. Blair, J. L. Heisler, G. A. Hoch, M. S. Lett, and J. K. McCarron. 2005. An Ecosystem in Transition: Causes and Consequences of the Conversion of Mesic Grassland to Shrubland. BioScience Vol. 55: 243 – 254.Burns & McDonnell 2009. *Avian and Bat Risk Assessment*. Prepared for Caney River Wind Project, LLC. March

Chapman, Shannen S., Omernik, James M., Freeouf, Jerry A., Huggins, Donald G., McCauley, James R., Freeman, Craig C., Steinauer, Gerry, Angelo, Robert T., and Schlepp, Richard L., 2001, *Ecoregions of Nebraska and Kansas* (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,950,000).

Council on Environmental Quality (CEQ). 1997. *Environmental Justice: Guidance Under the National Environmental Policy Act*. CEQ, Washington, DC.

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.

Erickson, W.P., G. D. Johnson, M. D. Strickland, D. P. Young Jr., K. Sernka, and R. Good. 2001. Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Avian Collision Mortality in the United States. Washington, DC: Resolve, Inc.

Erickson, W.P., G.D. Johnson, M. D. Strickland, R. E. Good, M. Bourassa, K. Bay, and K. Sernka. (2002) *Synthesis and Comparison of Baseline Avian and Bat Use, Raptor*

Nesting and Mortality Information from Proposed and Existing Wind Developments. Prepared by WEST, Inc., Cheyenne, WY for the Bonneville Power Administration, Portland, OR

FERMATA, Inc. 2004. Assessment of the Economic and Tourism Impacts of Siting Wind Turbines in Kansas Natural Areas. FERMATA, Inc., Austin, Texas. http://www.fermatainc.com/ (accessed January 4, 2011).

Fiedler, J.K., T.H. Henry, R.D. Tankersley, and C.P. Nicholson. 2007. Results of Bat and Bird Mortality Monitoring at the Expanded Buffalo Mountain Windfarm, 2005. Tennessee Valley Authority, Knoxville, Tennessee.

GAO (Government Accountability Office). 2005. Wind Power: Impacts on Wildlife and Government Responsibilities for Regulating Development and Protecting Wildlife. GAO-05-9006. Washington, DC.

Gehring, J., P. Kerlinger, and A.M. Manville, II. 2009. Communication towers, lights, and birds: successful methods of reducing the frequency of avian collisions. *Ecological Applications*. 19: 505-514.

Gill, J.P., M. Townsley, and G.P. Mudge. 1996. Review of the Impacts of Wind Farms and Other Aerial Structures upon Birds. *Scottish Natural Heritage Review.* No. 21. Edinburgh: Scottish Natural Heritage.

Helzer, C.H. and D.E. Jelinski. 1999. The Relative Importance of Patch Area and Perimeter-Area Ratio to Grassland Breeding Birds. Ecological Applications 9:1448-1458.

Herkert, J.R., D.L. Reinking, D.A. Wiedenfeld, M. Winter, J.L. Zimmerman, W.E. Jensen, E.J. Finck, R.R. Koford, D.H. Wolfe, S.K. Sherrod, M.A. Jenkins, J. Faaborg, and S.K. Robinson. 2003. Effects of Prairie Fragmentation on the Next Success of Breeding Birds in the Midcontinental United States. Conservation Biology 17:587-594.

Herkert, J.R. 1994. The Effects of Habitat Fragmentation on Midwestern Grassland Bird Communities. Ecological Applications 4:461-471.

Hoen, Ben et al. 2009. The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis. Prepared for the Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy by the Ernest Orlando Lawrence Berkeley National Laboratory, Berkeley, California. Report LBNL-2829E. http://eetd.lbl.gov/ea/ems/reports/lbnl-2829e.pdf (Accessed February 3, 2010).

Intergovernmental Panel on Climate Change (IPCC). 2007. *Climate Change 2007: Synthesis Report*. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the IPCC. IPCC, Geneva, Switzerland (www.ipcc.ch).

Johnson, A.E. 1992. Early Woodland in the Trans-Missouri West. *Plains Anthropologist* 37:129-136.

Johnson, Greg and Matt Halloran. 2010. Greater Sage-Grounse and Wind Energy Development: A Review of the Issues. Western EcoSystems Technology, Inc., and Wyoming Wildlife Consultants, LLC. Commissioned by Renewable Northwest Project. http://www.west-inc.com/wind_reports.php (accessed December 29, 2010).

Johnson, G. D., W. P. Erickson, M. D. Strickland, M. F. Shepherd, D. A. Shepherd, and S. A. Sarappo. 2002. Collision mortality of local and migrant birds at a large-scale wind-power development on Buffalo Ridge, Minnesota. *Wildlife Society Bulletin*. 30: 879-887.

KARS (Kansas Applied Remote Sensing), 2009. 2005 Kansas Land Cover Patterns – Level IV. Kansas Biological Survey, The University of Kansas.

http://www.kars.ku.edu/research/2005-kansas-land-cover-patterns-level-iv/. (Accessed May 3, 2010).

Kansas Department of Wildlife and Parks. 2008. County Lists. Retrieved March 2008 from <http://www.kdwp.state.ks.us/news/other_services/threatened_ and_endangered_species/threatened_and_endangered_species/county_lists>.

Kansas Department of Wildlife and Parks. 2004. Wind Power and Wildlife Issues in Kansas: The Position of the Kansas Department of Wildlife and Parks. Kansas Department of Wildlife and Parks, Office of the Secretary, Topeka. 4 pp.

Kansas Energy Council. 2005. Wind Energy Siting Handbook: Guideline Options for Kansas Cities and Counties Special Report 2005-1. http://kec.kansas.gov/reports/wind_siting_handbook.pdf (accessed December 27, 2010).

Kansas Energy Resource Coordination Council. 2004. Wind and Prairie Task Force Final Report. http://kec.kansas.gov/wptf/WPTFFinalReport.pdf (Accessed December 27, 2010).

Kansas Geological Survey, Public Information Circular. 1998. Recording Kansas Earthquakes. Retrieved March 2008 from http://www.kgs.ku.edu/Publications/pic3/pic3_5.html.

Kansas Ornithological Society. Kansas County Checklist Project Page. Retrieved March 2007 from <http://www.ksbirds.org/>.

Kansas Renewable Energy Working Group. 2003. Siting Guidelines for Wind Power Projects in Kansas. The Kansas Renewable Energy Working Group, Environmental and Siting Committee. January 22, 2003. 6 pp. http://www.kansasenergy.org/documents/KREWGSitingGuidelines.pdf (accessed December 27, 2010).

Karl, Thomas R., Jerry M. Melillo, and Thomas C. Peterson. 1009. *Global Climate Change Impacts in the United States*. Cambridge University Press. Available at http://www.globalchange.gov/ (accessed March 23, 2010).

Kerlinger, P. and J. Kerns. 2003. FAA Lighting of Wind Turbines and Bird Collisions. Presentation at the National Wind Coordinating Committee--Wildlife Working Group Meeting: How Is Biological Significance Determined When Assessing Possible Impacts? November 17-18, 2003, Washington, D.C.

Kingsley, A. and B. Whittam. 2007. Wind Turbines and Birds: A Background Review for Environmental Assessment. Prepared by Bird Studies Canada Prepared for Environment Canada / Canadian Wildlife Service.

Klute, D. S., R. J. Robel, and K. E. Kemp. 1997. Will conversion of Conservation Reserve Program (CRP) lands to pasture be detrimental for grassland birds in Kansas? American Midland Naturalist 137:206-212.

Klute, D. S. 1994. Avian community structure, reproductive success, vegetative structure, and food availability in burned Conservation Reserve Program fields and grazed pastures in northeastern Kansas. M.S. Thesis. Kansas State University, Manhattan.

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. 2007a. Ecological impacts of wind energy development on bats: questions, research needs, and hypotheses. *Frontiers in Ecology & the Environment*. 5: 315–324.

Kuvlesky, W. P., L. A. Brennan, M. L. Morrison, K. K. Boydston, B. M. Ballard, F. C. Bryant. 2007. Wind energy development and wildlife conservation: Challenges and opportunities. *Journal of Wildlife Management.* 71: 2487-2498.

Kubiszewski, Ida, Cutler J. Cleveland, and Peter K. Endres. 2010. Meta-analysis of Net Energy Return for Wind Power Systems. *Renewable Energy* 35:218-225.

Leddy, K. L., K. F. Higgins, and D. E. Naugle. 1999. Effects of Wind Turbines on Upland Nesting Birds in Conservation Reserve Program Grasslands. Wilson Bull., 111(1), pp. 100-104.

Logan, B. 2006. Woodland Adaptations in Eastern Kansas. In Hoard, R.J. and W.E. Banks. *Kansas Archaeology*. University Press of Kansas. Lawrence, Kansas, pp. 76-92.

Longcore, T., C. Rich, S. A. Gauthreaux, Jr. 2008. Height, guy wires, and steady-burning lights increase hazard of communication towers to nocturnal migrants: a review and meta-analysis. *Auk*. 125: 485-492.

Manville, A.M., II. 2009. Towers, turbines, power lines, and buildings – steps being taken by the U.S. Fish and Wildlife Service to avoid or minimize take of migratory birds at these structures. Pp. 262-272, In T.D. Rich, C. Arizmendi, D. Demarest, and C. Thompson (eds.). Tundra to Tropics: Connecting Habitats and People. Proceedings 4th International Partners in Flight Conference, 13-16 February 2008, McAllen, Texas. Partners in Flight.

Marshall, James O. 2006. The Kansa. In Hoard, R.J. and W.E. Banks. *Kansas Archaeology*. University Press of Kansas. Lawrence, KS, pp. 219-232.

Morgan, Colin, Ervin Bossanyi, and Henry Seifert. 1998. Assessment of Safety Risks Arising from Wind Turbine Icing. Retrieved March 2007 from http://www.renewwisconsin.org/wind/Toolbox-Fact%20Sheets/Assessment%20of%20risk%20due%20to%20ice.pdf

NAS (National Academy of Sciences). 2007. Environmental Impacts of Wind-Energy Projects. The National Academies Press, Washington, D.C., USA.

National Research Council Board on Environmental Studies and Toxicology. 1991. Haze in the Grand Canyon: An Evaluation of the Windter Intensive Tracer Experiment. Washington, D.C.: National Academy Press.

National Wind Coordinating Collaborative. 2010. Wind Turbine Interactions with Birds, Bats, and their Habitats: A Summary of Research Results and Priority Questions. Retrieved January 7, 2010, from http://www.nationalwind.org/publications/bbfactsheet.aspx

National Wind Coordinating Collaborative (NWCC). 2001. Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Avian Collision Mortality in the U.S.. WEST, Inc. Retrieved March 2007 from <http://www.nationalwind.org/ publications/wildlife/avian_collisions.pdf>.

Natural Resources Conservation Service. 2007. Kansas State-listed Noxious Weeds. Retrieved March 2007 from <http://plants.usda.gov/java/noxious?rptType =State&statefips=20>.

Nicholson, C.P. 2003. Buffalo Mountain Windfarm Bird and Bat Mortality Monitoring Report: October 2001 - September 2002. Tennessee Valley Authority, Knoxville, Tennessee. February 2003.

Nicholson, C.P., J. R.D. Tankersley, J.K. Fiedler, and N.S. Nicholas. 2005. Assessment and Prediction of Bird and Bat Mortality at Wind Energy Facilities in the Southeastern United States. Final Report. Tennessee Valley Authority, Knoxville, Tennessee.

Petersen, Mark D., Frankel, Arthur D., Harmsen, Stephen C., Mueller, Charles S., Haller, Kathleen M., Wheeler, Russell L., Wesson, Robert L., Zeng, Yuehua, Boyd, Oliver S., Perkins, David M., Luco, Nicolas, Field, Edward H., Wills, Chris J., and Rukstales, Kenneth S., 2008, Documentation for the 2008 Update of the United States National Seismic Hazard Maps: U.S. Geological Survey Open-File Report 2008–1128.

Powell, Alexis F.L.A., 2008. Responses of Breeding Birds in Tallgrass Prairie to Fire and Cattle Grazing. *Journal of Field Ornithology* 79(1):41-52.

Prose, Bart L. 1985. Habitat Suitability Index Models: Greater Prairie-Chicken (Multiple Levels of Resolution). U.S. Fish and Wildlife Service Biological Report 82 (10.102). Retrieved April 22, 2011 from http://www.nwrc.usgs.gov/wdb/pub/hsi/hsi-102.pdf

Rahmig, C.J., W.E. Jensen & K.A. With, 2008. Grassland Bird Responses to Land Management in the Largest Remaining Tallgrass Prairie. *Conservation Biology* 23:420-432.

Reinking, Dan L., 2005, Fire Regimes and Avian Responses in the Central Tallgrass Prairie. *Studies in Avian Biology* 30:116-126.

Robel, R.J. 2002. Expected Impacts on Greater Prairie-chickens of Establishing a Wind Turbine Facility near Rosalia, Kansas. Prepared for Zilkha Renewable Energy, Houston, Texas. 29 pp.

Robbins, C. 2002. Direct testimony of Chandler S. Robbins Dec. 6, 2002, in the matter of the application of Clipper 101 MW generating facility in Garrett County, MD, Windpower, Inc. Case # 8938.

Robbins, Mark B., A. Townsend Peterson, and Miguel A. Ortega-Huerta. 2002. Major Negative Impacts of Early Intensive Cattle Stocking on Tallgrass Prairies: The Case of the Greater Prairie-Chicken (*Tympanuchus cupido*). *North American Birds* 56:239-244.

Rohrbaugh, R. W, Jr, D. L. Reinking, D. H. Wolfe, S. K. Sherrod, and M. A. Jenkins. 1999. Effects of prescribed burning and grazing on nesting and reproductive success of three grassland passerine species in tallgrass prairie. Studies in Avian Biology 19:165–170.

Roper, D.C. 2006. The Central Plains Tradition. In Hoard, R.J. and W.E. Banks. *Kansas Archaeology*. University Press of Kansas. Lawrence, Kansas, pp. 105-132.

Sagrillo, Mick. 2003. Putting Wind Power's Effect on Birds in Perspective. American Wind Energy Association. Retrieved March 2007 from <http://www.awea.org/faq/sagrillo/swbirds.html>.

Seifert, Henry, Annette Westerhellweg, and Jürgen Kröning. 2003. Risk Analysis of Ice Throw from Wind Turbines. Retrieved March 2007 from <http://web1.msue.msu.edu/cdnr/icethrowseifertb.pdf>.

Shaffer, J. A., C. M. Goldade, M. F. Dinkins, D. H. Johnson, L. D. Igl, and B. R. Euliss. 2003. Brown-headed Cowbirds in grasslands: their habitats, hosts, and response to management. Prairie Naturalist 35:145–186.

Tennessee Valley Authority. 2008. 2008 Request for Proposals for Renewable Energy and/or Clean Energy Resources.

Tennessee Valley Authority. 2011. Environmental Impact Statement for TVA's Integrated Resource Plan. TVA's Environmental and Energy Future.

Thompson M.C. and C. Ely. 1989 p 74. Birds in Kansas. University of Kansas, Museum of Natural History Public Education Series No. 11. Joseph T. Collins, Editor. 404 pp.

Toepfer, J. E. and W.L. Vodehnal. 2009. Greater Prairie Chickens: Grasslands and vertical structures. Presentation at the 28th Meeting of the Prairie Grouse Technical Council, Portales, New Mexico, October 5-8, 2009.

TRC Mariah Associates, Inc. 2005. Environmental Report for the Smoky Hills Wind Project, Lincoln and Ellsworth Counties, Kansas. Laramie, Wyoming

Timm, R. M., N. A. Shale, G.R. Pisani, J.R. Choate, G. A. Kaufman, and D. W. Kaufman. *Mammals of Kansas*. Retrieved 21 July 2008 from http://www.ksr.ku.edu/libres/Mammals_of_Kansas/list.html

USACE. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

U.S. Census Bureau. 2007. American Fact Finder (Based on 2005 Population Estimates, Census 2000, and 1990 Census Information). Accessed March 2007 from http://factfinder.census.gov/jsp/saff/ SAFFInfo.jsp?_pageId=sp1_acs

U.S. Fish and Wildlife Service. July 2010. Environmental Assessment and Land Protection Plan, Flint Hills Legacy Conservation Area. http://www.fws.gov/mountain-prairie/planning/habitat%20protection%20plans/kansas/kansas.htm (accessed December 28, 2010).

U.S. Fish and Wildlife Service. March 2010. Wind Turbine Guidelines Advisory Committee Report. http://www.fws.gov/habitatconservation/windpower/wind_turbine_advisory_committee.html (Accessed December 28, 2010).

U.S. Fish and Wildlife Service. 2007. National Bald Eagle Management Guidelines. http://www.fws.gov/pacific/eagle/NationalBaldEagleManagementGuidelines.pdf (accessed December 27, 2010).

U.S. Fish and Wildlife Service. 2003. Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines. Issued March 13, 2003. Available at http://www.fws.gov/habitatconservation/wind.pdf (accessed December 27, 2010).

U.S. Fish and Wildlife Service (USFWS): Mountain-Prairie Region. Endangered Species: Kansas. Retrieved March 2008 from <http://mountain-prairie.fws.gov/endspp/ CountyLists/KANSAS.htm>.

U.S. Geological Survey (USGS) 2005. Water Use in Kansas, 2005. Kansas Water Information Network. http://ga2.er.usgs.gov/kswater/wateruseks.cfm (Accessed April 8, 2010).

Vehik, S.C. 1992. Wichita Culture History. *Plains Anthropologist* 37:311-332.

Verville, G. Kulstad, R. Plummer, N. Schoewe, W. Goebel, E. Bayne, C. (1958). Geology, Mineral Resources, and Ground-Water Resources of Elk County, Kansas. Kansas Geological Survey, Volume 14. (Accessed April 8, 2010 at http://www.kgs.ku.edu/General/Geology/Elk/04_gw5.html).

Wasson, T., L. Yasui, K. Brunson, S. Amend, V. Ebert. October 2005. A Future for Kansas Wildlife, Kansas' Comprehensive Wildlife Conservation Strategy. Dynamic Solutions, Inc. in cooperation with Kansas Department of Wildlife and Parks.

The Watershed Institute. August 2008. Caney River Wind Project, Survey for American Burying Beetles (*Nicrophorus americanus*).

WEA-Schattenwurf-Hinweise, 2002: *Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergieanlagen.* http://www.smul.sachsen.de/umwelt/download/laerm_licht_mobilfunk/WEASchattenwurf-Hinweise_LAI.pdf

White, Scott W. 2006. Net Energy Payback and CO_2 Emissions from Three Midwestern Wind Farms: An Update. *Natural Resources Research* 15:271-281.

White, S.W. and G.L. Kulcinski. 1998. Net Energy Payback and CO_2 Emissions from Wind-Generated Electricity in the Midwest. Fusion Technology Institute, University of Wisconsin, Madison (accessed March 23, 2010 at

Wind and Prairie Task Force. 2004. Kansas Geological Survey Open-file Report 2004-29. University of Kansas, Lawrence. 55 pp. http://fti.neep.wisc.edu/pdf/fdm1092.pdf)

Winkleman, J. E. 1995. Bird/wind turbine investigations in Europe. Pages 43-47 in Proceedings of National Avian-Wind Power Planning Meeting. National Wind Coordinating Committee / RESOLVE. Washington, D.C.

Wirth, K.A., A.W. King, and W.E. Jensen. 2008. Remaining Large Grasslands May Not Be Sufficient to Prevent Grassland Bird Declines. Biological Conservation 141:3152-3167.

Zimmerman, J.L. 1992. Density-independent Factors Affecting the Avian Diversity of the tallgrass Prairie Community. *Wilson Bulletin* 104:85-94.

Zimmerman, J.L. 1997. Avian Community Responses to Fire, Grazing, and Drought in the Tallgrass Prairie. Pages 167-180 in *Ecology and Conservation of Great Plains Vertebrates*. Knopf, F. and F. Sampson, eds. Springer-Verlag, New York.

APPENDIX A: CORRESPONDENCE FROM AGENCIES AND ELECTED OFFICIALS

APPENDIX B: PILOT AGREEMENT

APPENDIX C: ROAD MAINTENANCE AGREEMENT

APPENDIX D: BIOLOGICAL DATA

APPENDIX E: NATIVE ENVIRONMENT CONSERVATION PLAN

APPENDIX F: TRAVERSABILITY ANALYSIS