

**BEFORE THE STATE CORPORATION COMMISSION
OF THE STATE OF KANSAS**

Received
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by
State Corporation Commission
of Kansas

**In the Matter of the Application of Grain)
Belt Express Clean Line LLC for a Siting)
Permit for the Construction of a High)
Voltage Direct Current Transmission Line in)
Ford, Hodgeman, Edwards, Pawnee, Barton,)
Russell, Osborne, Mitchell, Cloud,)
Washington, Marshall, Nemaha, Brown,)
and Doniphan Counties Pursuant to)
K.S.A.66-1,177, *et seq.*)**

Docket No.13-GBEE-803-MIS

DIRECT TESTIMONY OF

TIMOTHY B. GAUL

ON BEHALF OF

GRAIN BELT EXPRESS CLEAN LINE LLC

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1 *Certain capitalized terms in this testimony have the meaning set forth in the Glossary included*
2 *as Exhibit C to the Application.*

3 **I. QUALIFICATIONS**

4 **Q. Please state your name, present position and business address.**

5 A. My name Tim Gaul. I am the Associate Vice President, Energy Services for the Louis
6 Berger Group, Inc. (“Louis Berger”). My business address is 1250 23rd Street,
7 Washington, DC.

8 **Q, What are your duties and responsibilities as Associate Vice President – Energy**
9 **Services of Louis Berger?**

10 A. I am employed by Louis Berger as the Associate Vice President of Energy Services in the
11 Planning, Facilities, and Resource Management Business Unit. In that capacity, I provide
12 management and oversight of our Transmission Services, GIS Services, and Hydropower
13 Teams.

14 I am also an environmental scientist and planner by training and experience, and I
15 served both as the Project Director for Louis Berger for the Grain Belt Express Clean
16 Line transmission project (“Grain Belt Express Project” or “Project”), and as a member
17 of the Routing Team . As a Routing Team member, I was directly involved in the
18 development and analysis of routes, public outreach efforts, coordination with state and
19 federal agencies, comparison of alternatives, and preparation of the Kansas Route
20 Selection Study (“Routing Study”), which is attached to my testimony as **Exhibit TBG-**
21 **1.**

22 **Q. What is the purpose of your testimony in this docket?**

1 A. I am testifying on behalf of Grain Belt Express Clean Line LLC (“Grain Belt Express”),
2 and the purpose of my testimony is to support the reasonableness of the proposed Grain
3 Belt Express Project route, a multi-terminal +600 kilovolt (“kV”) high voltage direct
4 current (“HVDC”) transmission line, and associated transmission facilities, running from
5 near the Spearville 345 kV substation in Ford County, Kansas to a delivery point near the
6 Sullivan 765 kV substation in Sullivan County, Indiana. My testimony describes in detail
7 the routing process and serves to sponsor the Routing Study.

8 **Q. Are you sponsoring any exhibits?**

9 A. Yes. In addition to the Routing Study previously mentioned, I am also sponsoring
10 **Exhibit TBG-2** which is my Curriculum Vitae.

11 **Q. Please summarize your education and professional background.**

12 A. I have a B.S. from SUNY College of Environmental Science and Forestry at Syracuse
13 University (1997) and an M.S. from Creighton University (2000). Throughout my career
14 I have supported a range of environmental science and planning studies, and I specialize
15 in planning efforts for infrastructure, environmental impact assessment and modeling,
16 natural resource inventory and permitting, and GIS analysis in support of environmental
17 planning and compliance. My curriculum vitae is attached to this testimony as **Exhibit**
18 **TBG-2.**

19 **Q. Have you previously testified before regulatory commissions?**

20 A. Yes, I have provided testimony before the Virginia Corporation Commission,
21 Pennsylvania Public Utility Commission, and the West Virginia Public Service
22 Commission.

II. EXECUTIVE SUMMARY

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Q. Please provide an overview of the Routing Study.

A. The Routing Study documents the route selection methodology, public and agency outreach process, and the Proposed Route identification process for the Kansas portion of the Grain Belt Express Project that extends from Ford County, Kansas, to the Missouri River south of Troy, Kansas on the Missouri/Kansas border.

The overall goal of the Routing Study was to gain an understanding of the opportunities and constraints in the Study Area, develop feasible Alternative Routes, evaluate potential impacts and identify a reasonable Proposed Route for the Project. Grain Belt Express defined the Proposed Route as the route that minimizes the overall effect of the transmission line on the natural and human environment and avoids unreasonable and circuitous routes, unreasonable costs, and minimizes special design requirements.

Q. Who conducted the Routing Study?

A. The Routing Study was conducted by an interdisciplinary Routing Team. Members of the Routing Team have experience in transmission line route planning and selection, impact assessment for natural resources, land use assessment and planning, cultural resource identification and assessment, impact mitigation, and transmission engineering, design, and construction. **Appendix A of Exhibit TBG-1** lists the Routing Team members, their business affiliation, and their respective areas of responsibility.

1 The remaining routes extended northeast from Ford County, Kansas, crossed the
2 Missouri River south of St. Joseph, Missouri, crossed the Mississippi River north of St.
3 Louis, and continued to the Sullivan Substation on paths south of Springfield, Illinois.
4 These remaining routes were considered Potential Routes, and following another iteration
5 of review and revision, were presented to regulators and the general public at public open
6 house meetings (“Open Houses”) in the Study Area in Kansas.

7 Following the Open Houses, the Routing Team assembled and reviewed the input
8 gathered, revised the Potential Routes where necessary, and compiled a series of fifteen
9 Alternative Routes for analysis and comparison. The Routing Team divided the
10 Alternative Routes into three distinct geographic segments that had common beginning
11 and end points: West, Central, and East. Alternative Routes in each segment were
12 compared against one another, and the most suitable route from each segment was
13 selected for compilation of the Proposed Route. In the West, Alternative Routes A
14 through H were compared, in the Central Segment Alternative Routes I through K were
15 compared, and in the East, Alternative Routes L through O were compared.

16 **Q. How was agency input incorporated into the process?**

17 A. The Routing Team coordinated with numerous federal and state agencies and local
18 officials to gather information for the route planning process. Initial agency coordination
19 efforts focused on introductions to the Project, data gathering, and discussions concerning
20 likely permitting and consultation requirements. Discussions aided in the identification
21 of routing constraints and informed the development of initial routing guidelines. A list
22 of the agencies consulted during the process is provided in **Exhibit TBG-1**, pg. 3-1 and
23 3-2.

1 **Q. How was public input incorporated into the process?**

2 A. The Routing Team led a community outreach program that was designed to educate the
3 public about the purpose and benefits of the Project, inform community leaders and the
4 public about the regulatory process and Project timeline, and gather general comments on
5 the Project and specific information that would refine the siting effort. Please see the
6 testimony of Mark Lawlor for a detailed description of the public outreach process.

7 Two rounds of public outreach meetings were conducted for the Project:
8 community leader roundtables (“Roundtables”) and Open Houses. The main goal of the
9 Roundtables was to coordinate with and gain valuable information from local leaders in
10 each county in the Study Area. Community leaders included local, county, and municipal
11 elected officials, local government planners, community and business leaders, economic
12 development experts, local utilities and cooperatives, as well as federal and state agency
13 officials. At each meeting, members of the Routing Team presented an overview of the
14 Project and described the routing process. After the presentation, attendees and members
15 of the Routing Team broke into small working groups to review an aerial map of the
16 county they represented. Attendees provided information about sensitive features,
17 planned development, and existing infrastructure in their community, and were also
18 encouraged to draw route suggestions on the aerial maps that the Routing Team should
19 consider in the study. Representatives from more than 50 counties attended the 19
20 Roundtables held in Kansas, and more than 300 people participated.

21 The main goal of the Open Houses was to inform the general public about the
22 Project and present a series of Potential Routes for their consideration and comment. At
23 the Open Houses, attendees signed in and were given a guided presentation about the

1 Project by members of the Routing Team. At the end of the tour, the Routing Team
2 assisted attendees in locating their property or other features of concern on aerial
3 photography maps displaying the array of Potential Routes under consideration. More
4 than 2,300 people attended the 14 Open Houses.

5 Following the Open Houses, the Routing Team assembled and reviewed the input
6 gathered at the public meeting, revised the Potential Routes where necessary, and
7 compiled a series of fifteen Alternative Routes for detailed analysis and comparison. The
8 Routing Team divided the Alternative Routes into three distinct geographic segments that
9 had common beginning and end points: West (A-H), Central (I-K), and East (L-O).
10 Alternative Routes in each segment were compared against one another, and the most
11 suitable route from each segment was selected for compilation of the Proposed Route.

12 **IV. SELECTION OF THE PROPOSED ROUTE**

13 **Q. Describe the alternatives analysis and selection of the Proposed Route.**

14 The Alternative Routes (Alternative Routes A-O) were assessed and compared with
15 respect to their potential impacts on natural resources (water resources, wildlife and
16 habitats, special status species, and geology and soils), human uses (agricultural use,
17 populated areas and community facilities, recreational and aesthetic resources, and
18 cultural resources), and with respect to any noted engineering or construction challenges
19 (transportation, existing utility corridors, other existing infrastructure, and the Missouri
20 River crossings).

21 From that analysis, the Routing Team recommended a combination of Alternative
22 Routes H, I, and M as the Proposed Route for the Project. This combination of
23 Alternative Routes met the overall goal of minimizing impacts on the natural, human, and

1 historic resources along the route, while best utilizing existing transmission rights-of-way
2 (“ROW”) and avoiding non-standard design requirements.

3 Alternative Route H was selected in the West Segment and included a
4 combination of section/parcel based alignments and alignments adjacent to existing
5 transmission lines. Alternative Route H avoids the physical congestion near Spearville
6 and largely follows section/parcel boundaries until it meets up with the Arthur
7 Mullergren Tap 230 kV line approximately 35 miles northeast of the western converter
8 station. Beyond this point, Alternative Route H follows a largely parallel alignment
9 toward Great Bend with only one diversion to avoid additional visual impacts to Fort
10 Larned National Historic Site and several houses immediately adjacent to the existing
11 line.

12 Alternative Route I was selected in the Central Segment and followed existing
13 transmission lines for the majority of its length (79 percent). While Alternative I was
14 longer than other options, its impact on sensitive grassland habitat is mitigated by
15 paralleling an existing transmission line. In addition, Alternative I avoids more
16 residences, maximizes the distance from several towns and culturally sensitive areas,
17 maximizes the distance from major whooping crane stopover habitat and designated
18 critical habitat, and minimizes the creation of new obstructions in farmlands that are
19 otherwise unimpeded. The Routing Team chose Alternative I because it minimized
20 impacts to habitat, sensitive species, developed areas, and agricultural land in large part
21 by paralleling existing transmission lines.

22 Alternative Route M was selected in the East Segment. It is the shortest
23 Alternative Route that also maximizes parallel alignments of both transmission lines and

1 gas lines. Alternative Route M directly parallels existing ROWs (mostly transmission
2 lines) for over half of its total length, impacts the fewest historic resources, and crosses
3 the Missouri River at a point where an existing utility corridor crosses the river.

4 **Q. Does the Proposed Route represent a reasonable route for the Grain Belt Express**
5 **Project?**

6 Yes. Together, Alternative Routes H, I, and M comprise a Proposed Route for the
7 Project that meets the Commission's standard of reasonableness by 1) following a route
8 selection process that integrates input from regulatory agencies, local officials, and the
9 general public into the route development, analysis, and selection process, and 2)
10 selecting a Proposed Route that best minimizes the overall effect of the Grain Belt
11 Express transmission line on the natural and human environment while avoiding
12 unreasonable and circuitous routes, unreasonable costs, and special design requirements.

13 **Q. Does this conclude your testimony?**

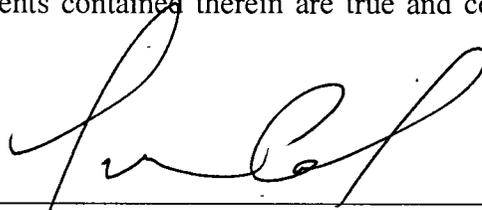
14 A. Yes, it does.

VERIFICATION

City
STATE OF Washington, DC

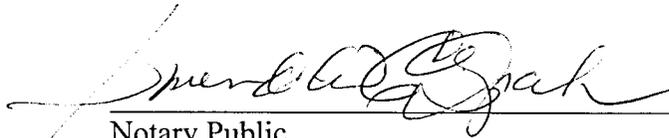
) SS
COUNTY OF _____)

The undersigned, TIM GAUL, upon oath first duly sworn, states that [he/she] is the [title] of [company], that [he/she] has reviewed the foregoing Testimony, that [he/she] is familiar with the contents thereof, and that the statements contained therein are true and correct to the best of [his/her] knowledge and belief.



[name] TIM GAUL
[title] Associate Vice President
[company] The Louis Berger Group, Inc.

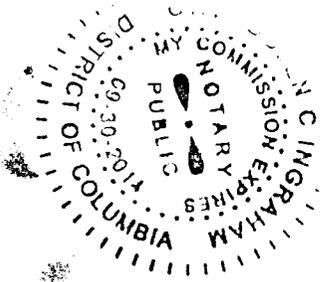
Subscribed and sworn to before me this 10th day of July, 2013.



Notary Public

Gwendolen C. Ingraham
Notary Public, District of Columbia
My Commission Expires 9/30/2014

My appointment expires: _____



GRAIN BELT EXPRESS CLEAN LINE

KANSAS ROUTE SELECTION STUDY



Prepared for Clean Line Energy Partners, LLC



Prepared by The Louis Berger Group, Inc.



THE Louis Berger Group, INC.

JULY 8, 2013

EXHIBIT

TBG-1

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Acronyms and Abbreviations

AC	alternating current
A.D.	Anno Domini
B.C.	Before Christ
CRP	Conservation Reserve Program
DC	direct current
FAA	Federal Aviation Administration
FERC	Federal Energy Regulatory Commission
GIS	Geographic Information System
GPS	Global Positioning System
Grain Belt Express	Grain Belt Express Clean Line LLC
Grain Belt Project	Grain Belt Express Clean Line Project
HVDC	high voltage direct current
KCC	Kansas Corporation Commission
KDHE	Kansas Department of Health and Environment
KDOT	Kansas Department of Transportation
KDWPT	Kansas Department of Wildlife, Parks and Tourism
KSHS	Kansas State Historical Society
kV	kilovolt
KWO	Kansas Water Office
LBG	The Louis Berger Group, Inc.
MLRA	major land resource area
MISO	Midcontinent Independent System Operator, Inc.
MW	megawatt
NAIP	National Agricultural Imagery Program
National Register or NR	National Register of Historic Places
NHL	National Historic Landmark
NRCS	Natural Resources Conservation Service
PJM	PJM Interconnection, Inc.
PLJV	Playa Lakes Joint Venture
Project	Grain Belt Express Clean Line Project

ROW	right-of-way
SHPO	State Historic Preservation Office (Officer)
SINC	species in need of conservation
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

Glossary

Alternative Routes—routes assembled from links that were refined after the Open Houses. One Alternative Route is ultimately selected as the Proposed Route.

Conceptual Routes—initial routes developed to consider a range of reasonable alignments in the Study Area. They are the first step in identifying routes based on large-scale opportunities and constraints, and are aligned more generally than Potential Routes or Alternative Routes.

constraint—defined as areas that should be avoided to the extent feasible and reasonable during the route selection study process. The constraints were divided into two groups based on the size of the geographic area encompassed by the constraint. The first group included constraints covering large areas of land in the Study Area. The second group of constraints encompasses other features covering smaller geographic areas or point-specific locations.

general routing guidelines—establish a set of principles that guide the development of alignments with respect to area land uses, sensitive features, and considerations of economic reasonableness.

link—the section of a Potential Route located between two nodes.

node—a common point of intersection between two or more Potential Routes.

Open House – means public open house meetings in the Kansas Study Area.

opportunities—include areas where the transmission line would have less disruption to area land uses and the natural and cultural environment. Opportunity features typically included other linear infrastructure and utility corridors, such as the existing electric and gas transmission network, rail lines, and roads, but may also include reclaimed lands or unused portions of industrial or commercial areas.

Potential Routes—Conceptual Routes are refined into Potential Routes as additional information from agency coordination, public outreach, and ongoing route revisions are considered. Potential Routes ultimately become Alternative Routes after further refinement following Open Houses.

Potential Route Network—Includes all Potential Routes and their interconnection points (nodes).

Proposed Route—The route identified by the Route Selection Study that is ultimately filed with the Kansas Corporation Commission for construction.

Refined Potential Route Network—As the Potential Route Network is refined, links are modified, removed, or added creating the refined Potential Route Network. The Refined Potential Route Network is then presented to regulators and the public for comment and input.

Roundtables - means community leader roundtables.

Study Area—includes portions of Kansas, Missouri, Illinois, and Indiana. The Study Area includes the converter station locations in Ford County, Kansas, a converter station near the Missouri/Illinois border, and a converter station in Sullivan County, Indiana.

technical guidelines—provide the Routing Team with technical limitations related to the physical limitations, design, right-of-way requirements, or reliability concerns of the Project infrastructure.

Executive Summary

Introduction

Grain Belt Express Clean Line LLC proposes to construct a new high voltage direct current transmission line from Ford County, Kansas, to Sullivan County, Indiana. The HVDC line will be approximately 750 miles long and will deliver approximately 3,500 megawatts of low-cost, renewable power to markets in Missouri, Illinois, Indiana, and states farther east.

The HVDC transmission line will connect to the grid at three converter stations to be constructed near 1) Sunflower Electric Cooperative's Spearville Substation in Ford County, Kansas, 2) near Ameren's Palmyra Tap Substation close to the Missouri/Illinois border, and 3) near American Electric Power's Sullivan Substation in Sullivan County, Indiana. Together, the HVDC transmission line, converter stations, and a series of alternating current transmission lines that will collect electricity from generators in Kansas comprise the Grain Belt Express Clean Line Project.

Grain Belt Express retained the Louis Berger Group, Inc. in late 2010 to support the siting, public outreach, and regulatory process for the Project. Together, the Louis Berger Group, Inc. and Grain Belt Express staff conducted a Route Selection Study to identify a Proposed Route for the Grain Belt Express HVDC transmission line in Kansas. The Proposed Route was considered by the Routing Team to be the route that minimizes the overall effect of the transmission line on the natural and human environment while avoiding unreasonable and circuitous routes, unreasonable costs, and special design requirements.

Routing Process

The Routing Team employed a route selection process that involved iterative phases of information gathering, outreach, route development, and route review and revision. The assemblage of routes under consideration were referred to with different terminology representing each major phase of route development from the earliest Conceptual Routes, to Potential Routes, to Alternative Routes, and ultimately to the selection of the Proposed Route.

Initial route development efforts started with the identification of large area constraints and opportunity features across the entire project Study Area. Using this information, the Routing Team developed a range of Conceptual Routes, which were approximate alignments that served to focus the early data gathering, field reconnaissance, and public outreach efforts of the Routing Team. During this step, Roundtables were held in portions of the Study Area in each county with Conceptual Routes. The Roundtable meetings were held to gather input from local officials on area constraints, opportunities, and Potential Route alignments in those areas that provided the most suitable routing options for the Project. Fifty-seven Roundtable

meetings were held across the Study Area. Upon completion of these Roundtables, the Routing Team had collected information from more than 740 community leaders in the Study Area. In Kansas, representatives from more than 50 counties attended the 19 Roundtables, and over 300 participants in the Roundtable meetings.

As the Routing Team continued to collect information, coordinate with regulatory agencies, and gather additional information, the assemblage of Conceptual Routes was narrowed and refined. These refinements ultimately eliminated the Conceptual Routes in the southern and central portions of the Study Area from further consideration due to challenges associated with a range of routing constraints, including: large areas of Federal land ownership, large complexes of reservoirs and recreational lakes, dense and interspersed development, and a lack of suitable crossings of the Mississippi River (among other challenges).

The remaining routes in the northern portion of the Study Area were considered Potential Routes and extended northeast from Ford County, Kansas, crossed the Missouri River between Kansas City and the Nebraska state line, crossed the Mississippi River north of St. Louis, and continued to the Sullivan Substation remaining south of Springfield, Illinois. The Potential Routes were further refined and presented to regulators and the general public at a series of Open House meetings in Kansas. At the Open Houses, the Routing Team provided information about the Project and collected feedback to help further refine the Potential Routes. More than 2,300 people attended the 14 Open Houses.

Following the Open Houses, the Routing Team assembled and reviewed the input gathered at the meetings, revised the Potential Route Network where necessary, and compiled a series of fifteen Alternative Routes for analysis and comparison. The Routing Team divided the Alternative Routes into three distinct geographic segments that had common beginning and end points: West (A-H), Central (I-K), and East (L-O). Alternative Routes in each segment were compared against one another, and the most suitable route from each segment was selected for compilation of the Proposed Route.

Alternatives Analysis and Selection of the Proposed Route

The Alternative Routes (Alternative Routes A-O) were assessed and compared with respect to their potential impacts on natural resources (water resources, wildlife and habitats, special status species, and geology and soils), human uses (agricultural use, populated areas and community facilities, recreational and aesthetic resources, and cultural resources), and with respect to any noted engineering or construction challenges (transportation, existing utility corridors, other existing infrastructure, and the Missouri River crossings).

From that analysis the Routing Team recommended a combination of Alternative Routes H, I and M as the Proposed Route for the Project. This combination of Alternative Routes met the

overall goal of minimizing impacts on the natural, human, and historic resources along the route, while best utilizing existing transmission rights-of-way and avoiding non-standard design requirements.

Alternative Route H was selected in the West Segment and included a combination of section/parcel based alignments and alignments adjacent to existing transmission lines. Alternative Route H avoids the physical congestion near Spearville and largely follows section/parcel boundaries until it meets up with the Arthur Mullergren Tap 230 kilovolt line approximately 35 miles northeast of the western converter station. Beyond this point, Alternative Route H follows a largely parallel alignment toward Great Bend with only one diversion to avoid additional visual impacts to Fort Larned National Historic Site and several houses immediately adjacent to the existing line.

Alternative Route I was selected in the Central Segment and followed existing transmission lines for the majority of its length (79 percent). While Alternative I was longer than other options, it parallels existing transmission line through sensitive grassland habitat, avoids more residences, maximizes the distance from several towns and culturally sensitive areas, maximizes the distance from major whooping crane stopover habitat and designated critical habitat, and minimizes the creation of new obstructions in farmlands that are otherwise unimpeded. The Routing Team chose Alternative I because it minimized impacts to habitat, sensitive species, developed areas, and agricultural land in large part by paralleling existing transmission lines.

Alternative Route M was selected in the East Segment. It is the shortest Alternative Route that also maximizes parallel alignments of both transmission lines and gas lines. Alternative Route M directly parallels existing ROWs (mostly transmission lines) for over half of its total length, reducing the overall impact of the line on visual, recreational, and historic resources, and crosses the Missouri River at a point where an existing utility corridor crosses the river.

Together, Grain Belt Express contends that Alternative Routes H, I, and M comprise a Proposed Route for the Project that meets the KCC standard of reasonableness by: 1) following a route selection process that integrates input from regulatory agencies, local officials, and the general public into the route development, analysis, and selection process, and 2) selecting a Proposed Route that best minimizes the overall effect of the Grain Belt Express transmission line on the natural and human environment while avoiding unreasonable and circuitous routes, unreasonable costs, and special design requirements.

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I. Introduction

I.1 Project Overview

Grain Belt Express Clean Line LLC (Grain Belt Express) proposes to construct a new high voltage direct current (HVDC) transmission line from Ford County, Kansas, to Sullivan County, Indiana. The HVDC line will be approximately 750 miles long and will deliver approximately 3,500 megawatts (MW) of low-cost, renewable power to markets in Missouri, Illinois, Indiana, and states farther east. HVDC is the ideal technology for transferring a large amount of power over long distances for several reasons, including electrical reliability and land use efficiency.

The HVDC transmission line will connect to the grid at three distinct locations. The proposed converter stations are to be constructed near 1) Sunflower Electric Cooperative’s Spearville Substation in Ford County, Kansas, 2) near Ameren’s Palmyra Tap Substation close to the Missouri/Illinois border, and 3) near American Electric Power’s Sullivan Substation in Sullivan County, Indiana. The converter station in Ford County, Kansas, will convert the alternating current (AC) electricity from new wind generators in the local area to direct current (DC) electricity for delivery by the HVDC line. The proposed converter stations near the Missouri/Illinois border and near the Sullivan Substation in Indiana will convert DC electricity to AC electricity for delivery to the local AC electric grid.

Together, the HVDC transmission line, converter stations, and a series of AC transmission lines that will collect electricity from generators in Kansas (AC Collector System) comprise the Grain Belt Express Clean Line Project (Grain Belt Express Project or Project) (see **Figure I-1** below). The primary focus of this study will be on the siting effort associated with the HVDC transmission line. The AC Collector System will be addressed in a separate line siting application.

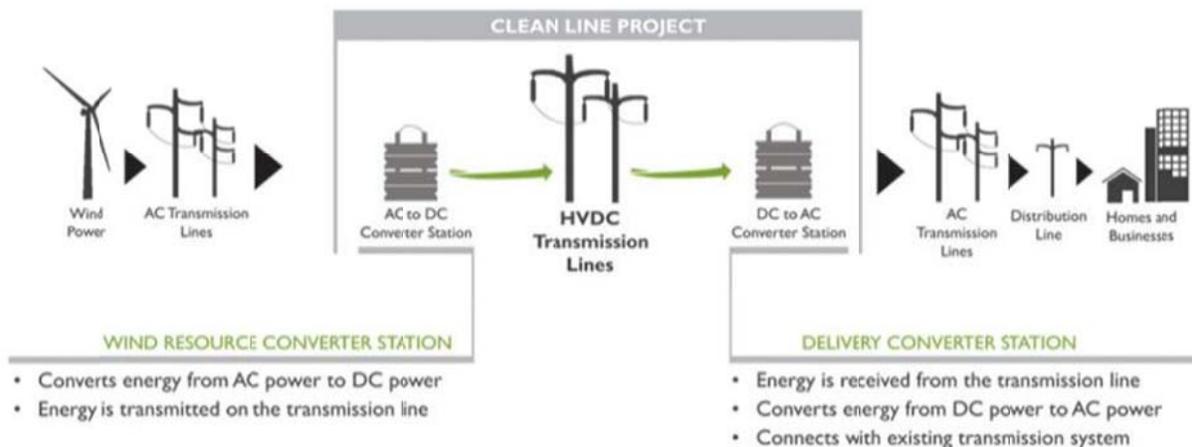


Figure I-1. Project Overview Diagram

1.2 Overview of the Regulatory Process

Grain Belt Express will seek approval to own, construct, and operate the HVDC transmission line in each state crossed by the Project, including Kansas, Missouri, Illinois, and Indiana. Regulatory proceedings associated with the approval of the Project will be hosted independently by each state utility commission per specific regulatory requirements in that state. Once approvals for the Project are received from each state, site-specific permitting and consultation efforts concerning wetlands, cultural resources, highway crossings, and others will be initiated with the appropriate state and federal agencies.

In Kansas, the regulatory process for approval to construct the Project will require two steps. The first step involves the filing of an application for a limited Certificate of Public Convenience and Necessity to site, construct, own, operate, and maintain bulk electric transmission facilities in the state of Kansas with the Kansas Corporation Commission (KCC). Grain Belt Express filed the first regulatory application on March 7, 2011, and on December 7, 2011, the KCC approved Grain Belt Express' application to conduct business as a transmission-only public utility in Kansas. The second step for approval to construct a transmission line is to file a Line Siting Application that presents a proposed alignment. This study will be presented as part of the Line Siting Application for the HVDC portion of the Grain Belt Express Project in Kansas. A routing study and a Line Siting Application for the AC Collector System in Kansas will be performed and submitted at a later date, after connecting generators are identified.

1.3 Project Timeline and Routing Process Overview

Grain Belt Express began formal development of the Project in July 2010. Soon after, Grain Belt Express contracted with The Louis Berger Group, Inc. (LBG) to support the siting, public outreach, and regulatory process for the Project. LBG and Grain Belt Express staff (herein after referred to as the Routing Team) began compiling information about the Study Area by coordinating with a range of regulatory agencies, and identifying Conceptual Routes (see Section 2.2 for a description of route development) for the Project.

In spring 2011, the Routing Team began hosting a series of Roundtables (Roundtables) (see Section 3.3.1) in southern Kansas and Missouri to gather information regarding local area constraints, regulatory concerns, and development plans from county officials, mayors, economic development coordinators, regional planners, environmental organization leaders, and federal and state agency officials. Throughout the summer of 2011, the Routing Team continued to consider routing concepts, coordinate with agencies and reviewed possible routing options in the field.

In July 2011, the Midcontinent Independent System Operator, Inc. (MISO)¹ provided Grain Belt Express with preliminary Systems Planning Analysis results from the interconnection studies of the Project. The results showed that the upgrades necessary to deliver 3,500 MW to the St. Francois Substation in Missouri would make the Project economically infeasible. The results of this analysis required Grain Belt Express to identify an additional point on the electric grid that could accept a large portion of power delivered by the Project, in addition to maintaining a delivery point in Missouri and MISO. After identifying the Sullivan Substation near the Illinois/Indiana border as a logical and suitable location for the Project's final delivery point, Grain Belt Express initiated a feasibility study in August 2011 with PJM Interconnection, Inc. (PJM).

In fall 2011, the Routing Team expanded the Study Area to account for the change in the Project's final endpoint and began to develop Conceptual Routes for the newly reconfigured Project. Under the new configuration, the eastern endpoint was shifted 85 miles to the north, allowing for possible routes north of Kansas City and St. Louis, in addition to potential routing options in southern Kansas and Missouri. The expanded Study Area also included a new range of reasonable interconnection points for the midpoint converter station location in Missouri (see Section 4.1).

During winter 2011, the Routing Team developed a range of Conceptual Routes in the Study Area for the reconfigured Project. By spring 2012, the Routing Team began a new series of Roundtable meetings in locations along the northern portion of the Study Area in Kansas, Missouri, and Illinois, and also held Roundtables in southern Illinois, gathering additional information to add to the information gathered across southern Kansas and Missouri to reach St. Francois. Fifty-seven Roundtable meetings were held across the Study Area. Upon completion of these Roundtables, the Routing Team had collected information from more than 740 community leaders in the Study Area. In Kansas, representatives from more than 50 counties attended the 19 Roundtables held, and over 300 participants in the Roundtable meetings.

During summer and fall 2012, the Routing Team continued to coordinate with state and federal regulatory agencies concerning key constraint areas and routing opportunity features as well as potential suitable river crossing locations of the Missouri, Mississippi, and Illinois Rivers. The Routing Team continued to review and refine the network of Conceptual Route alignments, and by fall 2012, the Routing Team had eliminated the southern and central Conceptual Routes to focus analysis and Potential Route development efforts on the northern portion of the Study Area. The refined Study Area encompassed the area around Spearville, Kansas; north of the Flint Hills and Kansas City and south of the Nebraska state line; east toward the Mississippi

¹ Formerly the Midwest Independent Transmission System Operator, Inc.

River between St. Louis, Missouri, and Quincy, Illinois; and then southeast across Illinois (on a general trajectory south of Springfield) toward the Sullivan Substation in Indiana, south of Terre Haute.

In winter and early spring 2013, the Routing Team planned and hosted 14 Open House meetings (see Section 3.3.2) throughout the northern portion of the Study Area in Kansas to present Potential Routes to local landowners and the general public. More than 2,300 members of the public attended the meetings and were asked to provide comments on the Project and the Potential Routes.

During spring 2013, the Routing Team reviewed and replied to hundreds of public comments from the Open Houses in Kansas and comments submitted online or by telephone. Input from the public was reviewed and considered on specific sensitive features and areas of concern, resulting in further refinement of the Potential Routes for the Project. Coordination with state and federal regulatory agencies as well as non-governmental groups associated with historic and natural resources continued during this period.

By late spring 2013, the Routing Team had refined the assemblage of Potential Route alignments and identified Alternative Routes from the western converter station to the Missouri River. The Routing Team continued coordination and status updates with state and federal regulatory agencies, and by June 2013, it had identified a Proposed Route through Kansas. This report presents the process, activities, analysis, and decision rationale for the selection of the Proposed Route.

1.4 Project Description

1.4.1 Line Characteristics

The Grain Belt Express Project will be constructed as ± 600 kilovolt (kV) HVDC transmission line that will be capable of delivering 3,500 MW of power. The HVDC transmission line facility consists of the primary conductors that carry the electricity, metallic return conductor, shield wires that protect the line from lightning strikes, structures that support the conductors and wires, and foundations that support the structures.

Up to eight primary conductors will be arranged in two bundles of three or four conductors, representing the positive and negative poles of the HVDC line. Each conductor will be roughly 1.5 inches in diameter and will be composed of aluminum wire strands surrounding inner strands of steel. Each conductor bundle will be suspended at the structures by insulators arranged in either a “V-string” or “I-string” configuration. The metallic return conductors will be located above the pole conductors and are supported at the structures by insulators rated to approximately 90 kV. At the top of the structures will be two shield wires. One or both of these shield wires may be optical ground wires that provide both lightning protection and fiber

optics for communications involved in the control and protection of the line and converter stations.

Grain Belt Express is proposing the use of steel lattice and steel monopole transmission structures for the majority of the Project. In some instances guyed lattice structures may be used. Grain Belt Express plans to use both lattice structures and tubular steel monopole structures for the Project, based on specific conditions at particular locations or in particular segments of the line.

Figure I-2 below presents schematics of two typical structure types showing typical dimension ranges. These ranges are approximate and subject to final engineering.

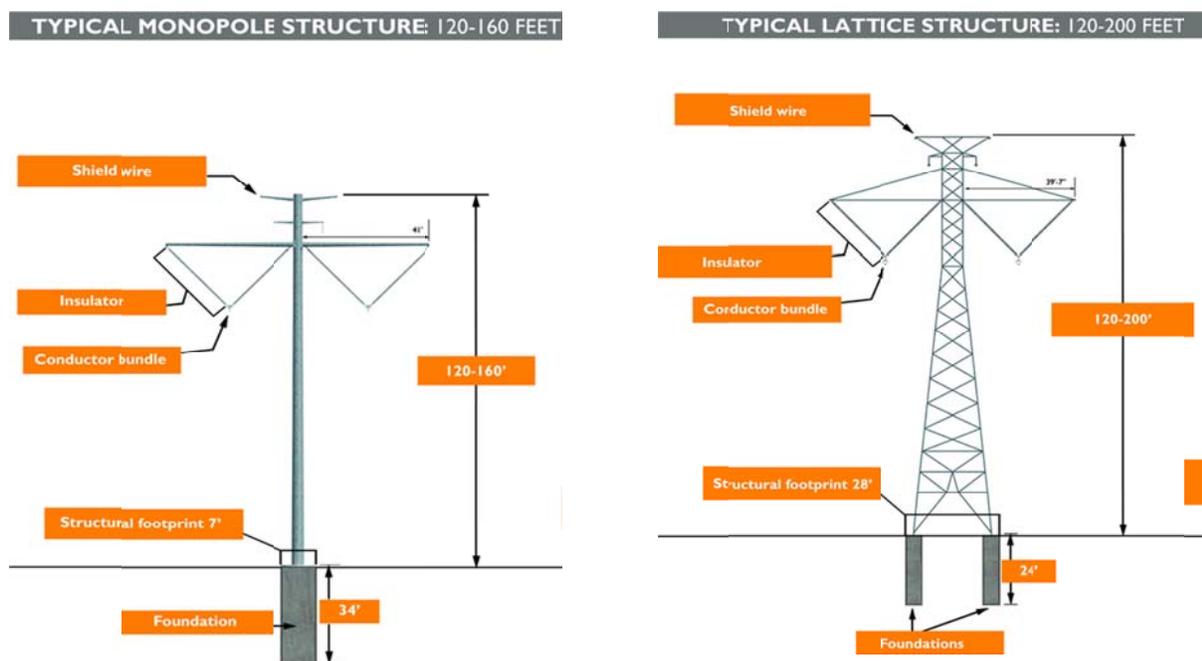


Figure I-2. Typical Structure Types

1.4.2 Right-of-Way Characteristics

The HVDC portion of the Grain Belt Express Project will be constructed within a 150- to 200-foot-wide right-of-way (ROW), which will be primarily composed of easements across private land. The ROW will be cleared to its full width of tall growing vegetation (taller than 10 feet) or as necessary for the safe and reliable operation of the transmission line. Farming and grazing land uses are typically compatible and can continue under the transmission line. Only the area at the base of each structure will be removed from existing land use (roughly 0.018 acre for a typical lattice structure or 0.0009 acre for a typical monopole structure).

1.4.3 Converter Stations

As mentioned previously, three HVDC converter stations are associated with the Grain Belt Express Project. A converter station at the western end, where the wind energy is generated in Kansas, will convert power from AC to DC. The other two converter stations will invert power from DC into AC for delivery to customers through the existing AC electric grid. The Grain Belt Express Project will deliver power to the AC grid in two locations, one in Missouri and one near the Illinois/Indiana border, to serve consumers in the MISO and PJM markets, respectively.

A converter station for an HVDC transmission line looks similar to a typical large electric substation; however, there is also a building that contains the converter power electronics in an enclosed environment. Each converter station will require roughly 40 to 60 fenced-in acres and will be located near its point of interconnection to the AC grid.

1.4.4 Project Vicinity

The Project will be constructed between Ford County, Kansas, and Sullivan County, Indiana (**Figure I-3**). Land use in the area is dominated by a combination of rural agricultural land uses (active farm and ranch lands) in the west and along the north with a progressive transition to more heavily forested landscapes farther east and south in Missouri and Illinois. Four major rivers cross the area and provide water for agricultural lands: the Arkansas River, the Missouri River, the Mississippi River and the Illinois River.

Major cities from west to east include Dodge City, Wichita, and Topeka, Kansas; St. Joseph, Kansas City, Springfield, Columbia, Jefferson City, and St. Louis, Missouri; and Quincy, Springfield, and Belleville, Illinois. Kansas City and St. Louis are by far the largest cities; together, they host nearly a million residents in the cities proper with estimates up to five million when combining the populations of both metro areas.

Major large land area attractions and recreation resources include the Flint Hills (Tall Grass Heartland), the Mark Twain and Shawnee National Forests, the general region of the Ozarks within which the forest lies, and a widely distributed array of federally and state-managed reservoirs that provide outdoor recreation, flood protection, and water sources.

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2. Routing Process

2.1 Goal of the Route Selection Study

The route selection study was conducted to identify the route for the Grain Belt Express Project transmission line. The overall goal of the route selection study was to gain an understanding of the opportunities and constraints in the Study Area, develop feasible Alternative Routes, evaluate potential impacts and identify a Proposed Route for the Project. The Proposed Route is defined as the route that minimizes the overall effect of the transmission line on the natural and human environment and avoids unreasonable and circuitous routes and unreasonable costs, and minimizes special design requirements.

This document describes the route selection methodology, public and agency outreach process, and the Proposed Route identification process for the Kansas portion of the Grain Belt Express Project that extends from Ford County, Kansas, to the Missouri River.

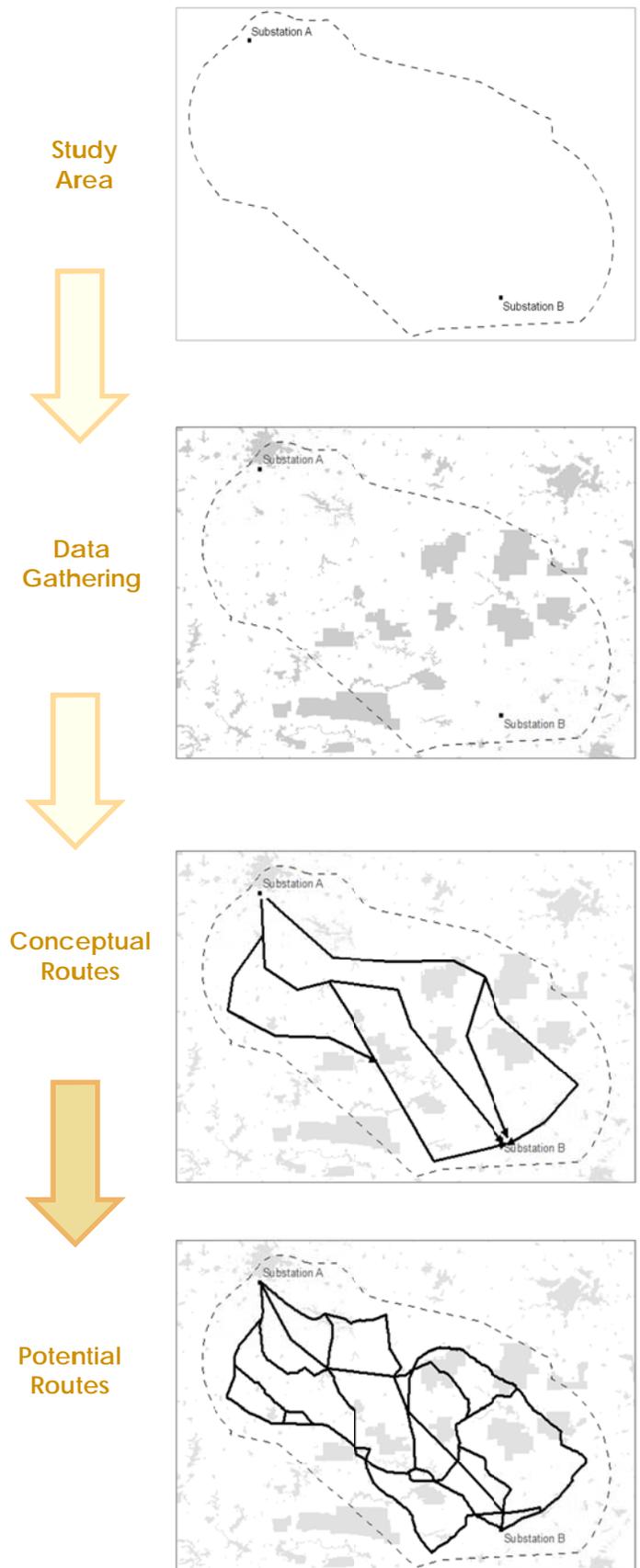
2.2 Process Steps and Terminology

The Route development process is inherently iterative with frequent additions or deletions of line segments and revisions to existing alignments as new constraints, opportunities, and inputs are received. Because of the evolutionary nature of the route development process, the Routing Team uses specific vocabulary to describe the routes at different stages of development.

Initial route development efforts start with the identification of large area constraints and opportunity features within the **Study Area**, which encompasses the endpoints of the project and areas in between. These areas are typically identified using a combination of readily available public data sources.

The Routing Team uses this information to develop **Conceptual Routes** adhering to a series of general routing and technical guidelines (see Section 2.4). Efforts are made to develop Conceptual Routes throughout the Study Area to ensure that all reasonable alignments are considered. Alignments are approximate at this stage, but they are revised after ongoing review and analysis and with input from the public, regulators, and stakeholders. During this step, Roundtables are held in each county with a Conceptual Route to gain more information about the Study Area.

As the Routing Team continues to collect information, coordinate with regulatory agencies, and gather additional site-specific information, Conceptual Routes are refined. The revised Conceptual Routes are considered **Potential Routes**.



Where two or more Potential Routes intersect, a **node** is created, and between two nodes, a **link** is formed. Together, the Potential Routes and their interconnected links are referred to as the **Potential Route Network**. The links are numbered for identification, and evaluated independently and collectively for refinements.

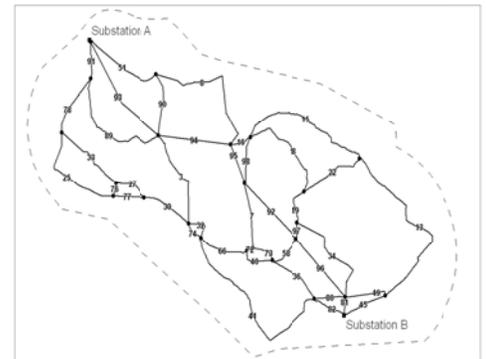
As the Routing Team continues to gather information and review the links of the Potential Route Network, links are modified, removed, or added. After an iterative process, a **Refined Potential Route Network** is presented to regulators and the public at Open House Meetings. Attendees provide input on Potential Route links and additional site-specific information for the Routing Team to consider.

Following the incorporation of public input, the links of the Potential Route Network are further refined and compared and a selection of the most suitable links is assembled into **Alternative Routes**.

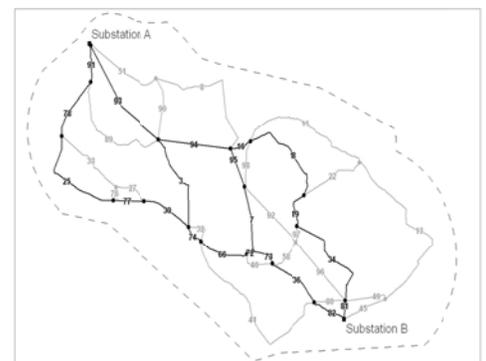
Alternative Routes are routes that begin and end at similar locations for direct comparison. Potential impacts are assessed and compared with land uses, natural and cultural resources, and engineering and construction concerns.

Ultimately, through analysis and comparison of the Alternative Routes, a **Proposed Route** is identified. The Proposed Route minimizes the effect of the Project on the natural and human environment, while avoiding circuitous routes, extreme costs, and non-standard design requirements.

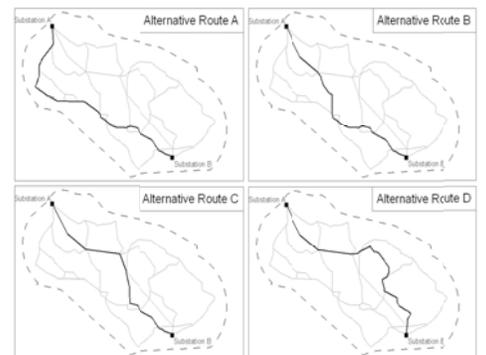
Potential Route Network



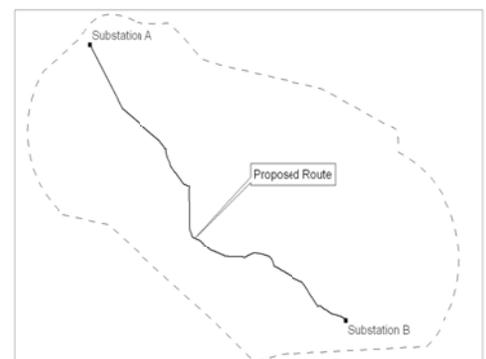
Refined Potential Route Network



Alternative Routes



Proposed Route



2.3 Routing Team Members

A multidisciplinary Routing Team performed the Route Selection Study. Members of the Routing Team have experience in transmission line route planning and selection, impact assessment for natural resources, land use assessment and planning, cultural resource identification and assessment, impact mitigation, transmission engineering and design, and construction. The team's objective was to identify a route that provides a reasonable balance between impacts on local communities and the natural environment, while applying appropriate routing and technical guidelines, as addressed in detail below. **Appendix A** lists the Routing Team members and their respective areas of responsibility.

The team worked together during the route selection study to:

- Define the Study Area
- Develop routing guidelines
- Collect and analyze environmental and design data
- Identify routing constraints and opportunities
- Consult with resource and permitting agencies
- Develop and revise the route alternatives
- Analyze and report on the selection of a Proposed Route

2.4 Routing Guidelines

As described above, the overall goal of the Route Selection Study is to identify a Proposed Route that minimizes the overall effect of the transmission line on the natural and human environment, that avoids unreasonable and circuitous routes and unreasonable costs, and that minimizes special design requirements. The use of routing guidelines helps to reach that goal by setting forth general principals or rules of thumb that guide the development of alignments considered in the study.

The Routing Team considered two types of Routing Guidelines: General Guidelines and Technical Guidelines. General Guidelines establish a set of principles that guide the development of alignments with respect to area land uses, sensitive features, and considerations of economic reasonableness. Technical guidelines provide the Routing Team with technical limitations related to the physical limitations, design, ROW requirements, or reliability concerns of the Project infrastructure.

2.4.1 General Guidelines

The following are general guidelines used for the Grain Belt Express Project:

- a. Minimize route length, circuitry, cost, and special design requirements
- b. Maximize the separation distance from and/or minimize impact on residences
- c. Maximize the separation distance from and/or minimize impact on schools, hospitals, and other community facilities
- d. Minimize the removal of existing barns, garages, commercial buildings, and other nonresidential structures
- e. Minimize impacts on agricultural use, including the operation of pivot irrigation infrastructure, where possible
- f. Avoid crossing cemeteries or known burial places
- g. Minimize crossing of designated public resource lands, such as national and state forests and parks, large camps and other recreation lands, designated battlefields or other designated historic resources and sites, and state designated wildlife management areas
- h. Minimize crossing large lakes, major rivers, and large wetland complexes
- i. Minimize impacts on critical habitat, protected species, and other identified sensitive natural resources
- j. Minimize substantial visual impact on residential areas and public resources

2.4.2 Technical Guidelines

The following are technical guidelines used for the Grain Belt Express Project:

- a. Minimize the crossing of 345 kV and 500 kV transmission lines
- b. Minimize paralleling corridors with more than one existing 345 kV or above circuit
- c. Maintain 200 feet of centerline-to-centerline separation when paralleling existing transmission lines of 345 kV or above
- d. Maintain 150 feet of centerline-to-centerline separation when paralleling 138 kV or lower voltage transmission lines
- e. Minimize turning angles in the transmission line greater than 45 degrees
- f. Minimize placing structures on sloping soils more than 30 degrees (20 degrees at angle points)
- g. Avoid underbuild arrangements with existing AC infrastructure

- h. Maintain a safe operational distance from existing wind turbines

2.5 Data Collection

The following sources of information were used to support the analysis in the Route Selection Study.

2.5.1 Digital Aerial Photography

Aerial photography is an important tool for route selection. The primary sources of aerial imagery used in the route identification, analysis, and selection effort for the Project include:

- 2010 color aerial photography produced by the National Agricultural Imagery Program (NAIP), and
- 2012 color aerial photography produced by NAIP

Aerial photography from these sources was viewed using Geographic Information System (GIS) software (ArcMap v10). Updated information, such as the location of residences and other constraints, was annotated to the photography by using either paper maps (at the public meetings) and transferred into the GIS, or digitizing the data directly into the GIS during field inspections.

2.5.2 GIS Data Sources

The study made extensive use of information from existing GIS data sets from many sources, including federal, state, and local governments (**Appendix B**). Much of this information was obtained from official agency GIS data access websites and government agencies. The Routing Team digitized information from paper-based maps, completed aerial photo interpretation, and conducted interviews with stakeholders and field reconnaissance.

2.5.3 Route Reconnaissance

The team members examined Potential Routes by automobile from points of public access and correlated observed features to information identified on aerial photography, U.S. Geological Survey 7.5 minute topographic maps in digital format, road maps, and the range of GIS sources. Prior to field reconnaissance, some key features, such as residences, outbuildings, recognized places of worship, cemeteries, and commercial and industrial areas, were identified and mapped in GIS using aerial photography. Residences were categorized as either occupied or unoccupied. In instances where it was unclear whether or not a residence was occupied, it was assumed to be occupied. These features were then verified and added to the GIS database using laptops running GIS software supported by real-time Global Positioning System (GPS) during field reconnaissance efforts.

In addition to automobile reconnaissance, the Routing Team also conducted a helicopter review to examine the Proposed Route from the air to determine the presence or absence of features that were not visible from the ground-based reconnaissance efforts.

2.6 Routing Constraints

The Routing Team identified and mapped routing constraints in the Study Area. These constraints were defined as areas that should be avoided to the extent feasible during the route selection study process. The constraints were divided into two groups based on the size of the geographic area encompassed by the constraint. The first group included constraints covering large areas of land in the Study Area. The Routing Team considered large-area constraints as unfavorable or incompatible for developing routes and chose to avoid those areas to the extent possible.

The constraint list was revised as the Routing Team developed greater familiarity with the Study Area and gathered additional data through agency and public meetings. The list of large-area constraints consists of:

- a. Urban areas, including cities, towns, small villages, and other built-up areas
- b. Federal lands, including national forests, national parks, national wildlife areas, lands owned by the U.S. Army Corps of Engineers (USACE) for flood control, and military facilities
- c. State forest and park lands and wildlife management areas
- d. Conservation lands and lands designated for their natural importance or scenic value
- e. Native American reservation lands
- f. Areas near airports and airstrips
- g. National Register Historic Districts and adjacent areas
- h. Large recreational sites
- i. Large lakes and reservoirs that could not be spanned with the structures set well back from the shores
- j. Large wetlands or wetland complexes

The second group of constraints encompasses other features covering smaller geographic areas or point-specific locations. Conceptual Routes were developed to avoid large-area constraints. The alignments were then refined to create Potential Routes that avoided, to the extent possible and practical, point-specific constraints, including but not limited to:

- a. Individual occupied² residences (including houses, permanently established mobile homes, and multi-family buildings)
- b. Commercial and industrial buildings
- c. Oil and gas wells and their associated storage tanks and pumping facilities
- d. Center pivot irrigation facilities
- e. Recorded and designated historic buildings and sites, including any specified buffer zone around each site
- f. Recorded sites of designated threatened, endangered, and other rare species or unique natural areas and the specified buffer zone around each site
- g. Small wetlands or playas
- h. Developed recreational sites or facilities
- i. Communication towers
- j. Wind turbines
- k. Designated scenic vista points

2.7 Routing Opportunities

Routing opportunities were identified by the Routing Team as locations where the proposed transmission line might be located with less disruption to surrounding land uses and the natural and cultural environment. Opportunity features typically included other linear infrastructure and utility corridors, such as the existing electric and gas transmission network, rail lines, and roads, but may also include reclaimed lands or unused portions of industrial or commercial areas.

Existing transmission lines were considered an opportunity if they were aligned in a suitable direction. Paralleling existing transmission lines is a common practice used when routing new transmission lines and is supported by many state utility commissions, state and federal regulatory agencies, and the Federal Energy Regulatory Commission (FERC, 1970). Paralleling existing linear utilities consolidates utility corridors, logically placing a new land use feature in close alignment with an existing similar land use feature thereby avoiding the fragmentation of existing land uses and habitats through an area. In addition, paralleling existing transmission lines can reduce the overall impact of the new transmission line on visually sensitive areas (historic sites, outdoor recreation areas, etc.), avian resources, and airfield flight zones, since any impacts of the new line are considered with respect to the impacts of the existing line. In

² See Section 2.5.3, *Route Reconnaissance*.

these areas, the impacts of the new line are considered incremental to the existing impacts, rather than completely new impacts in otherwise unimpacted areas.

Major pipelines were also considered an opportunity feature, especially in areas where existing transmission lines were not available and in forested areas where the pipeline has an established and cleared ROW. Like existing transmission lines, pipeline ROWs are cleared linear corridors of existing disturbance, upon which buildings and other non-pipeline facilities are prohibited from being constructed. Paralleling these features consolidates linear rights of way with similar construction and use limitations thereby avoiding the fragmentation of land uses through an area.

Roads are typically considered as a logical linear opportunity for planning transmission lines, and are commonly paralleled by lower voltage transmission and distribution lines. However, for higher voltage lines with larger structures and longer spans, alignments along roads often conflict with the residential and commercial development along them. In addition, when alignments are developed adjacent to roads managed by the Kansas Department of Transportation (KDOT), the policy states:

“Permanent aboveground facilities shall not be placed within the access control of the highway facility except for documented hardship conditions as approved by the Secretary in writing or for installations at Rest Areas” (KDOT, 2007).

As a result of this requirement, route centerlines were aligned 100 feet beyond the edge of the road ROW into adjacent lands. Rail lines present a similar type of opportunity feature; one that can be limited by adjacent development. Communities and industrial facilities (including grain elevators) are often located along rail lines, making it difficult to parallel them for any significant distance. However, when feasible both roads and rail lines remained an opportunity that were considered.

In addition to existing linear infrastructure, the grid-based section lines of the public land survey system and the parcel boundaries that further dissect each section (together herein after referred to as “section/parcel boundaries”) also served to guide the development of alignments along logical divisions of ownership. The Routing Team sought to align routes along section/parcel boundaries in the absence of, or as an alternative to, parallel alignments along existing linear infrastructure where existing land use would be more impacted by the Project otherwise. This was most relevant in farmed areas, where farming operations extend to the edge of the property boundary.

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3. Agency and Public Outreach

3.1 Regulatory Agency Coordination

The Routing Team contacted numerous federal, state, and local agencies to gather information for the route planning process. The agencies consulted are provided in the list below. Copies of correspondence with federal and state agencies are provided in **Appendix C**.

Initial coordination efforts focused on introductions to the Project, data gathering, and discussions concerning likely permitting and consultation requirements. The following list presents the federal and state agencies that have been contacted.

Federal Agency and Regulatory Authorities:

- U.S. Environmental Protection Agency, Region 7
- U.S. Fish and Wildlife Service
 - Mountain-Prairie Region, Kansas Ecological Services Field Office
 - Midwest Region, Columbia Ecological Services Office
 - Midwest Region, Rock Island Ecological Services Field Office
 - Midwest Region, Marion Ecological Services Sub-Office
- U.S. Army Corps of Engineers
 - Kansas City District
 - Rock Island District
 - Louisville District
 - St. Louis District
 - Tulsa District
- National Park Service
 - Fort Larned National Historic Site
 - National Historic Trails
 - California National Historic Trail
 - Santa Fe National Historic Trail
 - Oregon National Historic Trail
- Natural Resources Conservation Service

State Agency and Regulatory Authorities:

- Kansas
 - Kansas Corporation Commission
 - Kansas Department of Transportation
 - Kansas Department of Wildlife, Parks and Tourism
 - Kansas Historical Society
 - Kansas Forest Service
- Missouri
 - Missouri Public Service Commission
 - Missouri Department of Conservation
 - Missouri Department of Natural Resources
 - State Historic Preservation Office
 - Division of Environmental Quality
- Illinois
 - Illinois Commerce Commission
 - Illinois Department of Agriculture
 - Illinois Department of Natural Resources, Historic Preservation Office
 - Illinois Department of Natural Resources
 - Illinois Department of Transportation
- Indiana
 - Indiana Utility Regulatory Commission
 - Indiana Department of Environmental Management
 - Indiana Department of Natural Resources
 - Division of Fish and Wildlife
 - Division of Historic Preservation and Archeology

3.2 Non-Government Organizations

In addition to state and federal agencies, the Routing Team coordinated with members of several natural and historic conservation groups during the process. These contacts provided

valuable additional information sources for identifying sensitive natural resource habitats and historic resources in the Study Area. These groups included:

- The Nature Conservancy, Kansas, Missouri, and Illinois Chapters
- National Pony Express Association
- Oregon-California Trails Association
- Sierra Club, Kansas and Missouri Chapters

3.3 Community Outreach Activities

The Routing Team led a community outreach program that was designed to educate the public about the purpose and benefits of the Project, inform community leaders and the public about the regulatory process and Project timeline, and gather general comments on the Project and specific information that would refine the siting effort.

An important part of initiating the outreach program was to identify key community leaders in each county through which the Project might be constructed. To this end, Grain Belt Express staff met with local county officials throughout the Study Area early in the development process to give an introduction to the Project and to identify key planning, economic development, and community leaders in each county. These contacts provided insight into local planning issues and local development efforts. They also helped identify locations and support services for hosting local public meetings.

Two rounds of public outreach meetings were conducted for the Grain Belt Express Project: Roundtables and Open Houses. The Routing Team planned meeting locations within the Study Area so that potential attendees would be within a 30-mile radius of at least one meeting location. In addition, Grain Belt Express staff held three local business opportunity meetings in Kansas to explore opportunities to use local businesses during the development, construction, and maintenance phases of the Project.

3.3.1 Roundtables

The main goal of the Roundtables was to coordinate with and gain valuable information from local leaders in each county in the Study Area. Community leaders included local, county, and municipal elected officials, local government planners, community and business leaders, economic development experts, local utilities and cooperatives, as well as federal and state agency officials. At each meeting, members of the Routing Team presented an overview of the Project and described the routing process. After the presentation, attendees and members of the Routing Team broke into small working groups to review an aerial map of the county they represented. Attendees were encouraged to write on the maps and to provide and verify specific information about sensitive features, planned development, and existing infrastructure

in their community. Attendees were also encouraged to draw route suggestions on the aerial maps that the Routing Team should consider in the study, based on current and future opportunities and constraints. After the meetings, the constraints identified and routes suggested were digitized, reviewed, and/or incorporated into the routing process. Copies of the invitations for the meetings can be found in **Appendix D**.

Representatives from more than 50 counties in Kansas attended the 19 Roundtables held, and over 300 participants in the Roundtable meetings. Table 3-1 shows the locations and attendance for each Roundtable.

Table 3-1. Roundtable Location and Attendance		
Location	Date	Attendance
Dodge City	May 16, 2011 (AM)	43
Greensburg	May 16, 2011 (PM)	23
Pratt	May 17, 2011 (AM)	16
Hutchinson	May 17, 2011 (PM)	23
Anthony	May 18, 2011 (AM)	11
Wellington	May 18, 2011 (PM)	20
El Dorado	May 19, 2011 (AM)	11
Howard	May 19, 2011 (PM)	16
Yates Center	June 13, 2011 (PM)	16
Erie	June 14, 2011 (AM)	24
Pittsburg	June 14, 2011 (PM)	17
Lincoln	February 21, 2012 (AM)	36
Great Bend	February 21, 2012 (PM)	18
Larned	February 21, 2012 (PM)	9
Russell	February 22, 2012 (AM)	17
Osborne	February 22, 2012 (PM)	14
Concordia	February 23, 2012 (AM)	54
Washington	February 23, 2012 (PM)	14
Seneca	February 24, 2012 (AM)	12
Highland	February 24, 2012 (PM)	18
Total		412

The Roundtables provided the Routing Team an avenue to gain community perspectives on new or planned infrastructure in relation to their county or jurisdiction through face-to-face communication with local representatives. Generally, the community leaders at the Roundtables helped to identify large area constraints or opportunities in their county or jurisdiction. Community leader input also helped identify potential future land use plans, such as the construction of new water storage facilities, communication towers, or new industrial, commercial, or residential development. Community leaders also helped to identify the approximate location of existing features such as, historic sites, mining activities, communication towers, airstrips, schools, churches, etc. Data provided by community leaders at the Roundtables were considered in the Routing Team's route development and selection efforts.

3.3.2 Open Houses

In January, February, and March 2013, Grain Belt Express hosted Open House meetings in Kansas. At the Open Houses, Grain Belt Express provided information about the Project and collected feedback to help refine the Potential Routes and ultimately select a single Proposed Route to file for approval with the Kansas Corporation Commission. A total of fourteen Open House Meetings were held at locations along the Potential Route Network.

Meeting notification included individual mailings sent to landowners, newspaper advertisements, coordination with local community leaders, and posts on the Project website. Mailings were sent to property owners (as identified in the local county tax and parcel information received from each county) within an approximately three-mile wide 'planning corridor' around each Potential Route. Portions of the planning corridors that included major developed and/or incorporated areas were typically removed from mailing lists since these areas were not suitable for route development and the intent of the notification effort was to invite landowners with property that might be directly affected by the Project. Invitations were sent to more than 11,200 people within the planning corridors. Copies of the invitations can be found in **Appendix D**.

More than 2,300 people attended the 14 Open Houses in Kansas, including a make-up meeting in Russell due to inclement weather. **Table 3-2** contains the locations and attendance for each public meeting.

At each Open House, members of the Routing Team greeted and signed in meeting attendees. At sign in, attendees were provided a comment card and asked to fill in their address and contact information at the top of their comment card. The comment card was perforated, and after signing in, the top of the card was removed to document an individual's attendance. The lower portion of the comment card included several questions for attendees to answer and a space to write in general comments about the Project. Attendees were encouraged to turn in this portion prior to leaving the meeting, but were also provided the opportunity to mail comments back to the Routing Team. The upper and lower portions of the comment card

were labeled with the same unique number to identify the attendee. In this way, landowner attendance was tracked, and once filled out and submitted, the lower body of the comment card could be linked back to the individual landowner's contact information after the meeting.

Table 3-2. Open House Location and Attendance		
Location	Date	Attendance
Dodge City	January 28, 2013 (PM)	200
Great Bend	January 29, 2013 (AM)	150
Larned	January 29, 2013 (PM)	146
Russell	January 30, 2013 (AM)	80
Osborne	January 30, 2013 (PM)	120
Beloit	January 31, 2013 (AM)	125
Lincoln	January 31, 2013 (PM)	207
Concordia	February 1, 2013 (AM)	125
Washington	February 11, 2013 (AM)	266
Seneca	February 12, 2013 (AM)	230
Marysville	February 12, 2013 (PM)	253
Troy	February 13, 2013 (AM)	117
Hiawatha	February 13, 2013 (PM)	249
Russell (make-up)	March 12, 2013 (PM)	56
Total		2,324

After attendees signed in, they were given a guided presentation about the Project on poster boards set up on easels. The tour presented information on the purpose of the Project, Project benefits, the routing process and criteria, physical characteristics of the line, and the Grain Belt Express Code of Conduct. The guided tours typically lasted 15 minutes and were conducted in small groups to allow attendees the opportunity to ask questions and receive immediate answers from members of the Routing Team.

At the end of the tour, the Routing Team assisted attendees in locating their property or other features of concern on aerial photography maps displaying the array of Potential Route links under consideration. Each map presented a specific portion of the line with information on identified constraints, land areas, and existing infrastructure presented at a scale of 1 inch = 2,000 feet. Participants were provided the opportunity and encouraged to document the location of their houses, places of business, properties of concern, or other sensitive resources on the printed maps. Routing Team members worked with landowners and ensured that each comment or group of comments provided by an attendee was also referenced to the number on the attendee's individual comment card (by recording it on or next to the attendee's comments on the map).

One or two digital mapping stations were also provided at each Open House to allow attendees the opportunity to find their lands and document their concerns directly in the GIS database. Each digital mapping station was run by a GIS technician and contained all of the data presented on the printed maps and a full parcel database to help search for parcels that owners could not find on the printed maps. The GIS station was most often used and most efficient for those attendees who were not familiar with their properties from an aerial map perspective, owned a multitude of properties in the area, or had brought a list of properties by either parcel identification number or section/township/range for consideration.

After the Open Houses, all of the maps used to collect comments were scanned, geo-referenced, and integrated into the GIS database. The locations of specific comments provided by attendees, denoted by the commenter's unique comment card identification number, were digitized and linked to the information provided on the individual's complete comment card. All comments received via the comment cards were recorded and categorized in a database for review and correlation with mapped comment locations.

One question asked on the comment cards related to opportunity features. In developing Potential Routes, the Routing Team looked at paralleling several linear features including, transmission lines, gas pipelines, parcel boundaries, roads, and rail lines. To gain greater perspective on these opportunity features, the comment card contained a question asking the public which parallel option they preferred. **Figure 3-1** below shows the summary of responses to this question. In general, the public preferred paralleling existing transmission lines, parcel boundaries, and roads/highways.

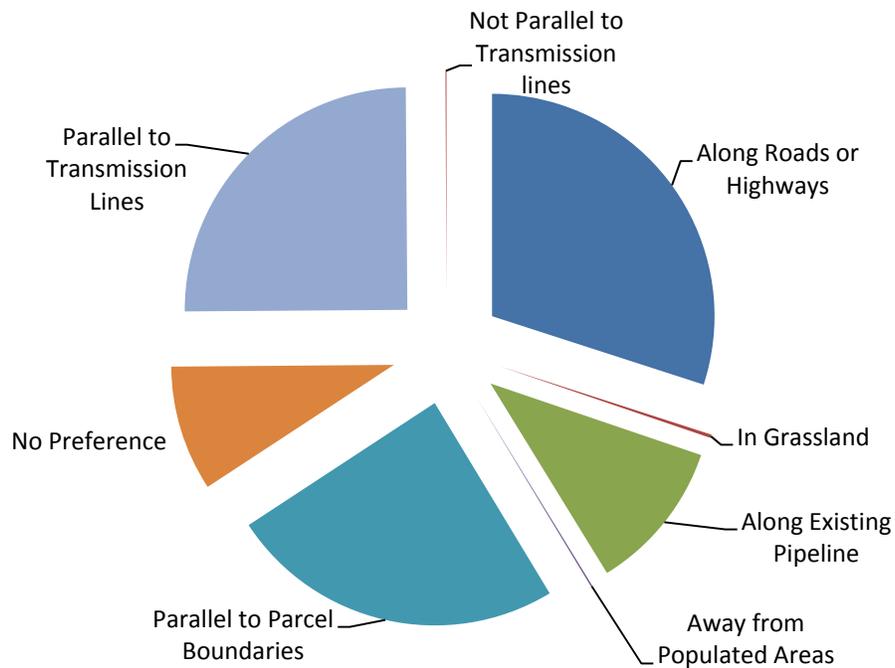


Figure 3-1. Summary of Public Response to Parallel Options

Summary of Public Comments

Generally, the members of the public who attended the Open House meetings helped to identify small area constraints or opportunities on their properties or in their communities. Meeting attendees provided specific information regarding the location, or planned location of elements such as residences, barns or outbuildings, pivot irrigation, oil wells, wind turbines, historic markers, cemeteries, schools, and airfields. They also provided information regarding current land use such as organic farming, seed crop production, and other agriculture practices, rangeland, recreation, residential, etc. Similar comments were also collected from the public through the Project website, mailed letters, emails, and a toll-free phone number. The maps with the Potential Routes presented at the Open Houses were also posted online so stakeholders could review the Potential Routes and provide comments even if they were unable to attend the Open Houses. Over 300 comments were received outside of the Open Houses, and members of the Routing Team responded to individuals to answer their questions and to address their concerns.

Categories were created in order to capture the main concerns or issues raised through public comment and included: aesthetics, keep informed, right-of-way, electric and magnetic field, need, safety, farm/rangeland, noise, sensitive species and habitats, health, other, state commission, historic/cultural, property values, vegetation management, irrigation, recreation, and water resources. The categories that were recorded most often (outside of keep informed) included, right-of-way, irrigation, farm/rangeland, and vegetation management.

A summary of all comments received (via email, website, comment card, phone call, and letter) is shown below in **Figure 3-2**. As the Routing Team reviewed and refined Potential Routes, the associated comments were reviewed and taken into consideration.

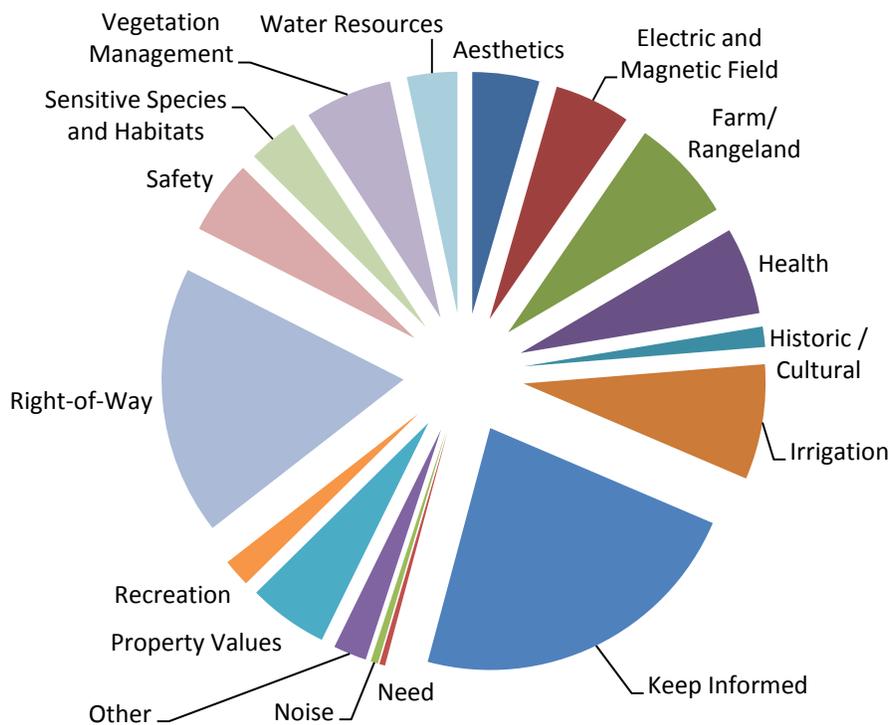


Figure 3-2. Summary of Public Comments

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4. Route Development

As described in Section 2.2, the route development effort is an evolutionary process with a set of Conceptual Routes that are further refined to become Potential Routes and a network of Potential Routes that are analyzed, compared, and refined to be assembled into Alternative Routes. Finally, comparative potential impacts are evaluated for each Alternative Route to identify a Proposed Route. At each stage of development, the route alignments become more specific and the data analysis more resolute. The following sections provide discussions of each of the phases of route development and present a summary of routing decisions and analysis that lead to the subsequent refinement stage.

4.1 Study Area

The Study Area for the Grain Belt Express Project is generally defined as the geographic area encompassing the two end-point converter stations in Ford County, Kansas and Sullivan County, Indiana and logical interconnection locations for the third, mid-point converter station near the Missouri/Illinois border (see **Figure 4-1** below). The presence and extent of certain relevant resources within the Study Area were also considered while delineating the Study Area boundary. One of the major factors that guided the definition of the Study Area boundary is the presence of existing linear ROWs, particularly electric transmission line and pipeline ROWs. Siting new transmission lines parallel to existing linear features is a common practice in transmission line siting and is supported by many state and federal regulatory authorities (see Section 2.7). Incorporating the location and trajectory of existing transmission and other utility corridors in the delineation of the Study Area ensures that Potential Routes parallel to existing lines are developed in the study.

Although the term Study Area boundary suggests that the Study Area is initially established and subsequently maintained throughout the study as a fixed boundary, in practice this is not usually the case. As the routing study progresses, additional opportunities and constraints are naturally identified, and some of these may require modification of the Study Area boundary.

4.2 Conceptual Route Development in the Study Area

Conceptual Routes are the first step in the route development effort. As the name would suggest, Conceptual Routes are developed based on broad routing ‘concepts’ that are typically based on avoidance of large area constraints or alignments that incorporate notable opportunity features in the Study Area. In practice, the transition from Conceptual Routes to Potential Routes falls along a continuum of change. However, for the purpose of this study and to provide for clarity in referencing different decision phases of the effort, routing decisions that impacted route planning across all four states are presented under the Conceptual Route development process.

A wide array of initial Conceptual Routes was developed for the Grain Belt Express Project in Kansas, Missouri, Illinois, and Indiana. The following sections provide a summary of the Conceptual Routes considered, including: the basis for the routing concept, key constraints and opportunities encountered, and the decision whether to eliminate or continue refinement of each Conceptual Route. For simplicity and clarity, the Conceptual Routes have been grouped in the following discussion based on their relative geography in the Study Area (see **Figure 4-1** above). Conceptual Routes in the northern portions of the Study Area followed paths that led north of Kansas City and St. Louis to reach the eastern converter station location. Conceptual Routes in the central portion of the Study Area generally followed paths north of Wichita, south of Kansas City, and north of St. Louis. Conceptual Routes in the southern portion of the Study Area generally followed a trajectory either north or south of Wichita and the reservoir system in Missouri, but crossed into Illinois south of St. Louis.

4.2.1 Conceptual Routes - Northern Portion of the Study Area

Conceptual Routes along the northern portion of the Study Area were developed to consider alignments that: crossed the Missouri River between Kansas City and the Nebraska state line, crossed the Mississippi River north of St. Louis, and continued to the Sullivan Substation remaining south of Springfield, Illinois (**Figure 4-1**). Residential density along the northern Conceptual Routes was relatively minimal, and most large area constraints were readily avoidable. However, three major river crossings, sensitive grassland habitats, and numerous historic sites and trails represented notable challenges to the route development effort through this portion of the Study Area.

Large area constraints in the northern portion of the Study Area in Kansas include: multiple federally owned reservoirs and state conservation lands, two national wildlife refuges, several U.S. Army bases, and the towns of Topeka, Lawrence, Salina, Hays, and Great Bend. In addition, the Flint Hills Ecoregion, one of the largest intact areas of tallgrass prairie in North America, occupies a significant portion of the Study Area in Kansas (**Figure 4-2**). In Kansas, the region exists as a band of largely intact prairie, roughly 50-60 miles wide east to west (falling roughly between Wichita and Topeka) that extends from the Kansas/Oklahoma border to nearly Nebraska. In 2011, to prevent further development of wind generation and promote ecological conservation and ecotourism, Governor Brownback designated nearly 11,000 square miles of this area as the Tallgrass Heartland. Although the area was not excluded from future transmission line construction in that designation, the Routing Team only considered crossings of the Tallgrass Heartland that were parallel to existing transmission lines to avoid the creation of completely new scenic and environmental impacts on this resource.

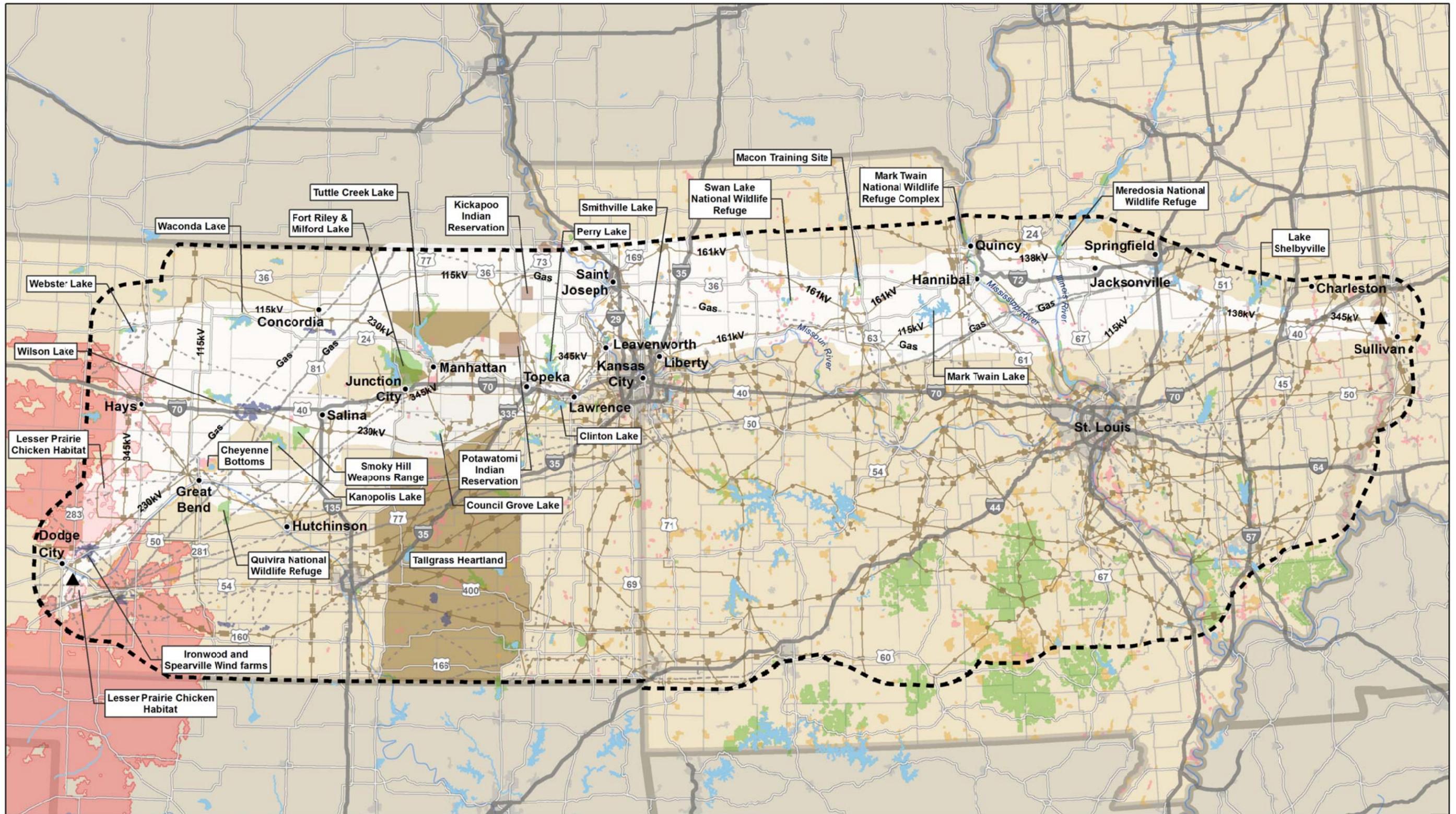
Opportunity features in the northern portion of the Study Area include the existing network of transmission lines and an array of interstate pipelines passing from southwest to the northeast across the Study Area. Section lines and parcel boundaries also served to guide the

development of alignments by allowing alignments to follow along ownership boundaries when possible. Several rail lines and state or federal highways were also considered in the initial development of Conceptual Routes; however, restrictions on overhanging state ROW (KDOT, 2007) combined with the close relationship between roads, rail, and commercial or residential development, limited the development of viable alignments along many of these features.

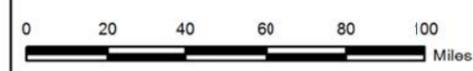
The Routing Team considered a variety of different route options to exit the western converter station toward the northern portion of the Study Area (see **Figure 4-2** below). Route development in this area is encumbered by extensive farmlands and center pivot irrigation facilities; the physical congestion of existing wind generation facilities, transmission lines, substations, and residences; and sensitive lesser prairie-chicken habitat that surrounds the Spearville area along its eastern and northern periphery. However, several suitable route options were developed along section/parcel boundaries to the north and east and along existing transmission exiting the converter station area toward the northeast.

Once beyond the western converter station area, Conceptual Routes either angled to the north along existing transmission lines or section/parcel boundaries toward Hays, or, continued to the northeast along an existing transmission corridor toward Great Bend. At Great Bend, Conceptual Routes continued either north along existing transmission line toward Osborne, northeast along an existing pipeline corridor toward Concordia, or east across the Arkansas River and between Cheyenne Bottoms Wildlife Area and the Quivira National Wildlife Refuge. The Routing Team ultimately removed this latter route concept from further consideration following coordination with the U.S. Fish and Wildlife Service (USFWS) and Kansas Department of Wildlife, Parks and Tourism (KDWPT). Cheyenne Bottoms and the Quivira National Wildlife Refuge provide important stopover habitat for migratory birds, and are designated as critical habitat for the federally endangered whooping crane. The area between these two conservation areas serves as a connectivity zone for migrating birds, and KDWPT and USFWS considered the area between the two unsuitable for construction of the Project.

Several west to east Conceptual Route segments were developed along or near Interstate 70 within the northern portion of the Study Area. Although the Routing Team initially attempted to develop routes directly parallel to Interstate 70, they were not considered viable for a variety of reasons. Most notably, paralleling the interstate required frequent diversions at each highway interchange to avoid adjacent commercial and residential developments, periodically resulting in long diversions to account for small towns or development that extended between two nearby exits. These types of diversions would be required because the transmission line would have to be located outside of the interstate and interchange ROWs per KDOT's Utility Accommodation Policy (2007). Ft. Riley Army Installation is also located adjacent to Interstate 70 and extends north, encompassing over 100,000 acres. Developed routes would have to avoid this area so as not to interfere with U.S. Army operations and training. In addition,



Sources: ESRI, NPS, USGS, USACE, USFWS, USDA-NRCS, US EPA, KDWPT, KPRA, KS DASC, KARS, KS Biological Survey, MODNR, MDC, ISGS, ILPRA, IN DNR, The Nature Conservancy



Coordinate System: North America Equidistant Conic
 Projection: Equidistant Conic
 Datum: North American 1983

• City	▲ Converter Stations	Conservation Land	Metropolitan Area
- - - Study Area	Existing Transmission	Local/Private	Water Body
Interstate	< 138 kV	State	Tallgrass Heartland
U.S. Highway	138 kV - 230 kV	Tribal	Lesser Prairie Chicken Habitat
Gas Pipeline	> 230 kV	Federal	CHAT Categories 1-3

Figure 4-2
Conceptual Route Development
in the Northern Portion of the Study Area

GRAIN BELT EXPRESS
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Interstate 70 passes through the Tallgrass Heartland of the Flint Hills, a highly scenic area that is viewed by between 12,000 and 20,000 travelers per day.

Although Conceptual Routes along Interstate 70 were removed from consideration, two conceptual alignments were initially considered near Interstate 70 as potential options for crossing the northern portion of the Tallgrass Heartland parallel to existing 345 kV transmission lines. These two options were also ultimately removed from further consideration. The first option, and most northern, paralleled an existing line that followed a circuitous route through a commonly viewed portion of the Flint Hills, crossed conservation lands protected by the Natural Resources Conservation Service's (NRCS's) Farm and Ranchland Protection Program, a wildlife area managed by KDWP, and the federal Perry Lake Reservoir before reaching the Missouri River. The second option, crossed near U.S. Highway 56, and angled north along the edge of Clinton Lake Reservoir and State Park, continued through the suburban developments west of Lawrence, and crossed the Missouri River just north of Fort Leavenworth. The likely impacts associated with both of these routes on public lands, residential areas, and designated scenic resources ultimately resulted in their removal from further consideration.

Conceptual Routes north of Great Bend continued either along section/parcel boundaries west of U.S. Highway 183, north along an existing 115 kV transmission line near U.S. Highway 281, or northeast along the Natural Gas Pipeline of America, LLC pipeline corridor to Concordia. Several west-to-east Conceptual Routes were developed through this area to connect the western north-south routes with conceptual alignments along the pipeline. Those routes that continued due north from Great Bend or through Hays ultimately angle to the east near Waconda Lake and continue along a combination of section/parcel boundaries and an existing 115 kV transmission line toward Concordia.

From Concordia to the Missouri River, three main west-to-east Conceptual Routes were developed with periodic interconnections north to south between each route. The most northern route followed section/parcel boundaries north of U.S. Highway 36. The central Conceptual Route continued along an existing transmission line corridor that began 65 miles to the west near Waconda Lake. The southernmost Conceptual Route followed along section/parcel boundaries on a heading just north of the northernmost tip of Tuttle Creek Lake and the lands of the Kickapoo Reservation.

Three primary crossing locations were considered for the Missouri River near St. Joseph, Missouri: two on a trajectory north of the city and one to the south. The two northern river crossings were developed at locations that both avoided a series of Missouri Department of Conservation lands in the floodplain and on the eastern bluffs of the river, while at the same time crossed at locations that readily provided access to parallel a 345 kV line toward St. Joseph. The southernmost crossing was developed to parallel the combined Rockies

Express/Keystone Pipeline corridor from near Fairview, Kansas to and across the Missouri River.

The residential and commercial development of St. Joseph served as the primary constraint on the eastern bluffs of the Missouri River. The steep topography beyond the floodplain quickly shifts land use from floodplain farmland to a combination of forest covered hillsides and moderate-high density residential development. The Routing Team initially developed alignments from the two northern river crossings along the Cooper – St. Joseph 345 kV line north of the city. However, fingers of residential and commercial development extending northward from the city along Interstates 229 and 29 prevented suitable parallel alignments along the line through this area. Ultimately, the Routing Team developed routing alignments that diverged from a parallel alignment near Amazonia and continued further east before angling to the south to continue along the east side of St. Joseph. The routes parallel the existing Hawthorne – St. Joseph 345 kV transmission line towards the southeastern corner of Buchanan County.

The Routing Team developed a network of Conceptual Routes that emanated from the Rockies Express/Keystone Pipeline crossing of the Missouri River. Similar to the northern crossing, steep topography beyond the floodplain quickly shifts land use from floodplain farmland to a combination of forested hills and moderate density residential development. A network of routes was developed from this southern crossing location eastward, through the farmlands in the Missouri floodplain and into the sporadic residential development along the bluffs and in the subsequent valleys eastward. Conceptual Routes were developed through this area along the pipeline or existing transmission lines to the southeast to pass through the residential development along the bluffs and around the community of Agency, Missouri further to the east.

Conceptual Routes beyond St. Joseph and east across Missouri were developed around three primary concepts: a section/parcel boundary based alignment just south of U.S. Highway 36; a route that continued parallel along the Rockies Express/Keystone Pipeline corridor; and an alignment that paralleled existing transmission lines to the north that looped between St. Joseph, Fairport, Jamesport, Brookfield, and Marceline, Missouri. The Routing Team ultimately removed this latter route alignment from further consideration because the benefits of paralleling the existing transmission lines through this area did not outweigh the likelihood of impacts associated with: frequent diversions to avoid residences near Gallatin and Jamesport, multiple transmission line crossings, and crossings of several private and federal conservation easements as well as the Pershing State Park.

Once beyond the extensive federal, state, and private conservation areas lining the Grand River, the Conceptual Routes diverge and head toward a series of potential Mississippi River crossing locations that were identified along a 75-mile stretch of river from Quincy, Illinois, to Wynfield,

Missouri. Per discussions with the USFWS and the USACE, the Routing Team attempted to find crossing locations with existing infrastructure crossings or disturbance. The Routing Team identified several suitable transmission line and pipeline crossings for potential crossings but also considered areas with breaks in federal and state ownership away from developed areas as reasonable crossing locations.

Once across the Mississippi and Illinois Rivers, the Routing Team developed a network of Conceptual Routes that continued east along existing transmission and pipeline corridors, and along parcel boundaries toward the Sullivan Substation. In general, land use in the area is agricultural with an increasing prevalence of forested lands further south near St. Louis. Major communities in the northern portion of the Study Area in Illinois included Quincy, Jacksonville, Springfield, Chatham, and Pana.

Large public land areas through this portion of the Study Area were either minimal or easily avoidable, and a range of opportunity features were available to develop Conceptual Routes across the state. However, in general, residential development tended to be higher in Illinois than in the northern portion of the Study Area in Missouri or Kansas.

4.2.2 Conceptual Route Development – Central Portion of the Study Area

The central portion of the Study Area essentially consists of those routes that generally followed the most direct path to the western converter station while still considering various opportunity features and avoiding constraints. As **Figures 4-1** (above) and **4-3** (below) readily show, Conceptual Route development efforts through this portion of the Study Area were greatly affected by nearly every major metropolitan area in the Study Area and their associated suburban development sprawl.

Conceptual Routes in the central portion of the Study Area exited the western converter area either to the northeast along the existing 230 kV transmission line from Spearville to Great Bend or to the east along the 115 kV line through Belpre to Stafford. The alignment to the north remained parallel to the 230 kV line around Great Bend to the north, skirted the southern edge of Cheyenne Bottoms Wildlife Area, and turned southeast toward Hutchinson. This alignment was ultimately discarded due to concerns regarding migratory birds and whooping cranes (see previous section). Ultimately the primary exit path for routes through the central portion of the Study Area was along a 115 kV line to Stafford.

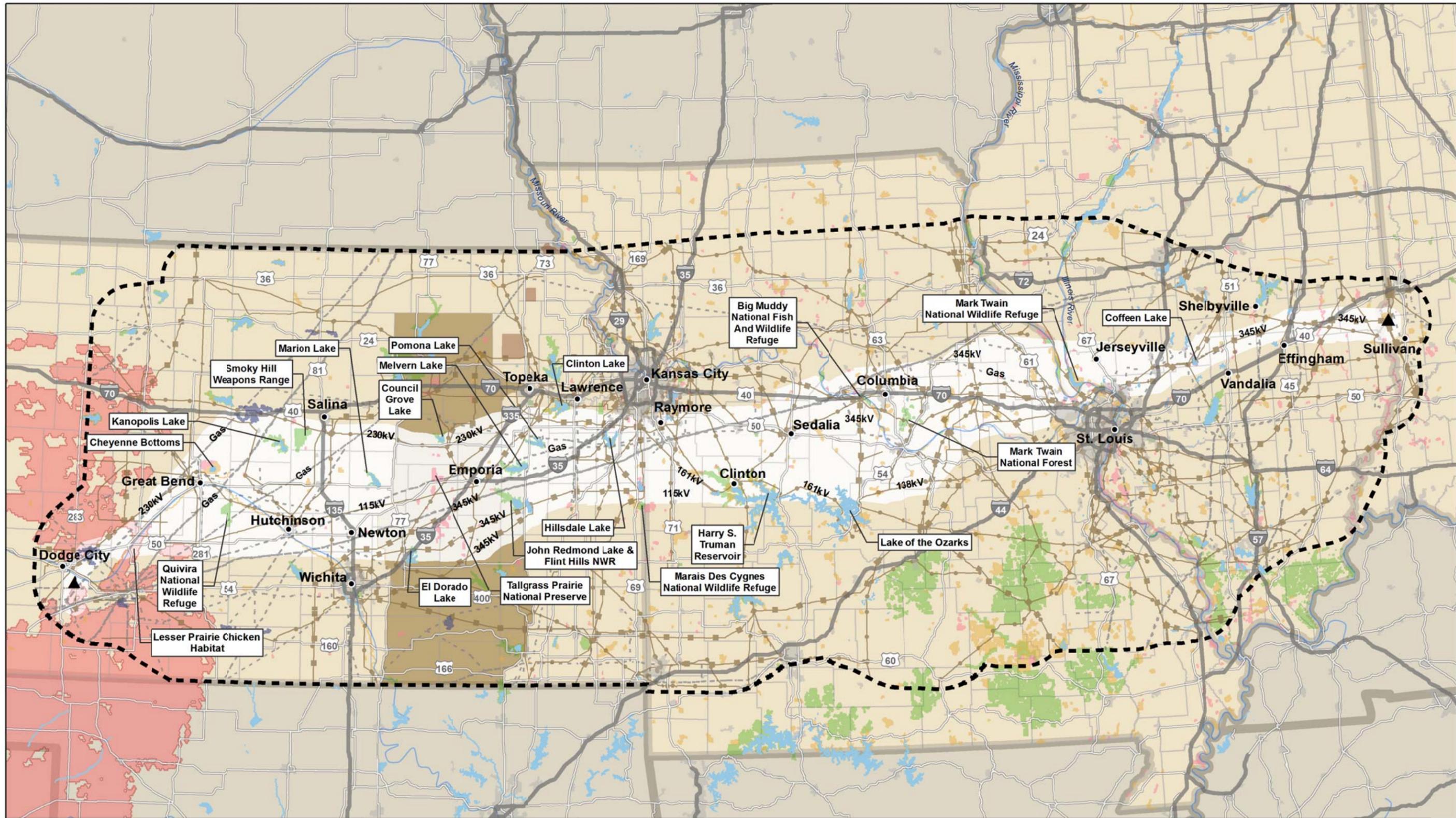
From Stafford, Conceptual Routes through the central portion of the Study Area either continued northeast to Hutchinson along existing transmission lines or due east along parcel and section lines for more than 75 miles to a point approximately 7 miles south of Newton. The routes to Hutchinson continued north along an existing 345 kV line between Hutchinson and the Summit Substation (roughly 7 miles southeast of Salina), and then east through the Tallgrass Heartland along existing transmission lines past the communities of Herington,

Council Grove, Carbondale, Gardner, and Stillwell. Maintaining parallel alignments along this route became increasingly difficult as residential development adjacent to the existing line increased in the satellite communities south of Topeka and Kansas City.

Conceptual Routes from Newton continued either northeast across the Tallgrass Heartland parallel to an existing 345 kV line eventually connecting with the routes described above through Carbondale or east to parallel a 115 kV line across the Tallgrass Heartland. Continuing east of the Tallgrass Heartland, Conceptual Route development became encumbered by development protruding south of Kansas City and the Harry S. Truman Reservoir to the east and south. Attempts were made to develop Conceptual Routes through this area along existing transmission lines that connect the outer suburbs of Gardner, Spring Hill, and Raymore and Pleasant Hill and along a pipeline that passed between Waverly, Kansas, and Holden, Missouri. Although routes were developed through this area, the Routing Team considered many of the alignments through this area less suitable for further pursuit due to the spread and density of residential development and the numerous diversions from parallel alignments along transmission lines, pipelines, and parcel boundaries to avoid individual residences.

East of the Kansas-Missouri state boundary and dense residential development south of Kansas City, the Conceptual Routes split, with the northernmost routes following an existing gas pipeline corridor northeast towards Warrensburg, diverting to find a suitable crossing of the Missouri River, and picking up the gas line corridor again north of the Missouri River and south of Franklin. The southernmost Conceptual Routes in this area attempted to follow 161 kV transmission lines around the north shores of the Truman Reservoir and Lake of the Ozarks, although frequent diversions from a parallel alignment were necessary due to residential development and recreation areas adjacent to the reservoirs. Additional Conceptual Routes were developed to the north of the lakes and south of Warrensburg and Sedalia.

Conceptual Routes following the gas line corridor past Franklin continued north of Columbia and into the northern Conceptual Route area. Increased residential development linking Columbia, Jefferson City, and communities on the north shore of the Lake of the Ozarks, and increased conservation land along the section of the Missouri River from Arrow Rock to Jefferson City decreased routing opportunities and suitable crossings of the Missouri River in this area. The Conceptual Routes that were developed followed primarily parcel boundaries or connected sections of existing transmission lines heading east or northeast for relatively short distances. The terrain between the reservoir complex in the south and the Missouri River in the north became increasingly more variable, and the land use became more heavily forested as the Conceptual Routes proceeded eastward into the Ozark Mountains.



Sources: ESRI, NPS, USGS, USACE, USFWS, USDA-IIRCS, US EPA, KDWP, KPRA, KS DASC, KARS, KS Biological Survey, MODNR, MDC, ISGS, ILPRA, INDNR, The Nature Conservancy

0 20 40 60 80 100 Miles

Coordinate System: North America Equidistant Conic
 Projection: Equidistant Conic
 Datum: North American 1983



Figure 4-3
Conceptual Route Development
in the Central Portion of the Study Area

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The Conceptual Routes just north of the Lake of the Ozarks turned to the northeast along 69 kV and 138 kV transmission lines towards Jefferson City and Chamois or towards Owensville. Due east from there, the larger metro area of St. Louis dominates the landscape with development extending far to the west and south of the city preventing the development of Conceptual Routes in these areas. The Conceptual Routes crossed the Missouri River by Chamois and angled northeast across an increasingly agricultural landscape compared to the Ozark region to the south.

As the Conceptual Routes approached the Mississippi River, the Routing Team identified existing transmission line crossings near Bolter Island and Iowa Island, due north of St. Charles. Conceptual Routes using existing transmission line crossings closer to St. Louis were not feasible due to the density of residential and commercial development outside of St. Louis and significant federal, state, and private conservation lands around the confluence of the Missouri, Mississippi, and Illinois Rivers.

Conceptual Routes in the central portion of the Study Area in eastern Missouri continued north to blend into the northern portion of the Study Area or crossed the Mississippi River at locations not occupied by public lands or historic communities. East of the Mississippi and Illinois Rivers, the Conceptual Routes converged south of Litchfield to parallel existing 345 kV transmission lines northeast towards Pana, Illinois in the northern portion of the Study Area or east towards the eastern converter station, staying north of Effingham and south of Charleston, Illinois.

4.2.3 Conceptual Routes – Southern Portion of the Study Area

In Kansas, the southern portion of the Study Area constraints include: Wichita and its associated suburban sprawl, the extensive airfields in and around Wichita, and the ecologically unique and scenic Tallgrass Heartland of the Flint Hills Ecoregion. Conceptual Routes exiting the western converter station primarily followed either section lines through farm lands east of Wichita, and/or paralleled existing transmission lines to the north and south of the Wichita metro area. Although alignments adjacent to rail lines were considered in some areas, the regular occurrence of towns every 8 to 10 miles required frequent diversions, limiting the value of parallel alignments.

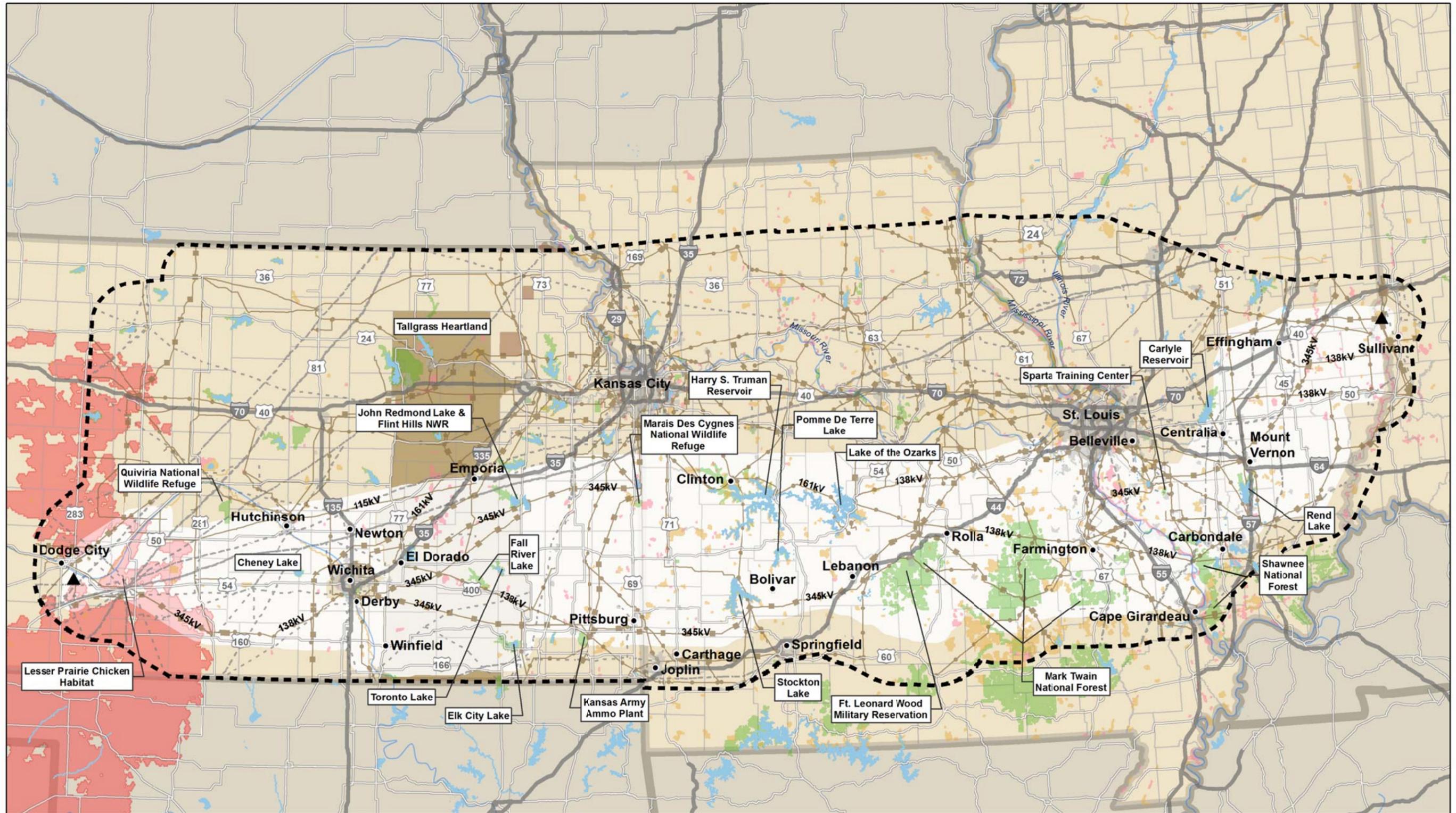
Routing opportunities near Wichita were highly encumbered by the extensive suburbs to both the north and south of the city, as well as an abundance of airfields associated with Wichita's extensive aviation industry. These two factors led to routes that were developed either north along existing 345 kV lines that crossed midway between Wichita and Newton or south of the city along parcel and section lines 10 and 20 miles south of the city. For this reason, Conceptual Routes were developed along each of the four 345 kV lines east of Wichita that transect the Tallgrass Heartlands in this area (see **Figure 4-4** below). Beyond the Tallgrass Heartland, Conceptual Route alignments continued along existing transmission lines or section

boundaries. Although route development through this area was comparatively simple given the low number of residences and public lands, significant oil and gas development as well as numerous wind farms hindered route development in some areas. Moreover, recent advances in technology have allowed for access to deeper oil resources in this area along the Kansas – Oklahoma border with the likelihood of significant expansion in extraction efforts in this area. The Routing Team was advised of this expansion in development at Roundtables, and it is likely that these efforts would further constrain route development in the near future.

The Conceptual Routes in southeastern Missouri were primarily developed along roads, parcel lines, and paralleling existing transmission. Land use in southwestern Missouri is similar to that in eastern Kansas with a dominance of farms and grasslands primarily used for grazing. The prevalence of grassland areas was specifically noted by the Missouri Department of Conservation as a focus for preservation of grassland/prairie habitat and reintroduction of greater prairie chickens in the area (MDC, July 13, 2011). The Routing Team attempted to avoid these areas and/or parallel existing transmission lines where possible through this area.

Continuing east, terrain becomes more variable, with less land suitable for agricultural use and a greater proportion of land under forest cover. An increase in large publicly owned lands, recreation areas, and reservoirs coincides with this physiographic change and greatly affected Conceptual Route development. Most notably, the irregular sprawl of the extensive Harry S. Truman, Lake of the Ozarks, Pomme De Terre, and Stockton Lake reservoirs significantly limited the potential for reasonable alignments south of Jefferson City and north of Springfield. Through this area, the most suitable alignments were either: along the northern edge of the Harry S. Truman and Lake of the Ozarks reservoirs; weaving south of the Harry S. Truman and Lake of the Ozarks reservoirs and north of Stockton Lake and Pomme De Terre; or following a southern path along an existing 345 kV line between Springfield, Missouri, and Lake Stockton.

Farther east, the large land holdings of the Mark Twain National Forest and interspersed holdings of the Department of Defense, National Park Service, and state of Missouri greatly impacted Conceptual Route development. Routes developed through this area primarily followed alignments that diverted either north of the main body of the Mark Twain National Forest (Houston/Rolla and Salem/Potosi Ranger Districts) or south along a trajectory between the National Forest lands and the Ozark National Scenic Riverway. An alignment was also considered that loosely paralleled the north side of Interstate 40 (along a lower voltage transmission line) for more than 150 miles. Direct parallel along Interstate 40 was avoided, due to the significant residential and commercial development along its path and in recognition of its role as part of the historic Route 66 corridor. Remnants of this historic travelway through the Ozarks are found just off Interstate 40 and have been designated as scenic roads by the state of Missouri.



Sources: ESRI, NPS, USGS, USACE, USFWS, USDA-NRCS, US EPA, KDWP, KPRA, KS DASC, KARS, KS Biological Survey, MODNR, MDC, ISGS, ILPRA, IN DNR, The Nature Conservancy



Coordinate System: North America Equidistant Conic
 Projection: Equidistant Conic
 Datum: North American 1983

• City	▲ Converter Stations	Conservation Land	■ Metropolitan Area
- - - Study Area	Existing Transmission	■ Local/Private	■ Water Body
— Interstate	— < 138 kV	■ State	■ Tallgrass Heartland
— U.S. Highway	— 138 kV - 230 kV	■ Tribal	■ Lesser Prairie Chicken Habitat
- - - Gas Pipeline	— > 230 kV	■ Federal	■ CHAT Categories 1-3

Figure 4-4
Conceptual Route Development
in the Southern Portion of the Study Area

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As described in Section 1.4.4, the midpoint converter station for the southern portion of the Study Area routes was proposed to be at or near the St. Francois Substation in the northeast corner of St. Francois County, Missouri. The extensive network of public lands to the west of this area both guided and limited route development through this area. Approaches to the converter station were forced to either: (1) follow along a northern trajectory, ultimately turning south into the converter station area once west of the Potosi Ranger District of the Mark Twain National Forest; or (2) follow a path from the southwest after weaving through the patchwork of state parks and National Forest lands (between the Salem and Fredericktown Ranger Districts) forming the Heart of the Ozarks recreational attractions.

While the extensive network of public lands in the area limited route development opportunities in many places, it also had a compounding effect of concentrating development to the areas in between. This effect was found throughout the Ozarks region, but was perhaps most notable immediately adjacent to the St. Francois Substation itself. In this area, several large state parks (the St. Joe and St. Francois State Parks) as well as a dense stretch of intervening development (Farmington, Leadington, Park Hills, Deslodge, and Bonne Terre) served as major constraints to the identification of suitable routes into the St. Francois Substation area.

Conceptual Routes east of the midpoint converter station location were largely guided by the identification of suitable Mississippi River crossing locations. The Routing Team focused on the area south of St. Louis and north of the Shawnee National Forest which occupies the east shore of the river from Grand Tower, Illinois, to roughly the Kentucky border. Few existing crossings of the river were found in this area, and extensive development extending south of St. Louis combined with large federal and state conservation areas – largely associated with the Mark Twain National Wildlife Complex – made many crossing locations unsuitable. The Routing Team considered crossings near Barnhart, along the northern edge of the Mark Twain National Wildlife Refuge; north of the Rush Island Power Plant adjacent to the recently constructed 345 kV line crossing; near Chester, Illinois, at the crossing of Missouri State Route 51; and further south near Grand Tower, Illinois. Each of these crossings was either highly encumbered by nearby development (Barnhart and Chester crossings) or a combination of state and federal conservation lands (the Shawnee National Forest Lands near Grand Tower, and the Mark Twain National Wildlife Refuge complex near Rush Island).

Once in Illinois, the network of Conceptual Routes south of St. Louis continued east and northeast toward the eastern converter station, generally east of the suburbs of St. Louis and Carlyle Lake. Three major Conceptual Routes were developed from the Mississippi River crossing to the Sullivan Substation with additional route links developed to connect sections of the three or to avoid highly constrained areas. Two of these major Conceptual Routes followed along a series of existing transmission lines across the state. The first followed a series of existing 345 kV lines from Rush Island, to Baldwin, West Mt. Vernon, Louisville,

Newton, Casey, and into the Sullivan Substation. The second followed a more southerly route along a mixture of 345 kV and 138 kV lines from Grand Tower, to West Frankfort, Norris City, Albion, Olney, Lawrenceville, Hutsonville, and into the Sullivan Substation in Indiana. The third Conceptual Route followed a pipeline from just southwest of Steelville, Illinois, and continued northeast past Oakdale, Nashville, and Centralia before turning east at Kinmundy and joining the first Conceptual Route near Louisville, Illinois.

In general, the density of residential and commercial development in Illinois was highest near East St. Louis, in the suburbs extending east of the city toward Belleville, and along the Interstate 70 and U.S. Highway 40 corridor.³ In addition, residential development near Centralia, Mt. Vernon, and West Frankfort also encumbered route development forcing the development of several new routes that only loosely were able to parallel existing section and parcel boundaries. Overall, residential density was highest in Illinois in the central and southern portions of the Study Area, as compared to the northern portion of the Study Area.

4.2.4 Comparison of Conceptual Routes in the Study Area

Once the network of Conceptual Routes for the entire Study Area was developed, the Routing Team conducted a comparative review of the Conceptual Routes. The analysis considered the likelihood for potential impacts from the Project through comparisons of key environmental, land use, and engineering factors for a given route or segment of route.

Initially, comparisons were conducted at the individual Conceptual Route or route segment level to eliminate routes that were not likely viable as a result of new insight derived from ongoing public and agency coordination efforts, newly acquired data sources, or route reconnaissance efforts. Similar to a fatal flaws analysis, this effort removed those Conceptual Routes that were not likely to reasonably meet the routing guidelines, or, simply resulted in likely impacts that were inconsistent with the majority of other routes considered. Several of these removals were referenced in the preceding sections.

The Routing Team then compared the overall feasibility of siting the Project in either the northern, central, or southern portion of the Study Area based on major differences between groups of Conceptual Routes in each. These analyses led to the identification of broad scale challenges and limitations of each portion of the Study Area, and ultimately the selection of the portion of the Study Area that the Routing Team would continue to pursue by developing Potential Routes.

³ Like the remnants of Historic Route 66 found along Interstate 40 in Missouri, historic features of the Historic 'National Road' created in 1806 by legislation signed by President Thomas Jefferson are found along the Interstate 70/40 corridor. This corridor is listed as a National Scenic Byway by the U.S. Department of Transportation, Federal Highway Administration.

Residential density was one of the most notable differences between the northern, central, and southern portions of the Study Area, and given the importance of residences in the siting process, was a key factor in the comparison. During the development of Conceptual Routes, the Routing Team recognized significant differences in the density of residential development and its effect on developing reasonable alignments along existing transmission lines, pipelines, and allowing for relatively straight alignments along section/parcel boundaries.

At the four-state scale, digitizing individual residences was not practical, so the Routing Team used census information to provide numerical evidence that would support the challenges observed by the Routing Team during the development of the Conceptual Routes. The 2010 census data include an estimate of the number of residences within each census block from which the Routing Team was able to derive a residential density (residences/square mile). The results of this analysis, with an overlay of the three generalized portions of the Study Area, are presented in **Figure 4-5** below. To provide the color categorization for the density ranges, the Routing Team evaluated the difficulty of developing routes in areas with varying numbers of residences per square mile. This was done by sampling Public Land Survey System sections (each roughly 1 square mile) throughout the Study Area, assessing the overall difficulty of routing a transmission line through it, and then counting the number of houses to derive a density.

As is clearly shown in **Figure 4-5**, the Conceptual Routes through the central portion of the Study Area in Missouri, although generally shorter in length, impact areas with significantly greater residential density. Areas of higher residential density begin south of Kansas City and continue through to Sedalia, Columbia, Jefferson City, St. Peters, and the metro area north of St. Louis. Moreover, where low residential areas appear in the central portion of the Study Area south of Kansas City, reservoirs and conservation areas occupy key areas. In addition to high residential densities, the Conceptual Routes in the central portion of the Study Area also had fewer miles parallel to existing transmission lines or pipelines; fewer suitable crossings of the Missouri River that did not impact either federal, state, or private conservation lands; and no suitable locations for crossing the Mississippi River without diverting to the north to reach crossings in the northern portion of the Study Area – increasing overall length. For these reasons, the Conceptual Routes in the central portion of the Study Area were removed from further consideration. In fact, due to the obvious limitations of Conceptual Routes through the central portion of the Study Area, the Routing Team did not hold Roundtables in these areas.

Conceptual Routes in the southern portion of the Study Area also contended with higher residential densities in Missouri and Illinois than in the northern portion of the Study Area. Residential density north of Springfield, Missouri along I-44 (Lebanon and Rolla), and into the St. Francois Substation near Farmington made Conceptual Route development difficult. In addition, the extensive and irregular sprawl of the Harry S. Truman, Lake of the Ozarks, Pomme De Terre, and Stockton Lake reservoirs significantly limited the potential for

reasonable alignments. The presence of extensive public lands of the U.S. Forest Service's Mark Twain National Forest, U.S. Army's Fort Leonard Wood, National Park Service's Ozark National Scenic Riverway, and extensive state and private conservation lands in the southern portion of the Study Area further confounded the development of reasonable Conceptual Routes. Not surprisingly, MDC and USFWS considered the southern portion of the Study Area to be least suitable for Conceptual Route development given the amount of land that is already protected for sensitive species and habitats.

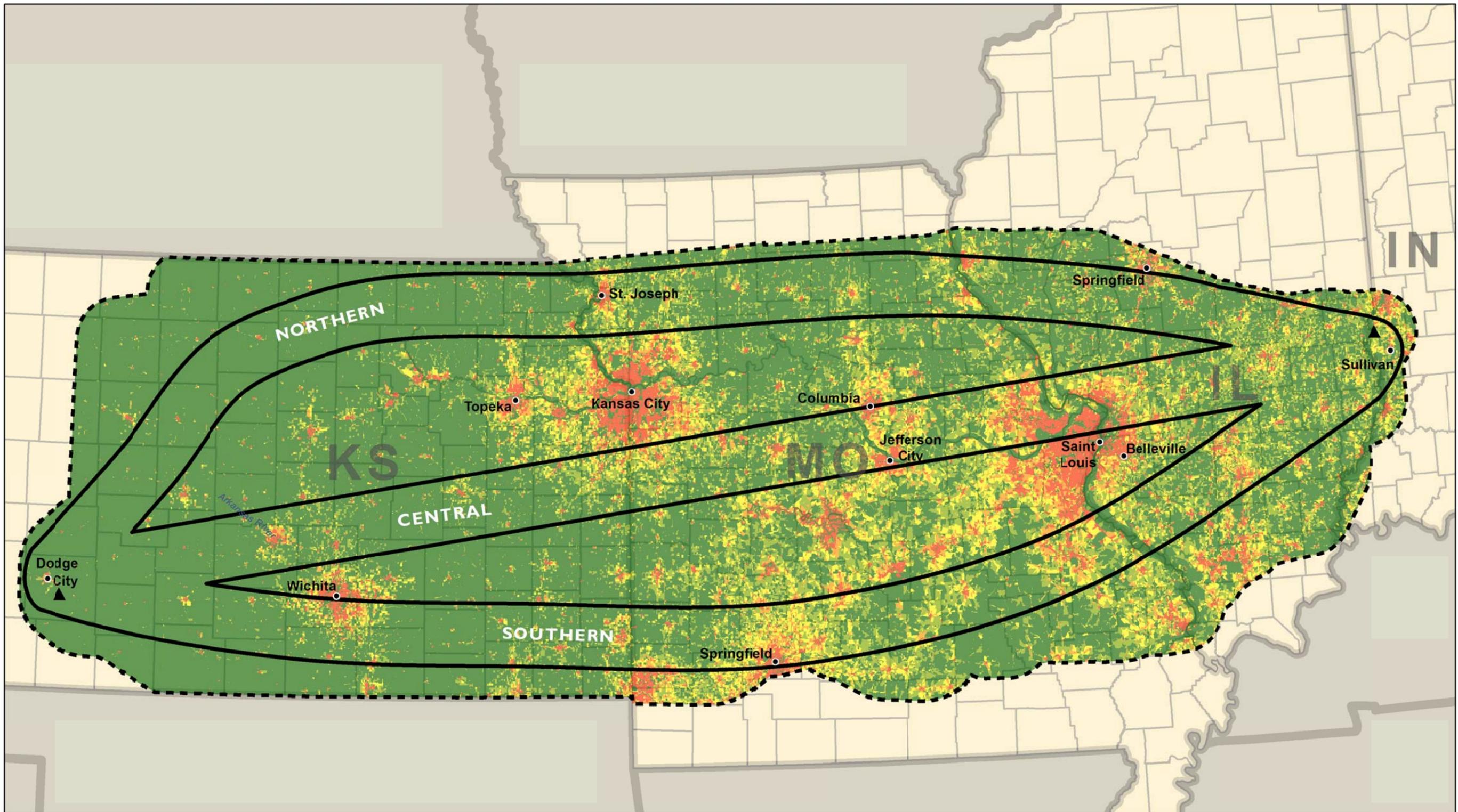
Despite notable challenges in the southern portion of the Study Area, the Routing Team considered the southern portion of the Study Area more reasonable than the central portion of the Study Area and completed a series of Roundtables in southern Illinois to add to data gathered at Roundtables conducted in southern Kansas and Missouri. Ultimately, after the identification of additional routing challenges at meetings with community leaders and regulatory agency representatives in Illinois, as well as further review and consideration of the few suitable Mississippi River crossings south of St. Louis, the Conceptual Routes in the southern portion of the Study Area were also removed from further consideration.

Ultimately, the Routing Team considered the Conceptual Routes in the northern portion of the Study Area to be the most viable for the Project and focused efforts on that portion of the Study Area. As is clearly shown in **Figure 4-5**, Conceptual Routes through the northern portion of the Study Area fall largely within areas with low overall residential density for the majority of the route. In addition, although public lands and reservoirs are common in the Study Area, they tend to be smaller and more dispersed, preventing the concentration of residential development in the lands in between and generally providing for multiple routing options to consider through an area. At the same time, sensitive habitats are generally limited in northern Missouri and Illinois, and those that are present are either largely avoidable or impacts on them can be minimized or mitigated. Lastly, an array of opportunity features of different types are available for the development and refinement of Potential Routes, and multiple suitable river crossing locations were identified for each of the major river crossings.

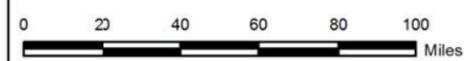
4.3 Potential Routes

4.3.1 Developing the Potential Route Network

Once the Routing Team focused on the northern portion of the Study Area, the Study Area was effectively reduced in size for the continued siting of the Project, and additional route revisions,



Sources: EsRI, U.S. Census Bureau 2010



Coordinate System: State Plane Kansas North (feet,
Projection: Lambert Conformal Conic
Datum: North American 1983



- City
- Project Study Area
- 0 - 5 Households per square mile
- 6 - 10 Households per square mile
- 11 - 20 Households per square mile
- 12 - 40 Households per square mile
- > 40 Households per square mile

Figure 4-5
U.S. Census Residential Density
in the Four State Study Area

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regulatory coordination, and field reconnaissance were conducted to refine the Conceptual Routes into Potential Routes in Kansas. In some cases, input from regulatory agencies informed route revisions (as described above); in others, comparative review of routes with similar start and endpoints eliminated or forced the revision of others. As an example, the Routing Team concluded that routes originally developed toward Hanston to parallel an existing Midwest Energy 115 kV line to State Route 96 and then finally Hays, Kansas were not suitable for further consideration. The impacts on sensitive habitats and impacts on residential development near Hays suggested that routes along the Spearville – Post Rock 345 kV, or north along the Arthur Mullergren – Waldo 115 kV line would both be more suitable while still providing the same connections within the Potential Route Network.

In some cases, Potential Routes were also added or modified as a result of suggestions received at the Roundtables, and many of these suggestions were presented at the subsequent Open Houses. For example, Potential Route alignments developed along the far western side of Barton and Russell County were developed as a result of route alignments drawn on aerial maps at the Roundtables in those counties. In fact, the continuation of these routes south of Waconda Lake past Tipton and on to parallel along the Natural Gas Pipeline of America gas corridor near Glasco were also suggestions presented at the Roundtables.

Ultimately, the Routing Team identified the Potential Route Network that would be suitable for presentation to the general public at Open House meetings. At the meetings, the Routing Team assisted attendees in locating their property or other features of concern on aerial photography maps showing the array of Potential Routes under consideration. Participants were provided pens and markers and were encouraged to document the location of their houses, places of business, properties of concern, or other sensitive resources on the printed maps. After the Open Houses, all of the maps presented at the Open Houses were scanned, geo-referenced, and integrated into the GIS database, and comments received via comment card were correlated with landowner addresses.

4.3.2 Revisions to the Potential Route Network

The Routing Team spent several months reviewing the thousands of comments received at the Open House meetings (see Section 3.3), making adjustments to individual route segments, and refining the Potential Route Network. The resulting Refined Potential Route Network is presented in **Figure 4-6** below.

Key Revisions to Potential Route Links

Revisions were made to the Potential Routes following Open Houses to respond to comments, to consider new information, and as a result of ongoing reviews of engineering challenges and solutions. Most of these revisions were relatively small (on the order of 50 to less than a couple hundred feet); however, several were larger in scale (on the order of miles) and deserve specific mention for those who may have reviewed slightly different alignments at the Open House meetings (see **Figure 4-6** below).

- I. US 50 near Offerle—Several route adjustments were developed in the area surrounding the western converter station and heading northeast to the point where ITC’s new Spearville – Post Rock 345 kV line and the Arthur Mullergren 230 kV Tap (from Spearville to Great Bend) diverge. The majority of these route adjustments were small shifts to better avoid residences and oil and gas infrastructure or to allow for better angle structure placement. However, one larger modification was made just north of the city of Offerle. Two Potential Routes were presented to the public in this area. The northernmost route followed a path from US 50 north along the mid-section line between 134th and 135th road to the existing transmission line ROWs, angled to the northeast, and continued along a parallel alignment adjacent to the Arthur Mullergren 230 kV line. The southernmost route continued east along US 50, diverted to the north of Offerle, and approximately 5 miles east of Offerle, turned north to meet the existing transmission ROWs just before the two lines diverge.

After the Open Houses, the Routing Team reviewed public comments and the distribution of constraints adjacent to the southernmost of these two routes and recognized that the route could be refined to better avoid: the town of Offerle, alignments past the historic Gano Grain Elevator (National Register of Historic Places [National Register] listed), and multiple crossings of portions of the Santa Fe National Historic Trail. The refined alignment continued north from US 50 to a point 1 mile north of County Route 22, turned east for another 6.5 miles, turned north and continued to the existing transmission line ROWs just before the two existing lines diverge. The modified route had significantly fewer nearby houses, avoided potential impacts on the National Register historic site, and avoided two crossings of the Santa Fe NHT.

2. Fort Larned National Historic Landmark (NHL)—A Potential Route presented at the Open Houses paralleled the existing Arthur Mullergren Tap 230 kV on its northwest side, approximately 0.75 mile west of the Fort Larned NHL. Following the Open Houses, the Routing Team coordinated with the National Park Service with regards to their stated concerns with respect to additional potential visual impacts to the Fort Larned NHL. The Park Service suggested that an adjustment further to the north, beyond a small line of natural topography, would prevent additional degradation

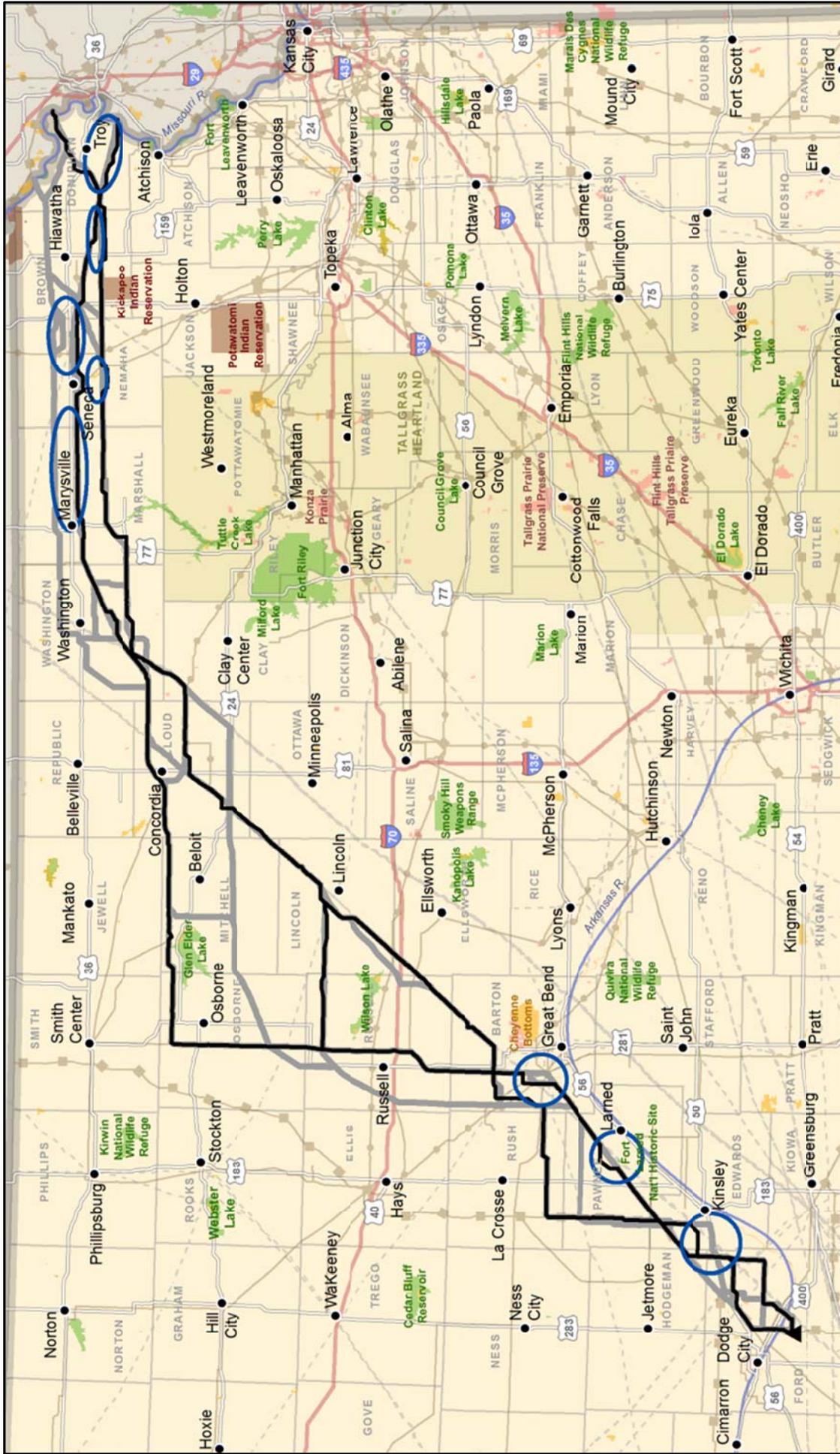


Figure 4-6
Post-Open House Revisions

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● City
 ▲ Converter Station
 — Alternative Routes
 — Potential Routes
 — Interstate Highway
 — U.S. Highway

○ Revision Areas
 Conservation Land
 Local/Private
 State
 Tribal
 Federal

— Gas Pipeline
 Existing Transmission
 < 138 kV
 138 kV - 230 kV
 > 230 kV

Sources: ESRI, NPS, USGS, USACE, USFWS, USDA-NRCS, KDWPT, KS DASC, KS Biological Survey, The Nature Conservancy
 Coordinate System: North America Equidistant Conic Projection: Equidistant Conic Datum: North American 1983

0 10 20 30 Miles
 N

of the sites historic viewshed. At the same time, the Routing Team was also considering creating a potential diversion in the route immediately northeast of the Fort Larned site to avoid passing between several houses that are already within close proximity to the existing line. Taken together, these two considerations suggested that a revision to the alignment would be prudent in this area and may provide a better alignment for both the NHL and the homes immediately to the northeast. The updated alignment turns north and follows a half section line between 190th and 200th avenues, turns northeast for 2.5 miles, then turns east along a half section line for another 3.3 miles before resuming a parallel alignment with the existing transmission line. In addition to increasing the distance from Fort Larned, the updated alignment has a small ridge between the fort and the route, further reducing the likelihood of impacts to the viewshed of the fort and the number of houses within close proximity to the new line overall.

4. Northwest of Great Bend—The Routing Team recognized that maintaining a parallel alignment on the west side of the South Hays – Arthur Mullergren 230 kV line, rather than crossing to the east just north of State Highway 96, would avoid several diagonal crossings of active farm land and multiple unnecessary angles to reach the Arthur Mullergren – Waldo 115 kV line. The modified route continues north on a half section line for 1 mile after the South Hays – Arthur Mullergren 230 kV line turns west and then parallels the northern side of NW 80 Road for a little over 2 miles.
5. Greenleaf to Marysville to Seneca—Review of route alignments near Marysville and Seneca suggested the need for further diversions south of these communities to avoid homes and improve the river crossing location of the Big Blue River south of Marysville. The Routing Team considered that maintaining alignment on the south side of the existing Knob Hill – Seneca 115 kV line beginning near the intersection of Eagle Road and 3rd Road in Washington County would allow for alignments that diverted sufficiently south of Marysville and Seneca to avoid areas of higher residential density, provide for a more suitable river crossing south of Marysville, and avoid a historic site and riparian areas of streams along the Knob Hill – Seneca 115 kV line.
6. Seneca to Fairview—East of Seneca the alignment was shifted approximately 1 mile south to remain on a half section line between Oak Grove Road (144th Road) and 136th Road until turning southeast along an existing gas pipeline corridor. This diversion increased the distance from U.S. Highway 36, the major transportation route in this area, and from residences along the highway. Diverting further south around Seneca, then going back to the original alignment east of Seneca would have added unnecessary additional circuitry to the route.

7. Flying H Ranch Airfield—The Flying H Airfield, south of Nemaha Wildlife Area, is just north of a Potential Route presented at the Open Houses. The route was subsequently modified 1 mile to the south to avoid impacting the commercial agricultural aviation operation based at the airfield.
8. Brown County—In the eastern half of Brown County, north of Willis, the Potential Route was modified to follow a half section line 1 mile south of the Potential Route presented at the Open Houses. The updated alignment, which continues for over 11 miles into Doniphan County, has greater distance from residences than the previous alignment.
9. Denton to the Missouri River—The Routing Team identified several areas along the existing gas line corridor, between Denton and the Missouri River, where a parallel alignment would be challenging due to the proximity of adjacent residences. After the Open Houses, the alignment was shifted up to 1 mile south to increase the distance from those residences, to reduce the length of diagonal alignments through farmland, and to align the route with a better angle to cross the Missouri River.

Potential Route Links Removed from Further Consideration

Following the Open Houses, the Routing Team reviewed the Potential Route Network in detail with respect to a variety of environmental and land use factors, public input on area constraints near the Potential Routes, and engineering input, and began eliminating those Potential Route links that were considered less suitable for the Project.

Potential Route links in and around the western converter station were encumbered by the close juxtaposition of dense wind farm and transmission infrastructure near Spearville and by a band of high quality habitat for the lesser prairie-chicken to the north and east of the converter station, through Hodgeman, Pawnee, Edwards, and Kiowa Counties. The Routing Team worked to refine the network of Potential Routes in this area to provide for a series of Alternative Routes that could both avoid impacts on lesser prairie-chicken habitats in the area, and, either maximize use of existing infrastructure or avoid areas of infrastructure congestion. Individual Potential Route links in the western converter vicinity that would likely result in greater impacts, or that did not provide appreciable benefits toward developed routes along these concepts, were removed from the network. The resulting configuration of routes is presented in **Figure 4-7**.

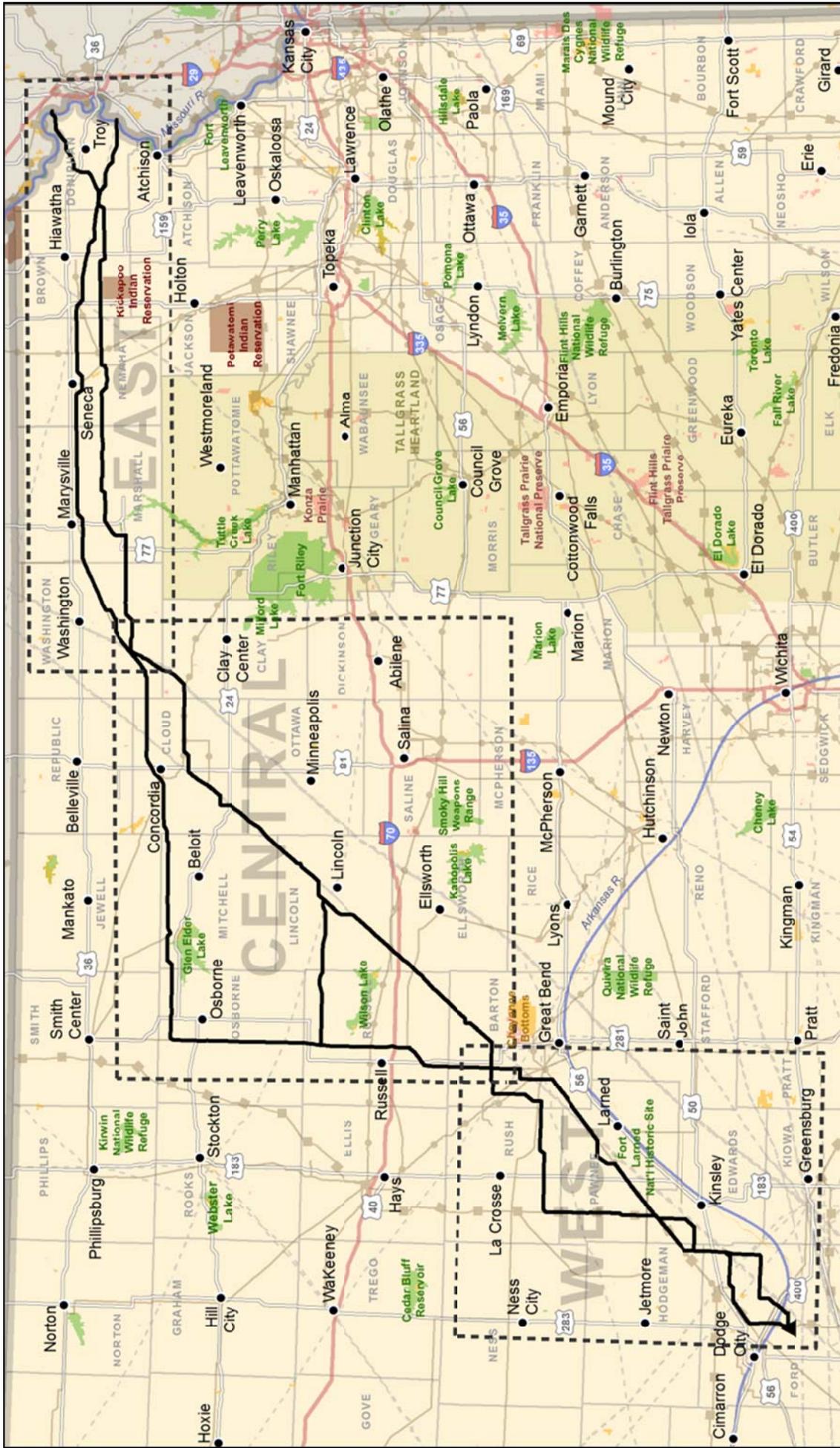


Figure 4-7
Revised Potential Route Network

GRAIN BELT EXPRESS
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● City	Conservation Land	--- Gas Pipeline
▲ Converter Station	Local/Private	--- Existing Transmission
— Alternative Routes	State	— < 138 kV
— Interstate Highway	Tribal	— 138 kV - 230 kV
— U.S. Highway	Federal	— > 230 kV

Sources: ESRI, NPS, USGS, USACE, USFWS, USDA-NRCS, KDWPT, KS DASC, KS Biological Survey, The Nature Conservancy

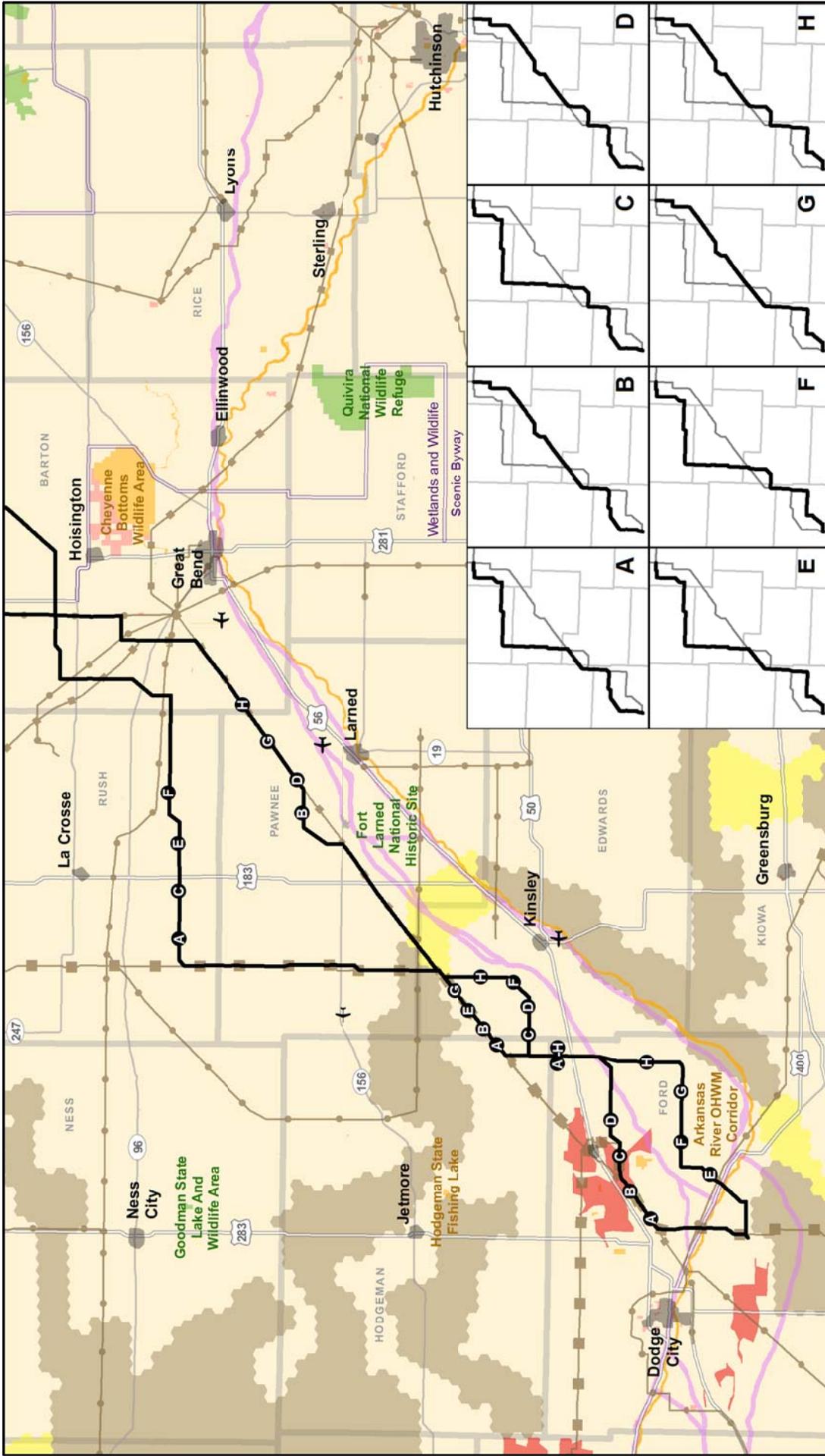
Coordinate System: North America Equidistant Conic
 Projection: Equidistant Conic
 Datum: North American 1983

Several west-to-east connections between the Spearville – Post Rock 345 kV line and Arthur Mullergren 230 kV Tap, and the Arthur Mullergren – Waldo 115 kV line and the NGPA pipeline were originally developed along section/parcel boundaries to provide optionality for Alternative Route development. However, several of these links were ultimately removed due to greater impacts on residences, airfields, or the need for circuitous diversions to avoid areas of significant development – such as along the Potential Route south of Waconda Lake near Tipton. In addition, several Potential Route links developed along the western edge of Barton and Russell County were also removed from further consideration after recognizing that Potential Routes along the Arthur Mullergren – Waldo 115 kV line farther east provided similar connections in the network with fewer impacts.

In the East Segment of the Study Area, from Washington to Doniphan County, three general concepts were considered for Potential Routes. After comparison, the Routing Team concluded that the northern-most Potential Route had the greatest overall impacts on residences, resources associated with the Oregon and California National Historic Trails, less parallel alignments adjacent to existing infrastructure, and several circuitous diversions to avoid area airfields. This Potential Route and links associated with it were therefore removed from further consideration.

4.3.3 Description of Alternative Routes

The Routing Team compiled the remaining links in the Refined Potential Route Network into Alternative Routes. In order to accommodate a reasonable comparison between Alternative Routes, the Routing Team divided the Alternative Routes into three distinct Segments, West, Central, and East (**Figure 4-7**). Each Segment begins and ends at a common point for all of the Alternative Routes within that Segment, which provides for a reasonable comparison between each of the Alternative Routes. From each of the Segments, one Alternative Route is ultimately selected and when all three are connected, the Proposed Route is formed. The West Segment begins at the converter station in Ford County, KS and ends at a common node north of Great Bend. The West Segment includes eight (8) Alternative Routes (**Figure 4-8**). The Central Segment begins north of Great Bend where the West Segment terminates and ends in southwest Washington County. The Central Segment includes three (3) Alternative Routes (**Figure 4-9**). The East Segment begins in southwest Washington County where the Central Segment terminates, and ends at the Missouri River. The East Segment has four (4) Alternative Routes (**Figure 4-10**). The following section provides detailed descriptions of each of the Alternative Routes by segment. The Alternative Routes are the focus of the comparative analysis presented in Chapter 5.



Sources: ESRI, NPS, USGS, USACE, USFWS, FAA
 USDA-NRCS, KDWPT, KS DASC, KS Biological Survey,
 KARS, The Nature Conservancy

N 0 10 20 Miles

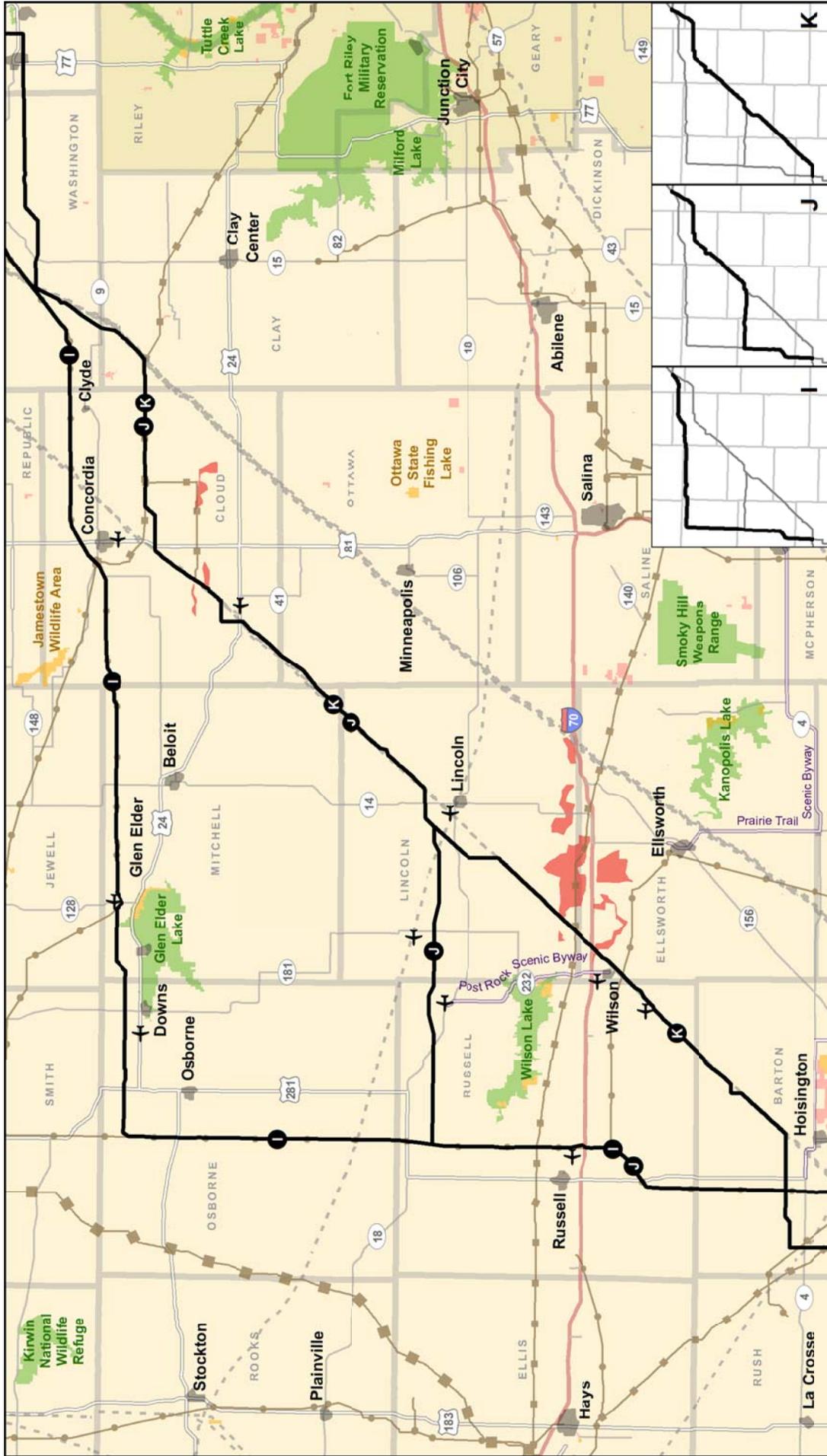
Coordinate System: State Plane Kansas South (feet)
 Projection: Lambert Conformal Conic
 Datum: North American 1983

Figure 4-8
West Segment
Alternative Routes

GRAIN BELT EXPRESS
 CLEAN LINE

- Alternative Routes
- Airport
- Urban Area
- Existing Transmission
 - < 138 kV
 - 138 kV - 230 kV
 - > 230 kV
- Scenic Byway
- Conservation Land
 - Local/Private
 - State
 - Federal Land
- Wind Farm
- Santa Fe
- National Historic Trail
- Lesser Prairie Chicken
 - Habitat Connectivity
 - Zone
 - Focal Area





<p>Alternative Routes</p> <ul style="list-style-type: none"> — Alternative Routes ✈ Airport — Interstate — U.S. Highway — State Highway — Scenic Byway 	<p>Urban Area</p> <ul style="list-style-type: none"> ■ Urban Area - - - Pipeline <p>Existing Transmission</p> <ul style="list-style-type: none"> — < 138 kV — 138 kV - 230 kV — > 230 kV 	<p>Wind Farm</p> <ul style="list-style-type: none"> ■ Wind Farm <p>Conservation Land</p> <ul style="list-style-type: none"> ■ Local/Private ■ State ■ Federal 	<p>Figure 4-9 Central Segment Alternative Routes</p> <p>GRAIN BELT EXPRESS CLEAN LINE</p>
<p>Sources: ESRI, NPS, USGS, USACE, USFWS, FAA, USDA-NRCS, KDWPT, KS DASC, KS Biological Survey, The Nature Conservancy</p> <p>N</p> <p>0 10 20 Miles</p> <p>Coordinate System: State Plane Kansas North (feet) Projection: Lambert Conformal Conic Datum: North American 1983</p>			

West Segment

Alternative Route A

Alternative Route A (see **Figure 4-8**) exits the proposed converter station to the northeast crossing I 18th Road and the Ironwood – Clark County 345 kV transmission line. The route then parallels the existing 345 kV transmission line for approximately 16 miles. The route is to the east of the existing transmission line for the first 8 miles of the parallel as the existing line heads north towards the community of Wright. The route turns to the northeast just south of Wright, as the Ironwood – Clark County 345 kV line begins to parallel the south side of the existing Judson Large – Spearville 230 kV transmission line. These three lines maintain a parallel alignment for approximately 5.5 miles, heading northeast towards the city of Spearville. South of Garnett Road, 2.5 miles southwest of Spearville, the Ironwood – Clark County 345 kV line and Alternative Route A deviate from the Judson Large – Spearville 230 kV line to head east for approximately 3 miles. After crossing over I 26th Road, Alternative Route A ends the parallel alignment with the existing 345 kV line and heads to the east on a half section line between Garnett Road and Foothill Street. The route remains on this half section line for 6 miles before turning to the north on another half section line between I 34 Road and I 35 Road. The route heads north on this half section line for approximately 8.5 miles before turning to the northeast to parallel the southern side of the existing Spearville – Arthur Mullergren 230 kV and Spearville – Post Rock 345 kV lines. The three lines parallel each other to the northeast for approximately 9.5 miles before Alternative Route A and the Spearville – Post Rock 345 kV turn to the north, crossing the 230 kV line just east of 70th Avenue (County Road 13).

Alternative Route A remains on the east side of the existing Spearville – Post Rock 345 kV line for approximately 23 miles as the two lines head north through Edwards and Pawnee County and into Rush County. Approximately 3.5 miles east and 2 miles south of the city of Burdette, Alternative Route A moves half a section to the east of the existing transmission line due to a concentration of pivot irrigation infrastructure. After approximately 2 miles, the existing 345 kV line moves half a section to the east, and Alternative Route A resumes a parallel alignment to the east of the existing line. Alternative Route A diverges from the existing transmission line and heads east on the half section line south of Avenue T in Rush County. The route remains on the half section line for more than 12 miles before turning north at County Road 300 and resuming its eastward trajectory 1 mile north at the next half section line. The route continues east for another 10.5 miles, into Barton County, where it turns to the north between NW 120 Avenue and NW 130 Avenue. Alternative Route A travels north for approximately 10.5 miles, moving to the northeast around the city of Albert. One half mile north of NW 130 Road, the route turns east on a half section line for 2.5 miles before moving to the north half a mile to parallel the south side of NW 140 Road for the remaining 2.5 miles of its length.

Alternative Route B

Alternative Route B (**Figure 4-8**) shares nearly half of its length with Alternative A; exiting the converter station to the northeast and paralleling the existing Ironwood – Clark County 345 kV line for 16 miles, heading to the east and north predominantly along half section lines for 17 miles, then paralleling the existing Spearville – Arthur Mullergren 230 kV and Spearville – Post Rock 345 kV lines for 9.5 miles. Alternative Route B continues to the northeast along the existing 230 kV line where Alternative Route A turned to the north along the existing 345 kV line. The route crosses to the north side of the existing 230 kV line and continues in a parallel alignment for 14 miles before diverging from the existing line and heading north along a half section line for 1.5 miles. At the center of the section between 190th and 200th avenues, north of O Road, the Alternative Route angles northeast for 2.5 miles before turning back to the east near 180th Avenue. Nearly 3.5 miles to the east, Alternative Route B resumes parallel of the Spearville – Arthur Mullergren 230 kV line, heading towards the city of Great Bend.

Alternative Route B diverges from the existing 230 kV line approximately 2.5 miles southwest of Great Bend. The route travels north along a half section line for 2 miles before beginning to parallel the west side of the existing South Hays – Arthur Mullergren 230 kV line, which it parallels due north for 3 miles. The route crosses the existing 230 kV line when it turns to the west and continues north and east for approximately 4 miles before turning north to parallel the west side of the existing Arthur Mullergren – Waldo 115 kV transmission line. Alternative Route B heads north in this parallel alignment for the remaining 6 miles of its length.

Alternative Route C

Alternative Route C (**Figure 4-8**) shares the same path as Alternative Route A for its first 32 miles, from the converter station to approximately 10 miles northeast of Spearville, and again for its final 63 miles, from the point where the existing Spearville – Arthur Mullergren 230 kV and Spearville – Post Rock 345 kV lines diverge in northern Edwards County to the end of the route north of Great Bend. Approximately 4 miles northwest of the city of Offerle, Alternative Route C begins to differ from Alternative Route A by turning to the east to follow a section line along C Road. The route follows that section line east for 5 miles before angling to the north along 60th Avenue and then along the half section line between 60th Avenue and 70th Avenue. Approximately 6 miles north, the route angles to the northeast and begins to parallel the existing Spearville – Arthur Mullergren 230 kV and Spearville – Post Rock 345 kV lines on their southeast side. The remaining 63 miles of Alternative Route C follow the same path as Alternative Route A; north along the existing Spearville – Post Rock 345 kV line north for 23 miles, east along half section lines for approximately 25 miles into Barton County, then north and east following half section lines and briefly paralleling NW 140th Road for the final 2.5 miles.

Alternative Route D

Alternative Route D (**Figure 4-8**) combines the first 45 miles of Alternative Route C with the final 50 miles of Alternative Route B. The route parallels the existing Spearville – Arthur Mullergren 230 kV and Spearville – Post Rock 345 kV lines to the southwest of the city of Spearville before following half section lines to the east and north to the point where the existing Spearville – Arthur Mullergren 230 kV and Spearville – Post Rock 345 kV lines diverge in Edwards County. From that point, Alternative Route D shares its path with Alternative Route B; continuing along the existing Spearville – Arthur Mullergren 230 kV transmission line towards Great Bend, branching off of that line to head north then east before paralleling the existing Arthur Mullergren – Waldo 115 kV transmission line to the north.

Alternative Route E

Alternative Route E (**Figure 4-8**) exits the proposed converter station site heading east along a half section line half a mile north of Saddle/Ford Ensign Road. It continues east for 3 miles before turning briefly north and then north east at 121 Road. The route heads northeast, crossing the Arkansas River, for approximately 6.5 miles before turning east to follow the half section line between Butter and Egg Road and Marshall Road. Alternative Route E follows this half section line for approximately 9.5 miles before angling north on a half section line in between 133 Road and 134 Road. The route continues north for another 7 miles before joining the path followed by Alternative Route A for its remaining 81 miles.

Alternative Route F

Alternative Route F (**Figure 4-8**) exits the proposed converter station site on the same path as Alternative Route E and follows the same route for its first 33 miles. At a point approximately 4 miles northwest of the city of Offerle, the route turns east to follow the path of Alternative Route C for its remaining 64.5 miles.

Alternative Route G

Alternative Route G (**Figure 4-8**) shares the same initial 33 miles as Alternative Routes E and F and then continues to follow Alternative Route E for an additional 11.5 miles once Alternative Route F heads to the east, northwest of Offerle. Alternative Route G continues along the route of Alternative Route E, paralleling the existing Spearville – Arthur Mullergren 230 kV and Spearville – Post Rock 345 kV lines to the northeast. At the point where these two lines diverge, Alternative Route G continues along the 230 kV line to the northeast, sharing the remaining 50 miles of its length with Alternatives Route B and D.

Alternative Route H

Alternative Route H (**Figure 4-8**) shares its initial 47 miles with Alternative Route F, heading east from the proposed converter station location and passing approximately 7 miles south of the city of Spearville before turning north between the cities of Spearville and Offerle. This

route continues west and then north of Offerle, on the same alignment as Alternative F until it reaches the point where the existing Spearville – Arthur Mullergren 230 kV and Spearville – Post Rock 345 kV lines diverge from one another. Alternative Route H continues to the northeast on the north side of the 230 kV transmission line, sharing the remaining 50 miles of its length with Alternative Routes B, D, and G.

Central Segment

Alternative Route I

From the point where the West Segment alternatives converge, Alternative Route I (see **Figure 4-9** below) crosses to the east side of the existing Arthur Mullergren – Waldo 115 kV transmission line and parallels it for approximately 70 miles to the north. This parallel alignment passes east of the city of Russell and west of the city of Osborne, Wilson Reservoir, and Waconda Lake. Approximately 12 miles west and 1.5 miles north of the city of Downs this alternative turns to the east, following a half section line between W 20th Drive and W 30th Drive for 16 miles. Northwest of Cawker City, the alternative angles a mile north to bypass the northernmost extent of Waconda Lake. Alternative Route I continues east along a half section line for approximately 5 miles before paralleling the existing Glen Elder – Smith Center 115 kV transmission line for a short distance as it approaches the Glen Elder Substation. East of the substation, Alternative Route I begins to parallel the existing Concordia – Glen Elder 115 kV transmission line east towards Concordia. This alternative stays on the south side of the existing 115 kV line for approximately 5 miles before moving to the north side of the existing line and remaining there for another 28 miles.

Alternative Route I bumps off the existing 115 kV transmission line to avoid the Concordia Substation, crosses the Republican River northwest of Concordia, then begins to parallel the south side of the existing Concordia – Clifton 115 kV transmission line. The alternative stays south of the existing line for 3 miles before crossing to the north side of the line just north of Union Road. Alternative Route I remains north of the existing 115 kV line until it reaches the Clifton Substation in Washington County. Northeast of the substation, the alternative begins to parallel the existing Clifton – Knob Hill 115 kV transmission line to the northeast and continues this parallel for the remaining 5.7 miles.

Alternative Route J

Alternative Route J (**Figure 4-9**) begins by paralleling the existing Arthur Mullergren – Waldo 115 kV transmission line for 37.5 miles on its east side, following the same path as Alternative Route I for this distance. Two and a half miles south of the city of Waldo, the alternative turns away from the existing 115 kV line heading east along a half section line between Paradise Road and Fairview Road. This alternative continues east on primarily this same trajectory for 30.5 miles, moving slightly north to increase the distance from the city of Lucas and south to increase the distance from the historic community of Denmark.

Approximately 3.5 miles north of the city of Lincoln, Alternative Route J begins to parallel the east side of a corridor of existing natural gas transmission lines. This parallel configuration continues for 36 miles with the exception of a diversion east of the city of Glasco to avoid a private airfield. Three and a half miles south of the city of Concordia, the alternative leaves the gas line corridor and heads due east for 3.5 miles along a half section line south of Milo Road (County Road 370). East of County Highway 791 the alternative angles to the northeast before beginning a parallel alignment to the east on the south side of the existing Concordia – Jeffrey Energy Center 230 kV transmission line. The alternative parallels the south side of the 230 kV line for 13 miles before crossing to the north side for the line for another 1.5 miles. East of Deer Trail Road, the existing line angles to the southeast and the alternative begins to parallel a natural gas and oil pipeline corridor to the northeast. This corridor is loosely paralleled for approximately 14 miles to the end of the Central Segment.

Alternative Route K

Alternative Route K (**Figure 4-9**) heads east from the end point of the West Segment alternatives, along the south side of NW 140 Road for nearly 6 miles. East of North Susank Road in Barton County, this alternative angles to the northeast, loosely paralleling the west side of an existing natural gas line corridor for more than 18 miles. This alternative crosses to the east side of the gas line corridor approximately 2.5 miles south of the Smoky Hill River, then crosses the river and continues another 21.5 miles along the gas line corridors eastern edge. Near the city of Lincoln the route diverts to the west to increase the distance from the Lincoln Municipal Airport, located adjacent to the gas line corridor. Approximately 3.5 miles northwest of Lincoln, Alternative Route K begins to follow the same path as Alternative Route J, eventually resuming the parallel of the gas line corridor to the northeast towards Concordia, paralleling the existing 230 kV lines east into Clay County, and then roughly paralleling a separate gas line corridor to the end of the alternative.

East Segment

Alternative Route L

Alternative Route L (see **Figure 4-10**) begins approximately 4 miles west of the city of Linn in Washington County, paralleling the existing Clifton – Knob Hill 115 kV transmission line to the northeast. The alternative continues on the south side of the existing line for nearly 5 miles before diverting about a mile to the south to increase the distance from the Washington County Memorial Airport. East of the airport, the alternative resumes paralleling the existing 115 kV line and continues the parallel alignment for another 11.5 miles across the Little Blue River and into Marshall County. The alternative crosses to the south side of the existing 115 kV line, just after the Marshall County border and remains on the south side for another 5 miles. West of the Big Blue River and southwest of the city of Marysville, Alternative Route L diverts away from the existing transmission line to the south due to development and pivot irrigation south of Marysville along the existing transmission right-of-way.

Alternative Route L begins paralleling the southern side of the existing Knob Hill – Seneca 115 kV transmission line just east of 11th Terrace near Marysville. This alignment continues to the east for over 26 miles and is approximately 1.25 miles south of U.S. Highway 36 for this entire length. This alternative diverts to the southeast two miles southwest of the city of Seneca to increase the distance from the city and residential developments to its south. Once past the city, this alternative angles back to the northeast before turning east to follow the half section line south of 144th Road for approximately 14 miles. Alternative Route L turns to the southeast about 1.5 miles south of the city of Fairview in Brown County. This alternative loosely parallels an existing gas line corridor containing the Keystone and Rockies Express pipelines for approximately 26 miles to the southeast into Doniphan County with a couple of diversions from the parallel alignment to increase distances from residences located directly adjacent to the gas line corridor. The alternative crosses the gas line corridor and heads to the northeast 2 miles after crossing into Doniphan County. From there, this alternative angles to the northeast for 23 miles to the Missouri River which forms the Kansas and Missouri state border. The last 23 miles of Alternative Route L pass north of the city of Bendena, across U.S. Highway 36 and the Glacial Hills Scenic Byway, and through forested hills approaching bluffs overlooking the Missouri River floodplain. The final 4 miles of this alternative are within the floodplain of the Missouri River.

Alternative Route M

Alternative Route M (**Figure 4-10**) shares its first 100 miles with Alternative Route L; along the Clifton – Knob Hill – Seneca 115 kV transmission lines, south of Marysville and Seneca, and into Doniphan County along the existing gas line corridor shared by the Keystone and Rockies Express gas pipelines. The remaining 18 miles of Alternative Route M loosely parallel the gas line corridor to the Missouri River and Kansas state boundary. This Alternative Route is south of the existing gas line corridor by between one-third of a mile and 1 mile for the majority of the 18 miles, due to residential development directly adjacent to the gas line corridor.

Alternative Route N

Alternative Route N (**Figure 4-10**) heads east from the end point of the Central Segment along 7th Road, south of the city of Linn. The Alternative Route angles north to a half section line between 7th Road and 8th Road approximately 3 miles east of Linn and continues east on this half section line for over 17 miles. This Alternative Route turns north along West River Road about halfway between the cities of Waterville and Blue Rapids and crosses the Little Blue River and Big Blue River before turning to the northeast. North of Blue Rapids the route parallels the north side of Ridge Road for 6 miles before angling north half a mile to the half section line between Ridge Road and Quail Road. This alternative continues on this same trajectory to the east for 21.5 miles, into Nemaha County. Northeast of the city of Centralia the alternative diverts to the south in order to increase distance from a private airstrip before returning to the same half section line and continuing east for another 23 miles.

Alternative Route N angles to the south near the city of Willis and continues east along the half section line between 150th Street and 160th Street for 11 miles. Three miles west of the city of Denton, the alternative begins angling to the northeast and follows the path of Alternative Route L the remaining 23 miles to the Missouri River and Kansas state boundary.

Alternative Route O

Alternative Route O (**Figure 4-10**) shares its first 100 miles with Alternative Route N; passing south of Linn, between Waterville and Blue Rapids, and primarily along half section lines through Marshall, Nemaha, and Brown counties. In Doniphan County where Alternative Route N turns northeast, Alternative Route O follows the path of Alternative Route M to the southeast loosely following the gas pipeline corridor to the Missouri River and the Kansas state boundary.

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5. Alternative Route Evaluation

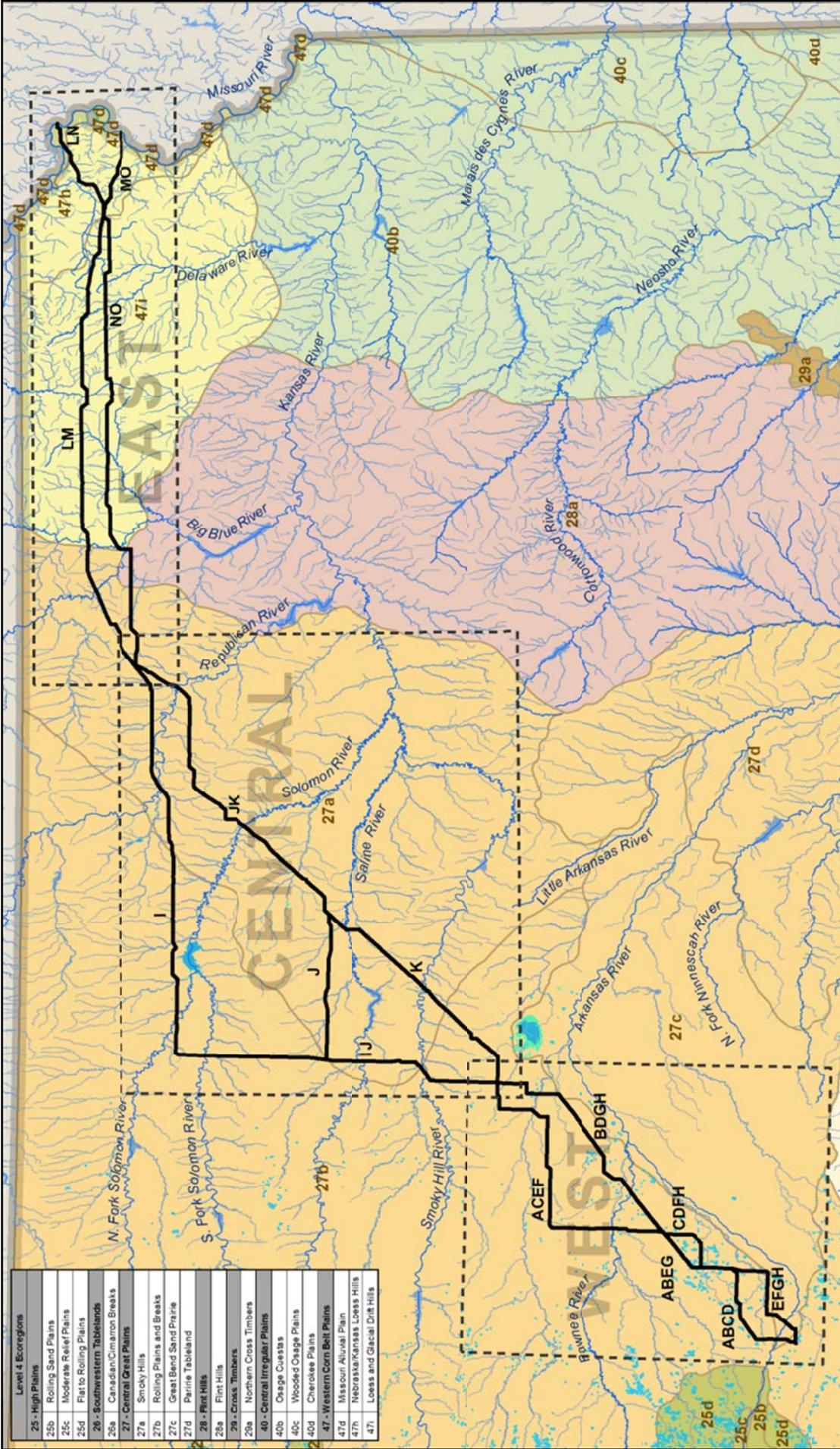
This chapter provides a description of key resources in the Study Area and a comparative analysis of the potential impacts of each Alternative Route on these resources. The analysis relies on a combination of information collected in the field, GIS data sources, supporting documents, stakeholder input, and the knowledge and experience of the Routing Team. Information presented throughout the chapter is based on an aerial photo-aligned centerline for each Alternative Route. The final location of any route ultimately approved by the KCC is subject to change based on final engineering, ground surveys, minimization of impacts on resources, and landowner negotiations.

5.1 Natural Environment Impacts

5.1.1 Water Resources

Kansas water resources are groundwater-dominated in the western half of the state and surface water-dominated in the eastern half. Generally, the northern half of Kansas drains to the Missouri River, and the southern half drains to the Arkansas River (Kansas Water Office [KWO], 2009). Kansas has few natural lakes; however, many reservoirs have been constructed to control flooding and store water for agricultural use. Streams in the Study Area are typically low gradient, meandering, and experience wide seasonal and year-to-year variations in flow (KWO, 2009). Groundwater quality across the Study Area is generally good, with naturally occurring minerals as the primary pollutant concern (Kansas Department of Health and Environment [KDHE], 2001). Water resources are presented in **Figure 5-1** below.

In the West Segment, major surface water features include the Arkansas River, Pawnee River, and Walnut Creek. Streams within Upper and Lower Arkansas River basins typically have lower mean flows and lower discharges than those in the greater Missouri River basin. The West Segment includes portions of Blood Creek which is designated as a Special Aquatic Life Use Water by the State of Kansas. This designation is for “surface waters that contain combinations of habitat types and indigenous biota not found commonly in the state, or surface waters that contain representative populations of threatened or endangered species” (KDHE, 2007). Major aquifers include the High Plains, Dakota, and Arkansas River alluvial (KWO, 2011). Intensive groundwater use in this area of Kansas has resulted in a loss of perennial streams (KWO, 2009). Generally, irrigation is the dominant water use in the West Segment (KWO, 2011); however, few locations are open to new appropriations. The Kansas Department of Agricultural has identified several areas for groundwater conservation under the Intensive Groundwater Use Control Area Program. These areas are found within the West Segment and partially in the Central Segment.



Level 4 Ecoregions	
25 - High Plains	
25b	Rolling Sand Plains
25c	Moderate Relief Plains
25d	Flat to Rolling Plains
26 - Southwestern Tablelands	
26a	Canadian/Cimarron Breaks
27 - Central Great Plains	
27a	Smoky Hills
27b	Rolling Plains and Breaks
27c	Great Bend Sand Prairie
27d	Prairie Tableland
28 - Flint Hills	
28a	Flint Hills
29 - Cross Timbers	
29a	Northern Cross Timbers
40 - Central Irregular Plains	
40b	Osage Cuestas
40c	Wooded Osage Plains
40d	Cherokee Plains
47 - Western Corn Belt Plains	
47d	Missouri Alluvial Plain
47h	Nebraska/Kansas Loess Hills
47i	Loess and Glacial Drift Hills

Alternative Routes

- 27 - Central Great Plains
- Playa Wetland
- Wetland

Level 3 Ecoregion

- 25 - High Plains

Figure 5-1
Ecoregions and Hydrology
within the Study Area

GRAIN BELT EXPRESS
CLEAN LINE

Sources: ESRI, USGS, US EPA, USFWS, PLVJ

Coordinate System: North America Equidistant Conic
Projection: Equidistant Conic
Datum: North American 1983

In the Central Segment, water resources transition from groundwater-dominated to surface water-dominated, moving west to east (KWO, 2011). The Central Segment transects the Lower Arkansas, Smoky Hill-Saline, Solomon, and Kansas-Lower Republican basins. Major rivers include the Smoky Hill River, Saline River, Solomon River (including the North and South Forks), and Republican River. The Republican is designated as a Special Aquatic Life Use River. The Saline River is designated an Exceptional State Water, and the Smokey Hill River is designated as both an Exceptional State Water and a Special Aquatic Life Use River. Exceptional State Waters are defined as: “any of the surface waters or surface water segments that are of remarkable quality or of significant recreational or ecological value, are listed in the surface water register as defined in K.A.R. 28-16-28b(zz), and afforded the highest level of water quality protection under the antidegradation provisions of K.A.R. 28-16-28c(a) and the mixing zone provisions of K.A.R. 28-16-28c(b)” (KDHE, 2007). Major reservoirs include Wilson Lake, operated by the USACE, and Waconda Lake, operated by the U.S. Bureau of Reclamation (KWO, 2009). Major aquifers underlying the central segment include the High Plains, Dakota, Flint Hills, and alluvial aquifers associated with major rivers (KWO, 2011). Groundwater availability is less than that in the West Segment (KWO, 2009). Water use is dominated by irrigation within all counties of the Central Segment with the exception of Russell County, where municipal use exceeds agricultural irrigation (KWO, 2011).

Cheyenne Bottoms is a 41,000-acre natural land sink of significant importance and is located in Barton County near Great Bend (Central Segment). It is considered the largest interior marsh in the United States and has been designated a wetland of international importance (Ramsar Convention, 2013). Approximately 20,000 acres of the bottoms are managed by KDWP as the Cheyenne Bottoms Wildlife Area, and another 8,000 acres, the Cheyenne Bottoms Preserve, are managed by The Nature Conservancy.

In the East Segment, water resources are surface water-dominated (KWO, 2011). The East Segment transects the Kansas-Lower Republican and Missouri River basins. Major rivers include the Little Blue River, Big Blue River, and Missouri River (KWO, 2009). The Missouri River and the South Fork Nemaha River are listed as Special Aquatic Use Life Waters. Tuttle Creek reservoir, operated by USACE, is located on the western part of the East Segment (KWO, 2009). Aquifers in the area include the glacial drift and Missouri River alluvial (KWO, 2011). Water use is dominated by municipal uses and groundwater is appreciably less than that in the other two segments (KWO, 2011).

Wetland habitats throughout the Study Area include salt marsh/prairie, spikerush playa lake, playa lake, low or wet prairie, freshwater marsh, cattail marsh, and weedy marsh (Wasson et al., 2005). These wetland habitats can be temporary, seasonal, or permanent. Wetlands are typically located in the floodplains along rivers and streams, in swales associated with rivers, or as margins of lakes and impoundments.

General Impacts and Mitigation Measures

Surface Waters

Direct impacts on hydrologic features are often minimized or avoided by spanning wetlands, rivers, or drainages, when feasible. In the absence of other constraints, engineers typically seek to place structures at high points in topography, inherently resulting in the avoidance of structure placement that impacts water or wetland features in low lying areas. However, in a few rare instances, such as at crossings of large wetland areas or complexes, a structure may need to be placed within a wetland. In these instances, the area of permanent wetland loss is limited to the area of the footprint of the structure foundation, typically between 0.0005 and 0.0009 acres of permanent impact (average permanent impact acreage for lattice steel and steel monopole structures, respectively).

Only a small portion of the wetlands in the Study Area are forested wetlands. Like all wetlands, the potential for permanent loss of wetland acreage is minimal for these wetlands; however, the need to remove tall growing trees from the ROW results in a conversion of the wetland from a forest wetland to either a scrub/shrub or herbaceous wetland.

Regardless of the type of impact, Grain Belt Express will continue to coordinate with the USACE concerning potential impacts on jurisdictional wetlands and will attempt to minimize permanent impacts when feasible and practical. To this end, Grain Belt Express will implement a range of best management practices during the design, construction, and operational phases to avoid or minimize impacts on wetlands. These practices may include the consideration of designs that limit clearing forests near drainages and in areas of steep topography, requiring the use of wetland mats to minimize impacts of construction traffic, and avoiding construction during seasonally wet periods in certain areas.

Other indirect impacts to surface waters, such as sedimentation and erosion of surrounding soils can also result from ground disturbing activities. Typically, sedimentation is easily controlled with proper perimeter controls around the transmission line construction area. Best management practices may include the implementation of sediment control measures such as silt fencing, access road drainage management measures, and rapid reseeding of disturbed soil areas. Grain Belt Express will coordinate with the Kansas Department of Health and Environment and obtain and comply with the necessary storm water permits for construction of the Project.

Groundwater

Generally, transmission line construction does not impact ground water. In some instances, dewatering may need to occur in areas with a high water table to place foundations in the ground. If dewatering is required, it would follow best management practices and would be

covered under the National Pollution Discharge Elimination System Permit (NPDES) or under a separate dewatering permit, if needed.

Alternative Route Comparison

For each segment, Alternative Routes were analyzed for number of stream crossings (including streams, rivers, or drainages that can be perennial, seasonal, intermittent, or ephemeral), count of waterbodies (lakes or ponds) crossed, acres of wetlands (forested and scrub/shrub) within the ROW, and the acreage of riparian areas within the ROW. **Figure 5-1** shows the ecoregions and hydrology for all three segments.

West Segment

All streams and waterbodies in the West Segment can be easily spanned, and potential wetland acreage within the ROW of each Alternative is generally similar (**Table 5-1**). All of the Alternative Routes cross a portion of Blood Creek, a Special Aquatic Life Use Water. No forested wetlands were specifically identified in available data sources for comparison between the Alternative Routes, but if present, they would most likely be associated with riparian areas identified along the routes. Alternative Routes G and H cross the fewest streams and have only slightly higher acreage of riparian area, and therefore are likely to have less overall impact on water resources.

Table 5-1. West Segment Alternative Routes Water Resources Information								
Water Resources Category	Alternative Routes							
	A	B	C	D	E	F	G	H
Stream crossings (count)	113	100	120	107	115	107	87	79
Waterbody crossings (count)	-	1	-	1	-	-	1	1
Wetlands within the ROW ¹ (acres)	18	18.5	21	21.5	17.5	20.5	18	21
Scrub-shrub wetlands within the ROW ¹ (acres)	1.5	2	1.5	2	1.5	1.5	2	2
State Designated Waters crossings (count)	1	1	1	1	1	1	1	1
Riparian area (acres)	13	17.5	14	18	14	14.5	18	19

¹ ROW is 100 feet on either side of centerline.

Central Segment

Similar to the West Segment, all waterbodies, streams, and wetlands can be easily spanned by the transmission line. The amount of forested wetlands within the ROW is similar for all three routes based on available data; riparian area acreage estimates are generally similar across the Alternative Routes (**Table 5-2**). All three Alternative Routes cross the same number of State Designated Waters. Alternative Route K crosses the Smokey Hill River and the Republican

River. Alternative Routes I and J cross the Saline River and the Republican River. Alternative Route K has the fewest stream crossings and the least amount of riparian area where the potential for forested wetland occurrence is greatest, suggesting that this alternative would likely have the least overall impact on water resources in the Central Segment.

Alternative Routes I and J cross 3.3 miles of an USACE Flowage Easement associated with Wilson Lake adjacent to an existing transmission line. The Routing Team coordinated with representatives of USACE to discuss potential concerns in respect to crossing the easement. The USACE considered impacts of the crossing at this location to be minimal. A consent-to-easement would be required for a crossing of the flowage easements, but impacts to flood zone function are anticipated to be negligible.

Water Resources Category	Alternative Routes		
	I	J	K
Stream crossings (count)	209	202	170
Waterbody crossings (count)	5	5	4
Wetlands within the ROW ¹ (acres)	19.5	22.5	15.5
Forested wetlands within the ROW ¹ (acres)	<1	<1	1
Scrub-shrub wetlands within the ROW ¹ (acres)	0	0	0
State Designated Water crossings (count)	2	2	2
Riparian within the ROW ¹ (acres)	99	106.5	92.5
Flowage Conservation Easement (miles)	3.3	3.3	0

¹ ROW is 100 feet on either side of the centerline.

East Segment

Excluding the crossing of the Missouri River (discussed in Section 5.3.4), all waterbodies, streams, and wetlands can be easily spanned by the Project in the East Segment. All of the Alternative Routes cross the South Fork Nemaha River and the Missouri River, both of which are designated as Special Aquatic Life Use Waters. Forested wetland acreage within the ROW is similar for all three routes based on available data; however, riparian area acreage estimates are lowest for Alternative Routes L and M (**Table 5-3**), suggesting these alternatives have the least potential for forested wetland impacts. Although Alternative Routes L and M have a greater number of waterbody crossings, all of these crossings are of existing impoundments or ‘farm ponds’. Impacts to these types of surface waters are not anticipated.

Table 5-3. East Segment Alternative Routes Water Resources Information

Water Resources Category	Alternative Routes			
	L	M	N	O
Stream crossings (count)	184	188	177	181
Waterbody crossings (count)	18	19	12	13
Wetlands within the ROW ¹ (acres)	19.5	22	11.5	14
Forested wetlands within the ROW ¹ (acres)	<1	<1	<1	<1
State Designated Water crossings (count)	2	2	2	2
Riparian areas within the ROW ¹ (acres)	118	120.5	143.5	146.5

¹ The ROW is 100 feet on either side of centerline.

5.1.2 Wildlife and Habitat

Vegetation and Habitats

Kansas was once primarily grassland, dominated by mixed grass and tallgrass prairies with scattered trees and shrubs along floodplains and riparian areas. Grassland vegetation and habitat is variable from west-to-east due to climate and precipitation, historically ranging from mixed grass prairie in the west to tallgrass prairie in the east. Today, many of these native ecosystems have been converted to cropland or rangeland. In certain areas, such as in the Smoky Hills and Sand Hills, large tracts of grassland still exist with varying degrees of habitat quality. The Routing Team reviewed these areas for their overall habitat value in the field, and revised route alignments in some places to minimize impacts on high quality habitats (see Section 5.1.3 for a more detailed description of these efforts).

Playas are found in the western part of Kansas and are naturally occurring depressions that are clay-lined and fill with water during periods of precipitation or run-off (KAWWS, 2013). They provide important habitat for migratory birds, specifically waterfowl, cranes, and shorebirds, and are also a primary source of recharge for the Ogallala aquifer. In an effort to protect playas, the Playa Lakes Joint Venture (PLJV) was formed, which is a partnership between federal, state, local, and private groups. The goal of the group is to provide data and information that can be used in planning and conservation of playas throughout the Great Plains region. As part of this venture, PLJV has developed the Playa Decision Support System for Kansas which identifies playas that are of low, medium, and high importance for restoration (PLJV, 2013).

The majority of forested areas are either planted wind breaks or riparian areas located along streams and rivers. Common tree species associated with forests and riparian areas include cottonwood (*Populus deltoides*), green ash (*Celtis occidentalis*), bur oak (*Quercus macrocarpa*), black walnut (*Juglans nigra*), and basswood (*Tilia americana*), as well as a variety of willows (*Salix* spp.). The prominence of forests increases within the wide alluvial valley of the Missouri River, historically supporting northern floodplain forest and commonly including, plains cottonwood,

green ash, boxelder (*Acer negundo*), and elms (*Ulmus* spp.), with lowland tallgrass prairie (Chapman et al. 2001).

Wildlife

Kansas is home to hundreds of native and naturalized wildlife species including approximately 800 species of vertebrates. This includes 468 species of birds, 89 mammals, 144 fishes, 53 reptiles, and 30 amphibians. Additionally, approximately 24,000 species of invertebrates, including mussels, crustaceans, and insects, are known to occur in Kansas (Wasson et al., 2005). Game species managed for hunting include big and small game animals, furbearing animals, upland game birds, and migratory game birds.

Kansas lies within the Central Flyway bird migration corridor. One of the four major North American migration corridors, the Central Flyway encompasses much of the Great Plains region, beginning in Central Canada and extending south to Texas and the Gulf of Mexico. During early spring and late fall, many bird species migrate between wintering grounds and spring/summer nesting grounds to take advantage of temperate climates and resource availability during seasonal shifts. Stopover habitats, in the form of playas for migrating shorebirds and waterfowl or riparian forests for passerines, are important ecological sites for migrating avian species.

Conservation Lands

Conservation lands primarily include lands in the NRCS Wetland Reserve Program and lands in the United States Department of Agriculture's (USDA) Conservation Reserve Program (CRP). The NRCS Wetland Reserve Program is a voluntary program that allows landowners to protect wetlands on their property under conservation easements. These easements are federal easements that can either be permanent or implemented in 30 year terms (USDA NRCS, 2013). The CRP program is also a voluntary program in which areas are planted with native plants to provide soil stability, water conservation, and wildlife habitat. Incentives to landowners include compensation for the acreage enrolled in the CRP program (USDA CRP, 2013).

Cheyenne Bottoms is located on the east side of the Central Segment in Barton County. During migration, one quarter of a million waterfowl and nearly one half of the shorebirds migrating east of the Rocky Mountains stop at Cheyenne Bottoms (The Nature Conservancy, 2013). Common species include gadwall (*Anas strepera*), American wigeon (*Anas americana*), American black duck (*Anas rubripes*), canvasback (*Aythya valisineria*), redhead (*Aythya americana*), lesser scaup (*Aythya affinis*), Clark's grebe (*Aechmophorus clarkii*), neotropic cormorant (*Phalacrocorax brasilianus*), American avocet (*Recurvirostra americana*), and Franklin's gull (*Larus pipixcan*) (KSBirds.org, 2012). Two large tracts of conservation lands are associated with Cheyenne Bottoms. The Cheyenne Bottoms Wildlife Area is managed by the State of Kansas, and the Cheyenne Bottoms Preserve is managed by The Nature Conservancy. Both areas are

intensively managed for restoration and preservation of diverse natural wetlands that benefit waterfowl and shorebird species during migration (The Nature Conservancy, 2013).

General Impacts and Mitigation Measures

Vegetation and Habitats

During construction, trees and other tall growing vegetation within the ROW would be removed to maintain appropriate clearances for the conductors. Tall growing vegetation and the associated habitat would be removed from the ROW for the life of the transmission line. Smaller shrub species (less than 10 feet in height) or grasses would be encouraged to grow where possible (i.e. non-farmed areas). In pasture/grassland areas, little vegetation clearing would be required and permanent impacts would be limited to the foundations of the structures and any areas requiring permanent access roads.

After construction, access roads can be re-vegetated with native grasses or agricultural crops. For areas where a road was cut into the landscape, the road can either be reclaimed back to the original grade or the road bed left in place and re-vegetated for future maintenance needs. Whether or not a road is reclaimed would depend on several factors, including landowner negotiations and need to access that particular section of the transmission line in the future.

Wildlife

Impacts to wildlife would either be short-term or long-term, depending on the type of impact and nature of the species impacted. Short term impacts may include temporary displacement from an area due to construction-related noise or temporary modifications in habitat. Long-term impacts occur if the habitat for the species is permanently removed, such as with the conversion of forested habitat to grassland, or less obviously, when the Project introduces a new feature that degrades the overall quality of the habitat for certain species.

It should be noted that impacts on habitats need to be considered with respect to the current status of habitats and the nature of its current wildlife assemblage. Many of the native grasslands and forested riparian habitats in the Study Area have long been cleared and are tilled yearly for farming. Species that are currently associated with these converted habitats are typically tolerant of farming operations. Forest dwelling species located adjacent to agriculture settings are either endemic to or tolerant of edge-type habitats. For many of the species now present, additional permanent impacts will be either unlikely or negligible as a result of the construction of the Project, especially when considering the nature of the species present and the ongoing impacts of other area land uses.

Several studies have suggested that grassland birds may avoid the use of otherwise suitable habitat adjacent to trees, oil and gas wells, power lines, or other tall vertical structures (Leu, 2008). Although research into these effects is ongoing, avoidance of the transmission line structures may reduce the quality of grassland bird habitats, and in the worst case, cause habitat

loss and fragmentation effects. Since grassland habitats are both a focus of wildlife conservation efforts in the state and grassland birds are the most likely species group to be adversely impacted by the project, they are the primary comparative consideration in this study. In those areas with existing transmission lines, oil and gas infrastructure, or cell/radio towers, impacts to grassland bird habitat quality have already occurred, therefore impacts of new transmission lines may likely be limited.

Avian collisions with power lines are a recognized concern for transmission line development. Given that the Study Area is within the Central Flyway, avian collisions are a concern. Typically, the risk of avian collision is associated with the smaller diameter and less visible shield wire. In areas with high bird use, collision risk can be avoided or minimized by marking the wire to increase visibility. To minimize avian risk Grain Belt Express will develop an Avian Protection Plan in accordance with the suggested guidance and best practices identified by the Avian Power Line Interaction Committee. The Avian Protection Plan will evaluate potential risks to avian species and develop specific measures to avoid, minimize, and mitigate avian collisions with the transmission line.

Alternative Comparison

The potential for each Alternative Route to impact wildlife habitats can be generally assessed by comparing each Alternative Route with respect to the amount of forest cover, wetlands, and playas crossed. In addition, the length of each route through grassland/pasture habitats is also presented, both in total and when not parallel to existing transmission lines (where impacts on grassland habitat would likely be greatest).

West Segment

The Alternative Routes are generally similar with respect to wetland, playa, and pasture/grasslands crossed. Although Alternative Routes A, B, C, and D cross the least amount of forested area (**Table 5-4** below), the difference between routes is largely the result of clearing necessary in planted windbreaks or monoculture hedge rows and not naturally forested habitats.

Alternative Routes B, D, G, and H cross the least amount of grassland when not parallel to existing transmission lines, less than half that of A, C, E, and F. The difference between these two groups is primarily the result of the non-parallel route segment between the Spearville – Post Rock 345 kV line and Great Bend.

Playas of medium or high importance for restoration, as identified by PLJV, are crossed by all of the Alternative Routes. In review of the size of the playas crossed, it was determined that all playas could be spanned by the transmission line. Although spanning the playas does not physically affect playa function or the habitat provided by the playa, birds could still be impacted

by the presence of the transmission line. The risk of birds colliding with the transmission line increases as birds are more likely to use playas for resting, feeding, and breeding.

Table 5-4. Wildlife Habitat within the West Segment Alternative Routes								
Factor	Alternative Routes							
	A	B	C	D	E	F	G	H
Forested (acres)	16.5	19	17.5	20	31.5	32.5	34.5	35
Wetlands (acres)	13	13.5	13	13.5	13.5	13.5	14	14
Pasture/grasslands (miles)	32.4	18.2	35.4	21.2	31.2	34.2	17.0	20.0
Pasture/grasslands (miles) not parallel to existing transmission	19.3	4.7	23.4	8.9	22.1	26.3	7.6	11.8
Playas crossed (medium or high priority for restoration)	3	3	3	3	2	2	2	2
Parallel transmission ROW (miles)	46.6	64.0	37.9	55.3	30.1	21.4	50.5	41.7
Parallel transmission ROW (percent)	44%	68%	35%	60%	28%	20%	53%	42%

Central Segment

All three Alternative Routes would require similar amounts of forest impact (**Table 5-5** below). However, Alternative Route I has the most miles parallel to existing transmission lines, with the vast majority of its length adjacent to an existing 115 kV line. The extensive use of transmission line parallel alignments for this route results in less potential for new impacts on grassland birds, since the habitat for these species is already impacted by the existing line. The addition of a second transmission line would result only in an incremental increase in the potential for avian collisions since the existing line already creates the initial potential for this impact in the area.

In contrast, Alternative Routes J and K do not parallel existing electric transmission lines for much of their length. Although they do parallel an existing pipeline corridor through the area, the pipelines themselves have little impact on the quality of grassland habitats, and thus, a route adjacent to the pipeline corridor would likely result in completely new impacts to grassland bird habitat. Lastly, Alternative Routes J and K would create a new potential for avian collision impacts through the Central Segment, where none currently exist.

Table 5-5. Wildlife Habitat within the Central Segment Alternative Routes

Factor	Alternative Routes		
	I	J	K
Forested (acres)	114.5	112.5	102
Wetlands (acres)	19.5	22.5	15.5
Pasture/grassland (miles)	49.4	76.9	58.0
Pasture/grassland (miles) not parallel to existing transmission	5.4	48.1	52.9
Parallel transmission ROW (miles)	121.1	48.8	12.9
Parallel transmission ROW (percent)	79%	35%	10%

East Segment

Compared with other Project segments, there is noticeably more forest cover in the East Segment, particularly near the Missouri River (**Table 5-6** below). Windbreak forest cover and hedgerows are less frequent further east, with much of the forest cover occurring in the drainages and on steeper hillsides that are less suitable for farming. The amount of forest clearing required increases significantly compared to the Central and West Segments, with Alternative Route M having the least amount in the East Segment.

Grassland habitats decline significantly in proportion, and are generally of lesser habitat value moving eastward with increased population density. Although the amount of grassland crossed is nearly the same across all Alternatives, Alternative Routes L and M have fewer miles of grassland crossed when not parallel to an existing transmission line, suggesting that these routes would likely have less overall potential impact on grassland habitats.

Table 5-6. Wildlife Habitat within the East Segment Alternative Routes

Factor	Alternative Routes			
	L	M	N	O
Forested (acres)	411	354.5	484	427.5
Wetlands (acres)	19.5	22	11.5	14
Pasture/grassland (miles)	22.7	22.1	21.3	20.8
Pasture/grassland (miles) not parallel to existing transmission ROW	12.7	12.2	21.3	20.8
Parallel transmission ROW (miles)	45.9	45.9	0.7	0.7
Parallel transmission ROW (percent)	37%	39%	1%	1%

5.1.3 Special Status Species

Grain Belt Express contacted the USFWS, KDWPT, and The Nature Conservancy to identify threatened and endangered and rare species potentially affected by the project. The USFWS

responded by letter on March 2, 2011, identifying federally listed species known to occur within counties crossed by the Alternative Routes (USFWS, 2011). Grain Belt Express also met with KDWPT and USFWS officials to further discuss the Project. A search of the Kansas Natural Heritage Inventory data resulted in a list of threatened and endangered and rare wildlife and plant species with known occurrences within 1 mile of the Alternative Routes (KBS, 2008). A search of the KDWPT public database (KDWPT, 2013a; KDWPT, 2013b) resulted in a list of additional threatened and endangered and rare state-listed species with a known current range within counties containing the Alternative Routes. **Table 5-7** below presents all federally listed and state-listed species that may occur in the counties crossed by the Alternative Routes. In addition, species known to occur within 1 mile of the Alternative Routes and federally listed and state-listed species with designated critical habitat in counties where the Alternative Routes occur are also noted. **Figure 5-2** below illustrates the distribution of special status species and natural communities located within the Study Area.

Federal Species

According to the Kansas Natural Heritage Inventory data, only two federally listed endangered species, the pallid sturgeon (*Scaphirhynchus albus*) and the whooping crane (*Grus americana*), are known to occur within 1 mile of the Alternative Routes (**Table 5-7**). Potential habitat for one federally proposed threatened candidate species, the lesser prairie-chicken (*Tympanuchus pallidicinctus*), occurs within 1 mile of the Alternative Routes. According to USFWS (USFWS, 2011) and the KDWPT data (KDWPT, 2013a), the federally listed threatened and endangered species with designated critical habitat in the counties where the Alternative Routes occur are the interior least tern (*Sternula antillarum athalassos*), whooping crane (*Grus americana*), Topeka shiner (*Notropis topeka*), Arkansas River shiner (*Notropis girardi*), and two candidate species, sicklefin chub (*Macrhybopsis meeki*), and the sturgeon chub (*Macrhybopsis gelida*). The following section describes habitat characteristics and proximities to specific routes for each species or their designated critical habitat.

Lesser Prairie-Chicken

Kansas currently harbors the largest population of the lesser prairie-chicken (LPC) in the species' five state range. The greatest densities occur in the sandsage prairies of southwest Kansas, but extensive populations also occur in the mixed-grass prairies of the Red Hills. Lesser prairie-chickens also inhabit seeded CRP grasslands in proximity to native mixed prairies of the Pawnee, Walnut, and Smoky Hill drainages in west-central Kansas. In early spring, groups of males assemble on communal mating grounds known as leks. These leks serve as a display ground for breeding males to attract females. Males generally have a strong fidelity to individual lek sites and return to the same one each year.

Table 5-7. Federal and State Special Status Species

Common Name	Scientific Name	Status¹	Occurrence within 1 Mile of Alternative Routes	Federal or State Designated Critical Habitat (within Study Area)
Mammals				
Gray bat	<i>Myotis grisescens</i>	FE/SE		
Black-footed ferret	<i>Mustela nigripes</i>	FE/SE		
Eastern spotted skunk	<i>Spilogale putorius</i>	ST		State
Birds				
Whooping crane	<i>Grus americana</i>	FE/SE	X	State and Federal
Piping plover	<i>Charadrius melodus</i>	FT/ST		
Interior least tern	<i>Sterna antillarum athalassos</i>	FE/SE		State
Black-capped vireo	<i>Vireo atricapilla</i>	SE		
Eskimo curlew	<i>Numenius borealis</i>	SE		
Lesser prairie-chicken	<i>Tympanuchus pallidicinctus</i>	FPT		
Fish				
Arkansas river shiner	<i>Notropis girardi</i>	FTSE		Federal
Topeka shiner	<i>Notropis topeka</i>	FE/ST		Federal
Pallid sturgeon	<i>Scaphirhynchus albus</i>	FE/SE	X	State
Sicklefin chub	<i>Macrhybopsis meeki</i>	C/SE		State
Sturgeon chub	<i>Macrhybopsis gelida</i>	C/ST		State
Chestnut lamprey	<i>Ichthyomyzon castaneus</i>	ST		State
Flathead chub	<i>Platygobio gracilis</i>	ST		State
Shoal chub	<i>Macrhybopsis hyostoma</i>	ST		State
Silverband shiner	<i>Notropis shumardi</i>	ST		State
Plains minnow	<i>Hybognathus placitus</i>	ST	X	State
Western silvery minnow	<i>Hybognathus argyritus</i>	ST		State
Neosho madtom	<i>Noturus placidus</i>	FT		

Table 5-7. Federal and State Special Status Species

Common Name	Scientific Name	Status¹	Occurrence within 1 Mile of Alternative Routes	Federal or State Designated Critical Habitat (within Study Area)
<i>Invertebrates</i>				
Spectaclecase	<i>Cumberlandia monodonta</i>	FE/SE		
Slender walker snail	<i>Pomatiopsis lapidaria</i>	SE		State
Optiosevus riffle beetle	<i>Optioservus phaeus</i>	SE		
American burying beetle	<i>Nicrophorus americanus</i>	FE/SE		
<i>Plants</i>				
Mead's milkweed	<i>Asclepias meadii</i>	FT		
Western prairie fringed orchid	<i>Platanthera praeclara</i>	FT		

¹FE= Federally Endangered FT= Federally Threatened FPT= Federally Proposed Threatened C= Candidate for Federal Listing
 SE=State Endangered ST=State Threatened

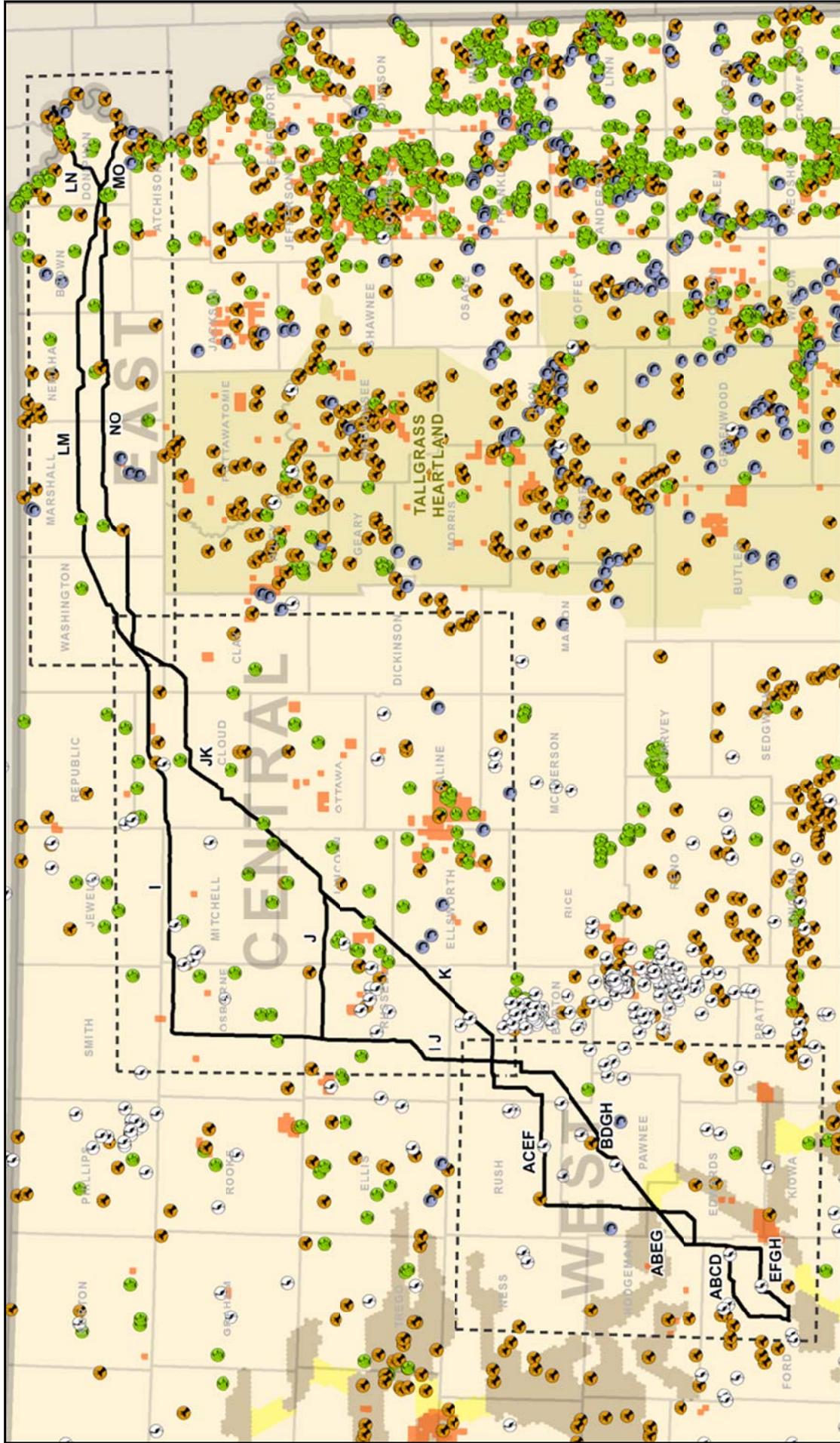


Figure 5-2
Special Status Species
within the Study Area

GRAIN BELT EXPRESS
CLEAN LINE

<ul style="list-style-type: none"> — Alternative Routes ☉ Whooping Crane Sighting Rare Species ☉ Invertebrate Animal ☉ Vascular Plant ☉ Vertebrate Animal 	<ul style="list-style-type: none"> ■ Natural Communities ■ Lesser Prairie Chicken ■ Habitat Connectivity Zone ■ Focal Area
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Sources: ESRI, KS Natural Heritage Inventory, KS Applied Remote Sensing, KS Biological Survey

Coordinate System: North America Equidistant Conic Projection; Equidistant Conic Datum: North American 1983

0 10 20 30 Miles

N

IN IL MO KS

Research conducted in southwest Kansas revealed a general pattern of avoidance of man-made structures by lesser prairie-chickens (Hagen et al., 2011). Generally, lesser prairie-chicken hens avoided nesting or brood-rearing within a quarter of a mile of power lines and within a third of a mile of improved roads. Buildings, including a power plant, were avoided at distances of between two-thirds of a mile and 1 mile, depending on their size.

During the route development process, efforts were made to avoid lesser prairie-chicken habitat. Several spatial planning datasets were used to identify potential lesser prairie-chicken habitat, including the Lesser prairie-chicken Crucial Habitat Assessment Tool 1.0 data (KARS, 2011) and a high probability lek dataset provided by Kansas Biological Survey (KBS). The CHAT dataset identifies potential habitat in the lesser prairie-chicken range and delineates five categories of habitat including: 1-Irreplaceable, 2-Limiting, 3-Significant, 4-Unknown, and 5-Common. The Routing Team identified CHAT Categories 1-3 as areas to avoid or minimize route development. The KBS lek probability model identifies the potential occurrence of both greater and lesser prairie-chicken lek habitat in Kansas but does not distinguish between the two species. The Routing Team used this lek probability model in combination with the lesser prairie-chicken specific CHAT data to assess the relative value and potential occurrence of lesser prairie-chicken lek habitat.

To more specifically identify high quality grassland bird habitat, Randy Rodgers, a former Wildlife Biologist with KDPWT, conducted a delineation and evaluation of potential grassland bird habitat along key segments of the Potential Routes. Supplemental to the LEPC lek probability and CHAT datasets, this qualitative assessment of habitat was used to verify the potential presence or absence of important habitat areas identified by the KBS and CHAT datasets.

Still later in the process, the Routing Team incorporated the CHAT 2.0 data that was developed in conjunction with the Range-wide Conservation Plan for the Lesser Prairie-chicken (WAFWA, 2013). The CHAT 2.0 data identifies high value lesser prairie-chicken habitats, called focal areas, and important Connectivity Zones between focal areas that are targeted for lesser prairie-chicken conservation and preservation. Habitat conditions for the lesser prairie-chicken are most suitable in the West Segment in the grasslands north of Spearville and to the immediate east in the Sand Hills along the Arkansas River. The probability of lesser prairie-chicken occurrence diminishes continuing north and east into the Central Segment.

Pallid Sturgeon

Pallid sturgeons inhabit main channels of large, excessively turbid rivers and are commonly found in areas with swift currents and a firm sand substrate. In Kansas, pallid sturgeons are

restricted to the main stem of the Missouri River. Although pallid sturgeons have occurred in the Kansas River near Lawrence, KS during flood flows, the river does not provide permanent suitable habitat (KDWPT, 2013a). The Kansas Natural Heritage Inventory indicates that there is a recorded pallid sturgeon occurrence within 1 mile of the East Segment Alternative Routes, and designated critical habitat occurs in Doniphan County, Kansas (KBS, 2008; KDWPT, 2013a). No occurrences are recorded within 1 mile of any Alternative Routes in the West or Central Segments (KBS, 2008). The Missouri River will be spanned and no structures will be placed in the river, therefore the project is not likely to have any effect on critical habitat of the Pallid Sturgeon.

Interior Least Tern

Interior least terns are summer nesting birds in Kansas. Nesting colonies have been recorded in six central and western Kansas counties, at Jeffery Energy Center, and along the Kansas River. Least tern habitat includes barren areas near water such as saline flats in salt marshes, sand bars in river beds, and shores of large impoundments and may occur occasionally anywhere in the state (KDWPT, 2013a). The USFWS has not designated critical habitat for the interior least tern. The KDWPT has designated Cheyenne Bottoms Wildlife Area in Barton County as critical habitat. Cheyenne Bottoms is within 6 miles of the West Segment Alternative Routes and 4 miles of any of the Central Segment Alternative Routes (KDWPT, 2013a). However, no occurrences are recorded within 1 mile of any of the Alternative Routes (KBS, 2008). The Project is not anticipated to impact the interior least tern.

Whooping Crane

Whooping cranes are regular spring and fall transients through Kansas, generally passing through the state during migration in March-April and October-November. Whooping crane migration and stopover habitat use most often occurs within a 200-mile wide band that stretches from Alberta to Texas. This yearly migration pattern, known as the whooping crane migration corridor, is based on an area in which 90 percent of annual sightings of whooping crane use have been documented. Preferred resting areas are typically wetlands in level to moderately rolling terrain away from human activity where low, sparse vegetation permits ease of movement and an open view (KDWPT, 2013a). Designated critical habitat occurs within Barton County, Kansas, at the Cheyenne Bottoms Wildlife Area. The critical habitat area is approximately 7 miles of any of the West Segment Alternative Routes and 6 miles of any of the Central Segment Alternative Routes. In addition, the West and Central Segment Alternative Routes occur within the designated whooping crane corridor (KDWPT, 2013a). Whooping crane sightings have been documented within 1 mile of Alternative Routes A-H (two occurrences), Alternative Route K (one occurrence) and Alternative Route I (one occurrence) (**Figure 5-2**). Given its coincident range and migration pattern, the Project could affect the whooping crane, most notably through potential collision with the conductors or shield wires of the transmission line. Grain Belt Express will develop an Avian Protection Plan to evaluate

potential risks to avian species and to develop specific measures to avoid, minimize, and mitigate avian collisions with the transmission line.

Topeka Shiner

The Topeka shiner is mainly found in east central Kansas and in Wallace County, Kansas (southwest Kansas). Topeka shiners live near the headwaters of small prairie streams with high water quality and warm temperatures, most often in pool and run areas (KDWPT, 2013a). No occurrences are recorded within 1 mile of any of the Alternative Routes (KBS, 2008). Kansas state-designated critical habitat occurs within Marshall County, Kansas, in North Elm Creek and its tributaries within 7 miles of any of the East Segment Alternative Routes (KDWPT, 2013a). The Project is located downstream of the critical habitat areas and therefore is not anticipated to impact the Topeka shiner.

Arkansas River Shiner

The Arkansas River shiner is extremely dependent upon flood flows and is restricted to a few stream reaches within the Lower Arkansas, Salt Fork Arkansas, and Cimarron basins, (KDWPT, 2013a). No occurrences are recorded within 1 mile of any of the Alternative Routes (KBS, 2008). State-designated critical habitat occurs within Barton County, Kansas, within the main stem of the Arkansas River between U.S. Highway 281 and the Kansas-Oklahoma border (KDWPT, 2013a). The endpoints of the Central Segment Alternatives Routes are approximately 8 miles from this critical habitat area. The Project is not anticipated to have any impacts on the Arkansas River shiner.

Sicklefin Chub

Sicklefin chubs require continuously flowing and heavily turbid waters of large rivers and are commonly found in areas with a strong current, flowing across sand or gravel substrate. In Kansas, the sicklefin chub is restricted to the Missouri River main stem, but has been recorded in the lower Kansas River during flood flows. However, the Kansas River does not provide suitable permanent habitat (KDWPT, 2013a). No occurrences are recorded within 1 mile of any of the Alternative Routes (KBS, 2008). Designated critical habitat occurs within Doniphan County, Kansas, in all reaches of the main stem of the Missouri River along the Kansas-Missouri border in the East Segment Alternative Routes (KDWPT, 2013a). The Project is not anticipated to have any impacts on the sicklefin chub.

Sturgeon Chub

Sturgeon chubs prefer large turbid sandy rivers over a substrate of small gravel and coarse sand (KDWPT, 2013a). Designated critical habitat occurs within Doniphan County, Kansas, in all reaches of the mainstem Missouri River along the Kansas-Missouri border in the East Segment Alternative Routes (KDWPT, 2013a). No occurrences are recorded within 1 mile of any of the Alternative Routes (KBS, 2008) and the Project is not anticipated to have any impacts on the sturgeon chub.

State Species

Six state-listed endangered species (five of which are also federally listed or candidate for listing and are discussed above) and nine state-listed threatened species (eight fish and one mammal) have designated critical habitat within the counties in which the Alternative Routes occur (**Table 5-7**) (KDWPT, 2013a). The fish species are associated with the Missouri River and are not likely to be impacted by the Project. The one state list-listed threatened mammal species, the eastern spotted skunk, has critical habitat in Barton County. Grain Belt Express will implement mitigation measures, developed in coordination with KDWPT, to minimize any potential impacts to the eastern spotted skunk from construction activities.

According to the Kansas Natural Heritage Inventory data (KBS, 2008) two state-listed endangered species, the pallid sturgeon and the whooping crane are known to occur within 1 mile of the Alternative Routes (see previous discussion). One state-listed threatened species, the plains minnow, is known to occur within 1 mile of the Central and East Segment Alternative Routes. It is not likely that the Project will impact the plains minnow.

The KDWPT maintains a list of state species in need of conservation (SINC) (KDWPT, 2013b). According to the Kansas Natural Heritage Inventory, one SINC species was identified within 1 mile of the West Segment Alternative Routes, one SINC species along the Central Segment Alternative Routes, and 15 SINC species along the East Segment Alternative Routes (KBS, 2008) and are shown in **Table 5-8**. According to KDWPT (KDWPT, 2013b), 30 additional SINC species have known current ranges within the counties in which the Alternative Routes occur (**Table 5-8**). Note that many of these may be based on historic accounts and may no longer be accurate. Based upon these data, however, no known locations of state-listed rare plant or animal species are crossed by any Alternative Routes.

Table 5-8. Species in Need of Conservation

Common Name	Scientific Name	Occurrence within 1 Mile of Alternative Routes	Known Current Range within Study Area		
			West	Central	East
American spikenard	<i>Aralia racemosa</i>	X			
Bigmouth shiner	<i>Notropis dorsalis</i>	X			
Black rail	<i>Laterallus jamaicensis</i>			X	
Black tern	<i>Chlidonias niger</i>		X	X	X
Blacknose dace	<i>Rhinichthys atratulus</i>				X
Blue sucker	<i>Cycleptus elongatus</i>				X
Bobolink	<i>Dolichonyx oryzivorus</i>		X	X	X
Brassy minnow	<i>Hybognathus hankinsoni</i>				X
Cave myotis	<i>Myotis velifer</i>	X			
Cerulean warbler	<i>Dendroica cerulea</i>	X			
Chihuahuan raven	<i>Corvus cryptoleucus</i>		X	X	
Creeping mussel	<i>Strophitus undulatus</i>				X
Curve-billed thrasher	<i>Toxostoma curvirostre</i>		X	X	
Cylindrical papershell mussel	<i>Anadontoides ferusscianus</i>			X	
Early meadowrue	<i>Thalictrum dioicum</i>	X			
Eastern hognose snake	<i>Heterodon platirhinos</i>		X	X	X
Fat mucket mussel	<i>Lampsilis siliquoides</i>				X
Ferruginous hawk	<i>Buteo regalis</i>		X	X	
Franklin's ground squirrel	<i>Spermophilus franklinii</i>			X	
Fremont's virgin's-bower	<i>Clematis fremontii</i>	X			
Giant ironweed	<i>Vernonia gigantea ssp. gigantea</i>	X			
Glossy snake	<i>Arizona elegans</i>		X		
Golden eagle	<i>Aquila chrysaetos</i>		X	X	X
Hairy sweet-cicely	<i>Osmorhiza claytonii</i>	X			
Henslow's sparrow	<i>Ammodramus henslowii</i>			X	X
Hooked agrimony	<i>Agrimonia gryposepala</i>	X			
Jacobs ladder	<i>Polemonium reptans</i>	X			
Large-flower bellwort	<i>Uvularia grandiflora</i>	X	X		
Long-billed curlew	<i>Numenius americanus</i>			X	
Mountain plover	<i>Charadrius montanus</i>			X	
Northern myotis	<i>Myotis septentrionalis</i>	X			
Notch bract eaterleaf	<i>Hydrophyllum appendiculatum</i>	X			
Prairie mole cricket	<i>Gryllotalpa major</i>			X	

Table 5-8. Species in Need of Conservation

Common Name	Scientific Name	Occurrence within 1 Mile of Alternative Routes	Known Current Range within Study Area		
			West	Central	East
River shiner	<i>Notropis blennioides</i>				X
Rock elm	<i>Ulmus thomasii</i>	X			
Short-eared owl	<i>Asio flammeus</i>		X	X	X
Southern bog lemming	<i>Synaptomys cooperi</i>			X	X
Southern flying squirrel	<i>Glaucomys volans</i>				X
Southern redbelly dace	<i>Phoxinus erythrogaster</i>				X
Spotted gar	<i>Lepisosteus oculatus</i>	X			
Tall tickseed	<i>Coreopsis tripteris</i>	X			
Timber rattlesnake	<i>Crotalus horridus</i>				X
Wabash pigtoe mussel	<i>Fusconaia flava</i>			X	
Western hognose snake	<i>Heterodon nasicus</i>		X	X	X
Whip-poor-will	<i>Camprimulgus vociferus</i>		X	X	X
White baneberry	<i>Actaea pachypoda</i>	X			
Yellow-throated warbler	<i>Dendroica dominica</i>		X		

Alternative Route Comparison

West Segment

No known occurrences of federally listed fish species are reported within 1 mile of the Alternative Routes, and the nearest designated critical habitat is approximately 8 miles from any potential disturbance. Construction activities are not proposed to take place within or nearby aquatic habitats that are designated as state or federal critical habitat for protected aquatic species. Therefore, no impacts are expected to federally listed fish species from any of the Alternative Routes in the West Segment.

All of the West Segment Alternative Routes occur in areas with a moderate to high probability of lesser prairie-chicken lek habitat and within 1 mile of known whooping crane sightings. Alternative Routes B, D, G, and H pass through a ‘connectivity zone’ for lesser prairie-chicken conservation (**Table 5-9** below). However, the Alternative Routes parallel an existing transmission line (Arthur Mullergren-Tap 230 kV line) through this area suggesting the existing habitat adjacent to the line is already degraded and the presence of a new line will have only minor additional incremental impacts on sensitive species habitat quality and use. Alternative Routes A, C, E, and F pass through a ‘focal area’ of lesser prairie-chicken habitat, and generally have nearly twice the number of miles in high probability lek areas as B, D, G, and H. However,

routes A, C, E, and F are also parallel to the existing Spearville-Post Rock 345 kV transmission line minimizing the likelihood of additional impacts from the Project. Taken together, Alternative Routes B, D, G, and H are likely to have less potential to adversely impact lesser prairie-chicken habitat.

Table 5-9. Impacts to Sensitive Species within the West Segment Alternative Routes								
Category	Alternative Routes							
	A	B	C	D	E	F	G	H
Sensitive Species and Habitat (miles)								
Rare species (count)	1	-	1	-	1	1	-	-
Prairie-Chicken Lek Probability (miles per category)¹								
Medium probability (20%-50%)	25.0	15.6	27.2	17.9	26.3	28.5	16.9	19.2
High probability (>50%)	19.9	11.7	22.2	14.1	18.5	20.8	10.3	12.7
LPC Crucial Habitat Assessment Tool 2.0 (miles)²								
LPC connectivity zone	1.4	5.1	1.4	5.1	1.4	1.4	5.1	5.1
LPC focal area	2.9	-	2.9	-	2.9	2.9	-	-
LPC Crucial Habitat Assessment Tool 1.0 (miles)³								
Irreplaceable habitat	-	-	-	-	-	-	-	-
Limiting habitat	10.8	4.5	9.1	2.8	10.8	9.1	4.5	2.8
Significant habitat	3	2.1	3	2.1	3	3	2.1	2.1

¹ Data from KBS, 2008 (Reflects lek probability for both greater and lesser prairie-chickens)

² Data from WAFWA, 2013: Chat 2.0

³ Data from KARS, 2011

All of the Alternative Routes occur within the 200-mile wide whooping crane migration corridor. Federally-designated critical habitat for the whooping crane occurs greater than 7 miles from any of the Alternative Routes. Whooping cranes have been sighted throughout the Western Segment of the Project and all Alternative Routes have two documented whooping crane sightings within 1 mile. Potential impacts to whooping cranes can be reduced by paralleling existing transmission lines and thereby avoiding construction of new transmission lines in otherwise non-impacted areas. Alternative Routes B and D parallel the highest percentage of existing transmission lines (75 percent and 63 percent, respectively) and remain closer to the dense wind development south of Spearville. Alternative Routes E and F follow the least amount of parallel transmission lines and could result in greater potential impacts on the whooping crane. In addition to paralleling existing vertical infrastructure, additional mitigation measures such as, using markers along the shield wire near wetlands, playas, foraging areas, or known stopover sites could reduce the risk for collision with the transmission line. As discussed in *Section 5.1.2, Wildlife and Habitat*, Grain Belt Express will develop an Avian Protection Plan which will include specific measures to avoid and minimize impacts to the whooping crane.

All of the Alternative Routes cross habitat identified as connectivity zones by the Crucial Habitat Assessment Tool 2.0. However, Alternative Routes B, D, G and H do not cross the focal areas as designated by the same tool. Likewise, these Alternative Routes also cross the least amount of significant habitat, as designated by the Crucial Habitat Assessment Tool 1.0.

Alternative Routes A, C, E, and F are within 1 mile of a reported occurrence of a state-listed SINC species, the cave myotis (*Myotis velifer*). None of the state-listed plant and animal species are reported to occur within 1 mile of Alternative Routes B, D, G, or H. One state-listed threatened species, the eastern spotted skunk, has designated critical habitat within Barton County, Kansas. This state designated critical habitat occurs along a riparian corridor of the Arkansas River. Thirteen SINC species have a known current range within counties in the West Segment (**Table 5-8**).

Central Segment

No known occurrences of federally listed fish species are reported within 1 mile of the Alternative Routes and no designated critical habitat is within proximity to the Alternative Routes. Therefore, no impacts are expected to federally listed fish species from any of the Alternative Routes.

Numerous sightings of the whooping crane have occurred at Cheyenne Bottoms, Wilson Lake, and Waconda Lake with isolated sightings scattered throughout the Central Segment. Both Alternative Routes I and K have had one documented sighting within 1 mile. Alternative Route J bisects the area between Wilson and Waconda Lakes, but is not adjacent to existing transmission lines. Therefore, Alternative Route J could result in a greater impact on the whooping crane as it introduces a new vertical obstacle between the two waterbodies with known whooping crane sightings. Alternative Route K, similar to Alternative Route J, does not parallel existing transmission lines and would present a new vertical obstacle for the whooping crane. Despite having one documented sighting of whooping crane, Alternative Route I would likely have less potential for impact to the whooping crane because it parallels an existing transmission line for 80 percent of its length and is a greater distance from known stopover habitats and major reservoirs.

All of the Alternative Routes occur in areas with a moderate to high probability of prairie-chicken lek habitat (**Table 5-10** below), however the lek probability model does not distinguish between lesser and greater prairie-chicken (*Tympanuchus cupido*; GPC) lek habitat. The central segment lies within the eastern edge of the current occupied lesser prairie-chicken range and the western edge of the current greater prairie-chicken range, therefore the lek habitat identified in the central segment could potentially be used by either species depending on range variability of these species. Alternative Route K crosses through the most high probability lek habitat (1.9 miles) and is not adjacent to an existing transmission line, thus creating a new vertical feature on the landscape. In comparison, Alternative Routes I and J cross less high

probability lek habitat (1.0 mile) and are adjacent to an existing transmission line, minimizing potential impacts to prairie-chickens.

Table 5-10. Impacts to Sensitive Species within the Central Segment Alternative Routes			
Category	Alternative Routes		
	I	J	K
Sensitive Species and Habitat (miles)			
Rare species (count)	1	1	2
Natural communities (miles)	0.2	-	-
Prairie-Chicken Lek Probability (miles per category)¹			
Medium probability (20%-50%)	15.8	18	17.2
High probability (>50%)	1	1	1.9

¹ Data from KDWPT (Reflects lek probability for both greater and lesser prairie-chickens)

Alternative Route I occurs within 1 mile of a reported occurrence of a state-listed threatened species, the plains minnow, in Cloud County, Kansas. It is not likely that the Project would impact the plains minnow species since all streams would be spanned. Alternative Route K occurs within 1 mile of reported occurrence of a state-listed SINC plant species, Fremont’s Virgin’s-bower. No other state-listed plant or wildlife species are reported to occur within 1 mile of the Alternative Routes. Four state-listed endangered species, the Arkansas River shiner, Arkansas River speckled chub, least tern, and the whooping crane (impacts described above), and one state-listed threatened species, the eastern spotted skunk, have potential designated critical habitat within the Central Segment in Barton County, Kansas, and 19 SINC species have known current range within the counties that the Central Segment crosses (**Table 5-8**).

East Segment

All Alternative Routes will cross the Missouri River, which is designated critical habitat for the pallid sturgeon, sicklefin chub, chestnut lamprey, flathead chub, shoal chub, silverband shiner, western silvery minnow, and sturgeon chub; however no impacts are anticipated to fish species since all Alternative Routes would span the Missouri River. Spanning all stream and river crossings reduces the need for heavy machinery or hazardous materials near riverbanks where accidental spills or erosion could occur. Other measures aimed at protecting aquatic habitats and water quality discussed in *Section 5.1.1, Water Resources*, would further minimize impacts.

No known occurrences of federally listed bird species are reported within 1 mile of the Alternative Routes, and no designated critical habitat is within proximity to the Alternative Routes. All of the Alternative Routes occur in areas with a low probability of prairie-chicken lek habitat (for both greater and lesser prairie-chicken), and no lesser prairie-chicken focal

areas or connectivity zones occur near the Alternative Routes. Therefore, no impacts are expected to federally listed bird species from the East Alternative Routes.

State-listed SINC species that are identified as occurring within the East Alternative Routes are summarized above in **Table 5-8**. Alternative Routes L and N have the greatest number of reported occurrences of state-listed SINC species within 1 mile (13 and 14, respectively). Alternative Routes M and O each have the lowest number of reported occurrences of state listed SINC species within 1 mile (2 each) and would likely have the least impact on these species.

5.1.4 Geology and Soils

The Study Area is located within four physiographic regions. The West Segment of the Project is fairly evenly split between the High Plains, Arkansas River Lowlands, and Smoky Hills Physiographic regions; the Central Segment is located entirely within the Smoky Hills; and the East Segment is located almost entirely within the Glaciated Region physiographic region, with a small portion in the west located in the Smoky Hills (Kansas Geological Survey, 2005). The Smoky Hills and the Glaciated Region represent the most sensitive geological areas because they are underlain by karst topography. Karst topography is characterized as being formed from limestone that readily dissolves in the presence of water; caves and sinkholes are formed by this process and can sometimes be a conduit to groundwater, thus these areas are environmentally sensitive. **Figure 5-3** below shows areas of karst topography in the Study Area. Caves and underground streams and rivers in karst areas provide habitat for animals specially adapted to this environment. Common animals include sensitive bat species that hibernate and breed in these geological formations.

The Study Area is divided into three major land resource areas (MLRAs) with geographically similar land use, water, soil, topography, and physiography. The three MLRAs are the Rolling Plains and Breaks, Central Kansas Sandstone Hills, and Nebraska and Kansas Loess – Drift Hills (United States Department of Agriculture [USDA], 2006a). The Rolling Plains and Breaks MLRA, which is crossed by the West and Central Segments, is dominated by soil associations characterized as having deep, productive soils comprising primarily loess, windborn silt, and residual sand and alluvial material (USDA, 2013). Land use throughout the Rolling Plains and Breaks MLRA is dominated by cropland (approximately 55 percent) and grassland (approximately 35 percent); as such, the major soil resource concerns within the Rolling Plains and Breaks MLRA are erosion via wind and water, and loss of organic matter through poor management practices (USDA, 2006a).

The Central Kansas Sandstone Hills MLRA, which is crossed by small portions of the Central and East Segments, is dominated by soil associations similarly characterized as those in the Rolling Plains and Breaks MLRA. However, the soils also comprise water-moved material, underlain by limestone, and are best suited for rangeland, which dominates the land use (USDA, 2006b). The major soil resource concerns include erosion via water and loss of organic matter through poor management practices and surface compaction (USDA, 2006c).

The Nebraska and Kansas Loess-Drift Hills MLRA, which is crossed by the East Segment, is dominated by soil associations characterized as having deep, productive soils comprised primarily of glacial till, alluvial material, and loess (USDA, 2013). Land use in the Nebraska and Kansas Loess-Drift Hills MLRA is dominated by cropland (approximately 60 percent) and, to a lesser extent, grassland (approximately 25 percent), and the major soil resource concerns are erosion via water and loss of organic matter through poor management practices (USDA, 2006d).

Prime farmland and farmland of statewide importance are special categories of highly productive cropland that is recognized and described by the NRCS. Prime farmland is land that has the best combination of physical and chemical characteristics for producing crops. Soils that do not meet the prime farmland category but are still recognized for their productivity by states may qualify as farmland of statewide importance.

Transmission construction activities such as vegetation clearing, access road construction, grading, and foundation construction can impact soils by disturbing the native structure of the soil and thereby creating areas of higher erosion potential, compaction, and lower soil permeability/fertility. The severity of soil impacts depends on several variables including vegetation cover, the slope of the land, soil particle size, thickness of the soil profile, depth to a restrictive layer, and soil moisture content.

Unvegetated soil surfaces are more susceptible to erosion and loss of soil productivity. Removing stumps during tree clearing increases the potential for soil erosion, and leaving topsoil exposed increases the potential of loss by wind and water. Best management practices to minimize erosion impacts may include leaving stumps in the ground, covering exposed soil, and reseeding after construction.

Prime farmland and/or farmland of statewide importance would be permanently removed from productivity when present at a given structure location. However, these impacts are anticipated to be minimal, since only 0.009 to 0.018 acres of farmland is removed from productive use at any structure site, with only 4-7 structures typically needed per mile. Extrapolating from these estimates, the permanent impacts to soils associated with crossing a full section (1 square mile) of farm land would only amount to just over a tenth of an acre of the entire 640 acre land area. Although additional temporary impacts would occur during

construction from soil disturbing activity, after construction, normal farming and grazing could continue up to the base of each tower.

Prior to construction activities, geotechnical investigations will occur to determine the presence of karst topography or caves along the Proposed Route. In the event that caves or karst topography is discovered during these investigations, special engineering considerations will be incorporated into the design and construction of the transmission line. In addition, BMPs will be implemented to minimize any erosion in areas with karst topography.

Alternative Route Comparison

As a result of the ultimate implementation of mitigation measures similar to those discussed above and the limited footprint of permanent impacts on soil productivity created by the structures themselves, any impacts to soils are likely minor for all Alternative Routes. Because of this, impacts on soil resources do not serve a usable comparison between Alternative Routes.

Karst topography and steep slopes are only found in the Central and East Segments. Alternative Routes I and O cross more karst topography than the other Alternative Routes (**Table 5-11**). Alternative Routes L and N cross more miles of steep slopes. As discussed above, areas with karst would be identified prior to construction and avoided when possible. Slopes would be taken into consideration during engineering and best management practices would be implemented during construction to prevent erosion.

Alternative Routes	Central Segment			East Segment			
Resource	I	J	K	L	M	N	O
Steep slopes (miles)	0.9	1.0	0.1	2.9	0.9	3.2	1.1
Karst topography (miles)	11.6	0	0	0	5.6	5.3	11.0

5.2 Human Uses

5.2.1 Agricultural Use (Farm and Pasture/Grassland)

The Alternative Routes cross 19 counties in the state of Kansas including, Ford, Hodgeman, Edwards, Pawnee, Barton, Rush, Russell, Ellsworth, Lincoln, Osborne, Mitchell, Ottawa, Cloud, Clay, Washington, Marshall, Nemaha, Brown, and Doniphan. The predominant type of land use throughout the entire Study Area is agricultural, and includes farmlands, range or grasslands, or pastures. Approximately 46 million acres of land in Kansas are utilized for agricultural practices, of which approximately 60 percent is cropland and 34 percent is pasture. The main crop agricultural commodities include wheat, corn, forage, sorghum for grain, and soybeans. The

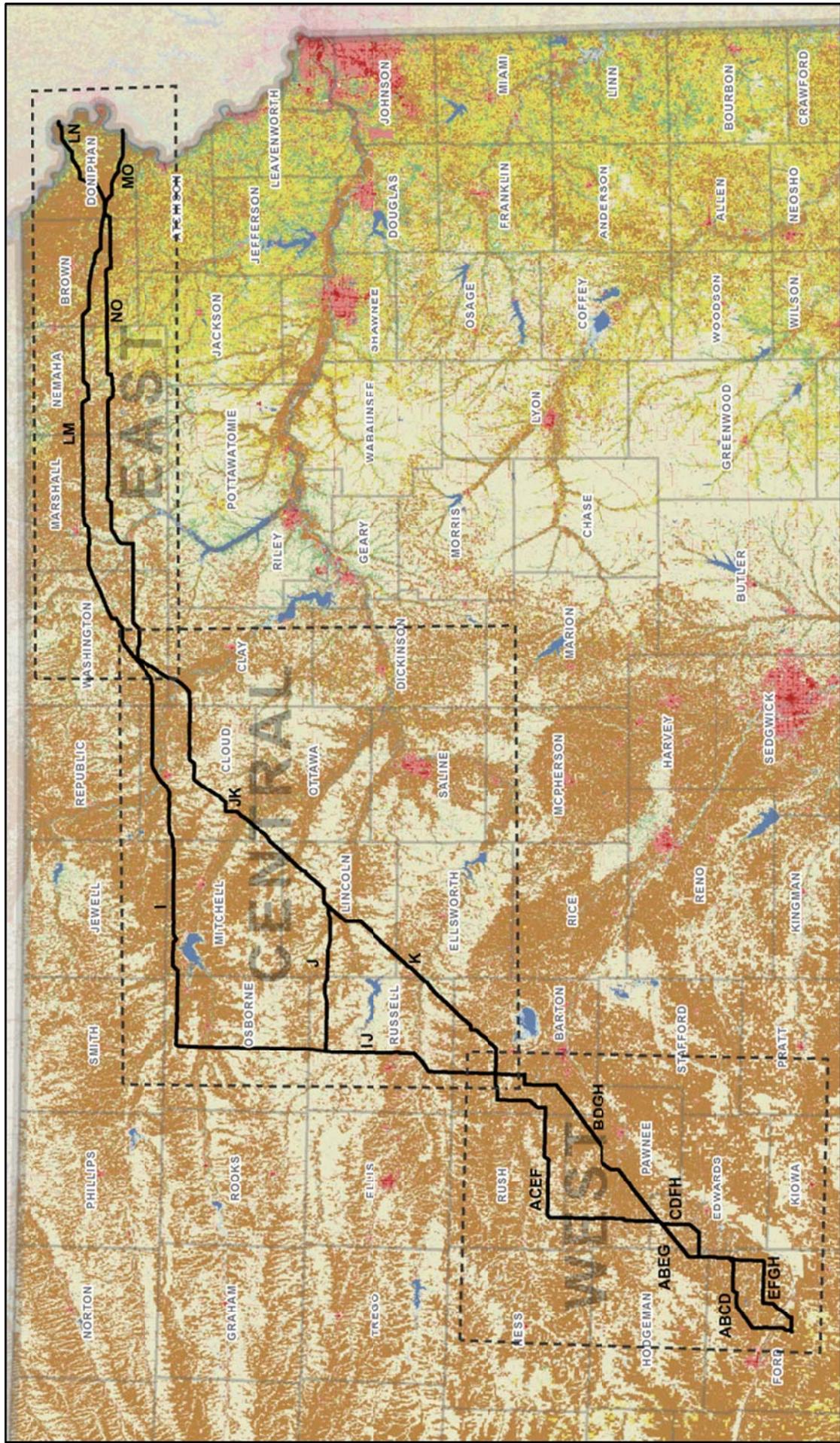
main livestock commodities include cattle and hogs/pigs (USDA NASS, 2011). Agricultural, crop and livestock products market value in 2011 was estimated at approximately \$28 billion dollars (USDA NASS, 2011). Land use transitions from primarily agricultural uses in the west to more pasture and grasslands in the central segment, and finally a mixture of rural residential and agricultural uses in the east. Most of Study Area utilizes dryland farming techniques with select areas near water resources also utilizing center pivot irrigation systems. The main crops in the West and Central Segments include sorghum, soybeans, and winter wheat. Within the East Segment, corn becomes more prevalent (USDA, 2012). Aerial spraying of crops with herbicides, fungicides, or pesticides is also common, particularly in the east. Land use, based on NLCD data, is shown in **Figure 5-4** below and displays the land use trends throughout the state.

General Impacts and Mitigation

Impacts to agricultural land (crops and pasture/grassland) would be primarily confined to the construction phase of the Project. In cropland, access into fields may be required during the growing season, which could damage crops or take an area out of production while the line is being constructed. Landowners would be compensated for crop damage as it relates to the construction of the transmission line. In grassland or pastureland, access across land may be required and could temporarily remove some area from grazing activities, but there would be no loss of cattle or livestock during construction. In addition, soil compaction and erosion may be possible during construction. Best management practices would be used to mitigate impacts resulting from soil erosion or compaction. Further, compensation would be part of the easement compensation terms and would account for any damage to crops or pasture.

Center pivot irrigation systems were avoided to the extent possible when determining the Alternative Routes. Impacts on center pivots were largely avoided. The span of the transmission line structures was taken into consideration to minimize the impact to the irrigation system (i.e. where possible, the outer edge of the pivot was spanned to not impede the motion of the irrigation arm). In the limited number of instances where impacts to center pivot irrigation takes place, mitigation measures would be implemented to address the impacts or landowner compensation would be provided where mitigation is not practical or possible.

Specific to cropland areas, once the transmission line is constructed, farmers would have to farm around the transmission structures. These impacts are not expected in grassland or pasture areas since large cultivation equipment is not typically used and livestock could move freely under the transmission line. As mentioned previously, the footprint of each structure location would be permanently taken out of agricultural production and could no longer be used for grazing.



<p>Sources: ESRI, U.S. Geological Survey</p> <p>Coordinate System: North America Equidistant Conic Projection: Equidistant Conic Datum: North American 1983</p> <p>0 10 20 30 Miles</p> <p>N</p>	<p>Figure 5-4 Land Use in the Study Area</p> <p>GRAIN BELT EXPRESS CLEAN LINE</p>	<ul style="list-style-type: none"> Alternative Routes Open Water Developed, Low Intensity Developed, High Intensity Forest Shrub/Scrub Grassland/Herbaceous Pasture/Hay Cultivated Crops Wetlands
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Alternative Route Comparison

West Segment

Land use type was digitized from aerial photography within the potential 200-foot ROW for each Alternative Route and is shown in **Table 5-12** below.

Land Use	Alternative Routes							
	A	B	C	D	E	F	G	H
Length (miles)	106.0	94.9	108.5	97.4	107.2	109.7	96.1	98.6
Agriculture/cropland (miles)	72.7	75.9	71.7	74.9	74.3	73.3	77.5	76.5
Pasture/grasslands (miles)	32.4	18.2	35.4	21.2	31.2	34.2	17.0	20.0
Potentially impacted pivot irrigation systems (>1,500-foot-crossing)	1	3	1	3	1	1	3	3

All Alternative Routes cross similar distances of cropland; however, Alternative Routes A, C, E and F cross more pasture/grassland areas when compared with B, D, G and H. Generally, there are fewer impacts associated with livestock (grassland/pasture) operations, as compared with cropland agriculture. Livestock farming does not require large machinery for plantings, pesticide control, or harvesting; therefore, farmers would not have to maneuver around transmission structures with large equipment. Routing transmission lines along parcel boundaries or fence lines is considered the best routing option in cropland areas. Routing on parcel boundaries places the disturbance between ownership, often minimizing the obstruction on farming operations for each landowner. On the other hand, routing a transmission line diagonally through cultivated fields often involves support structures located in the middle of fields rather than on the edge. This scenario results in a greater impact on farming operations, as it creates a new obstacle to farm around.

All Alternative Routes parallel existing transmission lines at some point along the length of the route (**Table 5-13** below).

Table 5-13. ROW Parallel in West Segment								
	A	B	C	D	E	F	G	H
Total length (miles)	106	94.9	108.5	97.4	107.2	109.7	96.1	98.6
Parallel (miles)								
115/138 kV	-	6.0	-	6.0	-	-	6.0	6.0
230 kV	-	32.0	-	32.0	-	-	32.0	32.0
345 kV	46.6	26.0	37.9	17.3	30.1	21.4	9.5	0.8
Total Transmission Parallel	46.6	64.0	37.9	55.3	30.1	21.4	47.5	38.8
Pipeline (miles)	1.5	1.5	1.5	1.5	-	-	-	-
Total ROW Parallel	48.1	65.5	39.4	56.8	30.1	21.4	47.5	38.8
Triple parallel of high voltage transmission lines	14.8	14.8	6.1	6.1	9.4	0.7	9.4	0.7
Percent Parallel								
115/138 kV	0%	6%	0%	6%	0%	0%	6%	6%
230 kV	0%	34%	0%	33%	0%	0%	33%	32%
345 kV	44%	27%	35%	18%	28%	20%	10%	1%
Pipeline (miles)	1%	2%	1%	2%	0%	0%	0%	0%
Total Parallel	45%	69%	36%	58%	28%	20%	49%	39%

All of the Alternative Routes would be constructed as a third transmission line along two existing parallel transmission lines for a distance. Alternative Routes G and H have significantly less triple transmission line parallel than all other Alternative Routes. Although paralleling existing lines is typically considered an opportunity for siting transmission, comments from landowners in the area suggested that this might not be appropriate in this case. The Routing Team considered these comments and recognized that in this instance, paralleling two existing transmission lines that crossed diagonally across an area of heavy agricultural use had relatively limited benefits and comparatively greater impacts on farming operations. This judgment was made based on several considerations and observations in the area. First, when paralleling one existing transmission line, engineers can often work with landowners to shift structure locations along the ROW to span a smaller field or drainage feature or place the structures in such a way that they either are in alignment with those of the existing line or have enough space between them to allow for farm equipment maneuvering. There are inherent limitations to these shifts that need to be considered in each specific case and to eventually find a configuration of structures that reasonably suits both the farmer and is feasible for construction. However, when a third line is planned, the options available to find a suitable geometry of structures between the three lines are reduced, and impacts to the farmer are

unavoidably more significant. These impacts are perhaps greatest when the lines already cross farmlands in a diagonal direction and the two existing lines are of significantly different construction (wood poles versus steel monopoles) with different optimal span lengths.

Alternative Routes A, B, C, and D would parallel two existing transmission lines (Spearville-Post Rock 345 kV and Arthur Mullergren-Tap 230 kV Transmission Line) for 5.5 miles south of Spearville. Alternative Routes A, B, E and G would parallel two existing transmission lines (Spearville- Post Rock 345 kV and Arthur Mullergren-Tap 230 kV Transmission Line) for 9 miles northeast of Spearville. All of the existing transmission lines cross diagonally through agricultural crops, do not parallel parcel boundaries, and are in close proximity to wind turbines. From an agricultural perspective, as described above, the Routing Team determined the benefits of paralleling existing transmission lines with these routes would not provide the benefits traditionally found when paralleling existing transmission. When all these factors are taken into account, the Routing Team considered that Alternative Routes F or H, which were aligned along parcel boundaries and field edges through the Spearville area would result in less impacts to cultivated agriculture. Both Alternative Routes are relatively short in length, do not parallel two existing transmission lines for a significant distance, and follow existing parcel boundaries where possible.

Central Segment

Alternative Route J and K cross less farmland and more pasture/grassland than Alternative Route I (**Table 5-14** below). While Alternative Route I crosses more agricultural land, it also parallels existing transmission lines for 79 percent of its length; compared with 34 percent and 10 percent transmission line parallel for Alternative Routes J and K (**Table 5-15**). In addition, Alternative Routes J and K could potentially impact one center pivot irrigation system while Alternative Route I would not impact any.

Table 5-14. Agricultural Land Use in Central Segment			
Land Use	I	J	K
Length (miles)	153.0	141.4	126.1
Agricultural (miles)	98.0	59.1	63.2
Pasture/grasslands (miles)	49.4	76.9	58.0
Potentially impacted pivot irrigation systems (>1,500-foot crossing)	0	1	1

Table 5-15. ROW Parallel in Central Segment			
	I	J	K
Length (miles)	153.0	141.4	126.1
Parallel			
115/138 kV	121.1	35.9	-
230 kV	-	12.9	12.9
345 kV	-	-	-
Total Transmission Parallel	121.1	48.8	12.9
Pipeline (miles)	-	39.0	70.5
Total ROW Parallel	121.1	87.8	83.4
Percent Parallel			
115/138 kV	79%	25%	0%
230 kV	0%	9%	10%
345 kV	0%	0%	0%
Pipeline (miles)	0%	28%	56%
Total Parallel	79%	62%	66%

Both Alternative Routes J and K parallel significantly fewer transmission lines and introduce new vertical features and obstacles to otherwise non-impacted croplands (pipelines have little above ground infrastructure that impacts farming operations). Both Alternative Routes J and K cross diagonally through croplands (parallel to an existing gas pipeline) instead of paralleling parcel boundaries, a practice more favorable by farmers and local landowners. Siting a transmission line diagonally through an area increases the likelihood that structures would be located in the middle of farming fields. Placement of the new transmission structures, either at the edge of fields (parcel boundaries) or aligned with existing structures would minimize impact to farming operations. Alternative Route I is the only Alternative Route that would not impact any center pivot irrigation systems in the Central Segment.

East Segment

The amount of agricultural land crossed by each Alternative Route is shown below in **Table 5-16**. None of the eight Alternative Routes within the East Segment cross center pivot irrigation systems and all Alternatives cross a similar amount of acreage of cropland and pastureland.

Table 5-16. Agricultural Land Use in East Segment				
Land Use	L	M	N	O
Length (miles)	122.6	117.5	123.3	118.2
Agricultural (miles)	80.9	78.6	77.4	75.1
Pasture/grasslands (miles)	22.7	22.1	21.3	20.8

The major differentiator regarding land use in the East Segment is existing ROW parallel (**Table 5-17** below). Alternative Routes L and M parallel over 45 miles of existing transmission lines, compared with less than 1 mile of existing transmission line parallel for Alternative Routes N and O. As stated previously, paralleling existing transmission lines is commonly considered in planning new transmission lines to consolidate linear infrastructure across a landscape and to avoid fragmenting land uses in otherwise unimpacted areas. For this reason, Alternative Routes L and M are the preferred Alternative Routes in the East Segment.

Table 5-17. ROW Parallel				
	L	M	N	O
Length (miles)	122.5	117.4	123.3	118.2
Parallel				
115/138 kV (miles)	45.9	45.9	0.7	0.7
230 kV (miles)	-	-	-	-
345 kV (miles)	-	-	-	-
Total Transmission Parallel	45.9	45.9	0.7	0.7
Pipeline (miles)	11.4	13.3	-	1.9
Total ROW Parallel	57.3	59.2	0.7	2.6
Percent				
115/138 kV (miles)	37%	39%	1%	1%
230 kV (miles)	0%	0%	0%	0%
345 kV (miles)	0%	0%	0%	0%
Pipeline (miles)	9%	11%	0%	2%
Total Parallel	47%	50%	1%	2%

5.2.2 Populated Areas and Community Facilities

Developed lands are centered near towns and sparsely located throughout the Study Area. The Routing Team worked to develop routes that minimized impacts to residential, commercial, and developed property to the extent possible. As a result, no residences are located within the ROW for any Alternative Routes. However, it should be noted that the complete avoidance of all residential and commercial areas was not possible.

The population trends for the 19 counties crossed by the Alternative Routes are shown in **Table 5-18**. Overall, Kansas increased in population by 6.5 percent between 2000 and 2011. However, all counties in the Study Area, with the exception of Ford County, have seen a decline in population during the same period. Ford County has seen an increase in population of approximately 6 percent (U.S. Census Bureau, 2013).

Table 5-18. Population Trends			
	2000	2011	Change (%)
State of Kansas	2,692,810	2,870,386	6.59
Counties Crossed by Alternative Routes			
Barton	28,129	27,841	-1.02
Brown	10,711	10,010	-6.54
Clay	8,812	8,573	-2.71
Cloud	10,226	9,365	-8.42
Doniphan	8,235	7,945	-3.52
Edwards	3,425	3,020	-11.82
Ellsworth	6,525	6,483	-0.64
Ford	32,574	34,568	6.12
Hodgeman.	2,084	1,966	-5.66
Lincoln	3,574	3,215	-10.04
Marshall	10,934	10,005	-8.50
Mitchell	6,911	6,295	-8.91
Nemaha	10,684	10,113	-5.34
Osborne	4,435	3,847	-13.26
Ottawa	6,189	6,119	-1.13
Pawnee	7,218	7,011	-2.87
Rush	3,534	3,238	-8.38
Russell	7,353	6,956	-5.40
Washington	6,472	5,845	-9.69

General Mitigation Measures

As outlined in the routing criteria, the Routing Team tried to avoid impacts on residences, commercial operations, and other developed land features. Major urban and developed areas were avoided to the extent feasible during the routing process and no residences are located within the ROW; therefore, any impacts on developed lands would be minor.

Alternative Route Comparison

West Segment

Spearville, Great Bend, and Larned are the largest towns in proximity to the West Segment. All of the Alternative Routes are south of Spearville, with Alternative Routes A, B, C, and D closer (approximately 2 miles) than Alternative Routes E, F, G, and H (7.5 miles south of Spearville). The western edge of Great Bend is located approximately 5 miles to the east from Alternative Routes B, D, G, and H and 10 miles from Alternative Routes A, C, E and F. Smaller communities, Albert, Olmitz, and Rozel are approximately 1 mile, 2 miles, and 2.5 miles, respectively, from Alternative Routes A, C, E, and F. The town of Offerle is approximately 2 miles east and 3.5 miles south of Alternative Routes C, D, F, and H. Alternative Routes B, D, G and H diverted from paralleling the existing transmission line to create a larger distance from Fort Larned and the town of Larned to avoid residences located immediately adjacent to the existing transmission line. No communities or town limits are crossed by any of the Alternative Routes and all are expected to have no impacts on those communities, with the exception of potential visual impacts from major roadways approaching the town limits.

Table 5-19 below compares the number of residences, churches, cemeteries, schools, and parcels crossed for each Alternative Route. The distance for residences, churches, cemeteries, and schools is calculated by distance from centerline, not the edge of the ROW. Parcel data was grouped by size and were obtained from each county.

Table 5-19. Populated Areas and Communities Comparison for Alternative Routes in West Segment								
	Alternative Routes							
Metric	A	B	C	D	E	F	G	H
Length (miles)	106	94.9	108.5	97.4	107.2	109.7	96.1	98.6
Residences within 250 feet ¹	0	0	0	0	0	0	0	0
Residences within 500 feet ¹	1	1	2	2	2	3	2	3
Churches within 250 feet ¹	-	-	-	-	-	-	-	-
Cemeteries within 250 feet ¹	-	-	-	-	-	-	-	-
Cemeteries within 500 feet ¹	-	-	-	-	-	-	-	-
Schools within 500 feet ¹	-	-	-	-	-	-	-	-
Parcels <10 acres	2	-	2	-	2	2	-	-
Parcels b/w 10-30 acres	4	6	4	6	6	6	8	8
Parcels b/w 30-80 acres	59	51	62	54	69	72	61	64
Parcels > 80 acres	250	231	255	236	265	270	246	251
Total parcels crossed	315	288	323	296	342	350	315	323

¹ Distance calculated from the centerline of the Alternative Routes.

No Alternative Routes have known churches, cemeteries or schools within 250 or 500-feet of the centerline. All Alternative Routes are comparable in regards to residences within 500-feet of the centerline, and no one Alternative Route stands out as significantly better or worse. Alternative Routes B and D cross the least amount of total parcels, and Alternative Routes E and F cross the most parcels, likely increasing the amount of impacted landowners.

As mentioned above, no communities or town limits are crossed by any of the Alternative Routes. However, the area in and around Spearville is one of the most heavily developed and congested areas in the West Segment (described more in Section 5.3.2). All Alternative Routes are fairly comparable based on most parameters shown in **Table 5-19**; however, Alternative Routes F and H both avoid the heavy congestion of developed land in the Spearville area, making these routes more preferable.

Central Segment

The most populated areas within the Central Segment include, Concordia, Russell, Osborne, and Lincoln. Alternative Route I is within 2 miles of Clyde, Concordia, Cawker City, and Downs. Alternative Route I is located approximately 2.5 miles and 4 miles, from the towns of Russell and Osborne, respectively. Alternative Routes J and K are located within 1 mile of Barnard, Glasco, and Clifton. Alternative Route K is also within 1 mile of Wilson, within 3.5 miles of Lincoln, and 3 miles from Hoisington. Overall, Alternative Route K is closer to more towns, more often than other Alternative Routes.

Despite its additional length, Alternative Route I has the least amount of residences within 250 feet and 500 feet (see **Table 5-20** below). In addition, Alternative Route I parallels an existing transmission line for 79 percent of its total length, and any homes adjacent to this route already have an existing transmission line near them. Overall Alternative Route I crosses more parcels than the other two Alternative Routes due to the longer length; however, Alternative Route I crosses fewer small parcels (less than 10 acres) and fewer parcels between 10-30 acres. Alternative Route K is the only Alternative Route which is within 500 feet of a cemetery; however impacts to cemeteries are not expected by any Alternative Routes since no cemeteries are physically crossed. Overall, Alternative Route I is the best Alternative Route for populated areas and communities because it avoids several residential communities, crosses fewer small parcels, parallels the most existing transmission lines, and has the least amount of residences within 250 and 500 feet.

Table 5-20. Developed Land Use For Central Segment			
	Alternative Routes		
Metric	I	J	K
Length (miles)	153.0	141.4	126.1
Residences within 250 feet ¹	1	2	2
Residences within 500 feet ¹	9	15	14
Churches within 250 feet ¹	-	-	-
Cemeteries within 250 feet ¹	-	-	-
Cemeteries within 500 feet ¹	-	-	1
Schools within 500 feet ¹	-	-	-
Parcels <10 acres	7	11	10
Parcels between 10 and 30 acres	5	9	9
Parcels between 30 and 80 acres	113	59	84
Parcels > 80 acres	306	324	292
Total parcels crossed	431	402	395

¹ Distance calculated from the centerline of the Alternative Routes.

East Segment

Numerous towns are located near the East Segment. **Table 5-21** below lists the towns, population and the distance to the closest Alternative Route. Alternative Routes L and M are within 3 miles of 14 towns and Alternative Routes N and O are within 3 miles of 12 towns. Generally, Alternative Routes L and M are closer to larger more densely populated towns (Marysville, Seneca, and Hiawatha) with Alternative Route L closer to the highly populated Troy (based on the 2010 Census data).

Table 5-21. Towns in Proximity to Alternative Routes in the East Segment			
Alternative Routes	Town	Population (2010 Census)	Approximate Distance (miles)
L, M, N, O	Palmer	111	1
	Linn	410	1.5
L, M	Greenleaf	331	1
	Home	151	1
	Baileyville	181	1.5
	Marysville	3,294	2
	Seneca	1,991	2
	Fairview	260	2
	Beattie	200	2.5
	Axtell	406	3
	Oneida	75	3
	Hiawatha	3,172	4
N, O	Willis	38	0.5
	Waterville	680	1
	Blue Rapids	1,019	1.5
	Centralia	512	1.5
	Vermillion	112	2
	Barnes	159	2.5
	Frankfort	726	3
L, N	Powhattan	77	3
	Severance	94	1
M, O	Troy	1,010	3
	Bendena	117	1
	Denton	148	1

None of the Alternative Routes have residences within 250 feet of centerline and all Alternative Routes have 5 residences within 500 feet of the centerline (see **Table 5-22** below). Alternative Routes N and O cross the greatest amount of total parcels and are not adjacent to existing transmission lines, potentially impacting more landowners. Alternative Route M crosses the least amount of small parcels (less than 30 acres in size) and crosses the least amount of parcels.

Table 5-22. Developed Land Use for Alternative Routes in the East Segment

Metric	Alternative Routes			
	L	M	N	O
Length (miles)	122.5	117.4	123.3	118.2
Residences within 250 feet ¹	0	0	0	0
Residences within 500 feet ¹	5	5	5	5
Churches within 250 feet ¹	-	-	-	-
Cemeteries within 250 feet ¹	1	1	-	-
Cemeteries within 500 feet ¹	1	1	1	1
Schools within 500 feet ¹	1 ²	1 ²	-	-
Parcels <10 acres	10	8	11	9
Parcels between 10 and 30 acres	18	7	18	7
Parcels between 30 and 80 acres	161	145	170	154
Parcels > 80 acres	257	259	299	300
Total parcels crossed	446	419	498	470

¹ The distance is measured from the centerline of Alternative Routes.

² The school identified is an Amish school associated with a privately owned residence.

An Amish school was identified approximately 16 miles east of Marysville through public comments. However, following discussions with the property owner, it was later identified that this was only a temporary school location, as a permanent facility is currently under construction north of Highway 36.

Alternative Route M is the best Alternative Route from a populated areas and community perspective because it minimizes impact to the number of parcels crossed, minimizes impact to small parcels, and parallels a greatest length of existing transmission line.

5.2.3 Recreational and Aesthetic Resources

Recreational and aesthetic resources are closely related due to scenic quality typically associated with a recreational area. Kansas hosts several natural and cultural-based recreational opportunities, including both dispersed and developed recreational areas. Examples of dispersed recreational activities include scenic driving, bicycling, backpacking, hunting, fishing, and off-road vehicle use. Developed recreation provides permanent facilities designed to accommodate activities such as camping, boat launching, athletic fields, or day-use activities (i.e., picnicking, interpretive exhibits, and hiking/biking trails). Predominant recreational activities include hunting, wildlife observation, tourist attractions, scenic driving,

National Historic Trails (NHT), boating activities at the reservoirs and rivers, and camping at state parks.

Aesthetics are defined as a mix of landscape visual character, the context in which the landscape is being viewed (view/user groups), and the scenic integrity of the landscape. The potential visibility and visual impact on the landscape and recreational areas from the three segments (West, Central, and East) were reviewed through landscape character assessment, field evaluation, and environmental factor tabulations.

This section presents information on the existing visual character and recreational opportunities occurring near the Alternative Routes and the associated visual impacts.

Description of Visual Character

Visual character encompasses the patterns of landform (topography), vegetation, land use, and aquatic resources (i.e., lakes, streams, and wetlands). The visual character is influenced both by natural systems, human interactions, and use of land. In natural settings, the visual character attributes are natural elements such as forested hillsides, open grasslands, or scenic rivers and lakes, whereas rural or pastoral/agricultural settings may include manmade elements such as fences, walls, barns and outbuildings, and occasional residences. In a more developed setting, the visual character may include commercial or industrial buildings, manicured lawns, pavement, and other infrastructure.

The Study Area is generally flat with some low rolling topography, particularly in the eastern portion. The flat landscape allows for long uninterrupted vistas across the landscape. Generally, the West Segment is flatter with less deciduous vegetation, compared with slightly more varied topography and forest cover (particularly near the Missouri River crossing) in the East Segment. Within the Study Area, four distinctive visual landscapes were observed: agricultural, rangeland and grassland, low to moderate density residential development, and industrial development. The vast majority of land is agricultural land with relatively sparse residential development. Grassland and pastureland is dispersed throughout, with a slightly larger concentration in the Central Segment. Industrial development can be found throughout and is largely associated with wind farms and gas development.

Wind development is abundant in the West Segment and introduces a large visible vertical manmade element to the landscape. Other industrial landscapes include oil and gas development, which can be found throughout all the Project Segments (see **Figure 5-11** below). Oil and gas developments are mostly small, privately owned, operations and do not tend to dominate the landscape. Lastly, low to moderate urban development can be found throughout the Kansas Study Area with several small towns along major roadways, becoming more populated and more frequent moving east. Near the Missouri River, the topography becomes more variable, and long vistas are not always possible. Steep bluffs can be found close to the Missouri River, adding a landscape scenically unique to the East Segment. The photos below show the typical landscape found in the West, Central, and East Segments.



Landscape in the Western Segment with Existing Transmission and Wind Infrastructure



Typical Landscape in the Central Segment of the Project



Landscape in the Eastern Segment of the Project (taken from a helicopter)

Viewer/User Groups

Many factors influence the visual impact of any Alternative Route. The viewer is one of these factors. A viewer is defined as not only the person who is viewing the transmission line but is also defined as also as his/her expectations, activities, and frequency of viewing the line (USDA USFS, 1995). Three types of viewers were identified in the Study Area:

- **Local Residents**—Local residents are those people who live in the area of the proposed transmission line. Residents may view the line from their yards or homes, while driving on local roads, farming, or during other activities in their daily lives. The sensitivity of local residents to the visual impact of the line may be mitigated over time by frequent exposure to existing transmission lines and other dissonant features already within the viewshed.
- **Commuters and Travelers**—Commuters and travelers are people who travel by the transmission line on their way to other destinations. Typically, drivers will have limited views of the transmission line where vegetation or buildings provide screening and where the line crosses high above the road surface. Under these conditions, the visual perception of the line for commuters and travelers is anticipated to be relatively low because they are typically moving and have a relatively short duration of visual exposure to the line. When new visual features persist in the immediate vicinity or directly parallel to the road over long distances, longer visual exposure can be expected.
- **Recreational Users**—Recreational users include primarily local residents involved in recreational activities, such as Wetlands and Wildlife National Scenic Byway, the Santa Fe National Historic Trail, Cheyenne Bottoms, USACE reservoirs and state parks, and others listed below. For some recreational users, scenery may be an important part of their experience because their activities may include attentiveness to views of the landscape for long periods. Such viewers also may have a high appreciation for visual quality and high sensitivity to visual change.

Scenic Integrity and Visual Absorption

Scenic integrity is the degree by which the landscape character deviates from a natural, or natural-appearing, landscape in line, form, color, and texture of the landscape. In general, natural and natural-appearing landscapes have the greatest scenic integrity. As manmade incongruities are added to the landscape, the scenic integrity diminishes.

Additionally, some landscapes have a greater ability to absorb alterations with limited reduction in scenic integrity. The character and complexity, as well as environmental factors, influence the ability of a landscape to absorb changes. A new transmission line next to an existing transmission line provides less contrast, and therefore can be absorbed into that landscape better than introducing a transmission line as a new feature in a previously undeveloped area.

Scenic integrity refers to the degree of intactness and wholeness of the landscape character. New transmission and substation facilities are more likely to “blend-in” with surroundings near pre-existing facilities and would not change the integrity of the landscape.

Visually Sensitive Features and Recreational Resources within the Segments

The following recreational areas are located in the vicinity and potentially visible from the Project Alternative Routes. Recreational areas are generally organized and described from west to east in Kansas (**Table 5-23**).

Table 5-23. Visually Sensitive Features and Recreational Resources			
Recreational Resource	Size	Major Recreational Activities	Proximity to Alternative Routes
Santa Fe National Historic Trail	Western Missouri - Santa Fe, New Mexico	Boot Hill Museum (Dodge City), Fort Larned National Park, other historic attractions	Directly crossed by Alternative Routes A, B, C, D, E, F, G &H.
Fort Larned National Park	718 acres	Museum tours and historic attractions	1.3 miles from Alternative Routes B, D, G and H
Pawnee Rock State Park	5.3 acres	Sightseeing and picnicking	4 miles from Alternative Routes B, D, G and H
Wetlands and Wildlife National Scenic Byway	77-mile route scenic byway connecting Cheyenne Bottoms and Quivira National Wildlife Refuge	Sightseeing, scenic driving, historic attractions	2 miles from Alternative Route K and 1.5 miles from Alternative Routes B, D, G and H
Cheyenne Bottoms Wildlife Area	19,857 acres	Wildlife viewing, scenic drives, camping, hiking, hunting, bird watching, fishing, and boating	More than 5 miles from all Alternative Routes
Cheyenne Bottoms Preserve (TNC)	8,000 acres	Wildlife viewing, and birding	3 – 5 miles from all Alternative Routes
Wilson Lake (including the Minooka, Sylvan, and Lucas Park Recreation Areas)	9,000 acres of surface water with 13,000 acres of surrounding land	Boating, fishing, camping, hiking, birding, swimming, water skiing, beach access, and wildlife viewing	2 and 5 miles from Alternative Routes J and K
Post Rock Scenic Byway (Historic)	18-mile scenic byway	Scenic driving, sightseeing, historic attractions.	1 – 2 miles from Alternative Routes J and K

Table 5-23. Visually Sensitive Features and Recreational Resources			
Recreational Resource	Size	Major Recreational Activities	Proximity to Alternative Routes
Waconda Lake and Glen Elder State Park and Wildlife Area	13,000 land acres and 12,586 water acres	Boating, fishing, hiking, camping, hunting, biking, golfing, and swimming.	1 – 1.5 miles from Alternative Route I
Tuttle Creek Lake and Wildlife Area	12,200 land acres and 12,000 surface water acres	Boating, hunting, fishing, wildlife viewing	One mile from Alternative Routes N and O
Nemaha County Wildlife Area and State Park	125 land acres and 18 water acres	Primitive camping, scenic trail, fishing and historic attractions	1 – 2 miles from Alternative Routes L, M, N and O
National Historic Trails: Interpretive Auto Tour (NPS)	Western Missouri to Northeastern Kansas	Sightseeing, scenic driving, historic attractions	Varying distances from auto-tour interpretive sites on Alternative Routes L, M, N, and O
Glacial Hills Scenic Byway	63-mile scenic byway	Sightseeing, scenic driving, historic attractions	Directly crossed by Alternative Routes L, M, N, and O

General Impacts

As described in Section 1.4, *Project Description*, a combination of lattice and monopole structures may be used for the Project. Visually, lattice structures blend into the background very easily, especially from the fore- and middle-ground distances. The lattice design allows the natural colors of the surrounding backdrop to be seen, dissipating the visual intrusion of the transmission line. Monopole structures tend to stand out more on the landscape, compared with lattice structures, and there are typically more monopole structures per mile than lattice structures. In areas such as western Kansas, where long vistas are possible, this could lead to greater visible impacts, particularly in areas where a transmission line parallels a roadway.

Generally, short-term effects of transmission line construction could potentially impact both public and private facilities. Construction could potentially negatively affect access to recreational areas by temporarily: (1) blocking access roads, trails, or other facility entrances; (2) closing roads during specific construction activities; (3) disrupting traffic; and (4) creating detours, possibly making access more difficult. Construction could also temporarily impact the rural setting and the scenic integrity of the area due to increased construction-related traffic, noise, dust, brightly colored signage, and number of people coming to the area. Large cranes

and/or helicopters are typically used during the construction of the line, creating an increased temporary disturbance in both the visual, aesthetic, and peaceful nature of some areas. The Project would mitigate or reduce these impacts by entering into a road or transportation agreement with the local county government, which will take into consideration local traffic patterns and local scenic resources.

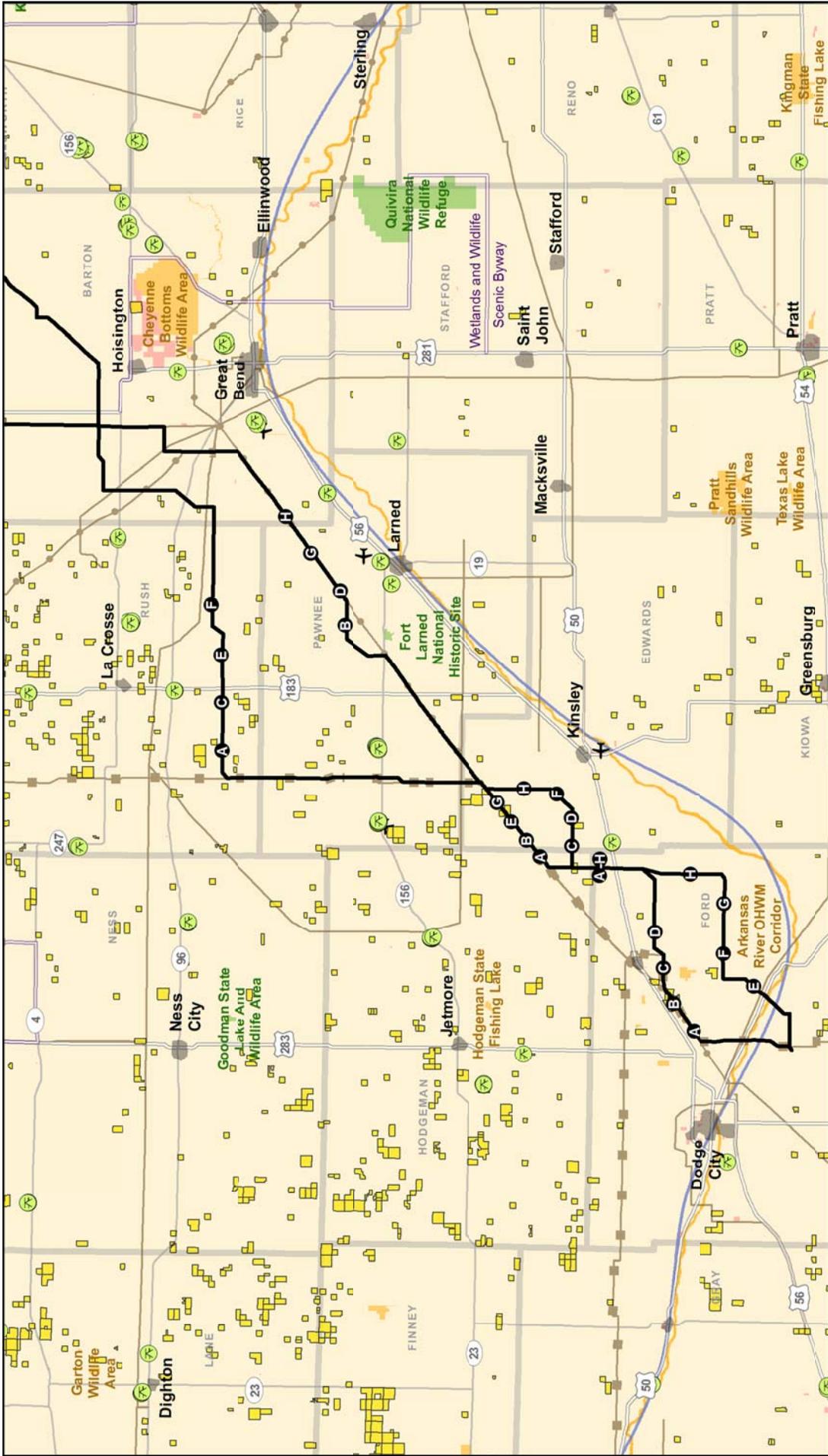
Alternative Route Comparison

West Segment

The West Segment is highly developed with wind turbines and the associated transmission facilities. Most of the development is in and around the Spearville, Kansas area and extending to the south. Alternative Routes A – D pass through a landscape scattered with wind and infrastructure development and poor scenic integrity, while Alternative Routes E – H divert east of Spearville, moving away from the dense wind and transmission development. Further, Alternative Routes A–D parallel existing transmission lines until congestion around Spearville prevents further paralleling. After a small deviation, Alternative Routes A, B, E, and G parallel the existing transmission lines north of Spearville. In contrast, Alternative Routes E, F, G, and H largely parallel parcel boundaries through the developed area. Placing the Alternative Routes away from an area with low scenic integrity to a location where the landscape is less uninterrupted would create new visual impacts in the area.

Areas with greater visual impacts include places where the Alternative Routes do not parallel existing transmission lines or where they parallel roadways, particularly in areas of higher development. Generally, parcel boundaries were followed in areas where existing transmission lines were not available or deemed more favorable. When possible and practical, the Routing Team sought to align the routes along half section lines shifting farther from roadways (areas of high visibility). Alternative Routes C, D, F, and H follow approximately 6 miles of roads, west of Kinsley and would be highly visible to local residents traveling these roads.

The main recreational resources within the West Segment include the Santa Fe NHT, Fort Larned National Park, Pawnee Rock State Park, the Wetlands and Wildlife National Scenic Byway, and Cheyenne Bottoms Wildlife Area (see **Figure 5-5** below). All Alternative Routes cross the Santa Fe NHT. The Santa Fe NHT meanders through this part of the state, and there are multiple alignments of the trail (not one centerline). Not surprisingly, several Alternative Routes cross the trail multiple times. In total, Alternative Routes A – D cross the trail four times, while Alternative Routes E – H only cross it twice.



Sources: ESRI, NPS, USGS, USACE, USDA-NRCS, USFWS, KDWPT, KS Recreation & Parks Association, KS Biological Survey

Coordinate System: State Plane Kansas South (feet)
 Projection: Lambert Conformal Conic
 Datum: North American 1983

0 10 20 Miles

Figure 5-5
Recreational Resources
in the West Segment

GRAIN BELT EXPRESS
 CLEAN LINE

- Alternative Routes
- Urban Area
- Recreation Facility
- Walk-In Hunting Area
- Scenic Byway
- Conservation Land
 - Local/Private
 - State
 - Federal Land
- Existing Transmission
 - < 138 kV
 - 138 kV - 230 kV
 - > 230 kV

The main recreational facilities associated with the Santa Fe NHT are located west of Dodge City and near Larned, Kansas, but there are historic markers near Offerle, Kansas, where recreational users may visit when experiencing the history of the NHT. Recreational facilities west of Dodge City and associated with the Santa Fe NHT would not be impacted given the distance from all Alternative Routes (more than 10 miles). Another recreational area associated with the Santa Fe NHT is the Santa Fe Trail Center and Museum and is located in Larned, Kansas (approximately 6 miles east of Alternative Routes B, D, G, and H). Given the distance and indoor nature of the museum, it is unlikely that any Alternative Routes would impact this recreational resource or associated viewshed.

Alternative Routes B, D, G, and H divert from a parallel alignment of the Arthur Mullergren-Tap 230 kV transmission line near the Fort Larned Historic Site (owned and managed by the National Park Service). This diversion places Alternative Route B, D, G, and H behind slightly rolling topography and allows for all Alternative Routes to avoid most impacts to the Fort Larned Historic Site and National Park.

The Pawnee State Park offers broad views of the landscape due to the higher elevation associated with its natural bluff. From the top of the outcrop you can see great distances including the towns of Dundee, Larned, Radium, Great Bend, and Seward, towns that are 5, 8, 8, 12, and 13 miles away respectively. As a result, it is likely that Alternative Routes B, D, G, and H would be visible from the state park. The Alternative Routes are located primarily adjacent to the Arthur Mullergren-Tap 230 kV transmission line in this area. Paralleling existing transmission lines typically mitigates visual impacts due to the previous visual disturbance.

Cheyenne Bottoms is located directly east of the Alternative Routes and hosts a variety of recreational activities, including a scenic byway and wildlife viewing activities. Alternative Routes B, D, G, and H are the closest to Cheyenne Bottoms and the Wetlands and Wildlife National Scenic Byway, but they are still 5 miles away from the closest portion of the locally managed designation. The majority of the recreational activities are located in the Cheyenne Bottoms State Park (east of the locally managed portion and approximately 8 to 15 miles from the Alternative Routes). Alternative Routes would likely not be visible from the main recreational areas associated with Cheyenne Bottoms; further, there are several other transmission lines west of Cheyenne Bottoms and in between the line of sight of the Alternative Routes and would be more visible from the recreational area.

The Wetlands and Wildlife National Scenic Byway connects Cheyenne Bottoms and Quivira National Wildlife Refuge. The scenic byway is a 77-mile route that offers scenic views of large complex wetlands, migrating birds, whooping cranes, a plethora of other wildlife viewing opportunities, weather-driven impacts to the landscape, and historic attractions such as an operating flour mill and part of the Santa Fe Trail. Alternative Routes B, D, G, and H and Alternative Routes A, C, E, and F cross State Highway 4 between 1.5 and 7 miles from the end

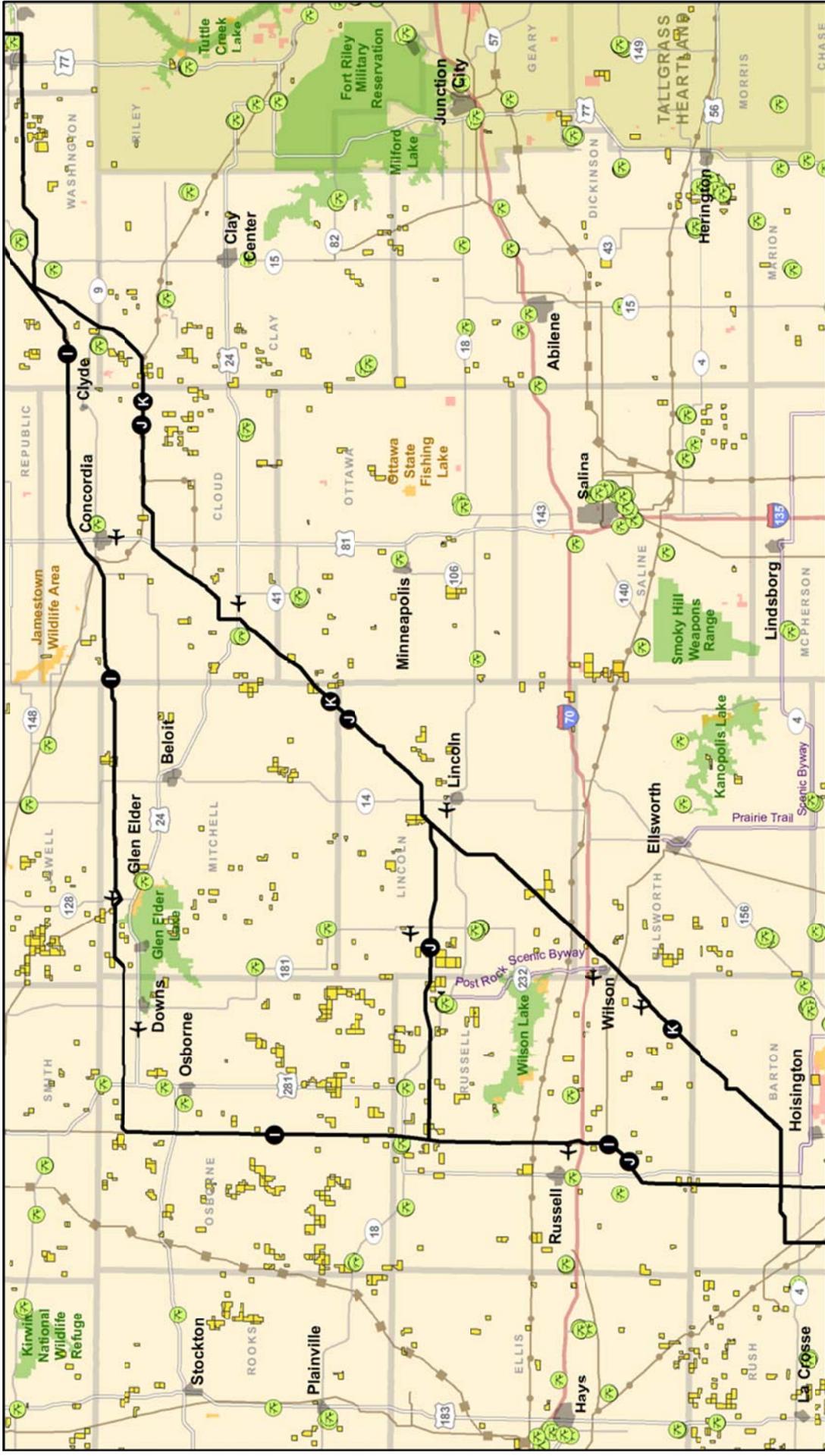
of the scenic byway (which follows State Highway 4 for a portion). Visitors of the scenic byway could pass under any of the Alternative Routes when accessing or leaving the scenic byway. However, Alternative Routes B, D, G, and H cross State Highway 4 along an existing transmission line; therefore, visual impacts currently exist in this location, and Alternative Routes A, C, E, and F would have greater impacts. Generally, Alternative Routes B, D, G, and H are closer to major recreational facilities in the area; increasing the potential visibility to an additional user group (recreational). Alternative Routes B, D, G, and H are largely along existing transmission lines near major recreational facilities, mitigating, but not eliminating (due to the size of the proposed structures), visual impacts due to the previously disturbed viewshed.

Alternative Routes A and B would have less impact on recreational and visual resources because they parallel existing transmission lines in a largely disturbed landscape with poor scenic integrity near Spearville. While Alternative Route B is closer to some recreational facilities, it is along an existing transmission line or diverts accordingly, near recreational areas. Alternative A is farther from the recreational facilities, but it is longer increasing visibility to more user groups.

Central Segment

The main recreational resources within the Central Segment include, Wilson Lake, Post Rock Scenic Byway, Waconda Lake, and Glen Elder State Park (see **Figure 5-6**). Alternative Route I parallels existing transmission lines for 79 percent of its length and Alternative K parallels a combination of pipelines and transmission lines for approximately 66 percent of its length. Alternative Route J is a combination of these Alternative Routes, with less overall parallel.

Wilson Lake, associated recreational areas, and the scenic byway are all located in the middle of the Alternative Routes. It is not anticipated that any one Alternative Route would have a significantly greater impact to these recreational resources. Further, the existing Knoll-Summit 230 kV transmission line is approximately 0.5 mile to 1.5 miles south of Wilson Lake, crosses the scenic byway and is closer to the recreational area than any of the Alternative Routes. This existing line has greater visual impacts for Wilson Lake than any of the proposed Alternative Routes.



Alternative Routes

- Urban Area
- Recreation Facility
- Walk-in Hunting Area

Scenic Byway

Conservation Land

- State
- Local/Private
- Federal

Existing Transmission

- < 138 kV
- 138 kV - 230 kV
- > 230 kV

Figure 5-6
Recreational Resources
in the Central Segment

GRAIN BELT EXPRESS
CLEAN LINE

Sources: ESRI, NPS, USGS, USACE, USDA-NRCS, USFWS, KDWPT, KS Recreation & Parks Association, KS Biological Survey

Coordinate System: State Plane Kansas North (feet)
Projection: Lambert Conformal Conic
Datum: North American 1983

The Post Rock Scenic Byway generally runs north to south on the east side of Wilson Lake and between the towns of Lucas and Wilson. Alternative Route K is approximately 1 mile east of Wilson and the end of the scenic byway. It is likely that Alternative Route K would be visible from the town of Wilson and from portions of the scenic byway, however viewers would be looking west towards Wilson Lake and away from Alternative Route K. Alternative Route I is located on the western side of the Wilson Lake recreation and conservation area and along an existing transmission line and farther from recreational activities and the scenic byway, when compared to Alternative Route K. Given the varied topography surrounding the lake and the fact that all Alternative Routes are several miles away, it is unlikely that any one would be widely visible from or would impact the function of the main recreational facilities.

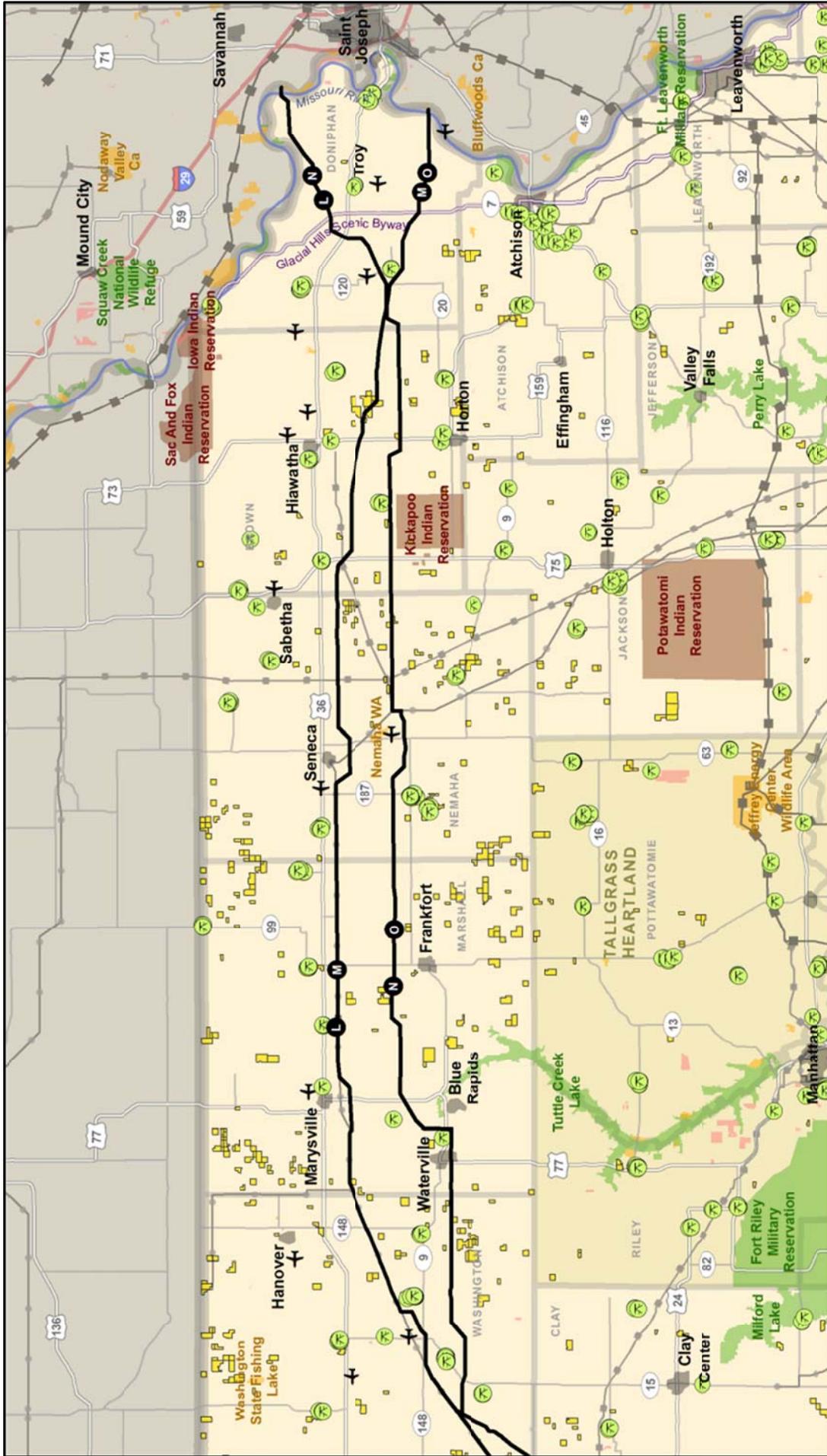
Alternative Route I is the only Alternative Route in the proximity of Waconda Lake and the Glen Elder State Park. Alternative Route I does not cross any recreational resources; however, it does border the lake and state park to the north for roughly 14 miles. On average Alternative Route I is 1.0 to 1.5 miles from the lake and recreation area; however, it is as close as 0.2 mile in one location. Given the close proximity, Alternative Route I would be visible from the recreational facility, however most users would be facing the lake and the transmission line would be behind their line of sight.

Alternative Route I is the longest route in the Central Segment. The additional length of the Alternative Route can be correlated with the potential visibility. Generally, longer routes impact more landowners and cross more roads, increasing the visibility of the Alternative Route. However, all three Alternative Routes have similar house counts and no real differences between Alternative Routes were noted. The main difference between Alternative Routes is that Alternative I follows transmission lines for the majority its length, while Alternative J and K largely parallel an existing gas pipeline (particularly Alternative Route K). Alternative Routes J and K are shorter, but cross diagonally through fields in an area previously undisturbed by vertical infrastructure. While Alternative I is longer, it parallels existing vertical infrastructure for 79 percent of its total length and keeps existing visual impacts together, while Alternative Route K would create a new visual impact on the landscape in an area previously undisturbed, diminishing the scenic integrity.

Overall, Alternative Route K would have higher impacts to recreational and visual resources due to the new vertical intrusion on the landscape for over 67 miles.

East Segment

The main recreational resources within the eastern segment include Tuttle Creek Lake and Wildlife Area, Nemaha County Wildlife Area and State Park, The National Historic Trails Auto Tour, and the Glacial Hills Scenic Byway (see **Figure 5-7** below). Tuttle Creek is a linear lake orientated north to south with the main recreational areas (state parks, beaches, trails, etc.) located at the southern extent. Alternative Routes N and O are approximately 1 mile from the



Alternative Routes	Conservation Land	Existing Transmission
Alternative Routes	Local/Private	< 138 kV
Urban Area	State	138 kV - 230 kV
Recreation Facility	Tribal	> 230 kV
Scenic Byways	Federal	
Walk-In Hunting Area		

Figure 5-7
Recreational Resources
 in the East Segment

GRAIN BELT EXPRESS
 CLEAN LINE

Sources: ESRI, NPS, USGS, USACE, USDA-NRCS, USFWS, KDWPT, KS Recreation & Parks Association, KS Biological Survey, MO Dept. of Conservation

0 10 20 Miles

N

Coordinate System: State Plane Kansas North (feet)
 Projection: Lambert Conformal Conic
 Datum: North American 1983

very northern extent of Tuttle Creek and would not have any impacts on the recreational resources associated with the park and reservoir.

Alternative Routes N and O cross U.S. Highway 77 three times on either side of Blue Rapids. Therefore, visitors, residents, commuters, and recreational users would pass under the transmission line coming to and from the area and would likely see the Alternative Routes as they pass through Blue Rapids, KS. Further, the “Crossing of Big Blue” a scenic destination point along the National Historic Trails Interpretive Auto Tour is located in Blue Rapids, KS. The crossing of the Big Blue River carries historical significance as a location where emigrants crossed the river. There is an interpretive display along the river in this location. Alcove Spring, another scenic destination along the National Historic Trails Interpretive Auto Tour, is located approximately 6 miles north of Blue Rapids along East River Road. Alternative Routes N and O cross East River Road 2 miles south of Alcove Springs. Visitors following the auto tour would drive under transmission line and have wide views of the line as it crosses the Big Blue River and associated floodplain. The area surrounding Blue Rapids is very scenic and rich in cultural significance. Alternative Routes N and O would introduce visual impacts through a previously undisturbed and natural landscape. The Pony Express Barn and Marshall’s Ferry, scenic destinations along the auto tour, are located on the west side of Marysville and are accessible via Highway 36. Given that these destinations are located in Marysville and that Alternative Routes L and M are far enough south, visual impacts to the scenic destinations of the auto tour are not expected.

The National Historic Trails Interpretive Auto Tour follows State Highway 36 (Pony Express Highway) east of Marysville, KS. Alternative Routes L and M are 1.25 miles south of State Highway 36 (the auto tour route and a major throughway) for over 40 miles, roughly between Marysville and Fairview, KS. Alternative Routes L and M follow an existing wooden H-frame transmission line for half of this distance along State Highway 36. Views of Alternative Routes L and M would often be blocked by residential and commercial development along the roadway. Visual impacts of Alternative Routes L and M would be greater along residential roads south of State Highway 36, as the transmission line is on the quarter section line and close to the local road. In contrast, Alternative Routes N and O would create a new visual disturbance farther from the developed land and previously impacted landscapes along State Highway 36.

Nemaha County State Park sits between Alternative Routes L, M, N, and O and they are approximately 1 to 2 miles away on either end of the park and vegetation immediately adjacent to the lake would likely limit views of any Alternative Routes at this location. No impacts to the recreational resources are expected.

Alternative Routes L and M meet Alternative Routes N and O just west of Denton, KS. Alternative Routes M and O turn south, while Alternative Routes L and N turn north. All Alternative Routes cross the Glacial Hills Scenic Byway (U.S. Highway 7), none of which are along existing transmission infrastructure. The Alternative Routes M and O cross at a largely flat agricultural area, with wide views of the country side. Alternative Routes L and N cross the byway in area with more rolling topography and tree cover, particularly along the roadway. The topography at the Alternative Routes L and N crossing would block extended views from the roadway, and the transmission line may not be seen as readily as a user approaches the crossing.



Missouri River Crossing on Alternative Routes M and O (looking southwest)

5.2.4 Cultural Resources

Archaeological Resources

The Kansas State Historical Society database was reviewed for archaeological sites, architectural resources, and historic properties listed on the National Register. Several kinds of archaeological resources were identified along and within the Study Area. Native American sites span the known periods of human occupation of present-day Kansas: the Paleoindian period (approximately 11,500 to 7,000 years Before Christ, or B.C.); the Archaic period (approximately 7,000 to 1 Anno Domini [A.D.]); the Early Ceramic period (approximately 1 to 1000 A.D.); the Middle Ceramic period (about 1000 to 1400 A.D.); and the Late Ceramic period (1400 to 1800 A.D.). Sites associated with Euroamerican occupation of Kansas date from about 1541 to the 1960s A.D.

Several historically recognized tribes occupied, hunted, and traveled through Kansas. These include primarily the Kansa, Osage, Pawnee, Arapaho, Southern Cheyenne, Kiowa, Plains Apache, Comanche, Wichita, Oto and Missouri. However, some resettled tribes temporarily resided in Kansas including the Delaware, Wyandot, Pottawatomie, Shawnee, Quapaw, Piankeshaw, Wea, Miami, and Kickapoo.

Trails were important transportation routes for Native Americans and later traders, the army, emigrants, miners, cattlemen, and settlers. Historic trails generally followed segments of trails used by Indians for hundreds of years. Indian trails include, the Pawnee Trail (north-central Kansas), the Osage Trail (southeastern and south-central Kansas) and the Kaw Trail, which more or less paralleled the Santa Fe Trail.

The Santa Fe Trail was established between northeast Kansas and New Mexico by traders in the 1820s. It was used by the military and also was one of the first stage coach routes in the west. The Oregon Trail includes 193 miles in northeastern Kansas between Johnson and Washington counties and consists of a braided network of trail routes. The Mormon Trail followed portions of the Santa Fe Trail before turning northwest through Wabaunsee, Riley, and Washington counties where it joined the Oregon Trail. Eighteen military roads were established across Kansas including roads from Fort Leavenworth south to Fort Scott, from Fort Leavenworth to Fort Riley and Fort Larned, from Fort Lyons to Fort Wallace, and from Fort Hays to Fort Dodge.

Stage coach lines through the state included the Santa Fe Trail; the Parallel Road that ran west about 30 miles south of the Kansas-Nebraska border from Atchison; the Smoky Hill Trail; the Butterfield and Overland Dispatch which closely followed the Smoky Hill Trail; and the Leavenworth and Pike's Peak Trail, which had three branches across eastern Kansas before joining near Salina. The short-lived Pony Express Trail extended from St. Joseph down and then west across the northern counties of Kansas.

Architectural Resources

The West Segment of the project has few known architectural resources within or near the segment. Most of the rural resources identified consist of farmsteads, rural schools, and bridges. Farmsteads generally appear to have frame barns and residences, though many have been altered with modern materials. The Santa Fe NHT is located within and adjacent to the Study Area from Dodge City to Great Bend on the north end of the segment. Pawnee Rock, which was a prominent landmark on the trail, is located adjacent to the Study Area in the Pawnee Rock State Historic Site. Another historic site, Fort Larned National Historic Site is near Alternative Routes in the West Segment in Pawnee County. Towns located within or near the West Segment include Spearville, Offerle, Kinsley, Rozel, and Burdett and previously surveyed architectural resources in these towns include schools, churches, commercial buildings, and in the case of Kinsley, the Edwards County Courthouse.

The types of previously surveyed resources in the Central Segment are similar to those found in West Segment. A significant number of stone barns and residences, built in the early 20th century, are located in Russell and Lincoln Counties north of Interstate 70. Though many of the roadside attractions have been demolished, mid-century period signs for the businesses remain in several locations. Towns located within or near the Central Segment include Albert, Olmitz, Otis, Hoisington, Galatia, Susank, Wilson, Dorrance, Walker, Gorham, Sylvan Grove, Russell, Paradise, Waldo, Luray, Lincoln, Glasco, Aurora, Clifton, Vining, Concordia, Glen Elder, Cawker City, Downs, and Tipton. Numerous properties such as residences, courthouses, post offices, theatres, libraries, gas stations, and commercial buildings, and five historic districts are listed in the National Register.

The East Segment is in a more densely populated region of the state. More architectural resources have been surveyed within the area, especially in several of the larger towns. Rural resources in the area are similar to those found in the Central Segment, including the presence of stone barns and residences. Both the Pony Express Trail and Oregon/California Trails cross through this East Segment. Several sites related to these trails have been surveyed and are located within or adjacent to the Study Area. The Hollenberg Pony Express Station, a NHL, is located along the northernmost alignment in Washington County. Another significant site associated with the Oregon/California Trail, Alcove Springs, is located along the southern alignment in Marshall County. Towns within or adjacent to the East Segment include Linn, Greenleaf, Barnes, Waterville, Powhattan, Willis, Severance, Denton, Sparks, Oneida, Seneca, Baileyville, Axtel, Beattie, Washington, and Sabetha.

General Impacts and Mitigation

Transmission lines tend not to have significant indirect impacts on archaeological resources, which are usually located entirely below the ground surface. However, some sites have surface expression, such as burial mounds, effigies and intaglios, stone circles or alignments, trail ruts,

foundations and walls, and cemeteries. The new transmission structures might detract from the setting or feeling of the site, particularly if the significance of the site relates in part to a sense of wildness, openness, primitiveness, or sacredness. Whenever possible, adverse impacts on identified sites would be avoided by strategically locating access roads, staging areas, and structures.

Impacts on archaeological properties may be physical and/or visual, depending on the type of site. Visual impacts, such as those described for architectural historic properties, can occur where the physical setting, location, or feeling contributes to the significance of the resource. Frontier military posts or homesteads, battlefields, historic trails, cemeteries, burial mounds, or landforms that are identified as sacred places are some examples. Adverse physical impacts can include ground disturbance by excavation to construct transmission line support structures and substations, compression and/or rutting by heavy machinery, grading/constructing access roads, pulling stumps, setting pole anchors, material storage, or surface collection of artifacts by construction crew persons.

Impacts on architectural historic properties would be primarily visual, created by the construction of new structures where none exist, the addition of a second transmission line next to an existing transmission line corridor (generally a lesser impact), and clearing of forested land. Impacts would vary based on local relief, height of existing vegetation, and any intervening recent development. Any physical impacts on architectural historic properties would be avoided, where possible, by strategically locating access roads, staging areas, and structures.

Alternative Route Comparison

A review of archaeological resources from the Kansas Historic Preservation Office (SHPO) identified 20 recorded archaeological sites along the project ROW for all Alternative Routes. Generally, archaeological resources are only a concern when located within the ROW and can usually be spanned or avoided, eliminating any impacts.

A review of the cultural resources and National Register from the Kansas Historic Resources Inventory was completed for each segment. Spatial information was collected on all previously identified architectural and archaeological resources within 0.25, 0.5, and 1 mile of each Alternative Route. A review of the architectural resources and National Register shapefiles from Kansas SHPO identified 1 NHL, 13 National Register-listed properties, and 17 properties that are eligible for listing in the National Register within 1 mile of the Alternative Routes.

West Segment

Alternative Routes A - D have one archaeological resource within the ROW and Alternative Routes E – F have zero (see **Table 5-24** below). Alternative Routes A, B, C, and D would cross the Santa Fe Trail four times each and Alternative Routes E, F, G, and H would cross the

Santa Fe Trail two times each. More crossings of the Santa Fe Trail increase the likelihood for discovery of archaeological resources within the ROW; avoiding multiple crossings of the Santa Fe Trail would minimize potential impacts to archaeological resources.

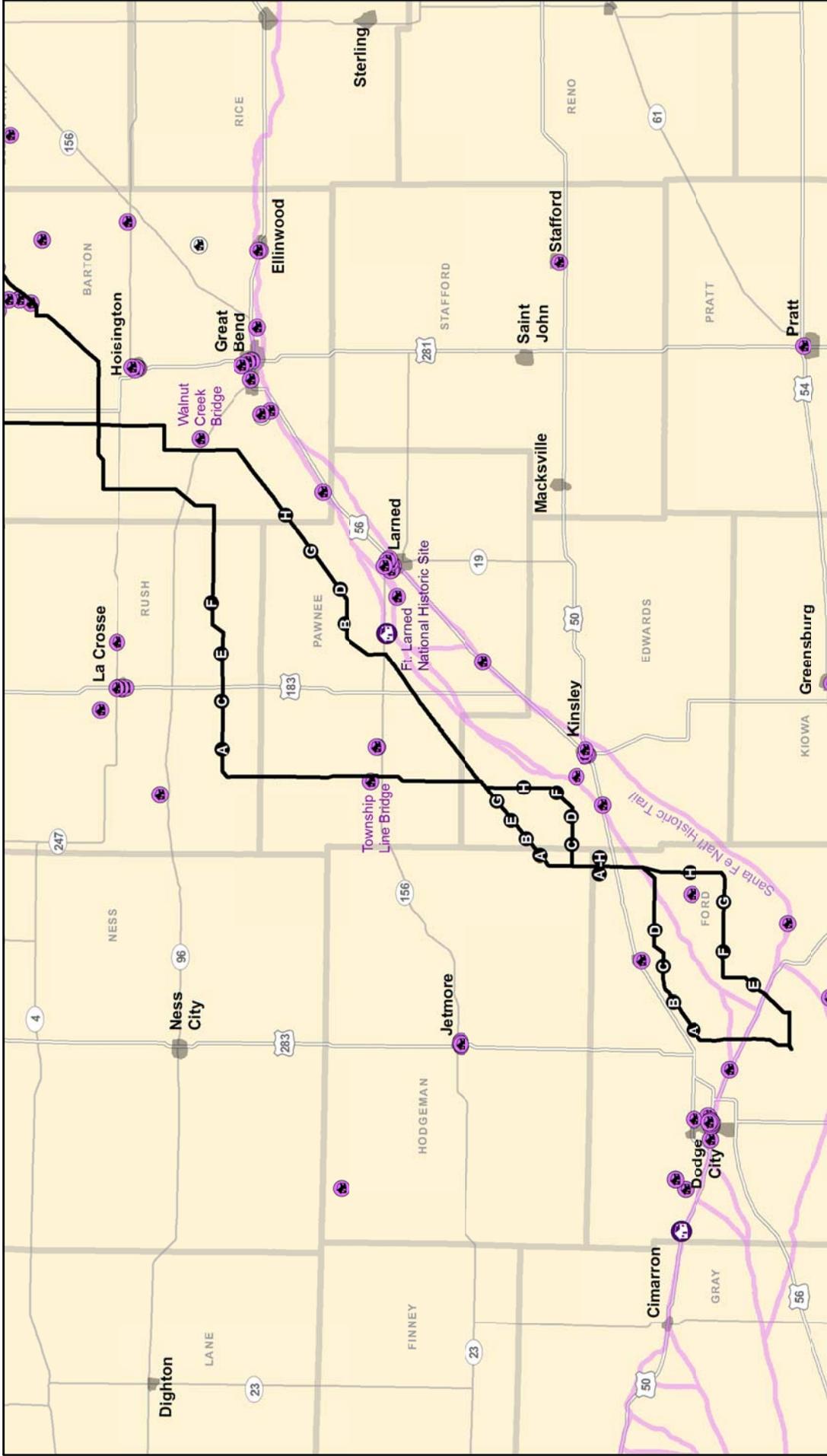
Table 5-24. Archaeological Resources for Alternative Routes in the West Segment								
	A	B	C	D	E	F	G	H
Resources within the ROW ¹	1	1	1	1	0	0	0	0
Resources within 1,000 feet ²	2	1	2	1	1	1	0	0
Santa Fe NHT Crossings	4	4	4	4	2	2	2	2

¹The ROW is 100 feet on either side of centerline.

²Resources are measured from the centerline of the Alternative Routes.

Three architectural resources that are listed in or have been determined eligible for listing in the National Register were identified within 0.25 mile of the Alternative Routes. All of the Alternative Routes have at least one National Register-listed resource within 1 mile of the centerline (see **Table 5-25** below). Alternative Routes B, D, G and H are in the vicinity of the Fort Larned National Historic site and NHL (approximately 1.3 miles). These Alternative Routes are parallel to an existing transmission line through the area but divert around Fort Larned to avoid potential visual impacts to this visually sensitive historic landmark (while also allowing for avoidance of several residences). The locations of architectural historic properties in the West Segment are included on **Figure 5-8** below.

Table 5-25. Architectural Resources in the West Segment (distance to each resource given in feet)										
KSHS No.	Resource Name	A	B	C	D	E	F	G	H	NR Status
145-0000-00093	Township Line Bridge	2,400	-	2,400	-	2,400	2,400	-	-	NR Listed
145-0000-00001	Fort Larned National Historic Site	-	7,050	-	7,050	-	-	7,050	7,050	NHL
009-0000-00084	Walnut Creek Bridge	-	4,800	-	4,800	-	-	4,800	4,800	NR Listed



Sources: ESRI, National Park Service, KS Historical Society

Coordinate System: State Plane Kansas South (feet)
 Projection: Lambert Conformal Conic
 Datum: North American 1983

Figure 5-8
Architectural Historic Properties
in the West Segment

- Alternative Routes
- Urban Area
- Santa Fe National Historic Trail Segments
- State Historic Site
- National Register of Historic Places Site
- National Historic Landmark

Central Segment

Alternative Routes J and K have one archaeological resource and Alternative Route I has two resources within the ROW (see **Table 5-26** below). Within 1 mile of the Alternative Routes, the numbers of archaeological sites increases moderately. The number of resources is nearly five times higher along Alternative Route I than along Alternative Route J. Two sites, the Purma Petroglyph Site (14RU316) and The Hildebrandt Petroglyph Site (14LC306) are situated within 1 mile of Alternative Route K and are listed in the National Register. Due to their distance from the project corridor, neither of the two sites would be adversely affected by the Project. No historic trails would be crossed by any of the Alternative Routes in the Central Segment.

	I	J	K
Resources within the ROW ¹	2	1	1
Resources within 1,000 feet ²	7	2	4

¹The ROW is 100 feet on either side of centerline.

²Resources are measured from the centerline of the Alternative Routes.

There are 23 architectural resources within 1 mile of Alternative Routes I, J and K in the Central Segment of the project (see **Table 5-27** below). Alternative Route I has one National Register-listed and two National Register-eligible properties within 1 mile. The closest property is the Deines Homestead, which is approximately 950 feet from Alternative Route I.

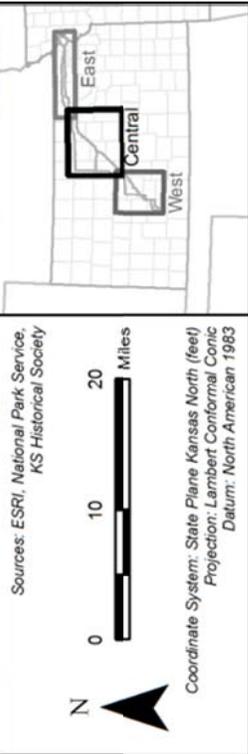
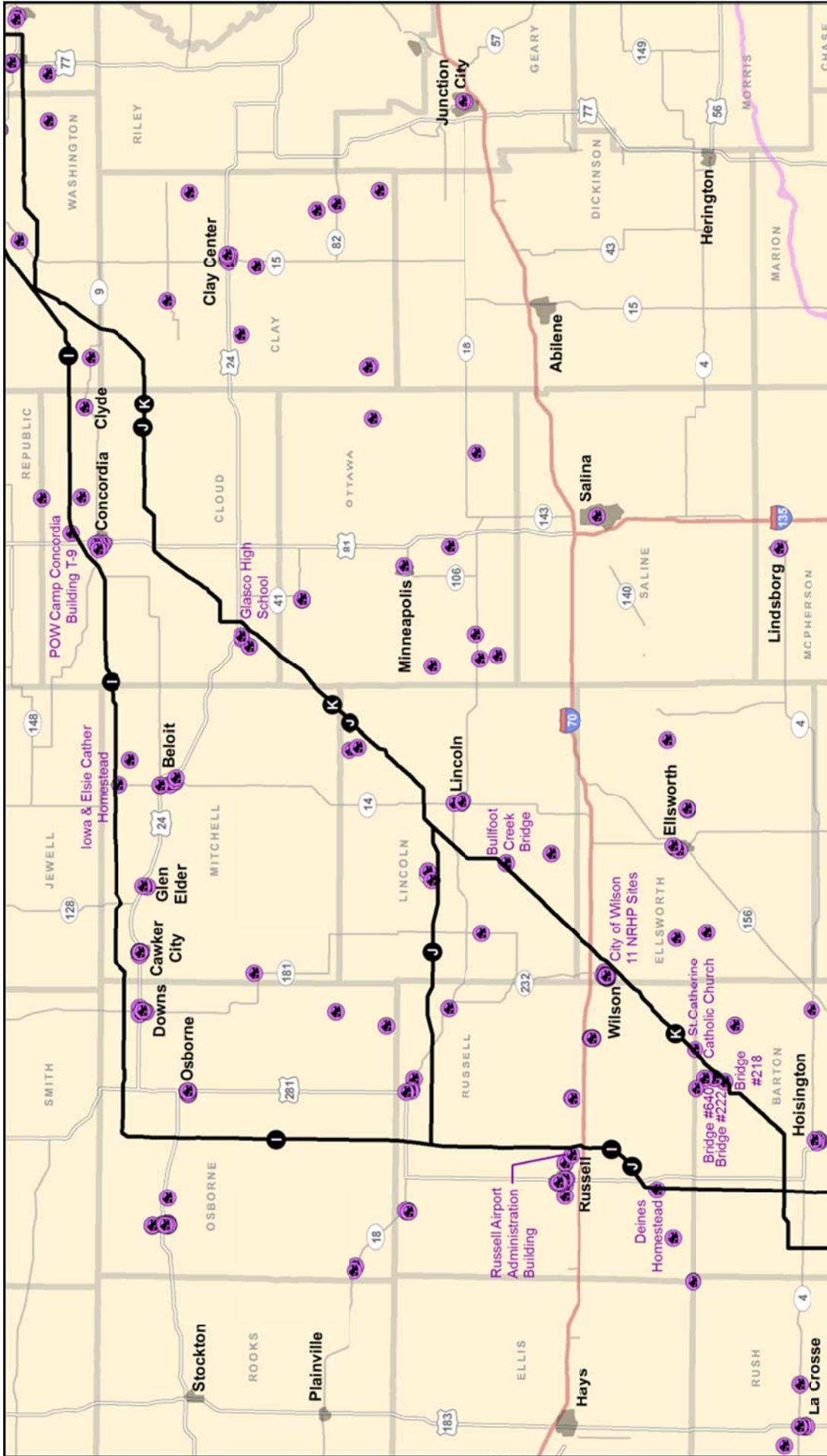
Alternative Route J has four National Register-eligible properties and two National Register-listed properties; again, the Deines Homestead is also the closest property to Alternative Route J at approximately 950 feet.

Alternative Route K has six National Register-listed and eleven National Register-eligible properties within 1 mile. One National Register-listed historic district is also located within 1 mile. Most of the properties are located between 0.5 mile and 1 mile and are located in small towns adjacent to the project area. For example, the historic district is located in the downtown area of Wilson. Two properties are within 0.25 mile and include a National Register-listed bridge (approximately 750 feet away) and the National Register-eligible St. Catherine Catholic Church (approximately 1,050 feet away) from Alternative Route K. The locations of architectural historic properties in the Central Segment are shown in **Figure 5-9** below.

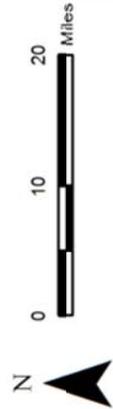
Table 5-27. Architectural Resources in the Central Segment

KSHS No.	Resource Name	Alternative Routes (distance in feet)			
		I	J	K	NR Status
009-170	Bridge #218 - Off System Bridge			750	NR Listed
167-0000-00168	Deines Homestead	950	950		NR Eligible
009-0411-00001	St. Catherine Catholic Church			1,050	NR Eligible
105-0000-00043	Bullfoot Creek Bridge			1,850	NR Listed
123-0000-00217	Iowa & Elsie Cather Homestead	2,200			NR Listed
009-169	Bridge #222 - Off System Bridge			2,750	NR Listed
009-168	Bridge #640 - Federal Aid Highway System Bridge			2,900	NR Listed
105-0000-00011	Danske Evangelist Lutheran Kirke		5,250		NR Listed
029-42	Glasco High School		5,250	5,250	NR Eligible
053-5940-00047	J.F. Tampier Building			5,100	NR Eligible
053-5940-00048	J.F. Tampier Building/Legion			5,050	NR Eligible
105-0000-00098	Jensen-Dahl House		5,150		NR Eligible
105-5310-00009	Nielsen Farm		3,200		NR Listed
053-5940-00045	Old Implement Dealership			5,150	NR Eligible
167-4820-00018	Russell Airport Administration Building	3,700	3,700		NR Eligible
053-5940-00022	Somer Hardware Building			5,050	NR Eligible
053-5940-00034	Sula Meat Market Building			5,150	NR Eligible
053-5940-00050	Thompson Monument Building			5,150	NR Eligible
053-5940-00003	Weber and Pierano Building			5,100	NR Eligible
053-5940-00049	Weber/Warta Motor Co			5,100	NR Eligible
053-5940-00015	Weinhold House			4,700	NR Listed
053-5940-00007	Wilson Czech Opera House			5,150	NR Eligible
053-5940-00052	Wilson Downtown Historic District No.3—Southside			5,000	NR Listed

In the Central Segment, Alternative Route I would be the best alternative. Alternative I parallels existing transmission lines minimizing the potential of new visual impacts on historic architectural resources and has the least amount of architectural features in close proximity to the ROW. It also has the least amount of archaeological resources directly within the ROW.



Sources: ESRI, National Park Service, KS Historical Society



Coordinate System: State Plane Kansas North (feet)
 Projection: Lambert Conformal Conic
 Datum: North American 1983

Figure 5-9
Architectural Historic Properties
in the Central Segment

- Alternative Routes
- Urban Area
- National Register of Historic Places Site

GRAIN BELT EXPRESS
 CLEAN LINE

East Segment

No Archaeological resources are located within the ROW for Alternative Routes M. Alternative Routes L, N and O have 2, 3, and 1 archaeological resource within the ROW, respectively (see **Table 5-28** below).

The California Trail is crossed once by Alternative Route N, twice by Alternative Route and three times by Alternative Route L. The trail is not crossed at all by Alternative Route O. The combined California/Oregon Trail is crossed once by all four of the Alternative Routes. The Pony Express Trail is crossed once by Alternative Routes L and N and twice by Alternative Routes M and O. Alternative Routes L and M have a higher probability for potential archaeological impacts, due to a larger number of trail crossings. However, proper structure placement and design will largely avoid these impacts.

Table 5-28. Archaeological Resources and Historic Trail Crossings for Alternative Routes in the West Segment				
	L	M	N	O
Resources within the ROW ¹	2	0	3	1
Resources within 1,000 feet ²	19	7	19	7
California trail crossings	3	2	1	0
California/Oregon trail crossings	1	1	1	1
Pony Express trail crossings	1	2	1	2
Total NHT crossings	5	5	3	3

¹The ROW is 100 feet on either side of centerline.

²Resources are measured from the centerline of the Alternative Routes.

Overall, five architectural resources are located within 1 mile of Alternative Routes in the East Segment of the project (see **Table 5-29** below). Alternative Routes L and M have a National Register-eligible bridge within 0.5 mile and a National Register-listed barn within 1 mile. Alternative Route M has the National Register-listed St. Benedict’s Church located within 0.5 mile.

Alternative Route N has two National Register-eligible resources between 0.5 and 1 mile: the Willis Public School and the Craft Farmstead, which has a stone house built in 1865. Alternative Route O also has the aforementioned resources and the National Register-listed St. Benedict’s Church within 0.5 mile.

Alternative Route L has one National Register-eligible bridge and one National Register-listed barn between 0.5 and 1 mile. Alternative Route M has the same two properties and the National Register-listed St. Benedict’s Church, located within 0.5 mile. The locations of architectural historic properties in the East Segment are shown in **Figure 5-10** below.

Table 5-29. Architectural Resources in the East Segment (distance to resource in feet)						
KSHS No.	Resource Name	Alternative Routes (distance in feet)				NR Status
		L	M	N	O	
013-0000-00190	South Fork Wolf River Camelback Truss Bridge	2,150	2,150	-	-	NR Eligible
043-0000-00200	St. Benedict's Church	-	2,600	-	2,600	NR Listed
013-208	Willis Public School	-	-	2,350	2,350	NR Eligible
117-268	Craft Farmstead	-	-	3,400	3,400	NR Eligible
043-0000-00171	Hanson, George, Barn	4,700	4,700	-	-	NR Listed

In the East Segment, Alternative Route M would be the best route from a cultural resource perspective. Alternative Route M has no known archaeological resources within the ROW and either parallels an existing transmission line or is near existing transmission and pipeline infrastructure at each NHT crossing. Architectural resources are comparable across Alternative Routes, which each route potentially impacting 2 or 3 eligible or listed resources. The overall impacts of these NHT crossings are fewer compared to other Alternative Routes that have the potential to create new impacts on otherwise undisturbed portions of the NHTs. Proper structure placement and design will largely avoid impacts to the NHTs.

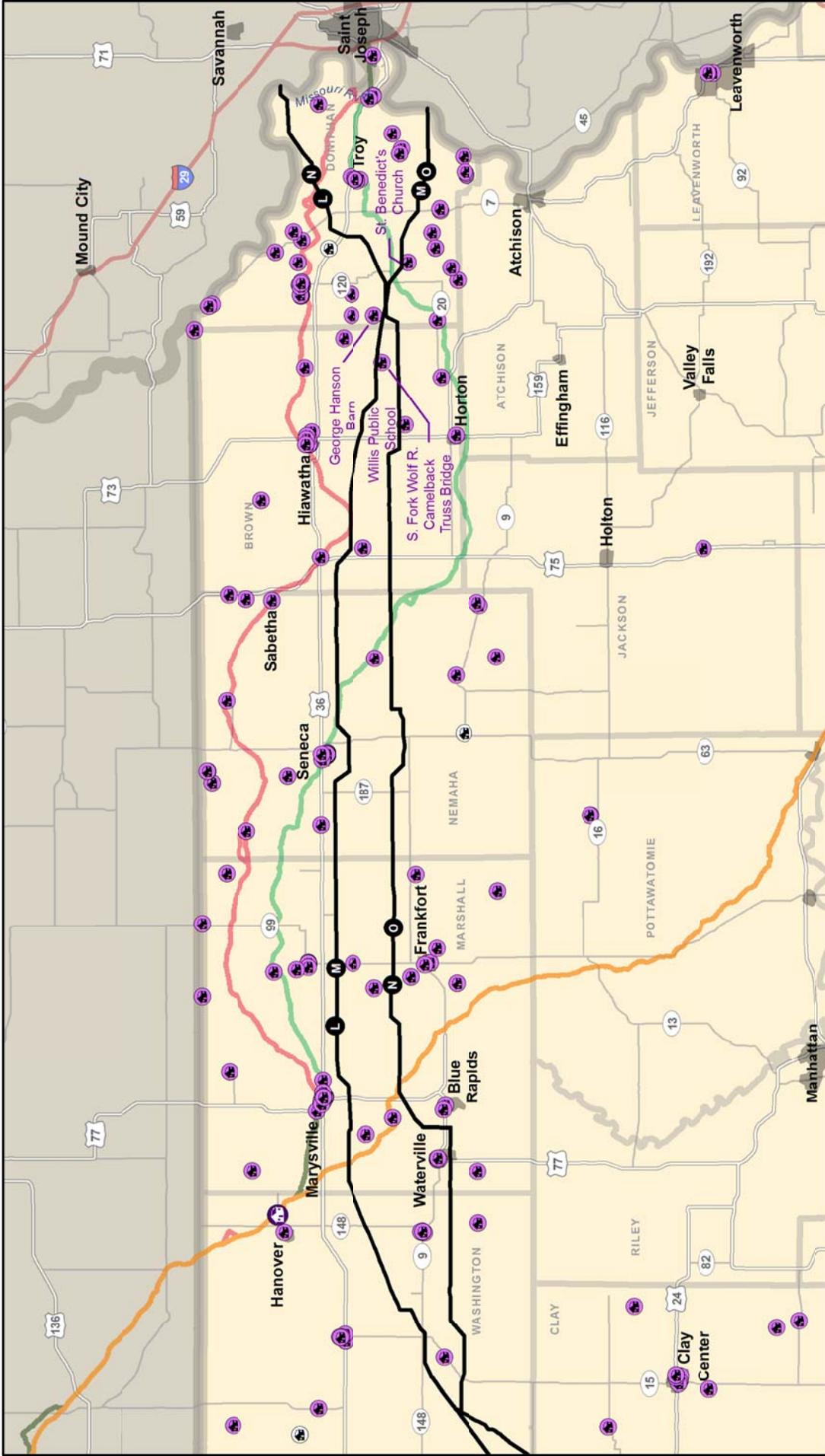


Figure 5-10
Architectural Historic Properties
in the East Segment

- Alternative Routes
- Urban Area
- State Historic Site
- National Register of Historic Places Site
- National Historic Landmark
- Historic Trail
- Oregon & California Trails
- California Trail
- Pony Express Trail

Sources: ESRI, National Park Service, KS Historical Society

Coordinate System: State Plane Kansas North (feet)
 Projection: Lambert Conformal Conic
 Datum: North American 1983

0 10 20 Miles

East
 Central
 West

5.3 Engineering

5.3.1 Transportation

Local and county roads are the dominant mode of transportation throughout the Study Area; however, there is one interstate (I-70) that crosses east-to-west through the center of Kansas. There are also numerous private and public airfields that are utilized for municipal, agricultural, and recreational uses. The Routing Team avoided crossing directly over all airfields; however, a few Route Alternatives do fall within the limits of Federal Aviation Administration (FAA) approximated notification zone requirements (Code of Federal Regulations, Title 14, Part 77 Subpart B). Many of the larger towns and cities in the Study Area are connected by railroads, several of which are crossed by Alternative Routes in all three segments.

General Impacts and Mitigation

Numerous U.S. highways, state highways, and county and local roads transect the Study Area. In general, highways and roadways can be spanned with the transmission line and impacts are minimal. During construction, it may be necessary to close portions of roads to allow for the stringing of the conductor over the road. Coordination with KDOT would occur for all highway crossings associated with the Project. Similarly, the crossing of rail lines results in minimal impacts although coordination with railway operators would be necessary during construction of the railway crossings.

Generalized notification zones for public and military airports and heliports are determined per FAA regulations (Code of Federal Regulations, Title 14, Part 77 Subpart B). The generalized zones are designed to identify potential flight obstructions and are based on the projected height of structures and the airport runway length. Impacts from structures located within a notification zone can be mitigated by lighting or marking the structure or by situating the new structure adjacent to an existing obstruction (such as an existing transmission line). Similar generalized notification zone buffers were considered around verified private airfields to avoid negatively impacting their operations even though these regulation do not apply to private airfields.

Alternative Route Comparison

West Segment

All of the Alternative Routes in the West Segment cross three state highways and three U.S. highways. State highways crossed by all eight Alternative Routes include U.S. Highway 156, 96, and 4. U.S. highways crossed by all the Alternative Routes include Highway 50, 400, and 183. All Alternative Routes cross the same number of railroads, U.S. and State Highways (see **Table 5-30** below). There are no private or public airfields in proximity to Alternative Routes, based on the notification zone as calculated by the runway length and the average height of structures.

All Alternative Routes cross 5 existing rail lines. No impacts to transportation are expected from any of the Alternative Routes.

Table 5-30. Transportation Infrastructure Crossed by Alternative Routes in the West Segment								
	A	B	C	D	E	F	G	H
Railroad crossings	5	5	5	5	5	5	5	5
Interstate crossings	-	-	-	-	-	-	-	-
U.S. highway crossings	3	3	3	3	3	3	3	3
State highway crossings	3	3	3	3	3	3	3	3

Central Segment

All of the Alternative Routes in the Central Segment cross Interstate I-70 once (see **Table 5-31** below) and Alternative Route I crosses the most U.S. highways (six crossings). These include U.S. Highway 281 (three crossings), 40, 24, and 81. Alternative Route I also crosses the most state highways (five crossings in total), which include highway 18, 181, 128, 14, and 9. Alternative Route J crosses four U.S. highways (U.S. Highways 281, 24, 81, and 40) and four state highways (State Highways 18, 14, 181 and 9). Alternative Route K crosses three U.S. highways (U.S. Highways 281, 24, and 81) and three state highways (State Highways 18, 14, and 9). Overall, Alternative Route K has the fewest highway crossings in the Central Segment.

Table 5-31. Transportation Infrastructure Crossed by Alternative Routes in the Central Segment			
	I	J	K
Public Airfields (notification zones crossed)	1	1	-
Private Airfields (notification zones crossed)	1	1	2
Railroad crossings	5	4	4
Interstate crossings	1	1	1
U.S. highway crossings	6	4	3
State highway crossings	7	4	3

All three Alternative Routes are within the notification zone for private airfields. Alternative Routes I and J are within the 7,500 foot estimated FAA notification zone of Russell Municipal Airport; however the Alternative Routes parallel an existing transmission line. The alignment of the runway is in a slight northwest/southeast orientation, whereas both the existing transmission line and the Alternative Routes are along a north/south alignment and on the western side of the 7,500 foot notification zone around the airport. Therefore, impacts to

aviation in and out of the Russell Municipal Airport are expected to be the same as those that currently exist.

North of Waconda Lake in Mitchell County, there is a private airfield north of the existing transmission line. Alternative Route I is within the 7,500 foot estimated FAA notification zone. The existing transmission line is between Alternative Route I and the airfield, therefore, additional impacts to the operation of the airfield are expected to be minimal.

East Segment

None of the Alternative Routes in the East Segment cross an Interstate Highway. **Table 5-32** below lists the U.S. highways and state highways crossed by each Alternative Route and the number of times that highway is crossed is in parentheses.

Table 5-32. Transportation Infrastructure Crossed by Alternative Routes in the East Segment				
	L	M	N	O
Public Airfields (notification zones crossed)	2	2	-	-
Private Airfields (notification zones crossed)	1	1	2	2
Railroad crossings	3	3	3	3
Interstate crossings	-	-	-	-
U.S. highway crossings	5	3	7	5
State highway crossings	8	9	6	7

Alternative Route M crosses the fewest number of U.S. highways but a greater number of state highways. Alternative Routes N and O cross U.S. highway 77 three separate times. Additional crossings of a roadway could lead to longer or more frequent interruptions to traffic along U.S. highway 77 and greater impacts to travelers on the roadway. Since Alternative Route M crosses the fewest number of U.S. highways and avoids a triple crossing of a major roadway, it is expected to have the least impacts on road transportation.

All Alternative Routes are near private airfields, and Alternative Routes L and M are within the general FAA notification zone for Washington Municipal Airport and Seneca Municipal Airport. There is an existing transmission line approximately one-third mile due south of the Washington Municipal Airport’s north/south runway alignment. The Alternative Routes L and M deviate from paralleling the existing transmission line in this area to provide greater distance from the airport and are 1.5 miles due south of the runway. The Seneca Municipal Airport consists of a 2,400 foot long turf airstrip oriented slightly northeast to southwest. Alternative Routes L and M parallel the south side of an existing 115 kV transmission line, which is 1,100 feet south of the end of the runway.

Alternative Routes N and O are within the 7,500 foot FAA notification zone for the Flying H Airfield which provides agricultural services. The Alternative Routes are approximately 5,500 feet from the end of the runway, which is an unimproved runway surface. Due to the distance of the Alternative Routes to the end of the runway, impacts to the operation of the airfield are not anticipated. Several residences are located between the runway and the Alternative Routes.

Alternative Routes M and O are within the 15,000 foot estimated FAA notification zone for the private Booze Island Airport. The Alternative Routes are located on the opposite side of the Missouri River from the airport by approximately 7,500 feet. Any impacts from the Alternative Routes on the operation of Booze Island Airport would be assessed as part of the FAA Part 77 notification.

5.3.2 Other Existing Infrastructure

Oil and Gas Wells

Oil and gas development is generally confined to the West and Central Segments (see **Figure 5-11** below), with smaller areas of oil and gas development are in the East Segment. Major oil and gas pipelines (greater than 12" in diameter) are found throughout all segments of the Project. When possible, transmission lines and oil/gas wells should be separated by a minimum distance of 150 feet to provide adequate clearance between the conductor and the well. This distance would allow the operator of the well to perform maintenance activities, which could include large equipment.

Wind Development

Several large wind farms exist in the West and Central Segments and are crossed by Alternative Routes (see **Figure 5-11** below). The presence of wind farms is expected considering the location of the Western Converter Station was chosen because of the wind potential in that area.

The Spearville I and II Wind Energy Facilities, consisting of 185 turbines, are located in Ford County around the city of Spearville. The Post Rock and Smoky Hills Wind Farms are located along the border of Ellsworth and Lincoln counties and consist of 287 turbines. In Cloud County, the Meridian Way Wind Farm consists of 67 turbines south of the city of Concordia.

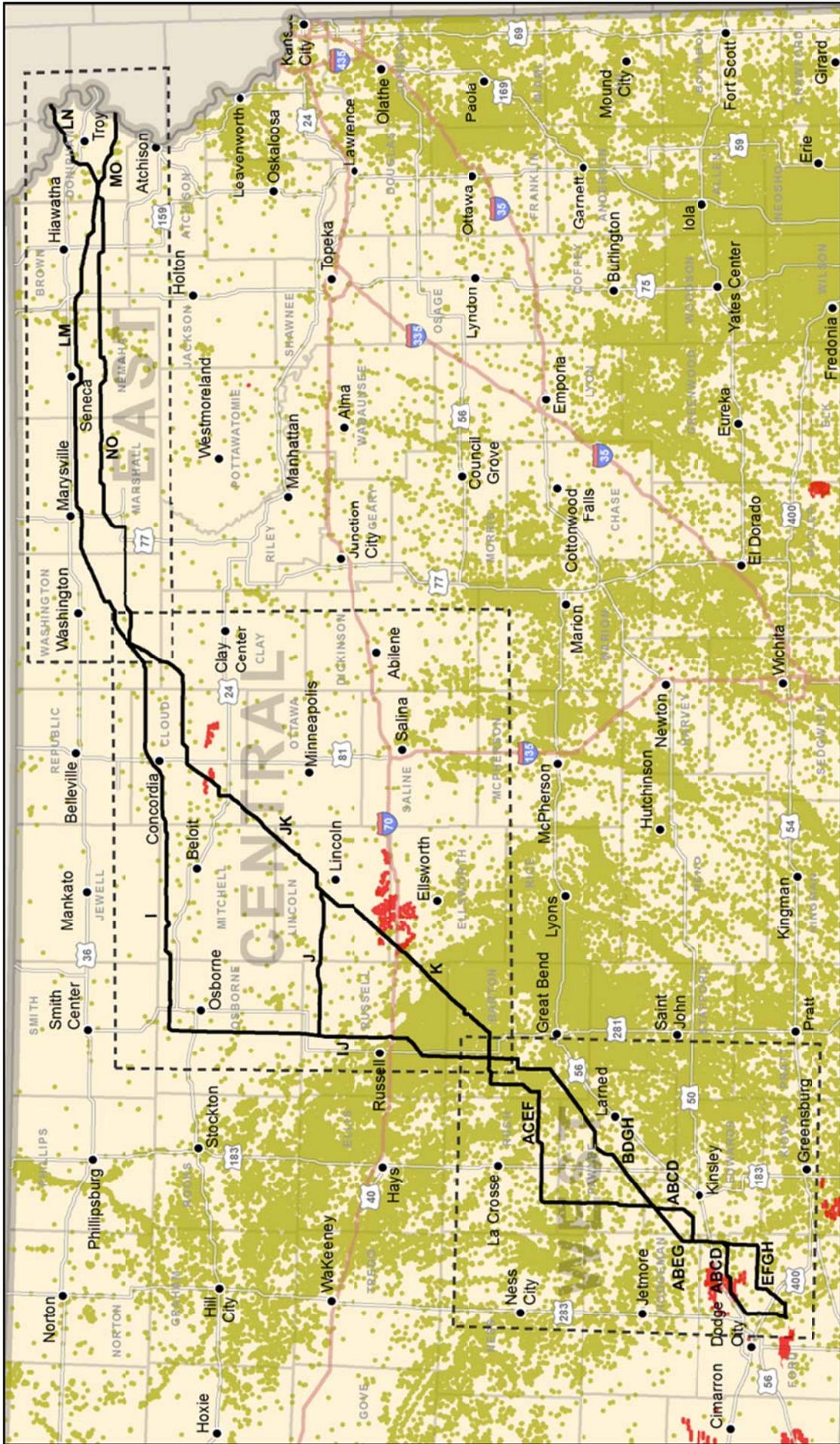


Figure 5-11
Mineral and Wind Development
in the Study Area

GRAIN BELT EXPRESS
CLEAN LINE

Sources: ESRI, Federal Aviation Administration, KS Geological Survey

Coordinate System: North America Equidistant Conic
Projection: Equidistant Conic
Datum: North American 1983

0 10 20 30 Miles

- Alternative Routes
- City
- Wind Turbine
- Interstate
- U.S. Highway
- Oil or Gas Well

N

Although transmission lines are necessary for wind development, consideration must be taken to ensure that proper clearances are maintained from the wind turbines and the transmission line conductors. Spearville and Spearville II Wind Energy Facilities have numerous turbines and existing transmission lines (two 230 kV transmission lines) throughout the area. It may be difficult to place a new transmission line and still maintain appropriate clearances in this area. In addition, during construction the presence of wind turbines may make construction efforts more complex, and wind turbines in close proximity to the construction area may need to be shut down for a period of time.

Cellular and Radio Towers

Cellular and radio towers exist throughout the Study Area. Although these structures have a relatively small base, many have guy wires that extend 150 feet or more from the base of the structure. In order to avoid interference with the maintenance and operation of these features, transmission lines typically avoid crossing over or under guy wires.

Alternatives Comparison

West Segment

All of the Alternative Routes in the West Segment have either 3 or 4 oil/gas wells within 150 feet of the centerline (see **Table 5-33** below).

Alternative Routes A, B, C, and D are within the Spearville and Spearville II Wind Projects. Alternative Routes B, D, G, and H are within the proposed Pioneer Revolution Wind Project, and Alternative Routes A, C, E, and F are within the proposed Rush County Wind Project. Exact turbine locations for the Pioneer Revolution Wind Project and the Rush County Wind Project would be dependent on later design phases of the project.

There is one cellular tower within 500 feet of Alternative Routes C, D, F, and H. No impacts to the operations or maintenance of the cellular tower would be expected because the base of the guy wires is more than 200 feet from the centerline of the Alternative Routes.

Table 5-33. Oil/Gas Wells, Wind Turbines, Cell/Radio Towers								
	A	B	C	D	E	F	G	H
Oil/gas wells (within 150 feet)	3	4	3	4	3	3	4	4
Wind turbines (within 500 feet)	3	3	4	4	-	-	-	-
Cell/radio towers (within 500 feet)	-	-	1	1	-	1	-	1

Central Segment

In the Central Segment, oil and gas development is heavily focused in the southern third of the segment area. All three routes pass through large well fields in northern Barton and southern

Russell counties. Alternative K has two fewer wells within 150 feet than Alternatives I and J (see **Table 5-34** below).

Alternatives J and K pass within 500 feet of one wind turbine in the Meridian Way Wind Farm in southern Cloud County. Additionally, Alternative K passes within 500 feet of a wind turbine in the Post Rock Wind Project in southern Lincoln County.

Table 5-34. Oil/Gas Wells, Wind Turbines, Cell/Radio Towers in Central Segment			
	I	J	K
Oil/gas wells (within 150 feet)	9	9	7
Wind turbines (within 500 feet)	-	1	2
Cell/radio towers (within 500 feet)	-	-	-

East Segment

There are no oil or gas wells within 150 feet of the Alternative Routes in the East Segment. Similarly, there are no existing wind turbines, cell towers, or radio towers within 500 feet of the Alternative Routes in the East Segment.

5.3.3 Existing Utility Corridors

All Alternative Routes parallel existing transmission lines or gas pipeline corridors for some percentage of their length. Paralleling existing infrastructure is generally considered an acceptable practice for siting new transmission lines. However, there are a few construction and engineering considerations to take into account when paralleling existing infrastructure. Existing infrastructure paralleled throughout the Study Area includes:

- Arthur Mullergren Tap 230 kV transmission line
- ITC Great Plains KETA 345 kV transmission line
- Ironwood- Clark County 345 kV transmission line
- Judson Large – Spearville 230 kV transmission line
- South Hays – Arthur Mullergren 230 kV transmission line
- Glen Elder – Smith Center 115 kV transmission line
- Concordia – Glen Elder 115 kV transmission line
- Concordia – Jeffrey Energy Center 230 kV transmission line
- Midwest Energy 69 kV transmission line
- Arthur Mullergren - Waldo 115kV transmission line
- Smith Center 115 kV transmission line
- Westar Concordia – Clifton 115 kV transmission line
- Westar Clifton – Knob Hill 115 kV transmission line
- Westar Knob Hill – Seneca 115 kV transmission line
- Natural Gas Pipeline Company of America (NGPL)
- Keystone Gas Pipeline
- Rockies Express Gas Pipeline
- Spearville- Post Rock 345 kV

General Mitigation Measures

During construction, outages may be required when working in close proximity to other transmission lines. Outages are often difficult to schedule due to peak use seasons (summer and winter) when utilities are unable to take lines out of service and could result in a longer construction time. In addition, there are areas where existing transmission lines would be crossed. The proposed line would be constructed over the top of existing transmission lines and would require taller structures to provide for adequate clearance between the conductors.

Existing pipelines are similar to existing transmission lines in terms of ROWs. The utilities can abut ROWs, but not overlap. Subsurface surveying may be required to determine the exact location of the pipelines prior to construction. Steel plating or matting may also be required when crossing over the top of pipelines to protect them from large construction vehicles.

Alternative Comparison

West Segment

The number of transmission and gas pipeline crossings for the West Segment Alternatives is shown below in **Table 5-35**. All Alternatives cross the same number of 230 kV and 345 kV transmission lines and have approximately the same number of total transmission line crossings. Alternative Routes G and H cross over more gas pipelines than other Alternative Routes and cross a large gas pipeline corridor, containing 3 pipelines, twice. The gas pipeline corridor would likely be able to be crossed by a single span at both of these crossing locations.

Transmission Lines Crossed	A	B	C	D	E	F	G	H
115kV/138kV/161kV	4	5	4	5	4	4	5	5
230kV	2	2	2	2	2	2	2	2
345kV	1	1	1	1	1	1	1	1
Gas pipeline corridors	3	4	3	4	5	5	6	6
Gas pipelines (>12 inches, approximate count)	3	6	3	6	9	9	12	12
Total Crossings	10	12	10	12	12	12	14	14

Central Segment

The number of transmission and gas pipeline crossings for the Central Segment Alternatives is shown below in **Table 5-36**. Alternative Route I has the greatest number of total transmission line crossings but fewer crossings of 230 kV or higher voltage transmission lines. While engineering challenges still exist when crossing any transmission line, crossing lower voltage lines is typically less of a challenge and would require shorter structures. Alternative Route J

and K have fewer transmission line crossings overall, however they have three crossings of a higher voltage transmission line (230 kV), which could result in taller structures and more complicated engineering. Overall, engineering challenges associated with any Alternative Routes would be comparable, given the tradeoffs in crossing lower and higher voltage transmission lines.

Table 5-36. Transmission and Gas Pipeline Crossings for Alternative Routes in the Central Segment			
Transmission Lines Crossed	I	J	K
115kV/138kV/161kV	7	2	2
230kV	1	3	3
345kV	-	-	-
Gas pipeline corridors	2	2	4
Gas pipelines (>12 inches, approximate count)	4	4	10
Total Crossings	10	7	9

East Segment

None of the Alternative Routes in the East Segment cross 230 kV or higher voltage transmission lines (see **Table 5-37** below). Alternative Routes L and M have the most total transmission line crossings. All of the Alternative Routes cross a significant gas pipeline corridor containing 6 pipelines that parallel each other in a braided fashion, with the offsets from one another changing with topography. As a result, the total corridor width varies at the locations that the Alternative Routes would cross, from approximately 1,400 feet to over 2,500 feet. Placing a structure within this pipeline corridor may present engineering challenges during construction of the Project and subsequent maintenance of the transmission line or gas lines.

Table 5-37. Transmission and Gas Pipeline Crossings for Alternative Routes in the East Segment				
Transmission Lines Crossed	L	M	N	O
115kV/138kV/161kV	5	5	2	2
230kV	-	-	-	-
345kV	-	-	-	-
Gas pipeline corridors	3	2	3	2
Gas pipelines (>12 inches, approximate count)	11	8	11	8
Total Crossings	8	7	5	4

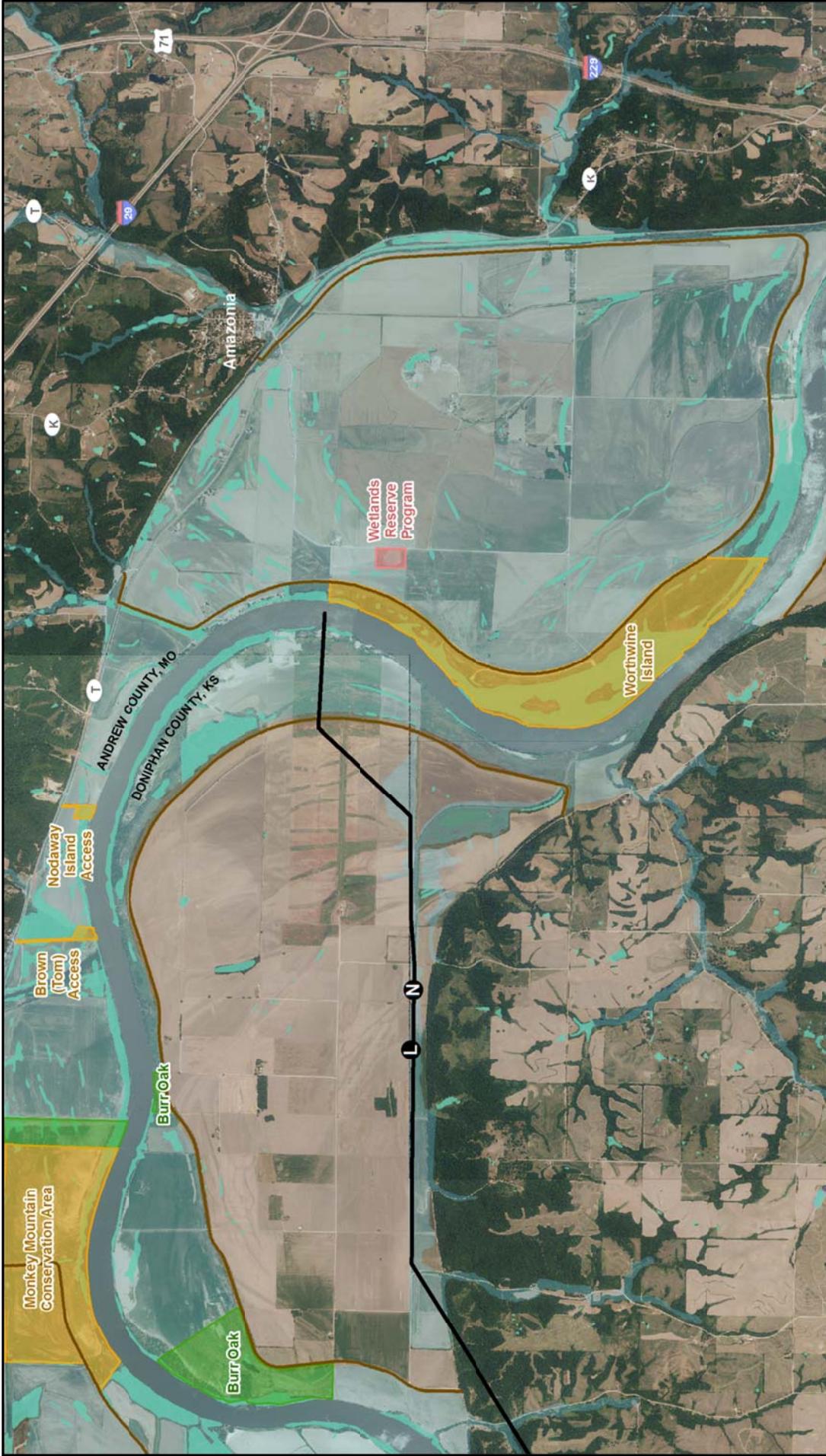
5.3.4 Missouri River Crossing Locations

The Missouri River is bordered by a large number of culturally sensitive sites and communities, ecologically important habitat, high value scenic and recreation areas, topologically variable terrain, and developed residential and urban areas. In addition, the width of the river and floodplain, presence of a significant levee system, and location of adjacent bluffs along some areas of the river present engineering challenges for the actual crossings itself. Two potential Missouri River crossing locations were identified for the alternate routes on the Kansas-Missouri state border which minimized impacts on these resources along the river and satisfy project engineering requirements.

Northern Crossing

The Alternative Routes enter the floodplain approximately 4.5 miles west of the river and continue east through agricultural land. The Missouri River crossing is near mile marker 460, just north of the Worthwine Island Conservation Area (Missouri Department of Conservation), and approximately 8 miles north of St. Joseph, Missouri (see **Figure 5-12** below). The span of the river from the water's edge at this location is less than 1,000 feet across. Land adjacent to the river on both sides is flat with marginal relief. Numerous private boat ramps and housing structures are located on the Missouri side of the river north of the river crossing.

The northern crossing of the Missouri River (Alternative Routes L and N) is not adjacent to any existing infrastructure and is close to several high use recreation areas on the Missouri side of the Missouri River. The crossing location is 1.5 miles west of the village of Amazonia.



Alternative Routes

- Alternative Routes
- Levee
- - - Pipeline
- Wetland

100-Year Flood Zone

500-Year Flood Zone

Conservation Land

Local/Private

State

Federal Land

Figure 5-12

Northern Missouri River Crossing

GRAIN BELT EXPRESS
CLEAN LINE

Sources: ESRI, FAA, FEMA, USACE, USFWS
MO Dept of Conservation, KDWP

Coordinate System: State Plane Kansas North (feet)
Projection: Lambert Conformal Conic
Datum: North American 1983

Southern Crossing

The Alternative Routes approach the river heading due east through a mix of agricultural and forested lands. They enter the floodplain approximately 0.5 mile from the edge of the river and cross near mile marker 437 (see **Figure 5-13** below). Three natural gas lines share a corridor across the river at this location north of the Alternative Route crossing. The span of the river from the water's edge is nearly 1,000 feet across. The Jentell Brees Access boat launch (Missouri Department of Conservation) is 500 feet north of the crossing on the Missouri side. Distance between levees on either side of the river is approximately 3,000 feet. Land adjacent to the river is relatively flat, but quickly increases in topography on either side of the river.

The southern crossing of the Missouri River (Alternative Routes M and O) is adjacent to an existing gas pipeline. Coordination with the USFWS and USACE indicated that a preferred crossing of the Missouri River would be along existing linear infrastructure, as opposed to crossing at a new, undisturbed location. Further, the possible use of existing access roads from construction of the gas pipeline helps to alleviate engineering or potential constructability issues.

The Routing Team determined that the southern option was the preferred location to cross the Missouri River. The southern crossing is located in close proximity to an existing utility crossing, has a shorter length within the floodplain, and has no residences within approximately 0.75 mile. In contrast, the northern crossing has a cluster of residences and boat launches just to its north, the Worthwine Island Conservation Area adjacent to the ROW, and, is located in close proximity to the village of Amazonia and the bluffs approaching the river.

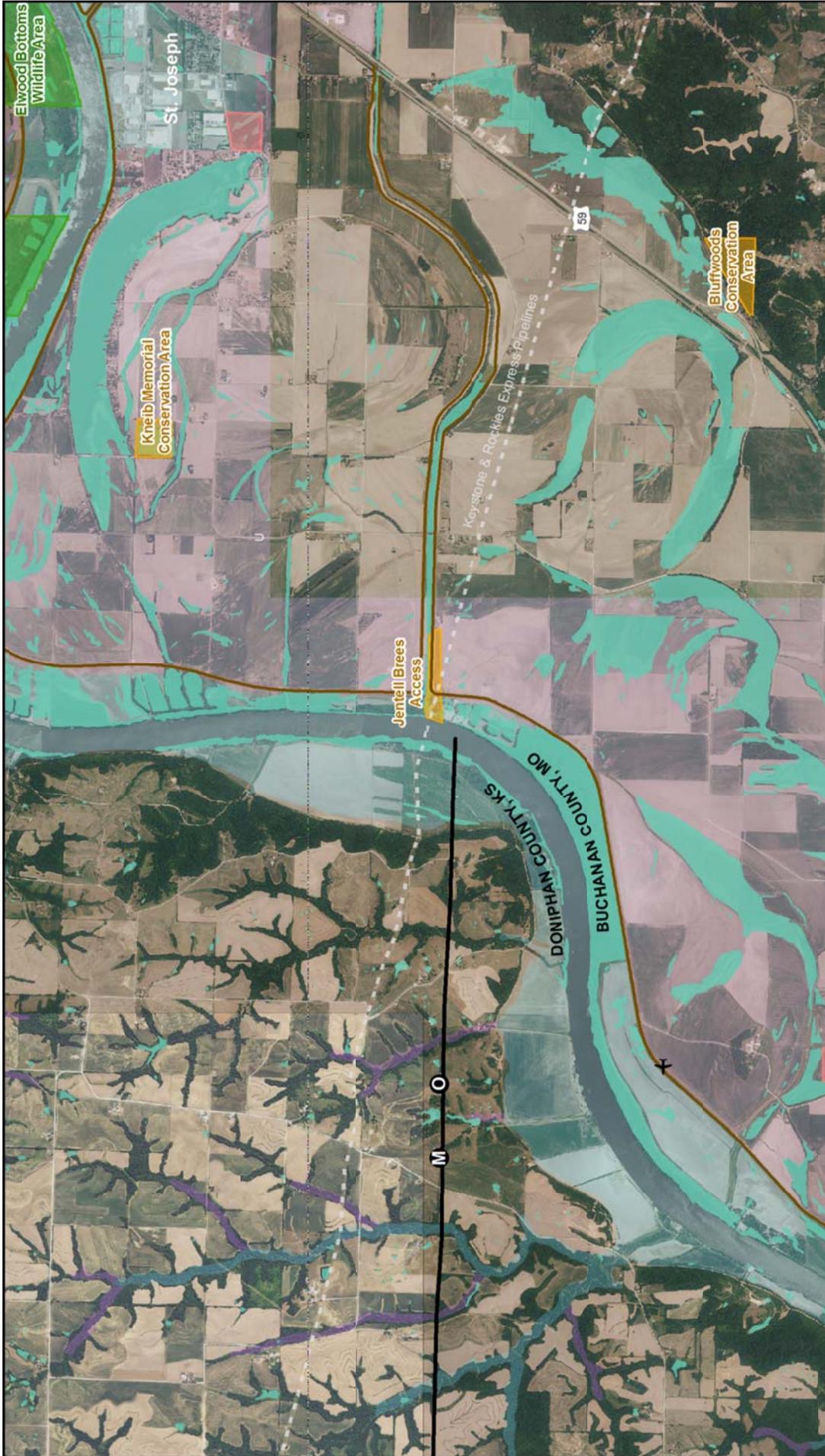


Figure 5-13
Southern Missouri River Crossing

GRAIN BELT EXPRESS
CLEAN LINE

Legend:

- Alternative Routes
- Levee
- Pipeline
- Wetland
- 100-Year Flood Zone
- 500-Year Flood Zone
- Conservation Land
- Local/Private
- State
- Federal Land

Sources: ESRI, FAA, FEMA, USACE, USFWS, MO Dept of Conservation, KDWPT

Coordinate System: State Plane Kansas North (feet)
Projection: Lambert Conformal Conic
Datum: North American 1983

Scale: 0 0.5 1 Miles

Inset Map: Shows the location of the study area within Missouri, highlighting Buchanan County and its neighbors: Holt, Andrew, Brown, Douglas, Atchison, and Buchanan.

6. Identification of the Proposed Route

6.1 Rationale for the Selection of the Proposed Route

As stated in the introductory chapters, the goal in selecting a suitable route for the Project is to minimize impacts on the natural, cultural, and human environment while avoiding circuitous routes, extreme costs, and non-standard design requirements. However, in practice, it is not usually possible to optimally minimize all potential impacts at all times. There are often inherent tradeoffs in potential impacts to every routing decision. For example, in heavily forested Study Areas, the route that avoids the most developed areas will likely have the greatest amount of forest clearing, while the route that has the least impact on vegetation and wildlife habitats often impacts more residences or farm lands. Thus, an underlying goal inherent to a routing study is to reach a reasonable balance between minimizing potential impacts on one resource versus increasing the potential impacts on another. The following section presents the rationale for selection of the Proposed Route and thus, the route that the Routing Team considered to best minimize the impacts of the Project overall. The rationale presented is derived from the accumulation of the routing decisions made throughout the process, the knowledge and experience of the Routing Team, comments from the public and regulatory agencies, and the comparative analysis of potential impacts presented in Chapter 5.

6.2 Summary of Alternative Route Comparison

6.2.1 West Segment

Alternative Route A

Advantages

- Fewest number of residences within 500 feet (same as B)
- Fewest number of transmission and gas pipeline crossings (10, same as C)

Disadvantages

- Crosses a high amount of high probability lek (19.9 miles crossed)
- Crosses one rare species buffer (Cave Myotis)
- Crosses the greatest amount of lesser prairie-chicken limiting habitat (10.8 miles)
- Longest distance of triple transmission line parallel (14.8 miles)
- High number of Historic Trail crossings (4 crossings; same as B, C, and D)
- Crosses a lesser prairie-chicken focal area (same as C, E, and F)
- One archaeological resource within the ROW (same as B, C, and D)
- Crosses lesser prairie-chicken focal area

Alternative Route B

Advantages

- Shortest Alternative Route (94.9 miles)
- Fewest number of residences within 500 feet (same as A)
- Crosses the fewest number of parcels (288)
- Parallels the highest percentage of transmission lines (68 percent of total length)
- Second lowest mileage of high probability lek habitat crossed (11.7 miles)
- No historic sites within 0.5 mile (same as D, G, and H)
- Second fewest miles crossing pasture/grassland not parallel to an existing transmission line ROW (4.7 miles)

Disadvantages

- Longest distance of triple transmission line parallel (14.8 miles; same as A)
- One archaeological resource within the ROW (same as A, C, and D)
- Potentially impacts three pivot irrigation systems (same as D, G, and H)

Alternative Route C

Advantages

- Crosses the second fewest riparian and forested areas (13 and 16.5 acres, respectively)
- Crosses the least amount of lesser prairie-chicken Connectivity Zones (1.4 acres)
- Crosses the least amount of agricultural land (71.7 miles)
- Crosses the highest amount of pasture/grassland areas (35.4 miles)
- Fewest number of transmission and gas pipeline crossings (10, same as A)

Disadvantages

- Greatest number of stream crossings (120)
- Second longest Alternative Route (108.5 miles)
- High number of NHT crossings (4 crossings; same as A, B, and D)
- Crosses one rare species buffer (Cave Myotis)
- Crosses the most high-probability lek habitat (22.2 miles)
- Crosses lesser prairie-chicken focal areas
- Greatest number of wind turbines within 500 feet (same as D)
- One archaeological resource within the ROW (same as A, B, and D)

Alternative Route D

Advantages

- Crosses the least amount of lesser prairie-chicken limiting habitat (2.8 miles, same as H)

- Second highest percentage of transmission line parallel (60 percent of total length)
- No historic sites within 0.5 mile (same as B, G, and H)
- Does not cross the lesser prairie-chicken focal areas
- Crosses the second lowest number of parcels (296)

Disadvantages

- One archaeological resource within the ROW (same as A, B, and C)
- Potentially impacts three pivot irrigation systems
- Highest number of wind turbines within 500 feet (same as C)

Alternative Route E

Advantages

- No archaeological resources within the ROW (same as F, G, and H)
- No wind turbines within 500 feet
- Lowest number of NHT crossings (same as F, G, and H)

Disadvantages

- One of the longest routes (107.2 miles)
- Crosses one rare species buffer (Cave Myotis)
- Crosses the greatest amount of lesser prairie-chicken limiting habitat (10.8 miles; same as A)
- Crosses the second highest number of parcels (342)
- Crosses lesser prairie-chicken focal area

Alternative Route F

Advantages

- Shortest distance of triple parallel (0.7 mile; same as H)
- Farthest away from high density wind and transmission infrastructure and congestion
- No archaeological resources within the ROW
- No wind turbines within 500 feet
- Crosses second greatest distance of pasture/grassland (34.2 miles)
- Lowest number of NHT crossings (same as F, G, and H)

Disadvantages

- Longest Alternative Route (109.7 miles)
- Crosses one rare species buffer (Cave Myotis)
- Crosses the greatest number of parcels (350)

- Shortest distance of transmission line parallel (20 percent of total length)
- Crosses lesser prairie-chicken focal area
- Greatest amount of pasture/grassland crossed not parallel to an existing transmission line (26.3 miles)

Alternative Route G

Advantages

- Second shortest route (96.1 miles)
- Crosses the fewest miles of high probability lek habitat (10.3 miles)
- No archaeological resources within 1,000 feet (same as H)
- No historic sites within 0.5 mile (same as B, D, and H)
- No wind turbines within 500 feet
- Does not cross any rare species buffers

Disadvantages

- Crosses the greatest amount of agricultural land (77.5 miles)
- Crosses the smallest amount of grassland (17 miles)
- Has the greatest number of ROW crossings (14, same as H)

Alternative Route H

Advantages

- Shortest distance of triple parallel (0.7 mile)
- Does not cross any rare species buffers
- No historic sites (Kansas State Historical Society [KSHS] and NHRP) within 0.5 mile (same as B, D, and G)
- No archaeological resources within 1,000 feet (same as G)
- Crosses the smallest amount of lesser prairie-chicken limiting habitat (2.8 miles)
- Crosses a low amount of high probability lek habitat
- Does not cross a lesser prairie-chicken focal area
- Farthest away from high density wind and transmission infrastructure and congestion
- Lowest number of National Historic Trail crossings (2; same as E, F, and G)
- No wind turbines within 500 feet

Disadvantages

- Crosses the second greatest amount of agricultural land (76.5 miles)
- Crosses the greatest amount of riparian and forested areas (19 and 35 acres, respectively)
- Has the greatest number of ROW crossings (14, same as G)

- Crosses the greatest amount of lesser prairie-chicken Connectivity Zone (5.1 miles, same as B, D, and G)

6.2.2 Central Segment

Alternative Route I

Advantages

- Fewest number of residences within 250 and 500 feet (1 and 9)
- Fewest miles of high probability lek habitat crossed (1 mile, same as Alternative J)
- Smallest amount of pasture/grassland crossed not parallel to an existing transmission line (5.4 miles)
- Lowest number of historic sites within 1 mile (3, compared with 17 on Alternative Route K)
- Highest percentage of transmission line and overall ROW parallel (79 percent, all of which is transmission lines)
- Parallels existing transmission lines through lesser prairie-chicken and grassland habitat, reducing the creation of new habitat impacts and fragmentation
- Crosses lowest number of small parcels (less than 30 acres in size)
- Not likely to impact any pivot irrigation
- Fewer impacts to visual resources since parallel to an existing transmission line
- No wind turbines within 500 feet

Disadvantages

- Longest Alternative Route (153 miles)
- Only Alternative Route to cross karst topography (11.6 miles)
- Greatest number of parcels crossed (431)
- One of two Alternative Routes to cross a flood conservation easement (3.3 miles)
- Greatest number of ROW crossings
- Greatest number of US Highway (6) and State Highway crossings (7)
- Crosses the most agricultural land (98 miles)

Alternative Route J

Advantages

- Fewest miles of high-probability lek habitat crossed (1 mile, same as Alternative I)
- Crosses the smallest amount of agricultural land (59.1 miles)
- Does not cross karst topography

Disadvantages

- Greatest number of wetlands within the ROW (22.5 acres)
- One of two Alternative Routes to cross a flood conservation easement (3.3 miles)
- Greater impacts on sensitive species and natural grasslands
- Greatest amount of riparian area within the ROW (106.5 acres)
- Potentially impacts one pivot irrigation system

Alternative Route K

Advantages

- Shortest Alternative Route (126.1 miles)
- Does not cross karst topography
- Fewest number of parcels crossed (395)
- Crosses the smallest amount of steep slopes (0.1 mile)
- Fewest number of stream crossings (170)
- Smallest amount of wetlands within the ROW (15.5 acres)

Disadvantages

- Greatest number of miles of high probability lek habitat crossed (1.9 miles)
- Greatest number of Historic sites within 1 mile (17)
- Lowest percentage of transmission line parallel (10 percent)
- Longest length within FAA notification zone for private airfields (4.1 miles)
- Greater agricultural use and visual impacts due to creation of a new vertical disturbance in a previously undisturbed area
- Greater impacts on sensitive species and natural grasslands
- Potentially impacts 1 pivot irrigation system
- Highest amount of pasture/grassland crossed not parallel to an existing transmission line (52.9 miles)
- Most wind turbines within 500 feet

6.2.3 East Segment

Alternative Route L

Advantages

- Does not cross any karst topography
- Low number of historical resources within 0.5 mile and 1 mile (2 total, same as N)
- Second greatest amount of ROW parallel (47 percent)
- Small amount of pasture/grassland crossed not parallel to an existing transmission line (12.7 miles)
- Reduced potential visual, recreational, and historic impacts due use of parallel alignments adjacent to existing transmission

Disadvantages

- Greatest number of NHT crossings, but the same as Alternative Route L (5)
- Crosses great amount of steep slopes (2.9 miles)
- Greatest number of ROW crossings (8)

Alternative Route M

Advantages

- Shortest Alternative Route (117.4 miles)
- Crosses the least amount of steep slopes (0.9 mile)
- No archaeological resources within the ROW
- Fewest number of parcels crossed (419)
- Greatest amount of transmission line and ROW parallel (50 percent total)
- Reduced potential visual, recreational, and historic impacts due use of parallel alignments adjacent to existing transmission
- Least amount of pasture/grassland crossed not parallel to an existing transmission line (7.4 miles, comparable to Alternative L)
- Crosses the Missouri River adjacent to an existing gas pipeline corridor

Disadvantages

- Crosses 3 FAA estimated notification zones (public and private)
- Greatest number of NHT crossings, and the same as Alternative Route L (5)
- Greatest number of historic sites within 0.5 mile and 1 mile

Alternative Route N

Advantages

- Does not cross any estimated public airfield notification zones
- Fewest number of Historic Sites within 0.5 mile and 1 mile (2 total, same as L)
- Fewest NHT crossings (3, same as O)

Disadvantages

- Lowest percentage of transmission line and ROW parallel (1 percent)
- Crosses karst topography (5.3 miles)
- Crosses the greatest number of miles of steep slopes (3.2 miles)
- Crosses the highest number of parcels (498)
- Highest number of archaeological resources within the ROW (3)

Alternative Route O

Advantages

- Second shortest Alternative Route (118.2 miles)
- Crosses the second fewest number of miles of steep slopes (1.1 miles)
- Does not cross any public airfield notification zones
- Lowest number of ROW crossings (4)
- Crosses the Missouri River adjacent to an existing gas pipeline corridor
- Fewest NHT crossings (same as N)

Disadvantages

- Low percentage of transmission line and ROW parallel (2 percent)
- Second greatest number of parcels crossed (470)
- Visual impacts near the community of Blue Rapids
- Greatest number of historic sites within 0.5 and 1 mile (same as M)

6.2.4 Combined Proposed Alternative Route

The Routing Team recommends a combination of Alternative Routes H, I, and M as the Proposed Route for the Project (see **Figure 6-1** below). This combination of Alternative Routes meets the overall goal of minimizing impacts on the natural, human, and historic resources, while best utilizing existing transmission ROW parallels and avoiding non-standard design requirements. The Proposed Route has a total length of 369 miles and parallels existing transmission lines and other linear ROWs for 59 percent of its total length.

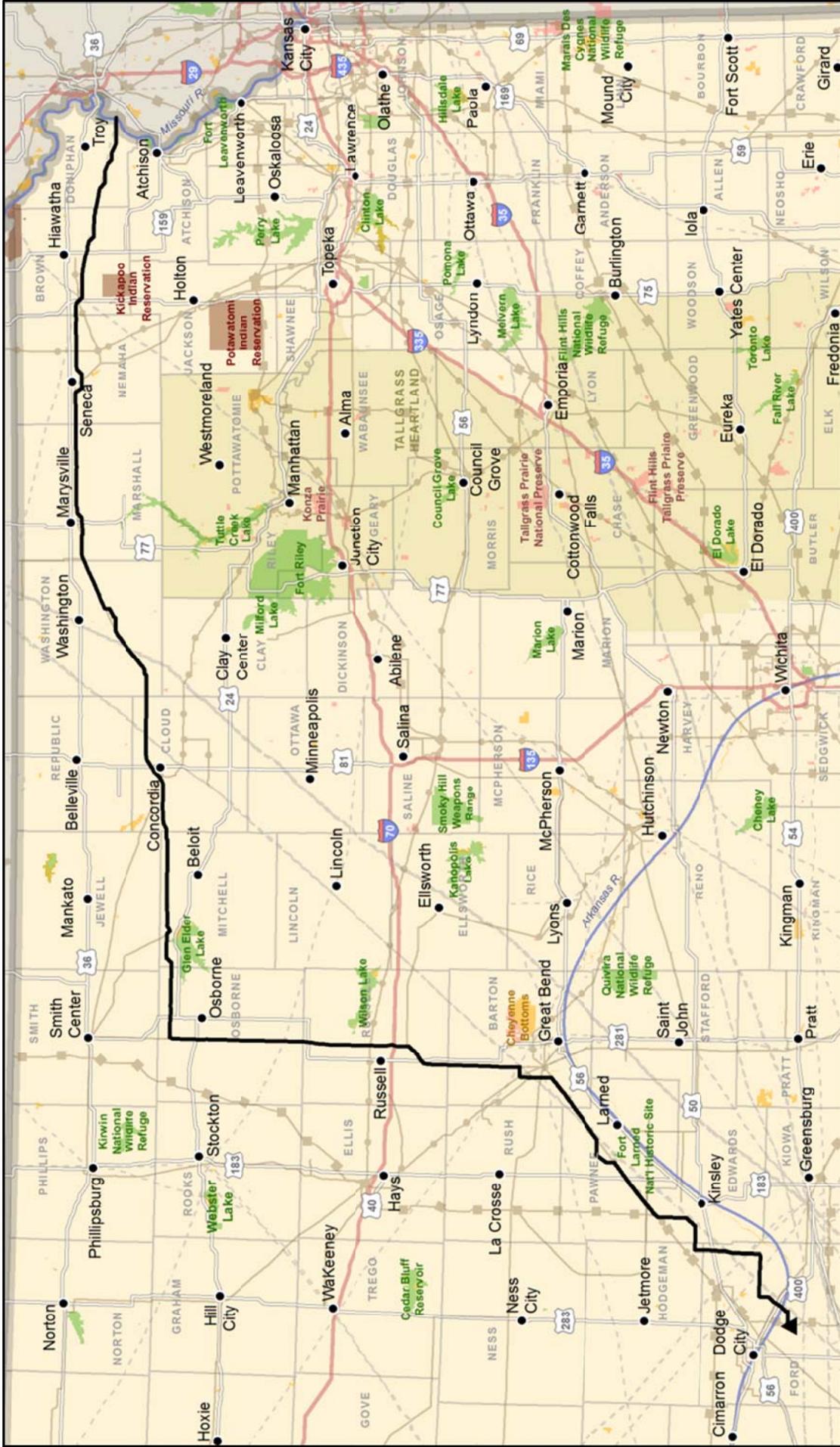
Alternative Route H was selected in the West Segment and included a combination of section/parcel based alignments and alignments adjacent to existing transmission lines. Near the western converter station, routing challenges associated with the close juxtaposition of extensive wind farm development, supporting transmission and substation facilities, and oil and gas development limited the suitability of parallel alignments in this area. In addition, the Routing Team also considered public comments, which suggested that the limited benefits of paralleling two existing transmission lines in the heavily farmed lands near Spearville did not outweigh the potential impacts on farming operations caused by construction of a third transmission line diagonally across parcel boundaries (see Section 5.2.1, *Agricultural Use*, for further discussion). Instead, Alternative Route H avoids the physical congestion near Spearville and largely follows section/parcel boundaries until it meets up with the Arthur Mullergren Tap 230 kV line, approximately 35 miles northeast of the western converter station. Beyond this point, Alternative Route H follows a largely parallel alignment toward Great Bend with only one diversion to avoid additional visual impacts to Fort Larned National Historic Site and several houses immediately adjacent to the existing line.

Alternative Route I was selected in the Central Segment. Alternative Route I parallels existing transmission line ROW for the majority of its length (79 percent). While Alternative I was longer than other options, it parallels existing transmission line through sensitive grassland habitat, avoids more residences, maximizes the distance from several towns and culturally sensitive areas, maximizes the distance from major whooping crane stopover habitat and designated critical habitat, and minimizes diagonal crossings of farmland. The Routing Team chose Alternative I because it minimizes impacts to habitat, sensitive species, developed areas, and agricultural land in large part by paralleling existing transmission lines.

Alternative Route M was selected in the East Segment. It is the shortest Alternative Route that also maximizes parallel alignments of both transmission lines and gas lines. Alternative Route M directly parallels existing ROWs (mostly transmission lines) for over half of its total length, reducing the overall impact of the line on visual, recreational, and historic resources, and crosses the Missouri River at a point where an existing utility corridor crosses the river.

Together, Grain Belt Express contends that Alternative Routes H, I, and M comprise a Proposed Route for the Project that meets the KCC standard of reasonableness by: 1)

following a route selection process that integrates input from regulatory agencies, local officials, and the general public into the route development, analysis, and selection process, and 2) selecting a Proposed Route that best minimizes the overall effect of the Grain Belt Express transmission line on the natural and human environment while avoiding unreasonable and circuitous routes, unreasonable costs, and special design requirements.



Sources: ESRI, NPS, USGS, USACE, USFWS, USDA-NRCS, KOWPT, KS DASC, KS Biological Survey, The Nature Conservancy

0 10 20 30 Miles

Coordinate System: North America Equidistant Conic Projection: Equidistant Conic Datum: North American 1963

Figure 6-1
Proposed Route

GRAIN BELT EXPRESS
CLEAN LINE

- City
- ▲ Converter Station
- Proposed Route
- Interstate Highway
- U.S. Highway
- Gas Pipeline
- Existing Transmission
- Local/Private
- State
- Tribal
- Federal
- Conservation Land
- < 138 kV
- 138 kV - 230 kV
- > 230 kV

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APPENDIX A: ROUTING TEAM

ROUTING TEAM

Member	Affiliation	Title	Specific Role
Mike Skelly	CLE	President	Project oversight
Jason Thomas	CLE	Environmental Director	Environmental oversight
Wayne Galli	CLE	Executive Vice President – Transmission and technical services	Engineering support and oversight
Mark Lawlor	CLE	Director of Development	Siting support, public outreach, agency consultation
Diana Rivera	CLE	Project Development Manager	Siting support and public outreach
Adhar Johnson	CLE	Manager	Siting support Public outreach and relations
Ally Smith	CLE	Associate	Siting support Public outreach
John Kuba	CLE	Associate – Environmental Specialist	Siting support, agency consultation, environmental and sensitive species
Daniel Hodges Copple	CLE	Associate	Public outreach support
Alex Landon	CLE	Associate	Public outreach support
Claire Richard	CLE	Associate	Public outreach support
Louisa Kinoshi	CLE	Associate, Communications	Public outreach support and graphics
Ty White	CLE	Associate	GIS support
Timothy Gaul	LBG	Associate Vice President, Energy Services	Project Manager, siting support, agency consultation, public outreach
Laurie Spears	LBG	Environmental Planner	Deputy Project Manger, siting support, agency consultation, public outreach
James Puckett	LBG	GIS Specialist	Siting support, GIS Analysis and Mapping
Todd McCabe	LBG	Environmental Scientist	Siting support, public outreach, agency consultation, GIS support, sensitive species
Emily Larson	LBG	Environmental Scientist	Siting support, Public outreach, Visual and Recreational Resources,
Brad Fine	LBG	Environmental Planner	Public outreach support and logistics
Linda Green	LBG	GIS Specialist	GIS Analysis and Mapping

ROUTING TEAM

Member	Affiliation	Title	Specific Role
Chris Flannagan	LBG	Environmental Scientist	Soils and Geology
Camilla Deiber	LBG	Cultural Resource Specialist	Architectural resources
Chris Schoen	LBG	Cultural Resource Specialist	Archaeological resources
Laura Totten	LBG	Environmental Scientist	Wildlife and habitat and sensitive species
Mike Snyder	LBG	Environmental Scientist	Water resources
Neeli Landon	LBG	Communications Specialist	Public outreach
Korey Smith	LBG	Communications Specialist	Public outreach
Phil Robertson	POWER Engineers	Engineer	Siting support and engineering
Kelsey Rockey	Parris Communications	Communications Specialist	Public outreach
Kelly Cooper	Parris Communications	Communications Specialist	Public outreach

APPENDIX B: DATA SOURCES

Category	Definition	Units	Data Source
Aerial Photography			
National Agricultural Imagery	Kansas NAIP 2008/2012		The National Agricultural Imagery Program (NAIP) obtains aerial imagery during agricultural growing seasons. The most current imagery for the state of Kansas when the project began was taken in 2008. Imagery flown in 2012 was used once it became available. Imagery is collected at the spatial resolution of one square meter and with the spectral resolution as natural color.
Natural Resources			
Hydrology			
Streams	National Hydrography Dataset flowlines	Number of streams crossed	A statewide subset of the National Hydrography Dataset (NHD) model version 2 was downloaded from the United States Geological Survey (USGS). Feature classes used for calculations included canal/ditch, stream/river (intermittent and perennial), and artificial path. A member of the routing team verified each stream/river crossing point using 2012 NAIP imagery.
Water bodies	National Hydrography Dataset waterbodies	Length of water body crossed by potential route	A statewide subset of the National Hydrography Dataset (NHD) model version 2 was downloaded from the United States Geological Survey (USGS).
Wetlands	National Wetlands Inventory	Length of wetlands crossed by potential route	National Wetland Inventory (NWI) data was downloaded in tiles from the U.S. Fish and Wildlife Service's (USFWS) wetland mapper tool. A statewide layer for Kansas was unavailable in digital format so areas covered by scanned map data, the Routing Team modified converted raster polygons to establish a complete wetland layer.
Playa Wetlands/Playa Lakes		Length of playa wetland crossed	Playa Lakes Joint Venture (PLJV) combined national soils, wetlands, hydrography, and imagery datasets, along with localized data provided by conservation organizations to identify probable playa lakes and establish a restoration priority level for each lake.
Floodplains	100 and 500-year floodplains		The Federal Emergency Management Agency (FEMA) provides a digital version of their National Flood Hazard Layer on DVDs. Floodplain data for the study area was requested on November 14, 2011. Where possible, unmapped flood areas near the potential Missouri River crossings were digitized from georeferenced FIRMettes.
Flood Conservation Easement	Flood Control Easement		A map of USACE flood easements was provided by the USACE Kansas City District for Wilson Lake and Tuttle Creek.
Protected and Public Lands			
Public and Conservation Lands	Local, private, state, and federally owned lands	Length of public/conservation land crossed	This data layer represents features from a wide variety of sources, including the U.S. Geological Survey's Protected Areas Database (PADUS v1.2); U.S. Army Corps of Engineers; National Resource Conservation Service; U.S. Fish and Wildlife Service; U.S. Forest Service; The Nature Conservancy; National Conservation Easement Database; Illinois Department of Natural Resources; Illinois Parks and Recreation; Illinois Nature

Category	Definition	Units	Data Source
			Preserve Commission; Illinois State Geological Survey; Missouri Department of Natural Resources; Missouri Department of Conservation; Indiana Department of Natural Resources; Kansas Department of Wildlife, Parks, and Tourism; Kansas Data Access and Support Center; Kansas Parks and Recreation Association; and many counties and municipalities. Where possible, the boundaries of these protected areas have been edited to match parcel boundaries provided by the counties in the study area.
Sensitive Species and Habitat			
Rare Species		Count within 1 mile	The location of endangered, threatened, or rare plants and animals is maintained in a database by the Kansas Natural Heritage Inventory. Polygon data showing a one mile radius around the location was provided.
Natural Communities		Count crossed by the route	Kansas Natural Heritage Inventory maintains a database of high-quality native vegetation, such as tallgrass prairie, oak-hickory forests, and wetlands. The data was displayed at the resolution of the PLSS section.
PLSS Landscape Summary of Lesser Prairie Chicken Range Probability		Miles within 0-20%, 20-50%, and greater than 50% classes	The Kansas Biological Survey produced a grid based on the PLSS system of the highest predicted probability of a lesser prairie chicken lek occurring within that section. This prediction was derived from analysis of observed occurrences of lesser prairie chickens, presence of conservation areas or managed areas, landcover type, and presence of oil and gas infrastructure (2008).
LPC Focal Areas and Connectivity Zones		Length crossed in miles	Kansas Applied Remote Sensing (KARS) hosts the Southern Great Plains Crucial Habitat Assessment Tool, which models Lesser Prairie Chicken (LPC) habitat in order to provide information to conservations, planners, and the public. Project contributors include parks and wildlife departments from Colorado, Kansas, New Mexico, Oklahoma, and Texas; Playa Lakes Joint Venture; Western Governors' Association; and the U.S. Geological Survey. Habitat and connectivity zones shown in this report come from a revised final draft provided on March 25, 2013.
LPC Critical Habitat Index		Miles within each classification	The Western Governors Association Southern Great Plains Crucial Habitat Assessment Tool (SGPCHAT) is a multistate collaboration designed to model crucial habitat of the lesser prairie chicken. The Crucial Habitat Index classified the landscape into five categories ranging from Irreplaceable to Common.
Soils and Land Use			
Soils – Prime Farmland and Soils of Statewide Importance		Acres within 200' right-of-way	The Natural Resources Conservation Service of the United States Department of Agriculture maintains national soil survey data. This data includes information on soils of statewide importance and prime farmland.
Karst		Miles crossed	Data depicting regions of karst topography were acquired from the USGS (via the National Atlas Map).
Land Cover			The National Land Cover Database 2006 (NLCD 2006) compiled by the Multi-

Category	Definition	Units	Data Source
			Resolution Land Characteristics (MRLC) Consortium (including the U.S. Geological Survey, Environmental Protection Agency, U.S. Forest Service, National Oceanographic and Atmospheric Association, National Aeronautics and Space Administration, Bureau of Land Management, National Park Service, Natural Resource Conservation Service, and the U.S. Fish and Wildlife Service). NLCD 2006 products include 16 classes of land cover from Landsat satellite imagery.
Steep Slopes	Slopes > 20%	Feet crossed	Slopes (in percent) were derived from a digital elevation model (DEM) consisting of terrain elevations for ground positions at regularly spaced horizontal intervals (30 meters). The data used for this analysis was derived from the National Elevation Dataset (NED) prepared by the USGS.
Human Environment			
Residences	Residences within 250, 500, and 1000'	Counts	Residences were digitized using high resolution aerial image interpretation as well as field reconnaissance. Aerial imagery provided by the National Agricultural Imagery Program (2008/2012).
Schools, Churches, Cemeteries	Features within 1000 feet of route	Counts	The locations of churches, schools, and cemeteries were derived from the United States Geological Survey's Geographic Names Information System (GNIS) and augmented through high resolution aerial photo interpretation, field reconnaissance and public outreach efforts. The GNIS database serves as the Federal Government's repository of information regarding feature name spellings and applications for features in United States and its Territories. The names listed in the inventory are often published on Federal maps, charts, and in other documents and have been used in emergency preparedness planning, site-selection and analysis, genealogical and historical research, and transportation routing. Through field reconnaissance the Routing Team recorded local schools, churches, and cemeteries to augment and verify this data layer.
Parcels	Tax parcel boundaries	Number of parcels crossed	The routing team contacted counties in the study area (Ford, Hodgeman, Edwards, Pawnee, Barton, Rush, Ellsworth, Russell, Lincoln, Ottawa, Osborne, Mitchell, Cloud, Clay, Washington, Marshall, Nemaha, Brown, and Doniphan) and purchased parcel data during October and November 2012. Each county provided digital GIS or CAD parcel boundary data and associated ownership information.
Household Density		Miles crossed	Household density was derived at the census block level from census population data obtained from the US Census Bureau (2010).
Pivot Irrigation Systems	Pivots impacted	Counts	Pivot irrigation systems were digitized using high resolution aerial image interpretation. Members of the public were also encouraged to provide information about existing or planned pivot irrigation systems on their land, and this data aided in digitizing and verifying pivot locations. A pivot is considered potentially impacted when a potential route crosses more than 1,500 feet of irrigated area in a single span.
Energy Infrastructure			

Category	Definition	Units	Data Source
Transmission Lines		Length parallel to existing transmission lines. Count of existing transmission lines crossed.	The Kansas Corporation Commission maintains a database of existing transmission lines within the state. The information was augmented through aerial photo interpretation and field review.
Oil and Gas Pipelines		Length parallel to existing gas line corridors.	Major natural gas and oil pipeline information was obtained through the EV Energy Map of North America. Spatial accuracy of the data was augmented through field review of pipeline line corridors.
Oil and Gas Wells		Counts	The Kansas Geological Survey maintains a list of oils and gas well information submitted to the Kansas Corporation Commission. The Kansas Data Assess and Support Center converts this list into geographic data and makes it available to download.
Transportation			
Major Roads	Interstates, U.S. Highways, State Highways	Number of each road type crossed	Major roads data was prepared by the Environmental Systems Research Institute (ESRI), (2012) Redlands, California, USA.
Airport and Heliport Notification Zones	Airport points and FAA Notification Zone	Length of route within FAA Notification Zone	The location of airports and heliports was gathered from FAA databases, aerial photograph interpretation, field reconnaissance, public input, and navigational charts. An approximation of the air navigation obstruction zone was developed based on the Code of Federal Regulations (CFR) Title 14 Part 77, (Aeronautics and Space, Objects affecting navigable airspace). This approximation was calculated based on aerial interpretation of runway length, the average height of the proposed transmission towers, and approach zone formulas for airports and heliports in the CFR. Note, this is a rough approximation performed based on aerial photo interpretation without the inclusion of topographic effects or precise knowledge of runway length.
Recreation			
Recreation Trails and Facilities			The Kansas Recreation & Park Association provided a database of local, state, and federal recreation facilities and recreational trails in Kansas.
Walk-in Hunting Areas			The Kansas Department of Wildlife, Parks, and Tourism works with landowners to allow public hunting access on private lands. To facilitate use of these Walk-in Hunting Access areas, KDWPT maps the enrolled properties and provides an atlas of WIHA areas to the public. Data used in this report are current as of Fall 2012.
Scenic Byways		Crossings	Scenic and historic byway information in Kansas was collected primarily from KDWPT's "Kansas Byways" website. Each byway route was mapped in Google Maps and was downloaded as a GIS-compatible file. Information and driving directions from the National Scenic Byways Program augmented the Kansas byways data and enabled

Category	Definition	Units	Data Source
			mapping of scenic and historic byways in Missouri, Illinois, and Indiana.
Historic Resources			
Historic Trails		Crossings	The National Park Service provided a web service showing the California, Oregon, Pony Express, and Santa Fe National Historic Trails.
Historic and Archaeological Sites		Sites within ¼ mile, ½ mile, and 1 mile	The Kansas Historical Society provided spatial and tabular data of historic architectural sites.

APPENDIX C: FEDERAL AND STATE AGENCY COORDINATION

February 10, 2011

Mike LeValley
Kansas Field Office
U.S. Fish and Wildlife Service
2609 Anderson Ave.
Manhattan, KS 66502

Re: Clean Line Energy Partners' Proposed Grain Belt Clean Line Transmission Project

Dear Mr. LeValley:

Clean Line Energy Partners LLC (Clean Line) is seeking your input on our proposed project to develop, construct and operate the Grain Belt Express Clean Line transmission project ("project"). Clean Line is a privately-owned company focused on developing high voltage direct current (HVDC) transmission lines that would connect the best renewable energy resource regions to communities and cities that have limited access to renewable energy. The proposed project will be capable of moving up to 3,500 megawatts (MW) of renewable energy from the wind-rich region of southwestern Kansas to southeastern Missouri and markets farther east.

Clean Line has retained The Louis Berger Group, Inc. (Berger) to conduct a siting study for the proposed project. In accordance with the Endangered Species Act of 1973 (16 U.S.C. 1531-1544 as amended) we would like to request your comments on the project's potential to have adverse effects on federally threatened or endangered species. The development and environmental permitting process for this project will be a multi-year process, and we are still in a relatively early phase. This coordination will be the first of many opportunities for agencies to participate in the review of this project because Clean Line will need to obtain federal, state, and local permits from the appropriate agencies. A member of our project team will be contacting you in the next few weeks to schedule a follow-up meeting for a more interactive discussion of the project, to present the status of our studies, and to solicit your input on the siting process and corridor alternatives. Construction is anticipated to take approximately two years. Under the current schedule, Clean Line is proposing the project to be in service by the end of 2016.

The Grain Belt Express Clean Line, as currently proposed, will begin near the Spearville substation in Ford County, Kansas and end in southeastern Missouri near the St. Francois substation in St. Francois County, Missouri.

Proposed project facilities include a converter station and possibly ground beds at each terminus, two sets of bundled wire conductors per HVDC circuit, shield wire, and conductor support structures. Clean Line is proposing steel structures ranging in height from 120 to 150 feet that are spaced approximately 800 to 1,200 feet apart. The design and dimensions may vary based on terrain and other engineering considerations.



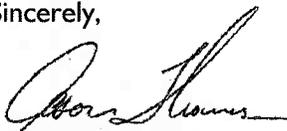
Please reply with your comments in writing and/or by email at your earliest convenience to:

Stephen Parker, Project Manager
The Louis Berger Group, Inc.
4050 Pennsylvania Avenue, Suite 121
Kansas City, MO 64111
sparker@louisberger.com

Although the route for the project has not been identified, the attached Overview Maps shows the entire project siting study area. We have also included a list of counties within the study area boundary. Upon request, the Louis Berger team can provide you with the electronic GIS boundary for the study area. Any additional comments or concerns you have that would assist us in siting the project would be greatly appreciated.

Thank you in advance for your assistance and please do not hesitate to contact Mr. Parker or me if you need additional information.

Sincerely,



Jason Thomas
Director, Environment
Clean Line Energy Partners
cell 713-805-6840
tel 832-319-6357
jthomas@cleanlineenergy.com



Stephen Parker
Senior Scientist
The Louis Berger Group, Inc.
cell 816-674-1110
tel 816-398-8658
sparker@louisberger.com

Attachments:

- I. Project Overview Maps
- II. List of Counties within the Study Area

Cc: Mark Lawlor, Clean Line Energy Partners
Diana Coggin, Clean Line Energy Partners

Kansas Counties within Study Area

Allen	Doniphan	Kiowa	Pawnee
Anderson	Douglas	Labette	Pottawatomie
Atchison	Edwards	Leavenworth	Pratt
Barber	Elk	Lincoln	Reno
Barton	Ellis	Linn	Rice
Bourbon	Ellsworth	Lyon	Riley
Brown	Finney	Marion	Rush
Butler	Ford	Marshall	Russell
Chase	Franklin	McPherson	Saline
Chautauqua	Geary	Meade	Sedgwick
Cherokee	Gray	Miami	Shawnee
Clark	Greenwood	Mitchell	Stafford
Clay	Harper	Montgomery	Sumner
Cloud	Harvey	Morris	Wabaunsee
Coffey	Hodgeman	Nemaha	Washington
Comanche	Jackson	Neosho	Wilson
Cowley	Jefferson	Ness	Woodson
Crawford	Johnson	Osage	Wyandotte
Dickinson	Kingman	Ottawa	



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Kansas Ecological Services Field Office
2609 Anderson Avenue
Manhattan, Kansas 66502-2801

March 2, 2011

Jason Thomas
Director, Environment
Clean Line Energy Partners
1001 McKinney, Suite 700
Houston, TX 77002

RE: Grain Belt Clean Line Transmission Project, Kansas

64411-2011-CPA-0256

Dear Mr. Thomas:

This is in response to your letter of February 10, 2011, requesting Fish and Wildlife Service review and comment on proposed installation of the Grain Belt Express Clean Line transmission project. The project proposes to construct a high voltage direct current transmission line from Spearville in southwest Kansas to St. Francois in southeast Missouri, and you have requested fish and wildlife resource information for the Kansas portion of the line. My staff has reviewed this proposal and offer the following comments for your consideration. Please also coordinate with our Missouri Field Office located in Columbia to receive their comments as well.

Because this project is in the very preliminary stages of design, no preferred route has been selected. The study area you provided for our consideration includes portions of 75 counties in Kansas. I am enclosing information you may use to determine the potential for occurrence of federally-listed threatened, endangered, proposed and candidate species in each county, along with general habitat information. Once alternative alignment routes are identified, more precise species lists may be generated for assessment.

In general, construction and operational activities should avoid wetlands, streams, and riparian woodlands to the maximum extent possible. All powerline construction rights-of-way should be surveyed for the presence of marshes and other wetland habitat types. If impacts to these areas are unavoidable, a permit may be required from the U.S. Army Corps of Engineers. If a permit is required, the Service will be given the opportunity to review the application and provide additional comments. All disturbed riparian areas should be revegetated with native plants as soon as possible after the disturbance occurs. Species composition following revegetation should parallel that which existed prior to the disturbance.

Intact native grassland occurs in several of the counties under consideration, and is an important yet declining resource in the state as well as nationally. Some species of nesting birds are known to be at least somewhat intolerant of vertical structures placed in or near their nesting habitat.

For this reason, I encourage siting to target already disturbed land, including crop land, as much as possible when selecting route alternatives.

Powerlines have been documented as constituting a significant collision hazard to a number of bird species, including waterfowl and some endangered species. For example, the line will completely bisect the known migratory corridor for the endangered whooping crane. Project proponents should provide for enhanced visibility on any overhead line segment within one mile of a stream or wetland. Marking of selected lines during construction should prove both easier and less expensive than application of remedial measures at a later date if it becomes necessary.

Electrical distribution lines also have been shown to pose the threat of electrocution to large birds of prey which use the poles, crossarms, and wires as perching sites. I recommend the incorporation of guidelines found in the Avian Power Line Interaction Committee's publication, "Suggested Practices for Raptor Protection on Power Lines; the State of the Art in 2006". These guidelines, which are available at www.aplic.org/, should be applied on all above-ground line segments to help ensure that the proposed facilities will have little significant effect on resident and migrant raptors, such as hawks, eagles, and owls. Utilization of these guidelines is a matter of company discretion, but be advised the failure to use them could result in the company being held liable for any raptor electrocutions which occur on these lines.

Under the Migratory Bird Treaty Act, construction activities that could result in the taking of migratory birds, eggs, young, and/or active nests should be avoided. Bird nests may be encountered in prairies, wetlands, stream and woodland habitats, as well as on bridges and other structures. While the provisions of MBTA are applicable year-round, most migratory bird nesting activity in Kansas occurs April 1 to July 15. Keep in mind that some migratory birds are known to nest outside these dates, so a field assessment may be necessary. If any phase of the project appears likely to impact habitat which could be used by nesting birds, I recommend a survey to determine the presence of active nests. Our office should be contacted immediately for further guidance if a survey identifies the existence of one or more active bird nests that you believe cannot be avoided temporally or spatially by the planned activities.

Invasive species have been identified as a major factor in the decline of native flora and fauna and impact aquatic resources. Information on aquatic invasive species in Kansas can be found on KDWP's website http://www.kdep.state.ks.us/news/fishing/aquatic_nuisance_species. I recommend the following proactive measures to prevent the inadvertent spread of exotic and invasive species:

All equipment brought on site will be thoroughly washed to remove dirt, seeds, and plant parts. Any equipment that has been in any body of water within the past 30 days will be thoroughly cleaned with hot water greater than 140° F (typically the temperature found at commercial car washes) and dried for a minimum of five days before being used at this project site. In addition, before transporting equipment from the project site all visible mud, plants and fish and animal parts will be removed, all water will be eliminated, and the equipment will be thoroughly cleaned. Anything that came in contact with water will be cleaned and dried following this procedure.

The recommendations provided in this letter are to assist you in minimizing adverse impacts resulting from this project. As project plans are refined and modified, please provide this office with the changes for further review. Thank you for this opportunity to provide comments.

Sincerely,

A handwritten signature in black ink that reads "Daniel W. Mulhern / Acting". The signature is written in a cursive style.

Michael J. LeValley
Field Supervisor

enclosures

cc: FWS/ES, Columbia, MO (Field Supervisor)
KDWP, Pratt, KS (Environmental Services)



United States Department of the Interior

FISH AND WILDLIFE SERVICE
 Kansas Ecological Services Office
 2609 Anderson Avenue
 Manhattan, Kansas 66503-6172
 Phone 785-539-3474



ENDANGERED, THREATENED, PROPOSED AND CANDIDATE SPECIES KANSAS COUNTIES

January 2010

T - Threatened
 E - Endangered
 C - Candidate

Species	Scientific Name	Status
ALLEN		
Mead's Milkweed	<i>Asclepias meadii</i>	T
Neosho Madtom	<i>Noturus placidus</i>	T
Neosho Mucket	<i>Lampsilis rafinesqueana</i>	C
Rabbitsfoot	<i>Quadrula cylindrical</i>	C
ANDERSON		
Mead's Milkweed	<i>Asclepias meadii</i>	T
ATCHISON		
Pallid Sturgeon	<i>Scaphirhynchus albus</i>	E
BARBER		
Arkansas Darter	<i>Etheostoma cragini</i>	C
Lesser Prairie-Chicken	<i>Tympanuchus pallidicinctus</i>	C
Whooping Crane	<i>Grus americana</i>	E
BARTON		
Arkansas Darter	<i>Etheostoma cragini</i>	C
Interior Least Tern	<i>Sterna antillarum athalassos</i>	E
Piping Plover	<i>Charadrius melodus</i>	T
Whooping Crane	<i>Grus americana</i>	E
BOURBON		
Mead's Milkweed	<i>Asclepias meadii</i>	T

BROWN		
No federally-listed or candidate species		
BUTLER		
Topeka Shiner	Notropis topeka	E
CHASE		
Neosho Madtom	Noturus placidus	T
Topeka Shiner	Notropis topeka	E
Rabbitsfoot	Quadrula cylindrica	C
CHAUTAUQUA		
American Burying Beetle	Nicrophorus americanus	E
CHEROKEE		
Arkansas Darter	Etheostoma cragini	C
Neosho Madtom	Noturus placidus	T
Neosho Mucket	Lampsilis rafinesqueana	C
Rabbitsfoot	Quadrula cylindrica	C
CHEYENNE		
No federally-listed or candidate species		
CLARK		
Arkansas Darter	Etheostoma cragini	C
Arkansas River Shiner	Notropis girardi	T
Interior Least Tern	Sterna antillarum	E
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C
Piping Plover	Charadrius melodus	T
Whooping Crane	Grus americana	E
CLAY		
No federally-listed or candidate species		
CLOUD		
Whooping Crane	Grus Americana	E

COFFEY		
Mead's Milkweed	<i>Asclepias meadii</i>	T
Neosho Madtom	<i>Noturus placidus</i>	T
Neosho Mucket	<i>Lampsilis rafinesqueana</i>	C
Rabbitsfoot	<i>Quadrula cylindrica</i>	C
COMANCHE		
Arkansas Darter	<i>Etheostoma cragini</i>	C
Arkansas River Shiner	<i>Notropis girardi</i>	T
Lesser Prairie-Chicken	<i>Tympanuchus pallidicinctus</i>	C
Whooping Crane	<i>Grus americana</i>	E
COWLEY		
Arkansas Darter	<i>Etheostoma cragini</i>	C
Interior Least Tern	<i>Sterna antillarum</i>	E
Rabbitsfoot	<i>Quadrula cylindrica</i>	C
CRAWFORD		
Gray Bat	<i>Myotis grisescens</i>	E
Mead's Milkweed	<i>Asclepias meadii</i>	T
DECATUR		
Whooping Crane	<i>Grus americana</i>	E
DICKINSON		
Topeka Shiner	<i>Notropis topeka</i>	E
DONIPHAN		
Pallid Sturgeon	<i>Scaphirhynchus albus</i>	E
DOUGLAS		
Mead's Milkweed	<i>Asclepias meadii</i>	T
Pallid Sturgeon	<i>Scaphirhynchus albus</i>	E
Western Prairie Fringed Orchid	<i>Platanthera praeclara</i>	T
EDWARDS		
Whooping Crane	<i>Grus americana</i>	E
Lesser Prairie-Chicken	<i>Tympanuchus pallidicinctus</i>	C
ELK		
American Burying Beetle	<i>Nicrophorus americanus</i>	E

ELLIS		
Whooping Crane	Grus americana	E
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C
ELLSWORTH		
Whooping Crane	Grus americana	E
FINNEY		
Whooping Crane	Grus americana	E
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C
FORD		
Whooping Crane	Grus americana	E
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C
FRANKLIN		
Mead's Milkweed	Asclepias meadii	T
GEARY		
Topeka Shiner	Notropis topeka	E
GOVE		
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C
Whooping Crane	Grus americana	E
GRAHAM		
Whooping Crane	Grus americana	E
GRANT		
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C
GRAY		
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C
Whooping Crane	Grus Americana	E
GREELEY		
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C
GREENWOOD		
Neosho Mucket	Lampsilis rafinesqueana	C
Topeka Shiner	Notropis topeka	E
Rabbitsfoot	Quadrula cylindrica	C

HAMILTON		
Lesser Prairie-Chicken	<i>Tympanuchus pallidicinctus</i>	C
HARPER		
Arkansas Darter	<i>Etheostoma cragini</i>	C
Whooping Crane	<i>Grus americana</i>	E
HARVEY		
Whooping Crane	<i>Grus americana</i>	E
HASKELL		
Lesser Prairie-Chicken	<i>Tympanuchus pallidicinctus</i>	C
Whooping Crane	<i>Grus americana</i>	E
HODGEMAN		
Whooping Crane	<i>Grus americana</i>	E
Lesser Prairie-Chicken	<i>Tympanuchus pallidicinctus</i>	C
JACKSON		
No federally-listed or candidate species		
JEFFERSON		
Mead's Milkweed	<i>Asclepias meadii</i>	T
Western Prairie Fringed Orchid	<i>Platanthera praeclara</i>	T
JEWELL		
Whooping Crane	<i>Grus americana</i>	E
JOHNSON		
Mead's Milkweed	<i>Asclepias meadii</i>	T
Pallid Sturgeon	<i>Scaphirhynchus albus</i>	E
KEARNY		
Lesser Prairie-Chicken	<i>Tympanuchus pallidicinctus</i>	C
KINGMAN		
Arkansas Darter	<i>Etheostoma cragini</i>	C
Whooping Crane	<i>Grus americana</i>	E
KIOWA		
Arkansas Darter	<i>Etheostoma cragini</i>	C
Lesser Prairie-Chicken	<i>Tympanuchus pallidicinctus</i>	C
Whooping Crane	<i>Grus americana</i>	E

LABETTE		
American Burying Beetle	Nicrophorus americanus	E
Neosho Madtom	Noturus placidus	T
LANE		
Whooping Crane	Grus americana	E
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C
LEAVENWORTH		
Pallid Sturgeon	Scaphirhynchus albus	E
Western Prairie Fringed Orchid	Platanthera praeclara	T
LINCOLN		
Whooping Crane	Grus americana	E
LINN		
Mead's Milkweed	Asclepias meadii	T
Spectaclecase Mussel	Cumberlandia monodonta	C
LOGAN		
Black-footed Ferret	Mustela nigripes	E
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C
LYON		
Neosho Madtom	Noturus placidus	T
Topeka Shiner	Notropis topeka	E
Rabbitsfoot	Quadrula cylindrica	C
MARION		
Neosho Madtom	Noturus placidus	T
Topeka Shiner	Notropis topeka	E
MARSHALL		
Topeka Shiner	Notropis topeka	E
MCPHERSON		
Whooping Crane	Grus americana	E
MEADE		
Arkansas Darter	Etheostoma cragini	C
Arkansas River Shiner	Notropis girardi	T
Interior Least Tern	Sterna antillarum	E

Lesser Prairie-Chicken	<i>Tympanuchus pallidicinctus</i>	C
Whooping Crane	<i>Grus americana</i>	E
MIAMI		
Mead's Milkweed	<i>Asclepias meadii</i>	T
MITCHELL		
Whooping Crane	<i>Grus americana</i>	E
MONTGOMERY		
American Burying Beetle	<i>Nicrophorus americanus</i>	E
Neosho Mucket	<i>Lampsilis rafinesqueana</i>	C
Rabbitsfoot	<i>Quadrula cylindrica</i>	C
MORRIS		
Neosho Madtom	<i>Noturus placidus</i>	T
Topeka Shiner	<i>Notropis topeka</i>	E
MORTON		
Arkansas River Shiner	<i>Notropis girardi</i>	T
Interior Least Tern	<i>Sterna antillarum</i>	E
Lesser Prairie-Chicken	<i>Tympanuchus pallidicinctus</i>	C
NEMAHA		
No federally-listed or candidate species		
NEOSHO		
Mead's Milkweed	<i>Asclepias meadii</i>	T
Neosho Madtom	<i>Noturus placidus</i>	T
Neosho Mucket	<i>Lampsilis rafinesqueana</i>	C
Rabbitsfoot	<i>Quadrula cylindrica</i>	C
NESS		
Whooping Crane	<i>Grus americana</i>	E
Arkansas Darter	<i>Etheostoma cragini</i>	C
Lesser Prairie-Chicken	<i>Tympanuchus pallidicinctus</i>	C
NORTON		
Whooping Crane	<i>Grus americana</i>	E
OSAGE		
Western Prairie Fringed Orchid	<i>Platanthera praeclara</i>	T

OSBORNE		
Whooping Crane	Grus americana	E
OTTAWA		
Whooping Crane	Grus americana	E
PAWNEE		
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C
Whooping Crane	Grus Americana	E
PHILLIPS		
Whooping Crane	Grus americana	E
Interior Least Tern	Sterna antillarum	E
POTTAWATOMIE		
Interior Least Tern	Sterna antillarum	E
Piping Plover	Charadrius melodus	T
Topeka Shiner	Notropis Topeka	E
PRATT		
Arkansas Darter	Etheostoma cragini	C
Whooping Crane	Grus americana	E
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C
RAWLINS		
Whooping Crane	Grus americana	E
RENO		
Arkansas Darter	Etheostoma cragini	C
Interior Least Tern	Sterna antillarum	E
Whooping Crane	Grus Americana	E
REPUBLIC		
Whooping Crane	Grus americana	E
RICE		
Arkansas Darter	Etheostoma cragini	C
Interior Least Tern	Sterna antillarum	E
Whooping Crane	Grus Americana	E

RILEY		
Interior Least Tern	<i>Sterna antillarum</i>	E
Piping Plover	<i>Charadrius melodus</i>	T
Topeka Shiner	<i>Notropis Topeka</i>	E
ROOKS		
Whooping Crane	<i>Grus Americana</i>	E
RUSH		
Lesser Prairie-Chicken	<i>Tympanuchus pallidicinctus</i>	C
Whooping Crane	<i>Grus Americana</i>	E
RUSSELL		
Whooping Crane	<i>Grus Americana</i>	E
SALINE		
Whooping Crane	<i>Grus americana</i>	E
SCOTT		
Whooping Crane	<i>Grus americana</i>	E
Lesser Prairie-Chicken	<i>Tympanuchus pallidicinctus</i>	C
SEDGWICK		
Interior Least Tern	<i>Sterna antillarum</i>	E
Whooping Crane	<i>Grus Americana</i>	E
SEWARD		
Arkansas River Shiner	<i>Notropis girardi</i>	T
Arkansas Darter	<i>Etheostoma cragini</i>	C
Interior Least Tern	<i>Sterna antillarum</i>	E
Lesser Prairie-Chicken	<i>Tympanuchus pallidicinctus</i>	C
Whooping Crane	<i>Grus Americana</i>	E
SHAWNEE		
Interior Least Tern	<i>Sterna antillarum</i>	E
Topeka Shiner	<i>Notropis Topeka</i>	E
SHERIDAN		
Whooping Crane	<i>Grus Americana</i>	E
SHERMAN		
Lesser Prairie-Chicken	<i>Tympanuchus pallidicinctus</i>	C

SMITH		
Whooping Crane	Grus Americana	E
STAFFORD		
Arkansas Darter	Etheostoma cragini	C
Interior Least Tern	Sterna antillarum	E
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C
Whooping Crane	Grus Americana	E
STANTON		
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C
STEVENS		
Interior Least Tern	Sterna antillarum	E
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C
SUMNER		
Interior Least Tern	Sterna antillarum	E
Whooping Crane	Grus Americana	E
THOMAS		
No federally-listed or candidate species		
TREGO		
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C
Whooping Crane	Grus Americana	E
WABAUNSEE		
Interior Least Tern	Sterna antillarum	E
Piping Plover	Charadrius melodus	T
Topeka Shiner	Notropis Topeka	E
WALLACE		
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C
Topeka Shiner	Notropis Topeka	E
WASHINGTON		
No federally-listed or candidate species		
WICHITA		
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	C

WILSON		
American Burying Beetle	Nicrophorus americanus	E
Neosho Mucket	Lampsilis rafinesqueana	C
Rabbitsfoot	Quadrula cylindrica	C
WOODSON		
Neosho Madtom	Noturus placidus	T
Rabbitsfoot	Quadrula cylindrica	C
WYANDOTTE		
Pallid Sturgeon	Scaphirhynchus albus	E

FEDERALLY LISTED AND PROPOSED
THREATENED AND ENDANGERED SPECIES IN KANSAS

(Updated January 2011)

Species Known to Occur in Kansas:

Piping plover (*Charadrius melodus*) is a seasonal spring and fall migrant through portions of Kansas, along the Cimarron, Ninnescah, Arkansas, Kansas, and Missouri Rivers, with nesting on the Kansas River in Pottawatomie and Wabaunsee counties. Plovers are associated with unvegetated shorelines, sandbars, and mudflats, utilizing aquatic invertebrates for food. **Threatened**

Least tern (*Sterna antillarum*) utilizes similar unvegetated shoreline habitat as do piping plovers, in the same geographic regions of Kansas, feeding primarily on small fish. It occurs as a spring and fall migrant through the State, and nests along the Cimarron River in Meade and Clark counties, the Kansas River in Pottawatomie, Wabaunsee, and Shawnee counties, at Jeffrey Energy Center in Pottawatomie County, and at Quivira National Wildlife Refuge in Stafford County. **Endangered**

Whooping crane (*Grus americana*) is a regular migrant through numerous central and western Kansas counties, generally occurring during March-April and October-November. Preferred habitat sites include wetlands and playas, open fields, and grasslands in areas of low relief with short vegetation which affords the birds an open view of the surrounding terrain. Federally-designated critical habitat includes Cheyenne Bottoms Wildlife Area in Barton County, and Quivira National Wildlife Refuge in Reno, Rice and Stafford counties. **Endangered**

Gray bat (*Myotis grisescens*) occupies a limited geographic range in limestone cave regions of the southeastern United States. The Kansas population occurs as a maternity colony from April through October in the storm sewers beneath Pittsburg, in Crawford County. They forage nocturnally for insects along wooded water bodies, particularly the various Cow Creek tributaries. **Endangered**

Black-footed ferret (*Mustela nigripes*) is almost exclusively associated with prairie dogs, dependent on them for cover and food. The last documented ferret evidence in Kansas was 1976, until a Federal reintroduction began in 2007 in southern Logan County. Those reintroduced animals and their progeny are persisting as a small population in that area. **Endangered**

Neosho madtom (*Noturus placidus*) is a small catfish which depends on clean oxygenated gravel bars throughout the mainstem Neosho, Cottonwood, and Spring Rivers in Allen, Chase, Cherokee, Coffey, Labette, Lyon, Morris, Neosho, and Woodson counties. **Threatened**

Pallid sturgeon (*Scaphirhynchus albus*) is a large bottom-dwelling fish which occurs in extremely low numbers in portions of the Missouri River and lower Kansas River, in Atchison, Doniphan, Douglas, Jefferson, Leavenworth, and Wyandotte counties. It requires sandbars, chutes, and backwater areas for reproduction. **Endangered**

Topeka shiner (*Notropis topeka*) is a small minnow generally occurring in clear, spring-fed pools in small tributary streams, primarily where sedimentation has been minimized. In Kansas it occurs in streams in Butler, Chase, Dickinson, Geary, Greenwood, Lyon, Marion, Marshall, Morris, Pottawatomie, Riley, Shawnee, Wabaunsee, and Wallace counties. **Endangered**

Arkansas River shiner (*Notropis girardi*) is a small minnow adapted to shallow, braided sand-bottom streams. It may presently be extirpated from Kansas or else occurs in very low numbers in flowing reaches of the Arkansas River, or the Cimarron River in Clark, Comanche, Meade and Seward counties, though it has not been observed since 1986. The portion of the Cimarron River downstream from U.S. Highway 54 is federally-designated as critical habitat. **Threatened**

Mead's milkweed (*Asclepias meadii*), is a perennial broad-leaved plant of unbroken tallgrass prairie, generally occurring as small populations or scattered individuals. Kansas counties containing confirmed populations include Allen, Anderson, Bourbon, Coffey, Crawford, Douglas, Franklin, Jefferson, Johnson, Leavenworth, Linn, Miami, and Neosho. **Threatened**

Western prairie fringed orchid (*Platanthera praeclara*) is a perennial plant generally occurring in swales or low edges of slopes in native tallgrass prairie. Small populations are currently known in Douglas, Jefferson, Leavenworth, and Osage counties. **Threatened**

American burying beetle (*Nicrophorus americanus*) is a large insect historically documented from several eastern Kansas counties, utilizing native vegetation habitats with good populations of small birds and mammals which serve as a carrion base. This species is currently known only from Wilson, Elk, Chautauqua, Labette and Montgomery counties. **Endangered**

Species Whose Kansas Status is Unknown:

Eskimo curlew (*Numenius borealis*) is an upland shorebird which formerly migrated through Kansas, foraging for invertebrates in plowed fields and heavily-grazed or burned grasslands. There have been no sightings in Kansas since 1902, and the species may be extinct rangewide. **Endangered**

Black-capped vireo (*Vireo atricapillus*) is a small perching bird that utilizes scattered trees and brushy clumps, typified by scrub oak, with woody vegetation separated by patches of bare ground or herbaceous vegetation. The species was last confirmed in Kansas in the 1950s, primarily occurring today in Texas and Oklahoma, though its range may be expanding northward again. Most likely area of re-occurrence would be the Red Hills of Barber and Comanche counties. **Endangered**

Indiana bat (*Myotis sodalis*) occupies caves during hibernation, but during the breeding season may be found in either caves or roost trees in scattered populations. Although never documented as occurring in Kansas, nearby populations occur in Missouri and Oklahoma. Habitat is believed suitable in the eastern tier of Kansas counties, and adequate surveys are needed to determine its occurrence. **Threatened**

Running buffalo clover (*Trifolium stoloniferum*) is associated with grassy areas in wooded stream valleys. The only Kansas record is from Miami County on the Missouri border, and the plant has not been reported from the State since prior to 1900. **Endangered**

Species Proposed for Federal Listing:

Mountain plover (*Charadrius montanus*) is an upland shorebird similar in size to a killdeer, which occupies shortgrass prairie and cultivated fields with a large amount of bare ground or sparse vegetation. This species may occur in Finney, Grant, Greeley, Hamilton, Haskell, Kearny, Morton, Sherman, Stanton and Wallace counties in southwest Kansas, with infrequent occurrences elsewhere. **Proposed as threatened**

FEDERAL CANDIDATE SPECIES IN KANSAS
(Updated January 2011)

The **lesser prairie-chicken** (*Tympanuchus pallidicinctus*) is a medium-sized grouse which prefers shortgrass and sandsage prairie and some cropland, occurring in Barber, Clark, Comanche, Edwards, Ellis, Finney, Ford, Gove, Grant, Gray, Greeley, Hamilton, Haskell, Hodgeman, Kearny, Kiowa, Lane, Logan, Meade, Morton, Ness, Pawnee, Pratt, Rush, Scott, Seward, Sherman, Stafford, Stanton, Stevens, Trego, Wallace, and Wichita counties.

The **Sprague's pipit** (*Anthus spragueii*) is a small passerine bird that prefers shortgrass prairie, but can utilize overgrazed tallgrass as well. It is a migrant through Kansas in spring and fall, possibly infrequent winter resident. Counties of occurrence include the Flint Hills west to the Colorado border.

The **Arkansas darter** (*Etheostoma cragini*) is a small fish inhabiting clear, vegetated wetlands and spring-fed pools in the mainstem and tributaries to the Arkansas, Cimarron, Medicine Lodge, Chikaskia, Ninnescah, and Spring Rivers in Barber, Barton, Cherokee, Clark, Comanche, Cowley, Harper, Kingman, Kiowa, Meade, Pratt, Reno, Rice, Sedgwick, Seward, Stafford, and Sumner County.

The **Neosho mucket** (*Lampsilis rafinesqueana*) is a freshwater mussel which occurs in riverine runs, shoals, and riffles with gravel substrates and moderate currents; in the Fall, Verdigris, Neosho, Cottonwood and Spring Rivers in Allen, Chase, Cherokee, Coffey, Greenwood, Labette, Lyon, Montgomery, Neosho, Wilson and Woodson counties.

The **spectaclecase** (*Cumberlandia monodonta*) is a freshwater mussel which occurs in rocky rivers. In Kansas it occurs in the Marais des Cygnes River in Linn County.

(Candidate species are those for which the Service has on file substantial information on biological vulnerability and threats to support proposals to list them as endangered or threatened species.)

February 10, 2011

Joe Cothern
U.S. EPA Region VII
901 N. 5th Street
Kansas City, MO 66101

Re: Clean Line Energy Partners' Proposed Grain Belt Clean Line Transmission Project

Dear Mr. Cothern:

Clean Line Energy Partners LLC (Clean Line) is seeking your input on our proposed project to develop, construct and operate the Grain Belt Express Clean Line transmission project ("project"). Clean Line is a privately-owned company focused on developing high voltage direct current (HVDC) transmission lines that would connect the best renewable energy resource regions to communities and cities that have limited access to renewable energy. The proposed project will be capable of moving up to 3,500 megawatts (MW) of renewable energy from the wind-rich region of southwestern Kansas to southeastern Missouri and markets farther east.

Clean Line has retained The Louis Berger Group, Inc. (Berger) to conduct a siting study for the proposed project. We would like to request the following, and, if available, any Geographic Information Systems data identifying their location:

NPL	USEPA Superfund Sites, National Priorities List
CERCLIS	USEPA Potential Superfund Sites
RCRA-LgGen	USEPA RCRA Large Quantity Generators
RCRA-SmGen	USEPA RCRA Small Quantity Generators
RCRA-TSD	USEPA RCRA Treatment, Storage and Disposal Sites
RCRA-Transp	USEPA RCRA Transporters
ERNS	USEPA Emergency Response Notification System
HWMP-UST/ LUST	KDHE UST and LUST Sites
HWMP-CERCLIS	KDHE Superfund Sites
HWMP-RCRIS	KDHE RCRA Sites
HWMP-Registry	KDHE Registry of Confirmed or Abandoned or Uncontrolled Hazardous Waste Sites
HWMP-VCP	KDHE Voluntary Cleanup Program Sites

The development and environmental permitting process for this project will be a multi-year process, and we are still in a relatively early phase. This coordination will be the first of many opportunities for agencies to participate in the review of this project because Clean Line will need to obtain federal, state, and local permits from the appropriate agencies. A member of our project team will be contacting you in the next few weeks to schedule a follow-up meeting for a more interactive discussion of the project, to present the status of our studies, and to solicit your input on the siting process and corridor alternatives. Construction is anticipated to take approximately two years. Under the current schedule, Clean Line is proposing the project to be in service by the end of 2016.



The Grain Belt Express Clean Line, as currently proposed, will begin near the Spearville substation in Ford County, Kansas and end in southeastern Missouri near the St. Francois substation in St. Francois County, Missouri.

Proposed project facilities include a converter station and possibly ground beds at each terminus, two sets of bundled wire conductors per HVDC circuit, shield wire, and conductor support structures. Clean Line is proposing steel structures ranging in height from 120 to 150 feet that are spaced approximately 800 to 1,200 feet apart. The design and dimensions may vary based on terrain and other engineering considerations.

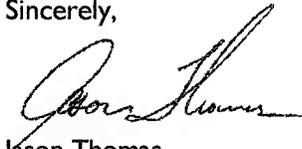
Please reply with your comments in writing and/or by email at your earliest convenience to:

Stephen Parker, Project Manager
The Louis Berger Group, Inc.
4050 Pennsylvania Avenue, Suite 121
Kansas City, MO 64111
sparker@louisberger.com

Although the route for the project has not been identified, the attached Overview Maps shows the entire project siting study area. We have also included a list of counties within the study area boundary. Upon request, the Louis Berger team can provide you with the electronic GIS boundary for the study area. Any additional comments or concerns you have that would assist us in siting the project would be greatly appreciated.

Thank you in advance for your assistance and please do not hesitate to contact Mr. Parker or me if you need additional information.

Sincerely,



Jason Thomas
Director, Environment
Clean Line Energy Partners
cell 713-805-6840
tel 832-319-6357
jthomas@cleanlineenergy.com



Stephen Parker
Senior Scientist
The Louis Berger Group, Inc.
cell 816-674-1110
tel 816-398-8658
sparker@louisberger.com

Attachments:

- I. Project Overview Maps
- II. List of Counties within the Study Area

Cc: Mark Lawlor, Clean Line Energy Partners
Diana Coggin, Clean Line Energy Partners

Missouri Counties within Study Area

Clay	Cooper	Johnson	Polk
Audrain	Crawford	Laclede	Pulaski
Barton	Dade	Lafayette	Randolph
Bates	Dallas	Lawrence	Ray
Benton	Dent	Livingston	Reynolds
Boone	Douglas	Madison	Saline
Buchanan	Franklin	Maries	Shannon
Caldwell	Gasconade	Miller	St. Charles
Callaway	Greene	Moniteau	St. Clair
Camden	Henry	Montgomery	St. Francois
Carroll	Hickory	Morgan	Ste. Genevieve
Cass	Howard	Newton	Texas
Cedar	Howell	Osage	Vernon
Chariton	Iron	Perry	Warren
Christian	Jackson	Pettis	Washington
Clinton	Jasper	Phelps	Webster
Cole	Jefferson	Platte	Wright

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Coffey	Hodgeman	Nemaha	Washington
Comanche	Jackson	Neosho	Wilson
Cowley	Jefferson	Ness	Woodson
Crawford	Johnson	Osage	Wyandotte
Dickinson	Kingman	Ottawa	

February 9, 2011

Mark Frazier
U.S. Army Corps of Engineers
Regulatory Division
Attn: OD-R, Rm 706
601 E. 12th Street
Kansas City, MO 64106

Re: Clean Line Energy Partners' Proposed Grain Belt Clean Line Transmission Project

Dear Mr. Frazier:

Clean Line Energy Partners LLC (Clean Line) is seeking your input on our proposed project to develop, construct and operate the Grain Belt Express Clean Line transmission project ("project"). Clean Line is a privately-owned company focused on developing high voltage direct current (HVDC) transmission lines that would connect the best renewable energy resource regions to communities and cities that have limited access to renewable energy. The proposed project will be capable of moving up to 3,500 megawatts (MW) of renewable energy from the wind-rich region of southwestern Kansas to southeastern Missouri and markets farther east.

Clean Line has retained The Louis Berger Group, Inc. (Berger) to conduct a siting study for the proposed project. We would like to request your comments in the form of an agency coordination letter. The development and environmental permitting process for this project will be a multi-year process, and we are still in a relatively early phase. This coordination will be the first of many opportunities for agencies to participate in the review of this project because Clean Line will need to obtain federal, state, and local permits from the appropriate agencies. A member of our project team will be contacting you in the next few weeks to schedule a follow-up meeting for a more interactive discussion of the project, to present the status of our studies, and to solicit your input on the siting process and corridor alternatives. Construction is anticipated to take approximately two years. Under the current schedule, Clean Line is proposing the project to be in service by the end of 2016.

The Grain Belt Express Clean Line, as currently proposed, will begin near the Spearville substation in Ford County, Kansas and end in southeastern Missouri near the St. Francois substation in St. Francois County, Missouri.

Proposed project facilities include a converter station and possibly ground beds at each terminus, two sets of bundled wire conductors per HVDC circuit, shield wire, and conductor support structures.



Clean Line is proposing steel structures ranging in height from 120 to 150 feet that are spaced approximately 800 to 1,200 feet apart. The design and dimensions may vary based on terrain and other engineering considerations.

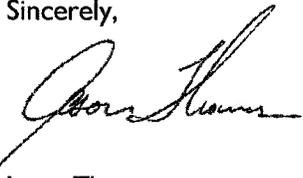
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Stephen Parker, Project Manager
The Louis Berger Group, Inc.
4050 Pennsylvania Avenue, Suite 121
Kansas City, MO 64111
sparker@louisberger.com

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Thank you in advance for your assistance and please do not hesitate to contact Mr. Parker or me if you need additional information.

Sincerely,



Jason Thomas
Director, Environment
Clean Line Energy Partners
cell 713-805-6840
tel 832-319-6357
jthomas@cleanlineenergy.com



Stephen Parker
Senior Scientist
The Louis Berger Group, Inc.
cell 816-674-1110
tel 816-398-8658
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Attachments:

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- II. List of Counties within the Study Area

Cc: Mark Lawlor, Clean Line Energy Partners
Diana Coggin, Clean Line Energy Partners

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Buchanan	Franklin	Maries	Shannon
Caldwell	Gasconade	Miller	St. Charles
Callaway	Greene	Moniteau	St. Clair
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Comanche	Jackson	Neosho	Wilson
Cowley	Jefferson	Ness	Woodson
Crawford	Johnson	Osage	Wyandotte
Dickinson	Kingman	Ottawa	



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
KANSAS CITY DISTRICT, CORPS OF ENGINEERS
635 FEDERAL BUILDING
601 E 12TH STREET
KANSAS CITY MO 64106-2824

March 17, 2011

Regulatory Branch
(NWK-2011-0199)
(Multiple Counties, KS & MO)

Mr. Stephen Parker
The Louis Berger Group, Inc.
4050 Pennsylvania Avenue, Suite 121
Kansas City, Missouri 64111

Dear Mr. Parker,

This is in response to your inquiry, for the proposed Grain Belt Clean Line Transmission Project, received on February 14, 2011. The project will be located in Kansas and Missouri. The Kansas City District, Little Rock District, and St. Louis District will coordinate to facilitate consistency and communication in the permitting process.

The Corps of Engineers has jurisdiction over all waters of the United States. Discharges of dredged or fill material in waters of the United States, including wetlands, require prior authorization from the Corps under Section 404 of the Clean Water Act (Title 33 United States Code Section 1344). The implementing regulation for this Act is found at Title 33 Code of Federal Regulations Parts 320-332. Any work or structures in, over, or under a navigable water of the United States, require prior authorization from the Corps of Engineers under Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403). Please see enclosed exhibit of approximate Section 10 waters within the study area.

To comply with the National Environmental Policy Act, we require notice of any federal funding, regulatory oversight or permit requirements you know of for our determination to establish a lead federal agency.

Federal regulations require that a Department of the Army (DA) permit be issued by the Corps of Engineers prior to the initiation of any construction on the portion of a proposed activity which is within the Corps' regulatory jurisdiction.

We are interested in your thoughts and opinions concerning your experience with the Kansas City District, Corps of Engineers Regulatory Program. We have placed an automated version of our Customer Service Survey form at: <http://per2.nwp.usace.army.mil/survey.html>. At your request, we will mail you a paper copy that you may complete and return to us by mail or fax.

The Kansas City District will be the lead district associated with this project; Ms. Kailey Rippen is the project manager. The Kansas City District will coordinate with Ms. Cynthia Blansett and Ms. Sarah Chitwood of the Little Rock District; and Ms. Jennifer Brown of the St. Louis District.

If you have any questions concerning this matter, please feel free to contact Ms. Kailey Rippen at 816-389-2123 (FAX 816-389-2032). Please reference Permit No. 2011-0199 in all comments and/or inquiries relating to this project.

Sincerely

Kailey Rippen
Project Manager
Regulatory Branch

Enclosure

Copy Furnished (electronically w/o enclosure)

Ms. Cynthia Blansett
Little Rock District Corps of Engineers, Regulatory Branch
Ms. Jennifer Brown
St. Louis District Corps of Engineers, Regulatory Branch
Environmental Protection Agency,
Watershed Planning and Implementation Branch
U.S. Fish and Wildlife Service, Manhattan, Kansas
Kansas Department of Wildlife and Parks
Kansas Department of Health and Environment
Kansas Department of Agriculture
U.S. Fish and Wildlife Service, Columbia, Missouri
Missouri Department of Natural Resources,
Water Protection Program
Missouri Department of Conservation
Missouri Department of Natural Resources,
State Historic Preservation Office



EXHIBIT

Approximate Section 10 waters

February 9, 2011

David Manning
U.S. Army Corps of Engineers
Chief Regulatory Office
1645 S. 101st East Ave.
Tulsa, OK 74128

Re: Clean Line Energy Partners' Proposed Grain Belt Clean Line Transmission Project

Dear Mr. Manning:

Clean Line Energy Partners LLC (Clean Line) is seeking your input on our proposed project to develop, construct and operate the Grain Belt Express Clean Line transmission project ("project"). Clean Line is a privately-owned company focused on developing high voltage direct current (HVDC) transmission lines that would connect the best renewable energy resource regions to communities and cities that have limited access to renewable energy. The proposed project will be capable of moving up to 3,500 megawatts (MW) of renewable energy from the wind-rich region of southwestern Kansas to southeastern Missouri and markets farther east.

Clean Line has retained The Louis Berger Group, Inc. (Berger) to conduct a siting study for the proposed project. We would like to request your comments in the form of an agency coordination letter. The development and environmental permitting process for this project will be a multi-year process, and we are still in a relatively early phase. This coordination will be the first of many opportunities for agencies to participate in the review of this project because Clean Line will need to obtain federal, state, and local permits from the appropriate agencies. A member of our project team will be contacting you in the next few weeks to schedule a follow-up meeting for a more interactive discussion of the project, to present the status of our studies, and to solicit your input on the siting process and corridor alternatives. Construction is anticipated to take approximately two years. Under the current schedule, Clean Line is proposing the project to be in service by the end of 2016.

The Grain Belt Express Clean Line, as currently proposed, will begin near the Spearville substation in Ford County, Kansas and end in southeastern Missouri near the St. Francois substation in St. Francois County, Missouri.

Proposed project facilities include a converter station and possibly ground beds at each terminus, two sets of bundled wire conductors per HVDC circuit, shield wire, and conductor support structures. Clean Line is proposing steel structures ranging in height from 120 to 150 feet that are spaced



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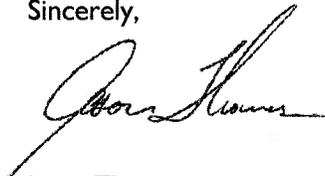
Please reply with your comments in writing and/or by email at your earliest convenience to:

Stephen Parker, Project Manager
The Louis Berger Group, Inc.
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Kansas City, MO 64111
sparker@louisberger.com

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Thank you in advance for your assistance and please do not hesitate to contact Mr. Parker or me if you need additional information.

Sincerely,



Jason Thomas
Director, Environment
Clean Line Energy Partners
cell 713-805-6840
tel 832-319-6357
jthomas@cleanlineenergy.com



Stephen Parker
Senior Scientist
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Diana Coggin, Clean Line Energy Partners

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Crawford	Johnson	Osage	Wyandotte
Dickinson	Kingman	Ottawa	

February 9, 2011

Ken Brunson
Environmental Service Section
Kansas Department of Wildlife and Parks
512 SE 25th St.
Pratt, KS 67124

Re: Clean Line Energy Partners' Proposed Grain Belt Clean Line Transmission Project

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Clean Line has retained The Louis Berger Group, Inc. (Berger) to conduct a siting study for the proposed project. In accordance with Kansas Statutes, Chapter 32, Section 32-957, *et seq.*, we would like to request your comments on the project's potential to have adverse effects on state threatened or endangered species. The development and environmental permitting process for this project will be a multi-year process, and we are still in a relatively early phase. This coordination will be the first of many opportunities for agencies to participate in the review of this project because Clean Line will need to obtain federal, state, and local permits from the appropriate agencies. A member of our project team will be contacting you in the next few weeks to schedule a follow-up meeting for a more interactive discussion of the project, to present the status of our studies, and to solicit your input on the siting process and corridor alternatives. Construction is anticipated to take approximately two years. Under the current schedule, Clean Line is proposing the project to be in service by the end of 2016.

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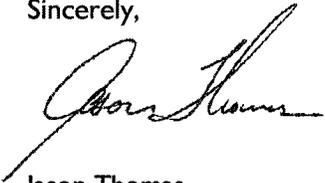
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Sincerely,



Jason Thomas
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Clean Line Energy Partners
cell 713-805-6840
tel 832-319-6357
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Stephen Parker
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February 9, 2011

Tim Weston, Archaeologist
Kansas State Historical Society
6425 SW 6th Avenue
Topeka, KS 66615-1099

Re: Clean Line Energy Partners' Proposed Grain Belt Clean Line Transmission Project

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Clean Line has retained The Louis Berger Group, Inc. (Berger) to conduct a siting study for the proposed project. In accordance with Section 106 of the National Historic Preservation Act (P.L. 89-665, as amended) and Kansas Statutes, Chapter 75, Section 75-2724, we would like to request your comments on the project's potential to have adverse effects on property of historical interest. The development and environmental permitting process for this project will be a multi-year process, and we are still in a relatively early phase. This coordination will be the first of many opportunities for agencies to participate in the review of this project because Clean Line will need to obtain federal, state, and local permits from the appropriate agencies. A member of our project team will be contacting you in the next few weeks to schedule a follow-up meeting for a more interactive discussion of the project, to present the status of our studies, and to solicit your input on the siting process and corridor alternatives. Construction is anticipated to take approximately two years. Under the current schedule, Clean Line is proposing the project to be in service by the end of 2016.

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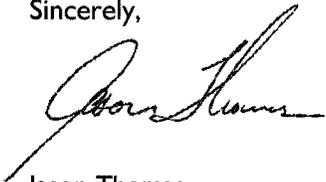
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6425 SW 6th Avenue
Topeka, KS 66615



phone: 785-272-8681
fax: 785-272-8682
email@kshs.org

Kansas Historical Society

Sam Brownback, Governor
Jennie Chinn, Executive Director

February 24, 2011

Stephen Parker
Project Manager
The Louis Berger Group, Inc.
4050 Pennsylvania Avenue, Suite 121
Kansas City, MO 64111

RE: Proposed Grain Belt Clean Line Transmission Project
Clean Line Energy Partners
Statewide

Dear Mr. Parker:

The Kansas State Historic Preservation Office has received your letter dated February 9, 2011 describing plans by Clean Line Energy Partners to develop a transmission project capable of moving renewable energy from southwestern Kansas to southeastern Missouri and markets further east. We are certainly willing to participate in the corridor selection process but we note that the study area presented for review takes in most of the state. Given such a large area, our office can offer little in the way of specific comments or concerns at this time. There are obviously many areas of high archeological potential as well as significant historic architectural resources within the study area. Once more specific information is available, our staff members would be happy to meet and discuss the project.

If you have any questions regarding these comments, please contact SHPO Archeologist Tim Weston at 785-272-8681 (ext. 214) or Review & Compliance Coordinator Kim Gant at 785-272-8681 ext. 225.

Sincerely,

Jennie Chinn
Executive Director and
State Historic Preservation Officer

Patrick Zollner
Deputy State Historic Preservation Officer

McCabe, Michael

From: McCabe, Michael
Sent: Wednesday, October 24, 2012 11:14 AM
To: 'Greg.Foley@kda.ks.gov'
Subject: Grain Belt Express Clean Line Transmission Line

Mr. Foley,

Clean Line Energy and The Louis Berger Group Inc. have developed a potential route network for the Grain Belt Express Clean Line Transmission Project. Preparations are being made to present the proposed routes at public open house meetings. Clean Line would like to present and discuss the proposed route network at a collective meeting with The Nature Conservancy, KDWP, USFWS, KDHE, and the Department of Agriculture in Topeka November 8th or 9th.

Would you, or someone from the Dept. of Agriculture be able to attend? If so, is either date more preferable?

Please let me know at your earliest convenience.

Thank you.

Todd McCabe
Environmental Scientist
(816) 398-8657

P.s. I tried calling your office at 785-296-3600 but, was not able to connect. I instead received a very loud "alarm" type noise. If you wish, please feel free to call me.

McCabe, Michael

From: McCabe, Michael
Sent: Wednesday, October 24, 2012 10:51 AM
To: 'jgaggero@kdheks.gov'
Subject: Grain Belt Express Clean Line Transmission Line

Mr. Gaggero,

Clean Line Energy and The Louis Berger Group Inc. have developed a potential route network for the Grain Belt Express Clean Line Transmission Project. Preparations are being made to present the proposed routes at public open house meetings. Clean Line would like to present and discuss the proposed route network at a collective meeting with The Nature Conservancy, KDWP, USFWS, KDHE, and the Department of Agriculture in Topeka November 8th or 9th.

Would you, or someone from KDHE be able to attend? If so, is either date more preferable?

Please let me know at your earliest convenience.

Thank you.

Todd McCabe
Environmental Scientist
(816) 398-8657

P.s. I tried calling your office at 785-296-4195 but, was not able to connect. I instead received a very, loud "alarm" type noise. If you wish, please feel free to call me.

McCabe, Michael

From: McCabe, Michael
Sent: Friday, February 15, 2013 11:31 AM
To: Dale Kirmer
Cc: Mark Lawlor; Gaul, Tim
Subject: RE: Kansas Department of Transportation Contact

Mr. Kirmer,

We wanted to touch base with you to determine your availability in the next couple of weeks or so to sit down and discuss the proposed Grain Belt Express Clean Line transmission project. If you would, please respond letting me know what dates and times would work best for you. Afterwards, we'll set up a date and time that's most convenient for everyone to discuss the project.

Thank you.

Todd McCabe

From: Gaul, Tim
Sent: Monday, February 04, 2013 4:31 PM
To: Dale Kirmer
Cc: Mark Lawlor; McCabe, Michael
Subject: RE: Kansas Department of Transportation Contact

Dale,

Good talking to you as well. We'll be in touch shortly after our next round of meetings to give you a briefing.

Regards,

Tim Gaul

AVP, Energy Services
Office: 202.303.2647
Mobile: 240.381.8054
Fax: 202.293.0787

The Louis Berger Group, Inc. | 1250 23rd Street NW | 3rd Floor | Washington, DC 20037 | www.louisberger.com

From: Dale Kirmer [mailto:Kirmer@ksdot.org]
Sent: Monday, February 04, 2013 4:42 PM
To: Gaul, Tim
Cc: Dale Kirmer
Subject: Kansas Department of Transportation Contact

Tim,
It was good to visit with you on the phone.
I look forward to meeting with you in the next few weeks and discussing the Kansas Department of Transportation Utility Accommodation Policy as it concerns the routing of the Grain Belt Express Clean Line.

Below is my contact information

Best Regards,

Dale W. Kirmer, P.E.
Bureau of Construction and Maintenance
Kansas Department of Transportation
Eisenhower State Office Bldg., 7th Flr.
700 SW Harrison
Topeka, Kansas 66603-3754
E-mail: kirmer@ksdot.org
Tel: (785) 296-6355
Fax: (785) 296-0999
Hearing Impaired - 711



Kansas Department of Transportation

This electronic transmission is intended for the addressee(s) named above. It contains information that is privileged, confidential, or otherwise protected from use and disclosure. If you are not the intended recipient, you are hereby notified that any review, disclosure, copying, or dissemination of this transmission or the taking of any action in reliance on its contents, or other use is strictly prohibited. If you have received this transmission in error, please notify the sender that this message was received in error and then delete this message.



Please do not print this e-mail unless absolutely necessary... Go GREEN!

APPENDIX D: PUBLIC OUTREACH MATERIALS

**KANSAS ROUNDTABLE INVITEE LETTERS
AND COMMENT CARD**



April 27, 2011

«Salutation» «First_Name» «Last_Name»
«Title»
«Organization»
«Addresss_Line_1» «Address_Line_2»
«City», «State» «Postal_Code»

RE: Grain Belt Express Clean Line Community Leader Roundtables

Dear «Salutation» «Last_Name»:

Grain Belt Express Clean Line LLC (Grain Belt Express) is currently developing a high-voltage direct current (HVDC) electric transmission line known as the Grain Belt Express Clean Line. The Grain Belt Express Clean Line will connect some of the nation's best wind resources, located in western Kansas, to energy demand centers in southeastern Missouri and points farther east. The line will be capable of transmitting 3,500 megawatts of new wind generation, representing at least \$7 billion of new investments.

We are hosting roundtable workshops with community leaders from your area, and we would like for you to attend. At our workshops, the Grain Belt Express development team will gather feedback and information from you and other leaders. We will use this information in developing potential routes for the transmission line. Project materials will be available for review, and refreshments will be served.

In the letter, you will find a list of our workshops in Kansas. Please RSVP by May 9, 2011: RSVP@GrainBeltExpressCleanLine.com – or – 816-599-3838. Please specify which roundtable you would like to attend.

The Grain Belt Express Clean Line will stimulate the development of thousands of megawatts of new wind generation that would otherwise not get built. The construction and operation of these new wind farms and the Grain Belt Express Clean Line will create thousands of new jobs, generate millions of dollars of new tax revenues for state and local governments, and will result

in land payments to property owners. Manufacturing companies supplying the wind energy industry are also likely to see a significant increase in business.

We hope to see you at the workshop. If you have any questions in the meantime, please do not hesitate to contact us. You can also find more information on our website at www.cleanlineenergy.com.

Sincerely,

A handwritten signature in black ink that reads "Diana Coggin". The signature is written in a cursive, flowing style.

Diana Coggin
Project Development Manager
832-319-6342
dcoggin@cleanlineenergy.com

CC:

P.S. Don't forget to RSVP by May 9, 2011 by
Email: RSVP@GrainBeltExpressCleanLine.com
Phone: (816) 599-3838
Please specify which roundtable you will attend. Thanks!

GRAIN BELT EXPRESS

CLEAN LINE

Community Leader Roundtables

Dodge City

Monday, May 16, 2011
12:00 p.m.
Magouirk Conference Center
4100 West Comanche Street

Greensburg

Monday, May 16, 2011
4:00 p.m.
5.4.7. Arts Center
204 West Wisconsin Avenue

Pratt

Tuesday, May 17, 2011
8:00 a.m.
Pratt Senior Center
619 North Main Street

Hutchinson

Tuesday, May 17, 2011
11:30 a.m.
Kansas Cosmosphere & Space Center
1100 North Plum Street

Anthony

Wednesday, May 18, 2011
10:00 a.m.
Smokehouse Supper Club
725 West Main Street

Wellington

Wednesday, May 18, 2011
4:00 p.m.
Raymond Frye Complex
320 North Jefferson Avenue

El Dorado

Thursday, May 19, 2011
8:00 a.m.
Welcome Center
Butler Community College
901 South Haverhill Road

Howard

Thursday, May 19, 2011
1:00 p.m.
Poplar Pizza
202 South Wabash Street

Yates Center

Monday, June 13, 2011
4:00 p.m.
Woodson County Ambulance Barn
114 North Main Street

Erie

Tuesday, June 14, 2011
9:00 a.m.
Neosho County Courthouse
100 South Main Street

Pittsburg

Tuesday, June 14, 2011
4:00 p.m.
Memorial Auditorium and Convention Center
503 North Pine Street

P.S. Don't forget to RSVP by May 9, 2011 via
Email: RSVP@GrainBeltExpressCleanLine.com
Phone: (816) 599-3838
Please specify which roundtable you will attend.



May 26, 2011

«Salutation» «First_Name» «Last_Name»
«Title»
«Organization»
«ADDRESS_LINE_1» «ADDRESS_LINE_2»
«CITY», «STATE» «POSTAL_CODE»

RE: Grain Belt Express Clean Line Community Leader Roundtables

Dear «Salutation» «Last_Name»:

Grain Belt Express Clean Line LLC (Grain Belt Express) is developing a high-voltage direct current (HVDC) electric transmission line known as the Grain Belt Express Clean Line. This transmission line will connect some of the nation's best wind resources located in western Kansas to energy demand centers in southeastern Missouri and points farther east. The Grain Belt Express Clean Line will be capable of transmitting 3,500 megawatts of new wind generation, representing at least \$7 billion of new investments.

We are hosting roundtable workshops with community leaders from your area, and we would like for you to attend. At our workshops, the Grain Belt Express development team will gather feedback and information from you and other leaders. We will use this information in developing potential routes for the transmission line. Project materials will be available for review, and refreshments will be served.

In this letter, you will find a list of our workshops in Kansas. Since this is not a public meeting, we ask that you designate only one commission member to attend a roundtable, to avoid public notice requirements. Public meetings will be held at a later date. We have limited space for these leadership roundtables so please let us know which commissioner and which meeting you would like to attend by June 6, 2011: RSVP@GrainBeltExpressCleanLine.com – or – (Toll Free Phone) 855-358-4340.



The Grain Belt Express Clean Line will stimulate the development of thousands of megawatts of new wind generation that would otherwise not get built. The construction and operation of these new wind farms and the Grain Belt Express Clean Line will create thousands of new jobs, generate millions of dollars of new tax revenues for state and local governments, and will result in land payments to property owners. Manufacturing companies supplying the wind energy industry are also likely to see a significant increase in business.

We hope to see you at the workshop. If you have any questions in the meantime, please do not hesitate to contact us. You can also find more information on our website at www.grainbeltexpresscleanline.com.

Sincerely,

A handwritten signature in black ink that reads "Diana Coggin". The signature is written in a cursive, flowing style.

Diana Coggin
Project Development Manager
832-319-6342
dcoggin@cleanlineenergy.com

CC:

Attachment: Community Leader Roundtables

P.S. Don't forget to RSVP by June 6, 2011 by
Email: RSVP@GrainBeltExpressCleanLine.com
Toll Free Phone: (855) 358-4340
Please specify which roundtable you will attend. Thanks!

May 26, 2011

«Salutation» «First_Name» «Last_Name»
«Title»
«Organization»
«ADDRESS_LINE_1» «ADDRESS_LINE_2»
«CITY», «STATE» «POSTAL_CODE»

RE: Grain Belt Express Clean Line Community Leader Roundtables

Dear «Salutation» «Last_Name»:

Grain Belt Express Clean Line LLC (Grain Belt Express) is currently developing a high-voltage direct current (HVDC) electric transmission line known as the Grain Belt Express Clean Line. This transmission line will connect some of the nation's best wind resources located in western Kansas to energy demand centers in southeastern Missouri and points farther east. The Grain Belt Express Clean Line will be capable of transmitting 3,500 megawatts of new wind generation, representing at least \$7 billion of new investments.

We are hosting roundtable workshops with community leaders from your area, and we would like for you to attend. At our workshops, the Grain Belt Express development team will gather feedback and information from you and other leaders. We will use this information in developing potential routes for the transmission line. Project materials will be available for review, and refreshments will be served.

In the letter, you will find a list of our workshops in Kansas. Please RSVP by June 6, 2011: RSVP@GrainBeltExpressCleanLine.com – or – (Toll Free Phone) 855-358-4340. We have limited space for these leadership roundtables so please let me know which meeting you would like to attend.

The Grain Belt Express Clean Line will stimulate the development of thousands of megawatts of new wind generation that would otherwise not get built. The construction and operation of these new wind farms and the Grain Belt Express Clean Line will create thousands of new jobs,

generate millions of dollars of new tax revenues for state and local governments, and will result in land payments to property owners. Manufacturing companies supplying the wind energy industry are also likely to see a significant increase in business.

We hope to see you at the workshop. If you have any questions in the meantime, please do not hesitate to contact us. You can also find more information on our website at www.grainbeltexpresscleanline.com.

Sincerely,

A handwritten signature in black ink that reads "Diana Coggin". The signature is fluid and cursive, with the first name being more prominent.

Diana Coggin
Project Development Manager
832-319-6342
dcoggin@cleanlineenergy.com

Attachment: Community Leader Roundtables

P.S. Don't forget to RSVP by June 6, 2011 by
Email: RSVP@GrainBeltExpressCleanLine.com
Toll Free Phone: (855) 358-4340
Please specify which roundtable you will attend. Thanks!

GRAIN BELT EXPRESS

CLEAN LINE

Community Leader Roundtables

Yates Center

Monday, June 13, 2011
4:00 p.m.

Woodson County Ambulance Barn
114 North Main Street

Erie

Tuesday, June 14, 2011
9:00 a.m.

Neosho County Courthouse
100 South Main Street

Pittsburg

Tuesday, June 14, 2011
4:00 p.m.

Memorial Auditorium and Convention Center
503 North Pine Street

Due to the large study area of the project we are not able to host a meeting in every county. We very much appreciate your attendance and apologize for any inconvenience this may cause.

P.S. Don't forget to RSVP by June 6, 2011 via
Email: RSVP@GrainBeltExpressCleanLine.com
Toll Free Phone: (855) 358-4340
Please specify which roundtable you will attend.



February 7, 2012

«Salutation» «First_Name» «Last_Name»
«Title»
«Organization»
«Address_Line_1» «Address_Line_2»
«City», «State» «Postal_Code»

RE: Grain Belt Express Clean Line Community Leader Roundtables

Dear «Salutation» «Last_Name»:

Clean Line Energy Partners is developing a high voltage direct current transmission line called the Grain Belt Express Clean Line. The transmission line will deliver 3,500 megawatts of low-cost, renewable power from western Kansas to communities in Missouri, Illinois and points farther east that have a strong demand for clean, reliable energy. This is enough energy to power over 1.4 million American homes. The \$2 billion Grain Belt Express Clean Line will create significant economic and environmental benefits throughout the region.

The Grain Belt Express Clean Line will enable construction of thousands of megawatts of new wind generation projects in Kansas that otherwise would not be built. The construction and operation of the transmission line and wind farms will create jobs, generate millions of dollars in new tax revenue, and result in land payments to property owners. The transmission line and wind power projects will also create significant business opportunities for manufacturing and service companies that supply the wind energy and transmission industries.

An important part of our development effort is engaging with leaders in our project study area. **We are hosting roundtable workshops with community leaders from your area, and we would like for you to attend.** At our roundtables, the Grain Belt Express Clean Line development team will discuss the need for transmission, provide information about the project and gather feedback and information from you and other leaders. We will use this information

in developing potential routes for the transmission line. Project materials will be available for review, and refreshments will be served.

Attached you will find a list of our roundtable workshops in Kansas. Please RSVP by Monday, February 13, 2012 via email: RSVP@GrainBeltExpressCleanLine.com – or – by toll free phone: 855-358-4340. Please specify which workshop you will attend.

We hope to see you at a roundtable. If you have any questions in the meantime, please do not hesitate to contact me. You can also find more information on our website: www.grainbeltexpresscleanline.com.

Sincerely,

A handwritten signature in black ink, appearing to read "Diana D. Coggin". The signature is fluid and cursive, written in a professional style.

Diana D. Coggin
Project Development Manager
832-319-6342
dcoggin@cleanlineenergy.com

Attachment: Community Leader Roundtables in Kansas

P.S. Don't forget to RSVP by February 13, 2012 via
Email: RSVP@GrainBeltExpressCleanLine.com
Toll Free Phone: (855) 358-4340
Please specify which roundtable you will attend. Thanks!

GRAIN BELT EXPRESS

CLEAN LINE

Community Leader Roundtable Meetings in Kansas

Lincoln

Tuesday, February 21, 2012
8:00 a.m. – 9:30 a.m.
Finch Theatre
122 East Lincoln Avenue

Great Bend

Tuesday, February 21, 2012
12:30 p.m. – 2:00 p.m.
The Front Door – Meeting Room
1615 10th Street

Larned

Tuesday, February 21, 2012
4:00 p.m. – 5:30 p.m.
J.A. Haas Building
400 East 18th Street

Russell

Wednesday, February 22, 2012
8:00 a.m. – 9:30 a.m.
Fossil Creek Hotel & Suites
1430 South Fossil Street

Osborne

Wednesday, February 22, 2012
3:00 p.m. – 4:30 p.m.
Circle Inn
1106 West U.S. Highway 24

Concordia

Thursday, February 23, 2012
8:00 a.m. – 9:30 a.m.
Our Lady of Perpetual Help
Catholic Church
307 East 5th Street

Washington

Thursday, February 23, 2012
3:00 p.m. – 4:30 p.m.
Mayberry's Restaurant
307 C Street

Seneca

Friday, February 24, 2012
8:00 a.m. – 9:30 a.m.
Settle Inn & Suites
1615 North Street

Highland

Friday, February 24, 2012
1:00 p.m. – 2:30 p.m.
Highland Community College – Wellness
Center
205 North Prairie Street

Due to the Grain Belt Express Clean Line's large study area, we are not able to host a meeting in every county. We very much appreciate your attendance and apologize for any inconvenience this may cause. We hope that you will join us at the meeting location nearest you.

Please RSVP by Monday, February 13 via
Email: RSVP@GrainBeltExpressCleanLine.com
or Toll Free Phone: (855) 358-4340
Please specify which roundtable you will attend.

**KANSAS OPEN HOUSE INVITEE LETTERS
AND COMMENT CARD**



PLEASE JOIN US!



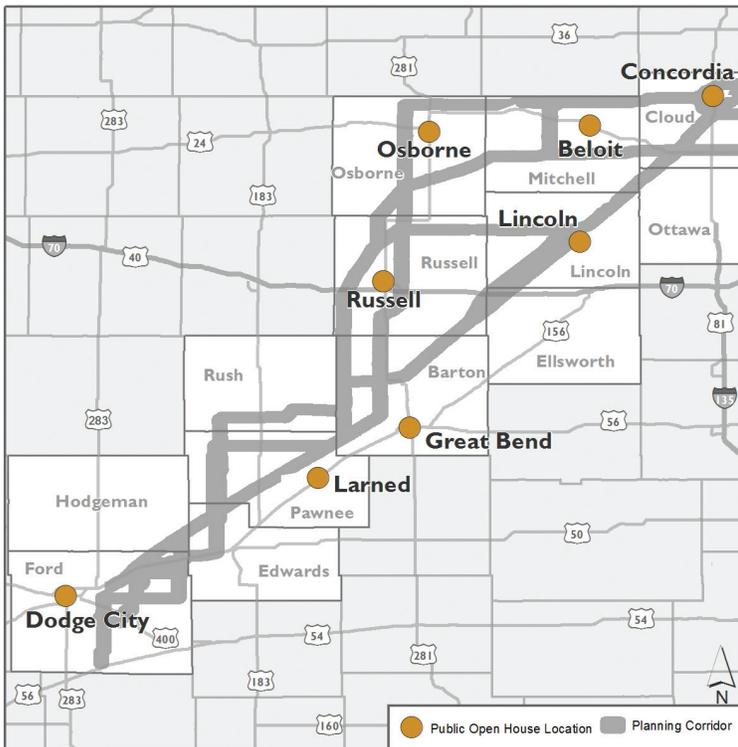
You are invited to an open house to provide feedback on potential routes for the Grain Belt Express Clean Line.

GRAIN BELT EXPRESS CLEAN LINE

Kansas has superb wind energy resources, but development is limited due to a lack of transmission to transport the energy generated from these resources to communities that need the power. The Grain Belt Express Clean Line will create thousands of jobs and give Kansas the ability to move a domestic energy source to market and enable \$7 billion of new, renewable energy projects to be built in Kansas.

The Grain Belt Express Clean Line is an approximately 700-mile overhead, high voltage direct current (HVDC) transmission line that will deliver 3,500 megawatts of low-cost wind power from Kansas to Missouri, Illinois, Indiana, and states farther east.

Planning Corridors in Your Area



GRAIN BELT EXPRESS HAS IDENTIFIED POTENTIAL ROUTES

A network of potential routes has been identified for the transmission line and will be presented at the public open houses. The potential routes are still under review at this time and are subject to change, so we are inviting landowners within an approximately 3-mile wide 'planning corridor' around each potential route to provide their input.

At the open house meetings, we will provide information about the Grain Belt Express Clean Line project and collect feedback that will help us refine the potential routes and ultimately select a single proposed route to file for approval with the Kansas Corporation Commission.

Detailed maps of the potential routes will be available at the open houses and online at www.grainbeltexpresscleanline.com

➡ RSVP Today!
Call toll-free 1(855)358-4340 or email rsvp@grainbeltexpresscleanline.com.

Public Open House Invitation

You have received this invitation because you own property along or near a potential route for a transmission line. Please join us to learn more about the project and share your feedback.

www.grainbeltexpresscleanline.com



To RSVP, please email rsvp@grainbeltexpresscleanline.com or call 1(855)358-4340

Monday, Jan 28	Tuesday, Jan 29	Wednesday, Jan 30	Thursday, Jan 31	Friday, Feb 1
	7 – 9 am Elks Lodge 1120 Kansas Ave. Great Bend, KS 67530	7 – 9 am Elk's Lodge 510 S. Front St. Russell, KS 67665	7 – 9 am Beloit Municipal Building 119 N. Hersey Ave. Beloit, KS 67420	7 – 9 am Christian Church (Fellowship Hall) 402 W. 6th St. Concordia, KS 66901
5 – 7 pm Magouirk Conference Center 4100 W. Comanche Dodge City, KS 67801	5 – 7 pm Haas Building 400 E. 18th St. Larned, KS 67550	5 - 7 pm American Legion Post 49 123 W. Main St. Osborne, KS 67473	5 – 7 pm Lincoln Park Manor 922 N. 5th St. Lincoln, KS 67455	

For a complete listing of open houses, visit our website at www.grainbeltexpresscleanline.com.

Detailed maps and informational materials will be provided at each open house.

All open houses will provide the same information; no formal presentation will be made.

Food and drinks will be provided.



c/o The Louis Berger Group
1600 Baltimore Ave. Suite 100
Kansas City, MO 64108

Public Open House Invitation

GRAIN BELT EXPRESS
CLEAN LINE

You have received this invitation because you own property along or near a potential route for a transmission line. Please join us to learn more about the project and share your feedback.

www.grainbeltexpresscleanline.com



GRAIN BELT EXPRESS
CLEAN LINE



To RSVP, please email rsvp@grainbeltexpresscleanline.com or call 1(855)358-4340

Monday, Feb 11	Tuesday, Feb 12	Wednesday, Feb 13
	7 – 9 am Seneca Community Building 1500 Community Dr. Seneca, KS 66538	7 – 9 am Leonard L. Clary Community Center 1225 Last Chance Rd. Troy, KS 66087
5 – 7 pm Mayberry's Restaurant 307 C St. Washington, KS 66968	5 – 7 pm American Legion 310 N. 19th St. Marysville, KS 66508	5 – 7 pm Fisher Center 201 E. Iowa St. Hiawatha, KS 66434

For a complete listing of open houses, visit our website at www.grainbeltexpresscleanline.com.

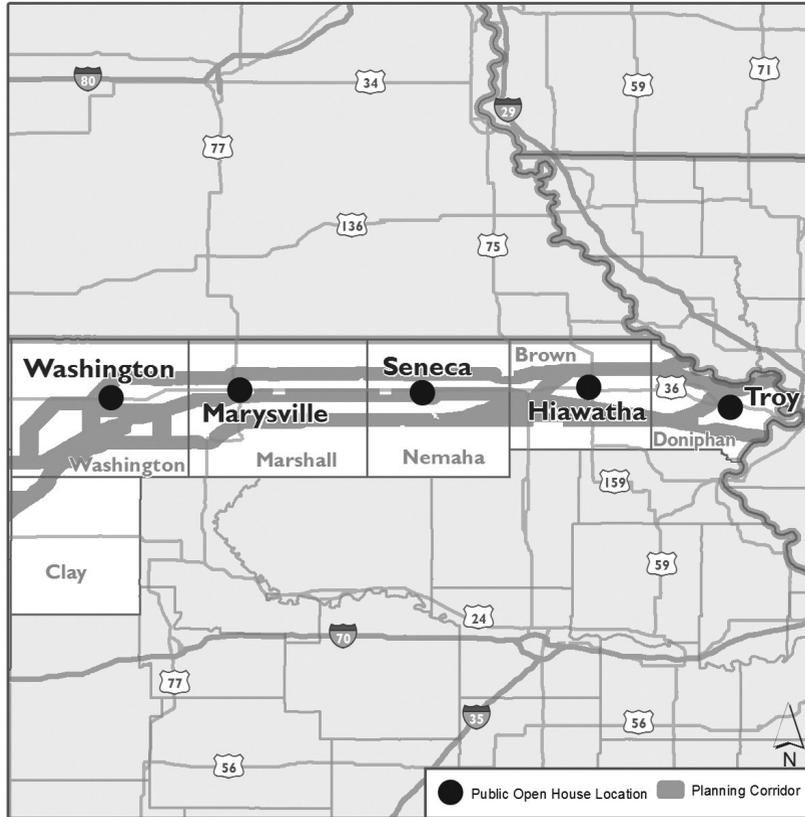
Detailed maps and informational materials will be provided at each open house.

All open houses will provide the same information; no formal presentation will be made.

Food and drinks will be provided.



PLEASE JOIN US!



Clean Line Energy invites you to join us for a public open house meeting in your area to learn about the Grain Belt Express Clean Line electric transmission project.

The Grain Belt Express Clean Line is an approximately 700-mile overhead, high voltage direct current (HVDC) transmission line that will deliver 3,500 megawatts of low-cost wind power from Kansas to Missouri, Illinois, Indiana, and states farther east. The Grain Belt Express Clean Line will create thousands of jobs and give Kansas the ability to move a domestic energy source to market and enable \$7 billion of new, renewable energy projects to be built in Kansas.

Planning Corridors in Your Area

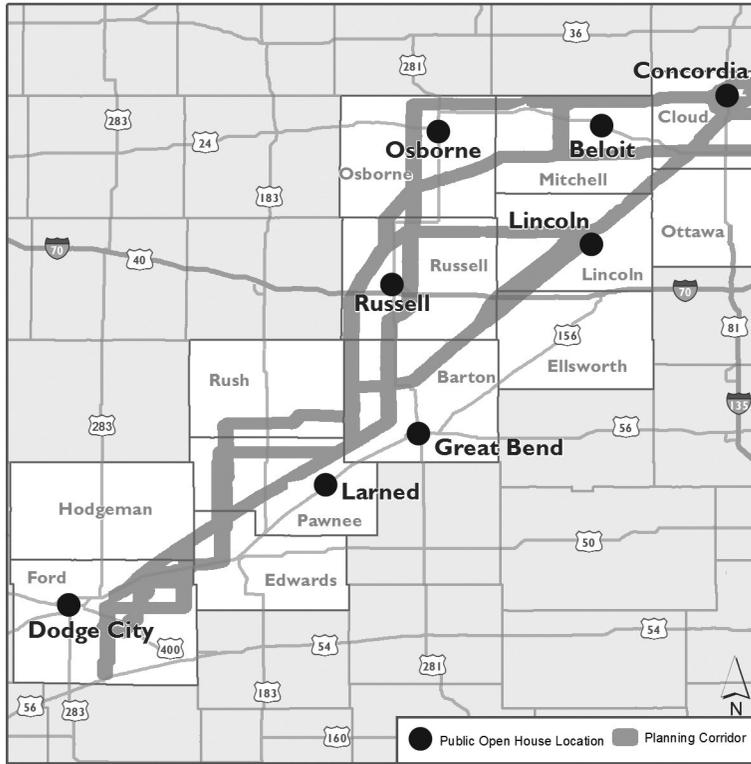
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RSVP TODAY!

Call **1(855)358-4340** or email rsvp@grainbeltexpresscleanline.com

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	<p>7 – 9 am Seneca Community Building 1500 Community Dr. Seneca, KS 66538</p>	<p>7 – 9 am Leonard L. Clary Community Center 1225 Last Chance Rd. Troy, KS 66087</p>
<p>5 – 7 pm Mayberry's Restaurant 307 C St. Washington, KS 66968</p>	<p>5 – 7 pm American Legion 310 N. 19th St. Marysville, KS 66508</p>	<p>5 – 7 pm Fisher Center 201 E. Iowa St. Hiawatha, KS 66434</p>

PLEASE JOIN US!



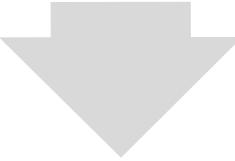
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Planning Corridors in Your Area

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RSVP TODAY! Call 1(855)358-4340 or email rsvp@grainbeltexpresscleanline.com

Mon, Jan 28	Tue, Jan 29	Wed, Jan 30	Thu, Jan 31	Fri, Feb 1
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<p>5 – 7 pm Magouirk Conference Center 4100 W. Comanche Dodge City, KS 67801</p>	<p>5 – 7 pm Haas Building 400 E. 18th St. Larned, KS 67550</p>	<p>5 – 7 pm American Legion Post 49 123 W. Main St. Osborne, KS 67473</p>	<p>5 – 7 pm Lincoln Park Manor 922 N. 5th St. Lincoln, KS 67455</p>	

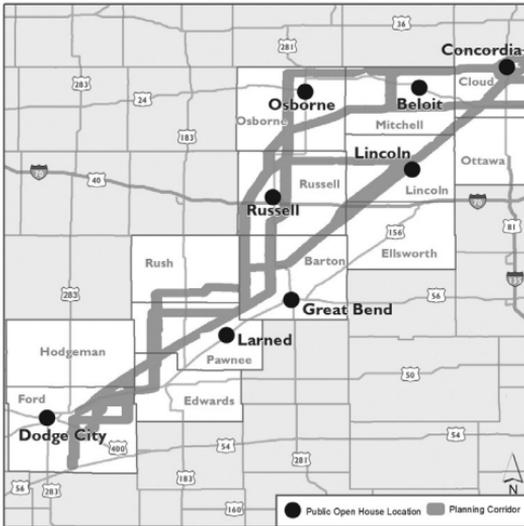


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Call 1(855)358-4340 or email rsvp@grainbeltexpresscleanline.com

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Space for additional comments:

Did you find this open house format to be informative?

Information provided: Yes No

Open House Format: Yes No

If no, what can we do better? _____

PLEASE DEPOSIT COMPLETED COMMENT FORMS IN THE COMMENT COLLECTION BOX UPON LEAVING THE MEETING



If you wish to provide input via mail, please send to:

Clean Line Energy Partners: Grain Belt Express
 C/O Brad Fine
 1600 Baltimore Ave, Suite 100
 Kansas City, MO 64108

If you wish to provide additional input, please visit <http://www.grainbeltexpresscleanline.com/>

TIMOTHY GAUL, Associate Vice President, Energy Services

Mr. Gaul is an environmental planner and scientist and the Associate Vice President of Louis Berger's Energy Services Group. He specializes in electric transmission siting studies, infrastructure planning efforts, ecological assessments, land and resource management plans, and information management efforts for major infrastructure development projects. Mr. Gaul has experience conducting a range of environmental planning studies including: transmission line siting studies, macro corridor analyses, watershed analyses, environmental assessments (EAs), environmental impact statements (EISs), ecological risk assessments, natural resource inventories, and road and transportation plans. He has experience in all aspects of transmission line route selection and permitting and has recent project experience working on several major transmission infrastructure development projects for Dominion Virginia Power, Allegheny Energy, American Electric Power, FirstEnergy, PPL Electric Utilities, and Public Service Electric & Gas (PSE&G). Mr. Gaul has also provided environmental planning support for a range of federal agencies including the U.S. Forest Service (USFS), National Park Service (NPS), Bureau of Indian Affairs, Bureau of Land Management, Department of Defense, and USACE.

FIRM Louis Berger Group

EDUCATION

- MS, Biology 2000
- BS, Environmental and Forest Biology 1997

REGISTRATIONS / CERTIFICATIONS

- Certified GIS Professional

RELEVANT PROJECT EXPERIENCE

ELECTRIC UTILITIES

Greater Fort Wayne Area Reliability Project, AEP, Fort Wayne Indiana

Project Director for two projects providing siting and permitting of 15 miles of double circuit 345/138 kV transmission line and ~15 miles of 765 kV transmission line to support Indiana Michigan Power Company, a subsidiary of AEP.

Wythe Area Improvement Project, AEP

Berger siting and environmental analysis lead for a ~20 mile double circuit 138 kV transmission line from the Jacksons Ferry Substation to the Wythe Substation, in Southern Virginia with one circuit terminating at the Progress Park Substation. Provided support for the Virginia Corporation Commission process.

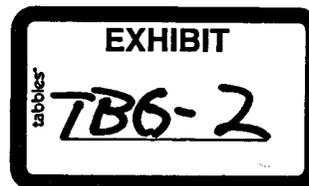
Allegheny Energy/American Electric Power, Potomac Appalachian Transmission Highline (PATH) Siting and Environmental Study. Project manager and siting expert for the route selection studies and permitting efforts associated with the West Virginia and Virginia portions (230 miles) of the PATH 765-kilovolt (kV) transmission line. Project extended across three states, from just north of Charleston, West Virginia, through Frederick, Virginia and into Kemptown, Maryland and included the siting of a 500/765 kV substation. Before PJM demand projections removed the project from further consideration, all siting studies were completed, direct testimony was submitted, and field surveys for cultural resources, wetlands, and T&E species were completed for more than half of the project.

Allegheny Energy, Trans Allegheny Interstate Line (TrAIL) Line Routing Study and Environmental Analysis. In June, 2006, PJM Interconnection approved an expansion plan calling for the construction of a new 500-kilovolt transmission line from Southern Pennsylvania to Northern Virginia. Mr. Gaul **managed** the routing study and environmental effects analysis for 180 miles of the project. He was responsible for daily client contact, organizing and facilitating data gathering efforts, managing staff allocation, budgets, and schedule. As part of this project he provided expert witness testimony for regulatory proceedings in West Virginia, Pennsylvania, and Virginia. This project is currently under construction.

Central Electric Power Cooperative, Macrocorridor Study and Environmental Impact Statement for the McClellanville 115 project. Led the



THE Louis Berger Group, INC.



preparation of the draft macrocorridor study for the ~20 mile McClellanville 115 kV transmission line. Project Director for the Environmental Impact Statement (in development) by the USDA Rural Utilities Service and the US Forest Service, Francis Marion National Forest.

AEP 765 kV Project Feasibility Study. Project Manager for a feasibility study investigating the potential siting and permitting constraints, opportunities, timelines, and costs for six different potential 100+ mile 765 kV connections in AEP's service region (confidential project, locations not provided)

Dominion Virginia Power, Meadow Brook to Loudoun 500 kV Line Permitting. Project Manager for permitting and regulatory compliance for 62 miles of 500 kV line, including: the delineation of wetlands along 62 miles (approximately 2,000 acres) of right-of-way; survey and assessments of sensitive migratory birds, sensitive plant surveys, and sensitive mussel habitats; a review of all stream crossings for the Virginia Marine Resources Commission; and preparation of architectural and archaeological surveys in support of Section 106 compliance for the Virginia Department of Historic Resources. This effort also included the preparation of two Environmental Assessments under National Environmental Policy Act (NEPA) compliance for the line's crossing of two National Parks, the Appalachian Trail and the Manassas National Battlefield.

PPL and PSE&G, Susquehanna to Roseland 500 kV Line. Senior technical advisor. PPL and PSEG contracted the Louis Berger/Commonwealth Team to conduct siting efforts for this 150 mile line across two states, provide expert witness testimony, provide engineering and design support, permitting, and public outreach support. Mr. Gaul serves as a senior technical advisor for this effort and provides technical review and analysis support for routing efforts, public outreach, and contract oversight.

Allegheny Energy, Osage-Whiteley 138 kV Project. Project Manager and siting expert for the route selection studies and permitting efforts associated with this interstate project involving 15 miles of 138 kV transmission line between Pennsylvania and West Virginia.

First Energy, Montville Whippany 115/230 kV Project - Project Director and siting lead for siting of a 230 kV connection between the Montville and Whippany Substations in central NJ. Efforts included management, siting, regulatory agency coordination, and permitting for the 10-15 mile 230 kV project.

First Energy, Red Bank 230 kV Project - Project Director and siting lead for siting of a 230 kV connection between the Montville and Whippany Substations in central NJ. Efforts included management, siting, regulatory agency coordination, and permitting for the ~15 mile 230 kV project.

First Energy, Oceanview – Larabee 230 kV Project - Project Director and siting lead for siting of 15+ miles of 230 kV line. Efforts included management, siting, regulatory agency coordination, and permitting for the x mile 230 kV project.

FirstEnergy, Transmission Reinforcement Study. Project Manager. FirstEnergy contracted Louis Berger and Commonwealth Associates to evaluate a range of electric solutions for constructing 30 miles of 115 kV transmission line in eastern Pennsylvania to improve reliability. Efforts included review of potential siting feasibility of several 115 kV routes and potential site identification for four substations.



U.S. FOREST SERVICE

U.S. Forest Service (USFS) Intermountain Rural Electric Association (IREA), Floyd Hill Distribution Tie Line Project, EA. Senior reviewer and advisor for development of this EA on a three-mile crossing of National Forest Lands in Colorado.

USFS, Thunder Basin National Grassland, Wyoming. Project manager and GIS specialist for a Roads Analysis for the Thunder Basin National Grassland, Wyoming, in accordance with FS-643, *Roads Analysis: Informing Decisions About Managing the National Forest Transportation System*. Served as facilitator for all interdisciplinary meetings, conducted the road valuation and risk analysis, and compiled a database for tracking risk and value rankings for each maintenance level 3 and higher road on the National Grassland.

USFS, Roads Analysis Process (RAP) Report for the Decommissioning of the Navy's Extremely Low Frequency (ELF) Transmitter on the Chequamegon National Forest, northern Wisconsin. Managed the analysis, modeling, and preparation of the RAP report, lead agency meetings for individual road risk and value assessments, and served as technical representative for the RAP at public scoping meetings.

USFS, Uwharrie National Forest Roads Analysis Process Report, North Carolina. Managed the production of the Uwharrie National Forest (North Carolina) Roads Analysis Process Report, in accordance with FS-643, *Roads Analysis: Informing Decisions About Managing the National Forest Transportation System*. Responsible for agency coordination, oversight and review of all analyses, preparation of the risk and value analysis, and assessment of hydrologic condition, aquatic communities, and forest resource access.

USFS, EA for Herbicide Treatments on the Long Cane Ranger District of the Sumter National Forest, South Carolina. Managed the preparation of an EA for Herbicide Treatments on the Long Cane Ranger District of the Sumter National Forest in South Carolina. For this analysis, major concerns focused on the indirect effects of herbicide treatments on wildlife, migratory bird use of regeneration sites, and forest composition effects.

USFS, Cullasaja Falls Recreation Improvement Project Biological Inventory and Assessment on the Nantahala National Forest, North Carolina. Project Manager for the Cullasaja Falls Recreation Improvement Project Biological Inventory and Assessment on the Nantahala National Forest, North Carolina. Responsible for project management of field surveys, analysis and assessment of wildlife and aquatic inventory analysis.

USFS, Valle Il Project EA (Proposed Restorative Treatment of the Forests of the Cerro Grande Fire Area) on the Santa Fe National Forest, New Mexico. Responsible for mapping and analysis of GIS information relative to areas under consideration for fire management activities.

USFS, Land and Resource Management Plan Amendment and EA for the Lincoln National Forest, New Mexico. Deputy project manager for the land and resource management plan amendment and EA for the Lincoln National Forest in New Mexico. The Lincoln National Forest proposes to amend its Forest Plan to meet current Federal wildland fire management policy, direction, and terminology. Proposed changes to the Forest Plan include allowing for the use of wildland fire for resource benefit, removing the option to use wildland fire in areas containing wildland/urban interface (WUI), allowing for prescribed fire in



wilderness, and requiring suppression of all human-caused ignitions.

USFS, Bethesda Analysis Area EA on the Enoree Ranger District of the Sumter National Forest, South Carolina. Project manager for the preparation of the Bethesda Analysis Area Environmental Assessment on the Enoree Ranger District of the Sumter National Forest (South Carolina). Also responsible for preparation of the analyses of timber and vegetation management effects on forest vegetation, soil, and visual and noise resources.

USFS, Lower Enoree Watershed Assessment, South Carolina. Deputy Project Manager, study included three separate analyses including; an ecosystem analysis, hydrologic condition analysis, and roads analysis all performed at the watershed scale. Responsible for the assessment of forest conditions, water quality analyses, and managing the preparation of the Hydrologic Condition Analysis and Roads Analysis.

USFS, Little Mountain Analysis Area EA on the Long Cane Ranger District of the Sumter National Forest, South Carolina. Responsible for preparation of the analyses of timber and vegetation management effects on forest vegetation, soil, and visual and noise resources.

USFS, EA for Proposed Modifications of Forest Highway 50 on the Pisgah National Forest, North Carolina. Major concerns focused on soil and water issues related to paving or not paving several portions of an 8 mile stretch of FS road. Conducted a field survey to support the modeling and assessment of erosion and sediment input to streams adjacent to the proposed road paving and maintenance operations. Analyses concerning soil erosion and water yield estimates will utilize the Forest Service Water Erosion Prediction Project Model (WEPP).

USFS, EA for the Land Between the Lakes Open Area Vegetation Management Plans, Kentucky. Conducted analyses of water quality and aquatic community concerns, and performed analyses using the Soil and Water Assessment Tool (SWAT) model to determine hazard and risk for a herbicide treatment program.

USFS, Little Muskingum Watershed Assessment, Wayne National Forest, Ohio. Responsible for inventory and assessment of forest vegetation and structure and technical support for analyses of water quality, aquatic community, and hydrologic conditions analyses.

USFS, Pine Creek Watershed Assessment, Wayne National Forest, Ohio. Responsible for inventory and assessment of forest vegetation and structure, analyses of water quality, aquatic communities. Provided GIS support through ortho-photo rectification, remote sensing, and land cover identification.

USFS, Shaver's Fork Watershed Assessment, Monongahela National Forest, West Virginia. Responsible for inventory and assessment of forest vegetation and structure and technical support for analyses of water quality, aquatic community, and hydrologic condition analyses.

USFS, Wayne National Forest Prescribed Fire Program EA, Ohio. Mapped and analyzed prescribed fire area boundaries, and planned and coordinated with both FS personnel and field personnel regarding property boundaries and required T&E survey boundaries.

USFS, EIS on Oil and Gas Leasing in the Finger Lakes National Forest, New



York. Responsible for mapping and assessing impacts associated with the various leasing alternatives. In addition to mapping and GIS based natural resource analyses, he supported the assessment of potential noise and visual impacts.

U.S. ARMY CORPS OF ENGINEERS

USACE Kansas City, Environmental Indefinite Delivery Indefinite Quantity (IDIQ). Ecological technical lead supporting the USACE in development of a research compendium to support the development of a Restoration Management Plan for the Missouri River Recovery Program.

USACE Mobile, Upper Turkey Creek Feasibility Study. Technical lead for the Upper Turkey Creek Flood Damage Reduction and Ecological Restoration Feasibility Study. Managed field assessments, ecological restoration treatment planning, and ecological restoration report preparation. Responsible for mapping and analysis of GIS information in support of field survey efforts and stream restoration planning and flow modeling.

USACE Omaha, South Dakota Title VI Land Transfer EIS. Team lead. This project involved a Congressional mandate for the transfer of Federal lands to the State of South Dakota for recreation and wildlife management purposes, and to several Native American Tribes. Acted as the team lead for GIS mapping and data analysis, and was also responsible for the analysis and assessment of potential visual impacts.

Quantico Marine Corps Base, Wetland Delineation and EA for Basic School Improvements. Lead wetland delineator and water resources analyst for NEPA compliance supporting major development efforts at the MCBQ Basic School.

ARMY NATIONAL GUARD

Army National Guard, EA for the Marmet Lock Improvement Project, Charleston, West Virginia. Modeled the effects of the anticipated increase in truck traffic along the entire transport route from the lock to the dredge disposal site using the FHWA's Highway Capacity Software.

Army National Guard, EA for the West Virginia ARNG Regarding Helicopter Flight Operations over the Monongahela National Forest, West Virginia. Responsible for data gathering, client coordination and contract management, and was involved in editing the EA document.

OTHER DEPARTMENT OF DEFENSE

Base Realignment and Closure Environmental Compliance (five EAs). Interdisciplinary team member and senior analyst responsible for assessing and reporting on water resource concerns under BRAC programs at Fort Bragg, Fort Meade, Fort Dix, Fort Detrick, and Devens Airforce Base (four EAs).

Roads Analysis Process (RAP) Report for the decommissioning of the Navy's Extremely Low Frequency (ELF) Transmitter on the Chequamegon National Forest, Wisconsin. Managed the analysis, modeling, and preparation of the RAP report, lead agency meetings for individual road risk and value assessments, and served as technical representative for the RAP at public scoping meetings.

EA for the U.S. Air Force on the Long Range Air Launch Target (LRALT) system. Technical lead. Project provided a realistic threat simulation for testing Theater Missile Defense systems over the Pacific Ocean. As leader for this project, participated in client coordination and alternatives and issues



development, as well as data gathering, analysis, and technical writing for the EA. As the technical lead for this project, responsible for analysis of the oceanic testing environment, technical aspects of environmental effects from missile launch debris and effluent, compilation and editing of report, and client coordination for modeling and analysis.

NATIONAL PARK SERVICE

National Park Service (NPS), Water Resource Scoping Report for the Denali National Park and Preserve, Alaska. The report provides an overview of water-related legislation, summarizes the hydrologic environments in the park, and identifies and provides an analysis of high-priority water resource issues and management concerns. Project responsibilities included **project management**, researching and identifying water resources issues relating to hydrology, development impacts, scoping meeting facilitation, and GIS analyses.

NPS, EA for Wrangell-St. Elias National Park and Preserve, Alaska. The proposed project would establish the first and only formal NPS campground in the park. The campground is located on sensitive wetland habitat along a lakeshore, which required analysis of classification of vegetation types from infrared imagery and available botanical studies to determine wetland impacts.

NPS, EA to Support Rehabilitation Efforts on the Roosevelt Ice Pond Dam in Hyde Park, New York. Responsible for project management and GIS analyses and modeling. GIS activities for this project included general mapping and efforts to determine peak flows for development of appropriate dam rehabilitation methods.

NPS, EA to Support Rehabilitation Efforts on the Val Kil Pond in Hyde Park, New York. Responsible for both project management and GIS analyses and modeling. GIS activities for this project included general mapping and review of historical imagery to assess changes in pond size and structure over time.

NPS, Potomac Gorge Wetland Inventory, Mapping, and Characterization Project, a Joint Venture between the Nature Conservancy and the NPS. Identified wetlands from satellite imagery and performed field inventory of the type and vegetation composition of all identified wetlands within the Potomac Gorge (which forms the boundary between Maryland/Washington, DC and Virginia).

NPS, Delaware Water Gap National Recreation Area McDade Trail EA Amendment and Monitoring Plan, Pennsylvania. Responsible for TR55 modeling and hydrologic analysis in support of culvert design and sediment and erosion control design efforts.

NPS, EA for the Mount Rushmore Fourth of July Fireworks Program, South Dakota. Responsible for analyses of vegetation and fire risk, noise, and all GIS mapping and analysis.

NPS, EA for the Blue Ridge Parkway, Regarding Reconstruction of a Bridge and Other Park Facilities and Restoration of Eroded Areas at the Otter Creek Campground, Amherst County, Virginia. The current bridge design results in debris buildup and flooding during severe storm events, causing massive stream bank erosion and subsequent sedimentation of Otter Creek and Otter Lake downstream, loss of riparian areas, and threatens visitor health and safety, as well as the stability of Park structures. High waters also flood a nearby sewage system, causing untreated wastewater to be discharged into the Creek. Analyzed impacts of the alternatives on air quality, the sanitation system, land



use, and impacts from construction noise on park operations and resources.

NPS, EA for the NPS Denver Service Center that analyzed the construction and operation of a new Corinth Civil War Interpretive Center in Corinth, Mississippi, to be operated and maintained as part of the Shiloh National Military Park, Tennessee. Responsible for the analysis of noise impacts from the proposed construction and operation of the interpretive center. This resource was of particular concern due to the potential of activities to affect a nearby elementary school and daycare center.

U.S. FISH AND WILDLIFE SERVICE

U.S. Fish and Wildlife Service, GIS Database Development, Mapping, and Training for the Chassahowitzka Refuge Complex, Florida. Provided introductory and advanced training in GIS to the Chassahowitzka Refuge Complex, which includes the Chassahowitzka, Crystal River, Egmont Key, Passage Key, and Pinellas Refuges. A custom training curriculum was developed to coincide with the needs of the refuges' CCP planning process. Additional tasks included the development a GIS database for the refuge and creation of maps for the final CCP.

GENERAL SERVICES ADMINISTRATION

General Services Administration, EA Analyzing Deer Management at a Federal Facility, Silver Spring, Maryland. Conducted field investigations of vegetation type and abundance both within the project area and in comparable sites in the region to characterize deer impacts on forest understory.

STATE AND LOCAL GOVERNMENTS

District of Columbia Comprehensive Plan, Environmental Technical Report. Led the preparation of an environmental baseline report in support of the District's Comprehensive Planning Process. Also served as GIS team lead for the project, coordinating GIS analysis for habitats, water resources, environmental hazards, and all mapping efforts.

Nottawasaga and Lake Simcoe Target Load Study, Lake Simcoe Regional Conservation Authority. Team lead for the Lake Simcoe and Nottawasaga River phosphorous load target setting study. Supported the development of a phosphorus target setting strategy for a rapidly developing watershed north of Toronto, California. Regularly presented results and status to the Project Technical Advisory Committee comprised of local municipality leaders in Ontario, managed GIS analysis efforts, and lead the production of the final report.

TRIBAL EXPERIENCE

EA to Support the Development of a Forest Management Plan for Naragansett Indian Tribe of Rhode Island. For the Naragansett (a Category 4 – Minimally Forested Reservation), forest planning centers around management of forest resources for firewood, wildlife, culturally significant species, and protection of forest resources from insects and disease. For this project, GIS analysis primarily focused on correlation of forest inventory data with Tribal land use patterns to determine appropriate management prescriptions for different land areas.

Forest Management Plan and associated EA for the Mississippi Band of Choctaw Indians. Project Manager. For the Choctaw (a Category 1 – Major Forested Reservation), forest planning centers around multiple use management of forest resources for timber production, recreation, and protection of forest resources from insects and disease. For this project, GIS analysis correlates forest inventory data with Tribal land use patterns, recent imagery, and for



developing appropriate management strategies for the 7 major communities that comprise the Mississippi Band of Choctaw lands.

ADDITIONAL INFORMATION (FOR INFORMATION ONLY)

Education

MS, Biology, Creighton University, 2000

BS, Environmental and Forest Biology, College of Environmental Science and Forestry at Syracuse University, 1997

Registrations/Certifications

Certified GIS Professional (GISP)

Training

Wetland Delineation and Management Training Course - U.S. Army Corps of Engineers (USACE)-approved, 2002

