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

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| In the Matter of the Application of Grain Belt Express, LLC for a Siting Permit for the Construction of Two 345 kV Transmission Lines and Associated Facilities through Gray, Meade, and Ford Counties, Kansas. | ) ) ) ) ) | Docket No. 24-GBEE-____-STG |

# DIRECT TESTIMONY OF

# JAMIE PRECHT

# ON BEHALF OF

# GRAIN BELT EXPRESS LLC

**May 31, 2024**

## Contents

## I. INTRODUCTION

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

A. My name is Jamie Precht. I am the Manager of the Environmental Studies Department of Burns & McDonnell Engineering Company, Inc. ("Burns & McDonnell"). My business address is 9450 Ward Parkway in Kansas City, Missouri 64114.

**Q. On whose behalf are you testifying?**

A. I am testifying on behalf of Grain Belt Express LLC ("Grain Belt Express").

**Q. Please describe your educational and professional background.**

A. I received a B.S. Degree in Biology with emphasis in Pre-Fisheries and Wildlife from Pittsburg State University in May 2003, and a M.S. Degree in Biology from Pittsburg State University in December 2006. I joined Burns & McDonnell in March 2005 as an Assistant Environmental Scientist. I was promoted to Staff Environmental Scientist in 2008 and Senior Environmental Scientist in 2012. In 2015, I was promoted to Project Manager and in 2021, promoted to Manager of our Environmental Studies Department. In this position, I manage routing, public involvement and permitting activities for high-voltage transmission line projects for various clients across the country as well as manage the day-to-day staffing needs and development of the Environmental Studies Department. I have supported the routing and siting efforts for hundreds of miles of transmission lines in the State of Kansas during my time at Burns & McDonnell. I previously filed testimony with the Kansas Corporation Commission in 2016 in Docket No. 17-WSEE-063-STG.

**Q. Please describe how Burns & McDonnell are involved in this proceeding.**

A. Burns & McDonnell was retained by Grain Belt Express to perform a routing study to assess appropriate routes for the construction of two inter-related transmission lines and

associated facilities: (1) a double-circuit[1] 345 kV transmission line of approximately 46 miles in length across portions of Gray, Meade, and Ford Counties (the "Meade-Dodge City Line" or "Meade Line"); and (2) a single or double-circuit 345 kV transmission line of approximately 16 miles in length traversing a portion of Ford County (the "Bucklin-Dodge City Line" or "Bucklin Line"). Together, Grain Belt Express may refer to these lines as the "AC Collector Lines," which make up a portion of the AC Collector System.[2] Burns & McDonnell staff were part of the "Routing Team," which included personnel from HDR Engineering, Inc., Burns & McDonnell, and Invenergy who collaborated on the routing process for the AC Collector Lines.

**Q. What is the purpose of your testimony?**

A. The purpose of my testimony is to support Grain Belt Express' request for a Siting Certificate to construct, own, operate, and maintain the Project. The Meade-Dodge City Line proposed route ("Meade Proposed Route")[3] is located within Gray, Meade and Ford counties. The Bucklin-Dodge City Line proposed route ("Bucklin Proposed Route")[4] is located within Ford County. My Direct Testimony introduces the Routing Study (the "Routing Study"), attached hereto as Exhibit JP-2. The Routing Study provides a high-level overview of the route selection methodology and analysis of environmental and other potential impacts such as agricultural,

[1] The Meade-Dodge City Line is currently planned as a double circuit transmission line, but further refinements to Grain Belt Express' design and engineering may occur. Grain Belt Express will update the Commission throughout this proceeding regarding significant design and engineering modifications.

[2] The AC Collector System is a system composed of AC transmission lines needed to connect generation facilities in western Kansas to the HVDC Line.

[3] As described more specifically in Section 4.5 and 4.6 of the Routing Study, the Meade Proposed Route is the route presented to the Commission for review and approval for the Meade-Dodge City Line.

[4] As described more specifically in Section 3.5 and 3.6 of the Routing Study, attached hereto as Exhibit JP-2, the Bucklin Proposed Route is the route presented to the Commission for review and approval for the Bucklin-Dodge City Line.

residential, and cultural, that were factored into the routing selection process. Grain Belt Express witness Emily Hyland describes the public engagement aspects of the AC Collector Lines in her Direct Testimony.

**Q. Are you sponsoring any exhibits as a part of your testimony?**

A. Yes, I am sponsoring the following exhibits:

- Exhibit JP-1 – Jamie Precht's Curriculum Vitae
- Exhibit JP-2 – Routing Study
- Exhibit JP-3 – Map of the Bucklin Line Proposed Route
- Exhibit JP-4 – Map of the Meade Line Proposed Route
- Exhibit JP-5 – Bucklin Line Legal Description
- Exhibit JP-6 – Meade Line Legal Description

## II. BACKGROUND ON THE AC COLLECTOR LINES AND THE PROPOSED ROUTES

**Q. What was the objective of the route selection study?**

A. The primary objective of the routing analyses was to identify economically feasible routes for the Meade-Dodge City Line and the Bucklin-Dodge City Line that offered the most benefits in terms of providing reliable interconnection, but also limited adverse impacts on landowners, as well as the social and natural environment within the study area. The ultimate goal of the study was to identify and analyze routing alternatives in order to select the Proposed Routes for the two AC Collector Lines.

**Q. What was your role on the routing team?**

A. I was the project manager and was responsible for overseeing the data collection, route development, and route evaluation for the AC Collector Lines.

## III. OVERVIEW OF ROUTE SELECTION PROCESS

**Q. Please summarize the route selection process that Grain Belt Express undertook for the AC Collector Lines.**

A. The route selection process was a multi-step process that included a four-phase approach: (1) study area phase, (2) alternate route network phase, (3) public involvement phase, (4) proposed route selection phase and final adjustments to the Proposed Route. Each phase is briefly described below and in more detail later in my Direct Testimony.

First, the study area phase involved defining the AC Collector Lines' endpoints, identifying the study areas, collecting publicly available study area data, and identifying constraints, opportunities, and routing factors.

Second, the alternate route network phase involved refining the routes identified by the Routing Team, identifying routing considerations, identifying modifications to the AC Collector Lines' alternate routes, identifying additional routes that make up the alternate route networks, conducting a field review of the alternate route networks, and finalizing the alternate route networks. This included making any adjustments to the alternate route network based on the field observations and the Routing Team's subject matter experts.

Third, the public involvement phase included public outreach and obtaining feedback from members of the public. This phase is described in Ms. Hyland's testimony. Feedback obtained from the public resulted in several change requests by several parties to the alternate route networks prior to the analysis on these refined alternate route networks.

Fourth, the Proposed Route selection phase involved performing a route analysis of the refined alternate routes and selecting proposed routes.

## IV. STUDY AREAS AND ROUTE DEVELOPMENT

**Q. Please explain the study area phase of the AC Collector Lines.**

A. In order to develop study areas in which to locate the Proposed Routes, AC Collector Line endpoints need to be defined. For the AC Collector Lines, the endpoints were the Bucklin Origination Point, Meade Origination Point and Grain Belt Express Kansas converter station AC switchyard. With these endpoints in mind, the Routing Team established the two study area boundaries.

The Bucklin Line Study Area is roughly bounded by the Arkansas River to the north, the town of Bucklin to the southeast and U.S. Highway 54 to the south. The western edge is along 117 road. The Meade Line Study Area is roughly bounded by the U.S. Highway 56 and Saddle Road to the north, U.S. Highway 54 and the Meade and Ford County boundary to the south, two existing 345kV transmission lines to the east, and State Road 23 to the west.

Defining the study areas' boundaries is important so that the investigation can become focused early in the process. The study areas were designed to provide a sufficient area within which numerous potential route alternatives could be developed and considered without being so large as to overwhelm the study with alternative options. The study areas for the AC Collector Lines included: several municipalities; several rivers; windfarms; and existing linear infrastructure, such as existing electric transmission and distribution lines, oil and gas pipelines, highways, railroads, and local roads.

**Q. What was the next step in the routing process, following the development of the study area?**

A. Publicly available data pertaining to the study areas was collected and organized within a geographic information system ("GIS") database. This data included recent aerial photography, U.S. Geological Survey ("USGS") topographic maps, wetlands, parcel data, roads,

and municipal boundaries. The collection of this data was necessary to identify constraints and opportunities within the study areas for the development of the initial alternative route network.

A constraint is an area that generally can be delineated on a map and that can affect the location of the new facility. Constraints represent potential obstacles or impediments to the routing of a transmission line. Examples of constraints for route selection included dense residential areas, forested wetlands areas, public and private airports, and crossings of other existing transmission lines. Several of the routing constraints identified within the study areas included center pivot irrigation, wind turbines, sensitive species habitat, and existing transmission lines.

Routing opportunities are locations where the routes could be located to avoid constraints and parallel, if appropriate, existing linear infrastructure, such as railroads, roads, existing transmission lines, etc., to potentially minimize the impacts of the AC Collector Lines on the social and natural environments. Routing opportunities in the study areas included the siting of route segments parallel to highways and local roads, existing power lines, or other linear features (i.e., paralleling opportunities) as well as utilizing undeveloped land where paralleling opportunities did not exist.

The Routing Team assembled this data and identified the opportunities and constraints for the study areas.

**Q. Once study area data is collected and the opportunities and constraints are identified, what was the next step in the process?**

A. The Routing Team identified the routing factors, which consisted of engineering, social and environmental/land use factors to be considered for the evaluation of the alternate route networks. This completed the first phase of the route selection process for the AC Collector Lines.

## V. ALTERNATE ROUTE NETWORK PHASE

**Q. You noted that the second phase of the route selection process involved the establishment of an alternate route network. Did you establish an alternate route network for the AC Collector Lines?**

A. Yes. Following the study area phase, the Routing Team identified an initial, extensive, and very broad network of geographically distinct route options that could connect the Meade Origination Point and the Bucklin Origination Point to the Grain Belt Express Kansas converter station AC switchyard. These routes were comprised of numerous shorter and interconnecting links. Once these alternative route links were identified, the Routing Team reviewed these alternate routes in detail during numerous project meetings and added, modified, or eliminated several of the route links. These changes were based on a review of the routing principles, selected evaluation factors, feedback received from agency correspondence, and compliance with Grain Belt Express' standards of feasibility and constructability.

**Q. What were the routing principles used to identify the route alternatives?**

A. Routing principles used to identify alternative routes are listed below:

- Maximize the distance of the transmission line from residences, businesses, public facilities, parks, cemeteries, communication towers, and wind turbines;
- Minimize crossing through cultivated land and center pivot irrigation arms;
- Maximize the distance of the transmission line parallel to existing utilities, roads, railroads, and/or parcel boundaries when practical;
- Minimize crossing wetlands, riparian areas, conservation lands, and protected species and their habitats for both the transmission line corridor and access for construction and maintenance; and
- Maintain a reasonable length with as few angles as possible.

**Q. Did the Routing Team conduct a field review of the identified alternate routes?**

A. Yes. After alternate route links were initially identified via desktop review, the Routing Team conducted a field review of the alternate routes along publicly accessible roads to verify potential constraints and opportunity areas, the feasibility of the routes, and to facilitate the further screening and evaluation of the routes.

At the conclusion of the field review process, the alternate routes that best adhered to the routing factors and minimized potential impacts were carried forward as the alternate route network and shown to the public. Based upon these considerations, a network of 46 route links was established between the Bucklin Origination Point and Grain Belt Express Kansas converter station AC switchyard. A network of 76 route links was established between the Meade Origination Point and Grain Belt Express Kansas converter station AC switchyard. The network of route alternatives for the AC Collector Lines is depicted in Figures 3-1 and 4-1 in the Routing Study provided in Exhibit JP-2. When combined, these various route links form the alternate routes that ultimately connect the project endpoints as further described below.

## VI. ROUTE ADJUSTMENTS FOLLOWING PUBLIC ENGAGEMENT

**Q. What opportunities were the public given to provide feedback during the route selection process?**

A. As described in Ms. Hyland's testimony, Grain Belt Express hosted a total of three in-person open house meetings on February 27, 28, and 29, 2024 in Ford, Meade, and Gray Counties, respectively. Burns & McDonnell participated in the open house meetings and collected feedback through routing questionnaires, aerial table maps, and computer stations.

Grain Belt Express also created a virtual open house that was hosted on the project website from February 23 to March 15, 2024. In addition, Grain Belt Express maintained a telephone

hotline and email inbox where landowners or other interested stakeholders could contact the company with questions or comments concerning the AC Collector Lines. The in-person open houses and other options for obtaining information and submitting feedback were advertised through postcards and newspaper advertisements, as described by Ms. Hyland.

**Q. Have stakeholders or members of the public provided feedback to Grain Belt Express?**

A. Yes, the Routing Team has received feedback from interested stakeholders and landowners in the AC Collector Line study areas.

**Q. Were any modifications to the Alternate Routes made as a result of this public feedback?**

A. Yes. Grain Belt Express has made a number of modifications to refine the alternate route network as a result of these interactions, which ultimately resulted in the refined alternate route network. Following receipt of landowner inquiries, the Routing Team removed link 266 from the Meade Line Alternate Route Network as it was located in close proximity to a wind turbine. Additionally, link 210 was modified to parallel the existing 115kV line east of the intersection of U.S. Highway 56 and State Highway 23. No modifications to the Bucklin Line Alternate Route Network were made following the open houses. The resulting route network for the Bucklin Line consisted of 46 route links that could be combined to create 696 different route alternatives. The resulting route network for the Meade Line consisted of 75 alternate route links that could be combined to form 6,152 alternate routes. These 696 Bucklin Line routes and 6,152 Meade Line routes were the routes that were carried through the analysis as the refined alternate routes.

## VII. EVALUATION OF THE REFINED ALTERNATE ROUTES

**Q. How were alternate routes evaluated?**

A. The level of complexity resulting from the number of refined alternate routes, combined with numerous factors and differences in measurement units, make it difficult to conduct a route-by-route comparison to identify a route that minimize potential overall impacts to the area. Consequently, Burns & McDonnell used a statistical z-score analysis as a tool to rank and screen the refined alternate routes and to identify a smaller, more manageable number of routes warranting further investigation and comparison for the selection of the Proposed Routes as described in Sections 3.5.3.1 and 4.5.3.1 of the Routing Study. Under this analysis, a lower value means less impact on a particular factor. No single route had the lowest value for all the measured factors. While a particular route may have the lowest impact for one factor, it may have higher impacts for another. The routing factors included units such as combined score, length, acres, and numbers of selected resources. These units are not directly comparable but need to be considered as a whole in the evaluation process.

**Q. What were the routing factors that were utilized to evaluate the refined alternate routes?**

A. The Routing Team evaluated the refined alternate routes using a systematic comparison of the alternatives based on the social, environmental, and engineering factors that represent potential adverse effects on resources in the study area. The routing factors are listed in Tables 3-4 and 4-4 of the Routing Study.

**Q. Were the routing factors weighted?**

A. Yes. The Routing Team assigned weights to the factors based on their experience with similar transmission line projects across the country and based on public and agency feedback. Not all factors are necessarily of equal importance within the study area. To allow the

evaluation to be more sensitive to concerns in the study area, relative weights were placed on factors that should most influence the selection of the Proposed Routes. Weights allow for more separation within the scores that make up the quantitative analysis which can make natural breaks in scores more apparent.

**Q. Were any state, federal, or local agencies contacted as part of the routing process?**

A. Yes. Letters were sent to state and federal agencies to seek input on threatened, endangered, proposed, and candidate species; eagles; protected habitats; conservation areas; wetlands and waters; and cultural resources. Requests for information were provided to the U.S. Environmental Protection Agency ("EPA"), National Park Service ("NPS"), U.S. Fish and Wildlife Service ("USFWS"), U.S. Army Corps of Engineers ("USACE"), Kansas Department of Wildlife and Parks ("KDWP"), Kansas Department of Agriculture ("KDA"), Kansas Department of Health and Environment ("KDHE"), Kansas Historical Society ("KSHS"), Natural Resource Conservation Service ("NRCS"), Federal Aviation Administration ("FAA"), Kansas Biological Survey ("KBS"), and Kansas Department of Transportation ("KDOT"). Additionally, as described in Ms. Hyland's testimony, elected public officials including county commissioners, county and municipal leaders, and other elected officials received copies of the information that was provided to landowners as part of the public outreach.

**Q. Was any feedback received from the agencies?**

A. Yes, it was, and we used that feedback in the development of the alternate routes and to assist in the weighting of the factors and in evaluating options to minimize impacts to environmental resources for the selected route. For example, alternative routes were developed to minimize impacts to known sensitive environmental areas such as wetlands, floodplains, and lesser

prairie-chicken habitat. KDWP recommended to follow road right-of-way ("ROW") when feasible to minimize environmental impacts, which, as previously discussed, was one of the primary routing principles.

**Q. Were any other adjustments made when analyzing the refined alternative routes?**

A. No.

## VIII. SELECTION OF THE PROPOSED ROUTES

**Q. Once the network of refined alternate routes for the AC Collector Lines were finalized, how did the Routing Team go about selecting the Proposed Routes?**

A. The data for the top 10 percent of routes were reviewed in detail to help differentiate the routes. Scores resulting from the z-score analysis of the refined alternate routes for the Bucklin Line ranged 120.70 points. Given the range of scores for the Bucklin Line is 120.70 points, the top 10 percent of routes by z-score includes all routes within 12.07 points of the lowest scoring route. The score of the lowest scoring route is -65.43 and all routes within 10 percent would score between -53.36 and -65.43. In this case, 11 routes made up the top 10 percent, which were considered further using the route data to make a final recommendation for a Proposed Route for the Bucklin Line.

Scores resulting from the z-score analysis of the refined alternate routes for the Meade Line ranged 126.31 points. Given the range of scores for the Meade Line is 126.31 points, the top 10 percent of routes by z-score includes all routes within 12.63 points of the lowest scoring route. The score of the lowest scoring route is -56.29 and all routes within 10 percent would score between -43.66 and -56.29. In this case, 51 routes made up the top 10 percent, which were considered further using the route data to make a final recommendation for a Proposed Route for the Meade Line.

This process is described in detail in Sections 3.5 and 4.5 of the Routing Study.

**Q. Which of the alternate routes for the AC Collector Lines was selected?**

A. The final route alignment selected as the Bucklin Line is Route 444 and is depicted in Figure 3-5 of the Routing Study. In addition, detailed maps and a legal description of the Proposed Route are provided in Exhibits JP-3 and JP-5, respectively.

The final route alignment selected as the Meade Line is Route 12 and is depicted in Figure 4-5 of the Routing Study. In addition, detailed maps and a legal description of the Proposed Route are provided in Exhibits JP-4 and JP-6, respectively.

**Q. What were the considerations that contributed to the selection of Routes 444 and 12 for the AC Collector Lines?**

A. Some of the considerations that led to the selection of Route 444 as the Proposed Route for the Bucklin-Dodge City Line include:

- minimizes acres of center pivot irrigation;
- minimizes acres of non-irrigated cropland;
- one of the shortest routes;
- minimizes impacts to land use and habitat by paralleling roads for a significant portion of its length;
- minimizes heavy angles;
- has no homes within 150 feet of the centerline;
- minimizes impacts to wetlands and potential whooping crane stopover locations; and
- minimizes acres of woodland clearing.

Some of the considerations that led to the selection of Route 12 as the Proposed Route for the Meade-Dodge City Line include:

- Minimizes acres of center pivot irrigation;

- minimizes acres of non-irrigated cropland;
- minimizes impacts to land use by paralleling roads;
- minmizes heavy angles;
- has no homes within 150 feet of the centerline and does not cross any residential driveways;
- minimizes impacts to lesser prairie-chicken habitat;
- minimizes impacts to private airports; and
- minimizes impacts to wetlands and potential whooping crane stopover locations.

## IX. CONCLUSION

**Q. What do you conclude regarding the route selection for the AC Collector Lines?**

A. The Proposed Route alignments for the AC Collector Lines, which were determined after a detailed analysis process and input from potentially affected landowners and other stakeholders, were selected because they would minimize the overall social and environmental impacts of the AC Collector Lines while providing an economical and reasonable route for design and construction.

**Q. Is it possible that changes will be made to the Proposed Routes?**

A. Based on local conditions that may be identified or encountered during boundary and environmental surveys, final engineering, design, ROW acquisition, or construction, Grain Belt Express may be required to make minor adjustments to the Proposed Route alignments. These adjustments would be to address specific, localized conditions or circumstances not readily apparent as part of the route selection process but would not be anticipated to result in substantial (if any) additional impacts. Any adjustments would generally be intended to reduce overall

environmental impacts, reduce the AC Collector Lines' inconvenience to landowners, and/or protect public safety.

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

A. Yes, it does.

## VERIFICATION

I, Jamie Precht, do solemnly, sincerely and truly declare and affirm that I am the Manager of the Environmental Studies Department at Burns & McDonnell Engineering Company, Inc., that I have read the foregoing testimony and know the contents thereof, and that the facts set forth therein are true and correct to the best of my knowledge and belief, and this I do under the pains and penalties of perjury.

By: Jamie Precht
Jamie Precht

May 31, 2024

# Exhibit JP-1

# JAMIE L. PRECHT, M.S., ENV SP

## Environmental Studies Department Manager / Project Manager

With 20 years experience working the Environmental field, Jamie currently serves as the Manger of the Environmental Studies Department in Kansas City, Missouri. Jamie has over 15 years of project management experience related to environmental permitting and siting. She has managed projects from the routing and siting phase through construction close out.

Jamie has routed or permitted linear facilities in more than 15 different states. These facilities ranged from less than one mile to more than 200 miles in length. She has worked on overhead transmission projects with voltages ranging from 69-kilovolt (kV) to 765-kV. Jamie has also provided witness testimony and oversight as part of filing efforts in Kansas and additional oversight for filing in Missouri. She is skilled in ecological restoration, NEPA, environmental compliance, routing/siting studies, alternatives analysis, permitting, and mitigation.

### EDUCATION

- BS, Biology; Pittsburg State University
- MS, Biology; Pittsburg State University

### CERTIFICATIONS

- Conflict Resolution in Natural Resources
- OSHA 10 Hour Construction Safety
- Envision Sustainability Professional (ENV SP)

**19** YEARS WITH BURNS & MCDONNELL

**21** YEARS OF EXPERIENCE

### North Manhattan to South Alma Transmission Line Project | Evergy

Riley, Pottawatomie and Wabaunsee County, Kansas | 2023 - 2024

***Project Manager*** for three new 115-kV transmission lines totaling approximately 34 miles in Kansas for Evergy. This project consists of evaluating various route alternatives for the siting of three transmission lines. Routes are being developed that consider both single circuit options as well as some shared double circuit options near the intermediate substation connections. Jamie's responsibilities include initial site visits, route development and selection processes, agency consultations, public scoping meetings, and project management throughout the siting phase.

### Martin City to Redel Transmission Line Project | Evergy

Johnson County, Kansas | 2022

***Project Manager*** for permitting 2 miles of rebuilt 161-kV overhead transmission line in Johnson County, Kansas. This project included the preparation of a stormwater pollution prevention plan and submittal of NOI to the Kansas Department of Health and Environment. Local permitting included City of Leawood land disturbance permit, City of Overland Park land disturbance permit, floodplain fill permits, and public access rights-of-way permits. Desktop wetlands, cultural and threatened endangered species review and reports were also included as well as information consultations with KDWP and the Kansas SHPO.

### Eerie to Neosho Transmission Line Project | Evergy

Neosho County, Kansas | 2021 - 2022

***Project Manager*** for 6 mile long 161-kV transmission line and 2 miles of 69-kV transmission in Kansas for Evergy. This project consisted of evaluating various route alternatives for the siting of two transmission lines. Routes were developed that would consider both single circuit options as well as some shared double circuit options near the new Erie Substation.

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Jamie's responsibilities included initial site visits, route development and selection processes, agency consultations, public scoping meetings, and project management throughout the siting phase.

### Fall River to Tioga Transmission Line Project | Westar Energy

Neosho, Wilson, Greenwood County, Kansas | 2020 - 2021

***Project Manager*** for approximately 33 miles new 138-kV overhead electrical transmission line in Kansas. Jamie's responsibilities included initial site visits, route development, agency consultations, and project management throughout the preliminary siting of this overhead transmission line.

### Salina Main Transmission Line Project | Evergy

Salina, Kansas | 2020 - 2021

***Project Manager*** for approximately 2 miles new 69-kV overhead electrical transmission line in Salina, Kansas. Jamie's responsibilities included initial site visits, route development and selection processes, agency consultations, virtual public scoping meetings, and project management throughout the siting and permitting phase.

### East Eureka Otter Creek Transmission Line Project | Evergy

Greenwood County, Kansas | 2019 - 2020

***Project Manager*** for approximately 10 miles new 115-kV overhead electrical transmission line near Eureka, Kansas. Jamie's responsibilities included initial site visits, route development and selection processes, agency consultations, public scoping meetings, and project management throughout the siting and permitting phase.

### Beech Tap to Springdale Transmission Line Project | Westar Energy

Wichita, Kansas | 2015 - 2016

***Project manager*** for 5 miles of new 138-kV through densely developed areas of Wichita, Kansas. The project consisted of the routing and permitting of both a greenfield line and a relocated line as a result of a highway project. Special considerations for this project included FAA restructured airspaces as well as coordination with the City of Wichita to minimize impacts to bridge improvements. Permitting efforts included desktop cultural, wetlands and threatened and endangered species reviews, FAA review, SWPPP/NOI, agency consultations, KDA Stream Obstruction Permits, KDOT and county road crossing permits. Jamie's responsibilities included initial site visits, route development and selection processes, agency consultations, public scoping meetings, and project management throughout the siting and permitting phase.

### Jade to Florence Transmission Line Project | Westar Energy

Marion County, Kansas | 2019 - 2020

***Project Manager*** for approximately 12 miles new 138-kV overhead electrical transmission line in Marion County, Kansas. Jamie's responsibilities included initial site visits, route development and selection processes, agency consultations, public scoping meetings, and project management throughout the siting of this overhead transmission line.

### Geary County to Chapman Junction Transmission Line Project | Westar Energy

Dickinson and Gary County, Kansas | 2015 - 2018

***Project Manager*** for a 15 mile greenfield 115-kV overhead transmission line Project for Westar Energy. The project consisted of a routing and siting phase for the rebuild of a 345-kV line to include a second 115-kV circuit as well as the siting

# JAMIE L. PRECHT, M.S., ENV SP

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and construction of two portions of new 115-kV line. The project tasks included public involvement activities, as well as full permitting efforts for the greenfield and rebuild lines. Permitting efforts included desktop cultural, wetlands and threatened and endangered species reviews, FAA review, SWPPP/NOI, agency consultations, KDA Stream Obstruction Permits, KDOT and county road crossing permits, RESA permit, and EL permit. Jamie's responsibilities included initial site visits, route development and selection processes, agency consultations, public scoping meetings, and project management throughout the siting and permitting phase.

### Kingfisher to Cheyenne to Walnut Transmission Line Project | Westar Energy

Brown, Atchison and Jackson County, Kansas | 2017 - 2019

***Project Manager*** for approximately 40 miles of new 115-kV overhead electrical transmission line in northeastern Kansas. Jamie's responsibilities included initial site visits, route development and selection processes, agency consultations, public scoping meetings, and project management throughout the siting and permitting phase. Permitting efforts included desktop cultural, wetlands and threatened and endangered species reviews, FAA review, SWPPP/NOI, agency consultations, KDA Stream Obstruction Permits, KDOT and county road crossing permits.

### Viola to Sumner County Transmission Line Project | Westar Energy

Sumner County, Kansas | 2014 - 2019

***Project Manager*** for a 35 mile long transmission line project in central Kansas for Westar Energy. This project consisted of evaluating various route alternatives for new 138-kV and 345-kV transmission lines. Routes were developed that would consider both single circuit options as well as some shared double circuit options. The project tasks included public involvement activities, as well as full permitting efforts for the greenfield and rebuild lines. Permitting efforts included desktop cultural, wetlands and threatened and endangered species reviews, FAA review, SWPPP/NOI, agency consultations, KDA Stream Obstruction Permits, KDOT and county road crossing permits, RESA permit, and EL permit. The project also included Phase I cultural resource surveys and habitat assessment for the state-listed checkered garter snake and New Mexico threadsnake. Jamie's responsibilities included initial site visits, route development and selection processes, agency consultations, public scoping meetings, and project management throughout the siting and permitting phase.

### Franklin to Sugar Creek Transmission Line Project | Westar Energy

Crawford County, Kansas | 2016 - 2017

***Project manager*** for 8 miles of new 69-kV overhead transmission lines through densely developed areas of southeast Kansas. The project consisted of the routing of three greenfield 69-kV transmission lines. Special considerations for this project included FAA restructured airspaces as well as coordination with the City of Pittsburg and KDWP to minimize impacts to parks and a Wildlife Management Area. Jamie's responsibilities included initial site visits, route development and selection processes, agency consultations, public scoping meetings, and project management throughout the siting and permitting phase.

### Dragon to Charger to Arnold Transmission Line Project | Westar Energy

Jefferson and Atchison County, Kansas | 2018 - 2019

***Project Manager*** for 25 miles of new 115-kV transmission and 15 miles of upgraded 69-kV to 115-kV overhead transmission lines in Jefferson and Atchison County, Kansas. The project included crossing through the U.S. Army Corps of Engineering Lake Perry. Special considerations were required to identify opportunities throughout large floodways in the

# JAMIE L. PRECHT, M.S., ENV SP

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study area. Jamie's responsibilities included initial site visits, route development and selection processes, agency consultations, public scoping meetings, and project management throughout the routing and siting phase.

### Sedan Tap to Elk City Transmission Line Project | Westar Energy

Montgomery and Chautauqua County, Kansas | 2016 - 2018

***Project Manager*** for a 19 mile long 69-kV transmission line relocation project in Kansas for Westar Energy. This project consisted of evaluating various route alternatives for new 138-kV and 345-kV transmission lines. Routes were developed that would consider both single circuit options as well as some shared double circuit options. The project tasks included public involvement activities, as well as full permitting efforts for the greenfield and rebuild lines. Permitting efforts included desktop cultural, wetlands and threatened and endangered species reviews, FAA review, SWPPP/NOI, agency consultations, KDA Stream Obstruction Permits, KDOT and county road crossing permits. The project also included Phase I cultural resource surveys, wetlands delineation and habitat assessment for the state-listed eastern spotted skunk. Jamie's responsibilities included initial site visits, route development and selection processes, agency consultations, public scoping meetings, and project management throughout the siting and permitting phase.

### Viola to Clearwater 138-kilovolt (kV) Transmission Line Project | Westar Energy

Kansas | 2014–2016

***Project manager*** for a major transmission line project in central Kansas for Westar Energy. The project consisted of evaluating various route alternatives to construct a new 138-kV line. Jamie's responsibilities included initial site visits, route development and selection processes, agency consultations, public scoping meetings, and project management.

### Atchison Phase 3 115-kilovolt (kV) Transmission Line Project | Westar Energy

Kansas | 2014–2015

***Project manager*** for a new transmission line project in Atchison, Kansas, for Westar Energy. The project required increasing electric reliability of Atchison, Kansas, and upgrading a portion of the existing 69-kV system to a 115-kV system. This project consists of evaluating various route alternatives to construct a new 138-kV line. Jamie's responsibilities included initial site visits, route development and selection processes, agency consultations, public scoping meetings, and project management.

### Summit to Elm Creek 345-kilovolt (kV) Transmission Line Project | Westar Energy

Saline County, Kansas | 2014

***Project manager*** for the permitting of Westar's Summit to Elm Creek Transmission Line Project. Jamie was responsible for obtaining the necessary permits for this project including both environmental and non-environmental permits for this 30-mile-long 345-kV line.

### Jeffrey Energy Center to East Manhattan 230-kilovolt (kV) Transmission Line Project | Westar Energy

Kansas | 2014

***Project manager*** for a major transmission line project in central Kansas for Westar Energy. This project consisted of evaluating various route alternatives to rebuild an existing 230-kV line by paralleling the existing right-of-way or with entirely new route alignments. The line was constructed as a 345-kV line, but it was operated at 230-kV. Jamie's responsibilities included initial site visits, route development and selection processes, agency consultations, public scoping meetings, project management, and witness testimony support for the Kansas Corporation Commission.

# JAMIE L. PRECHT, M.S., ENV SP

(continued)

### Stranger Creek to Iatan 345-kilovolt (kV) Transmission Line Project | Westar Energy

Northeast Kansas | 2016 - 2017

***Project Manager*** for a 10 mile rebuild and upgrade of an existing 161-kV overhead transmission line to 345-kV. Project for Westar Energy. The project consisted of routing and permitting for the upgraded 345-kV line. The project tasks included public involvement activities, as well as full permitting efforts for the greenfield and rebuild lines. Permitting efforts included desktop cultural, wetlands and threatened and endangered species reviews, FAA review, SWPPP/NOI, agency consultations, KDA Stream Obstruction Permits, KDOT and county road crossing permits, RESA permit, and EL permit. The project also required filing with the Kansas Corporation Commission (KCC). Jamie's responsibilities included initial site visits, route development and selection processes, agency consultations, public scoping meetings, and project management throughout the siting and permitting phase. Jamie also provided support as part of the KCC filing and associated testimony.

### Wichita Water Utilities 138-kilovolt (kV) Transmission Line Project | Westar Energy

Bentley, Kansas | 2010

***Project manager*** for Westar's Wichita Water Utilities' Transmission Line Project. Jamie was responsible for developing and evaluating preferred and alternative routes for approximately two miles of 138-kV line. The project also included a public meeting in Bentley, Kansas. Jamie was also responsible for developing the necessary routing reports for this project.

### Blackberry to Chouteau 345-kilovolt Transmission Line Project | KAMO Power

Missouri, Kansas, and Oklahoma | 2007

***Principal investigator*** for the Blackberry to Chouteau transmission line corridor study within Missouri, Kansas, and Oklahoma (included eight counties). The project involved the identification of a preferred corridor for one study area within the three states. Jamie's responsibilities included data collection, alternative corridor identification, corridor analysis, and report preparation. A corridor study was submitted to the Rural Utilities Service at the completion of the project. She also participated in two public meetings for the project along the route corridors. As part of this project, Jamie completed a Macro-corridor study and Environmental Assessment.

# JAMIE L. PRECHT, M.S., ENV SP

(continued)

### Waldron Substation EPC Project | Evergy

Parkville, Missouri | 2020 - 2023

***Environmental Project Manager*** for a new greenfield substation in Missouri. Jamie was responsible for the management of cultural, wetland and threatened and endangered species desktop review and agency consultations. She managed the permitting process for the new substation including developing a permit matrix, ESC plan, SWPPP and NOI. A Conditional Use Permit was also obtained. A wetlands delineation was completed as part of the process and a Jurisdiction Determination was received from the USACE. Compliance monitoring was also included for this project.

### Holden Substation EPC Project | Evergy

Holden, Missouri | 2020 - 2022

***Environmental Project Manager*** for a new substation in Missouri. Jamie was responsible for the management of cultural, wetland and threatened and endangered species desktop review and agency consultations. She managed the permitting process for the new substation including developing a permit matrix, ESC plan, SWPPP and NOI. A Conditional Use Permit was also obtained. Demolition permits were required, as were review of Phase I materials and documentation of potential contaminant on site. Contaminates were documented on site and a disposal plan was created. A wetlands delineation was completed as part of the process. Compliance monitoring was also included for this project.

### Otter Creek Substation EPC Project | Evergy

Greenwood County, Kansas | 2020 - 2023

***Environmental Project Manager*** for a new greenfield substation in southeast Kansas. Jamie was responsible for the identification of permit requirements for this EPC project. She managed the permitting process for the new substation including developing a permit matrix, ESC plan, SWPPP and NOI.

### Jayhawk Substation EPC Project | Evergy

Bourbon County, Kansas | 2019 - 2020

***Environmental Project Manager*** for a new greenfield substation in southeast Kansas. Jamie was responsible for the management of cultural, wetland and threatened and endangered species desktop review and agency consultations. She managed the permitting process for the new substation including developing a permit matrix, ESC plan, SWPPP and NOI. A wetlands delineation was completed as part of the process. Compliance monitoring was also included for this project.

### Edmond Street to Lake Road to Alabama Transmission Line Project | Evergy

St. Joseph, Missouri | 2022

***Project Manager*** for 5 mile long 161-kV transmission line relocation project in Missouri for Evergy. This project consisted of evaluating various route alternatives for the relocation of two 161-kV transmission lines. The route adjustments were required by the U.S. Army Corps of Engineers as part of a levee improvement program. Routes were developed that would consider both single circuit options as well as some shared double circuit options. Jamie's responsibilities included initial site

# JAMIE L. PRECHT, M.S., ENV SP

(continued)

visits, route development and selection processes, agency consultations, public scoping meetings, and project management throughout the siting phase.

### Gracemont to Elk City Transmission Line Project | Oklahoma Gas & Electric (OG&E)

Central Oklahoma | 2013–2015

***Project manager and principal investigator*** for a major transmission line project in central Oklahoma for OG&E. This 35-mile-long transmission line is essential for the system reliability in the central Oklahoma area. Jamie's responsibilities include initial site visits, contacts with county agencies and officials, and route development and route selection processes. She also organized and participated in two public workshops for this project and was responsible for the preparation of the routing study report. As part of this project, an Environmental Assessment as well as a Phase I Cultural Survey have also been developed and submitted to the Bureau of Indian Affairs.

### Renfrow to Koch Transmission Line Project | Oklahoma Gas & Electric (OG&E)

Grant County, Oklahoma | 2013

***Project manager*** for a new transmission line project in western Oklahoma for OG&E. This 12-mile-long transmission line is essential for the system reliability in the north-central Oklahoma area. Jamie's responsibilities included initial site visits, contacts with county agencies and officials, route development and selection processes, and presentations of the routes to OG&E officials.

### Renfrow to Chikaskia Transmission Line Project | Oklahoma Gas & Electric (OG&E)

Grant and Kay Counties, Oklahoma | 2013

***Project manager*** for a major transmission line project in north-central Oklahoma for OG&E. This 30-mile-long transmission line is essential for the system reliability in the north-central Oklahoma area. Jamie's responsibilities included initial site visits, corridor development and selection processes, and presentations of the corridors to OG&E officials.

### Feeder #39 Transmission Line Upgrade Project | Grand River Dam Authority (GRDA)

Eastern Oklahoma | 2012

***Project manager*** for three transmission line upgrade projects in eastern Oklahoma for GRDA. These three transmission line upgrades total approximately 25 miles in length. Jamie's responsibilities included agency contact and overseeing the local, state, and federal permitting activities associated with this project.

### Lutesville to Heritage Transmission Line Project | Ameren Missouri

Cape Girardeau, Missouri | 2012

***Principal investigator*** for a transmission line project in southeastern Missouri for Ameren Missouri. This project consisted of approximately 25 miles of 345-kilovolt (kV) transmission and 5 miles of new 161-kV transmission lines. The project is essential for the system reliability in the area. Jamie's responsibilities included initial site visits, contacts with county agencies and officials, route development and selection processes, and presentations of the routes to Ameren Missouri officials. She also participated in a public workshop for this project.

# Exhibit JP-2

BURNS McDONNELL

GRAIN BELT EXPRESS LLC

# KANSAS AC COLLECTOR SYSTEM ROUTING STUDY

## BUCKLIN TO DODGE CITY AND MEADE TO DODGE CITY 345KV TRANSMISSION LINE PROJECTS

PROJECT NO. 158983

MAY 2024

# CONTENTS

## FIGURES



## TABLES

# List of Abbreviations

| Abbreviation | Term/Phrase/Name |
|---|---|
| AC | Alternating Current |
| ACS | America Community Survey |
| Bucklin Line | 345kV transmission line connecting the Bucklin Origination Point to the Grain Belt Express Kansas converter station AC switchyard |
| Burns & McDonnell | Burns & McDonnell Engineering Company, Inc. |
| CFR | Code of Federal Regulation |
| CHAT | Southern Great Plains Critical Habitat Assessment Tool |
| DA | Department of the Army |
| DOF | Digital Obstacle File |
| EPA | U.S. Environmental Protection Agency |
| FAA | Federal Aviation Administration |
| FCC | Federal Communication Commission |
| FEMA | Federal Emergency Management Agency |
| FPPA | Farmland Policy Protection Act |
| GIS | Geographic Information System |
| GLO | General Land Office |
| Grain Belt Express | Grain Belt Express LLC |
| IPaC | Information for Planning and Consultation |
| Study | Kansas AC Collector System Routing Study |
| KBS | Kansas Biological Survey |
| KCC | Kansas Corporation Commission |
| KDA | Kansas Department of Agriculture |
| KDHE | Kansas Department of Health and Environment |
| KDOT | Kansas Department of Transportation |
| KDWP | Kansas Department of Wildlife and Parks |
| KGIS | Kansas State Archeological Site and Survey GIS Coverage |
| KNHI | Kansas Natural Heritage Inventory |
| KSHS | Kansas State Historical Society |
| kV | Kilovolt |
| Meade Line | 345kV transmission line connecting the Meade Origination Point to the Grain Belt Express Kansas converter station AC switchyard |
| NAIP | National Agriculture Imagery Program |
| NGDA | National Geospatial Data Agency |
| NHD | National Hydrography Dataset |
| NLCD | National Land Cover Database |
| NPS | National Park Service |
| NRCS | Natural Resource Conservation Service |
| NRHP | National Register of Historic Places |
| NWI | National Wetlands Inventory |
| PLSS | Public Land Survey System |
| ROW | Right-of-way |
| SGP | Southern Great Plains |

| | |
|---|---|
| TERPS | Terminal Instrument Procedures |
| U.S. | United States |
| USACE | U.S. Army Corps of Engineers |
| USDA | U.S. Department of Agriculture |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |

# 1.0 Introduction

Grain Belt Express LLC (Grain Belt Express) is proposing two projects to energize the greater Grain Belt Express transmission line that spans Kansas, Missouri, Illinois, and Indiana. This includes: (1) a double-circuit 345kV alternating current (AC) transmission line of approximately 45 miles in length across portions of Gray, Meade, and Ford counties (the “Meade-Dodge City Line” or the "Meade Line"), at the Meade Origination Point of the line; and (2) a single or double-circuit 345kV AC transmission line of approximately 20 miles in length traversing a portion of Ford County (the “Bucklin-Dodge City Line or the ”Bucklin Line“) at the Bucklin Origination Point of the line. Together, the Meade Line and the Bucklin-Dodge City Line make up the AC Collector Lines. The AC Collector Lines are included in a broader collector system comprised of AC transmission lines needed to connect generation facilities in western Kansas to the Grain Belt Express Project HVDC transmission line (AC Collector System).

Grain Belt Express retained Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) to assist with the route creation, evaluation, and documentation process for both lines. This process ultimately results in a final, proposed 345kV transmission line route for the Bucklin Line and a final, proposed 345kV transmission line route for the Meade Line. Both lines will require a typical right-of-way (ROW) of 150 feet.

This Kansas AC Collector System Routing Study (Study) includes a description of the study area for both the Bucklin Line and the Meade Line (Chapter 2), a description of the alternate route evaluation process for the Bucklin Line (Chapter 3), a description of the alternate route evaluation process for the Meade Line (Chapter 4), and a summary of agency contact responses for both lines (Chapter 5). Appendices include a list of threatened and endangered species with potential to occur in the study areas (Appendix A); detailed route maps (Appendix B); copies of agency correspondence (Appendix C); public involvement documentation, including landowner letters, project fact sheets, and a sample questionnaire presented to the public (Appendix D); and route analysis data (Appendix E) for both the Bucklin Line and the Meade Line.

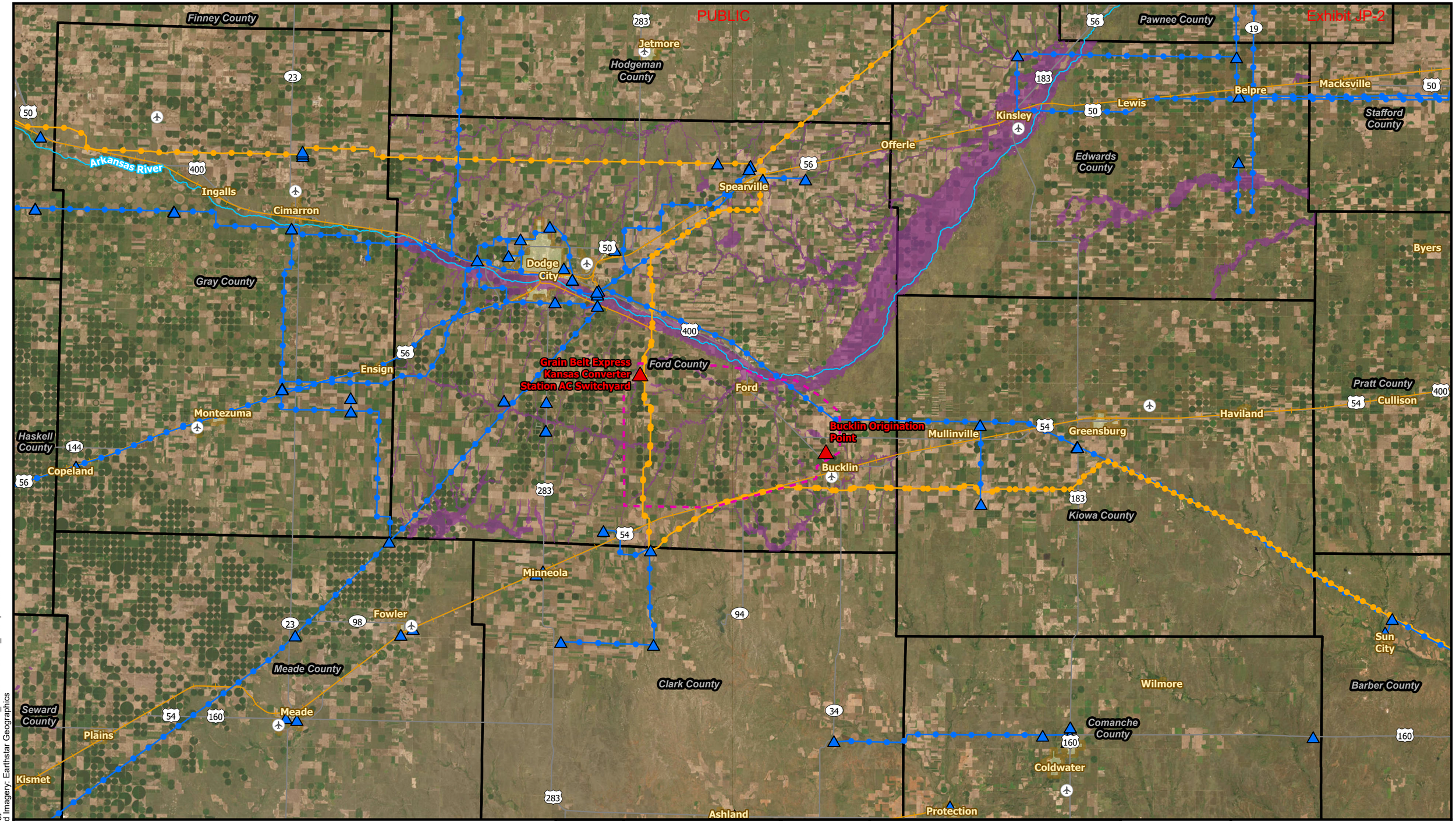
## 1.1 Description of Bucklin Study Area

A study area was developed to document and record features in the area surrounding the Bucklin Line. Primary factors considered in establishing the study area include the location of the Bucklin Line endpoints and features of the surrounding area. The study area must be large enough to provide sufficient opportunity for the development of multiple alternate routes, while also providing an area that is feasible for the alternate route analysis. The study area must also not be so large as to allow for an unreasonable number of potential alternate routes, needlessly affect additional jurisdictions or landowners, or burden the analysis with unnecessary information. In consideration of these factors, a study area encompassing approximately 85,300 acres of land was established. The study area measures approximately 15 miles across east-west, and 10 miles north-south at its widest points. The western boundary of the study area parallels 117 Road, and the eastern boundary parallels 132nd Road and Bucklin Road, before angling west to avoid the town of Bucklin. The northern boundary parallels both Saddle Road to the south, the Arkansas River to the north, and then briefly

parallels a 115kV transmission line. The southern boundary follows United States (U.S.) Highway 54 and Wrangler Road. Figure 1-1 shows a regional view of the study area, and Figure 1-2 shows a more detailed view of the study area.

## 1.2 Description of Meade Study Area

A study area was developed to document and record features in the area surrounding the Meade Line. Primary factors considered in establishing the study area include the location of the Meade Line endpoints and features of the surrounding area. The study area must be large enough to provide sufficient opportunity for the development of multiple alternate routes, while also providing an area that is feasible for the alternate route analysis. The study area must also not be so large as to allow for an unreasonable number of potential alternate routes, needlessly affect additional jurisdictions or landowners, or burden the analysis with unnecessary information. In consideration of these factors, a study area encompassing 268,846 acres of land was established. The study area measures approximately 30 miles east-west, and 18 miles north-south at its widest points. The western boundary parallels State Road 23, and its eastern boundary parallels 2 existing 345kV transmission lines. The northern boundary of the study area is defined by an approximately 1.5 mile setback from Saddle Road, and then a brief parallel of U.S. Highway 56. The southern boundary of the study area parallels H Road, U.S. Highway 54, and then runs along the Meade and Ford counties' boundaries. Figure 1-3 shows a regional view of the study area, and Figure 1-4 shows a more detailed view of the study area.




Project Endpoint
Public Airport
Existing Substation
River
Railroad
Highway
Study Area
FEMA Floodplain
Municipal Boundary
County Boundary

**Existing Transmission Line**
115kV
345kV


**Locator Map**

NORTH
5 2.5 0 5
Miles

BURNS McDONNELL

Figure 1-1
Bucklin Line Regional Area
Kansas AC Collector System
Grain Belt Express
Ford County
Exhibit JP-2

Path: C:\Desktop\QI\Invenergy\GrainBeltAC\GrainBeltAC_Pro\GrainBeltAC_Pro.aprx catenbus 5/15/2024
Service Layer Credits: World Imagery: Earthstar Geographics

Source: Grain Belt Express, Esri, NHD, FEMA, NWI, FAA, NTAD, HIFLD, FCC, Burns & McDonnell

Grain Belt Express
Kansas Converter
Station AC Switchyard

Bucklin
Origination
Point

Ford

Bucklin

Arkansas River

Mulberry Creek

Rattlesnake Creek

115 Rd
115th Rd
116 Rd
117th Rd
117 Rd
118 Rd
119 Rd
120 Rd
120th Rd
121 Rd
122 Rd
122nd Rd
123 Rd
124th Rd
125 Rd
126th Rd
127 Rd
128 Rd
129th Rd
129 Rd
130 Rd
131 Rd
131 Spur Rd
132 Rd
133 Rd
134 Rd
Bellefont Rd
Detour Rd
Kingsdown Ford Rd

Lariat Way
Ridge Rd
Liberty Trail Rd
Ford Ensign Rd
Saddle Rd
Saddle Side Rd
Tilman Rd
Tillman Rd
Valley Rd
Bloom Rd
Warrior Side
Upland Rd
Warrior Rd
Whirlwind Rd
Harness Rd
Million Dollar Rd
Wilburn Rd
Wildfire Rd
Windy Rd
Church St
Wrangler Rd

400
54
94
34

Project Endpoint
Public Airport
Microwave Service Tower
Land Mobile Private Transmission Tower
NHD Stream/River

Existing Pipeline
Railroad
Highway
Local Road
Study Area

NWI Wetland
FEMA Floodplain
Municipal Boundary

**Existing Transmission Line**
115kV
345kV

**Part 77 Surfaces**
Approach
Conical
Transitional

NORTH
1 0.5 0 1
Miles

BURNS McDONNELL

Figure 1-2
Bucklin Line Study Area
Kansas AC Collector System
Grain Belt Express
Ford County
Exhibit JP-2

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Service Layer Credits: World Imagery: Earthstar Geographics

Source: Grain Belt Express, Esri, NHD, FEMA, NWI, FAA, NTAD, HIFLD, FCC, Burns & McDonnell

Garden City
Finney County
Ingalls
Cimarron
Gray County
Hodgeman County
Spearville
Offerle
Kinsley
Edwards County
Lewis
Dodge City
Ford County
Ensign
Haggard
Montezuma
Grain Belt Express Kansas Converter Station AC Switchyard
Arkansas River
Ford
Haskell County
Copeland
Sublette
Satanta
Bucklin
Mullinville
Greensburg
Kiowa County
Bloom
Minneola
Meade Origination Point
Fowler
Meade County
Meade
Plains
Seward County
Kismet
Clark County
Ashland
Comanche County
Coldwater
Protection

50 400 56 283 83 160 144 23 54 98 94 34 183 190 51

Project Endpoint
Public Airport
Existing Substation
River
Railroad
Highway
Study Area
FEMA Floodplain
Municipal Boundary
County Boundary

**Existing Transmission Line**
115kV
345kV

Locator Map
Colorado
Kansas
Missouri
PUBLIC

NORTH
5 2.5 0 5
Miles

BURNS McDONNELL

Figure 1-3
Meade Line Regional Area
Kansas AC Collector System
Grain Belt Express
Ford, Gray, and Meade Counties
Exhibit JP-2

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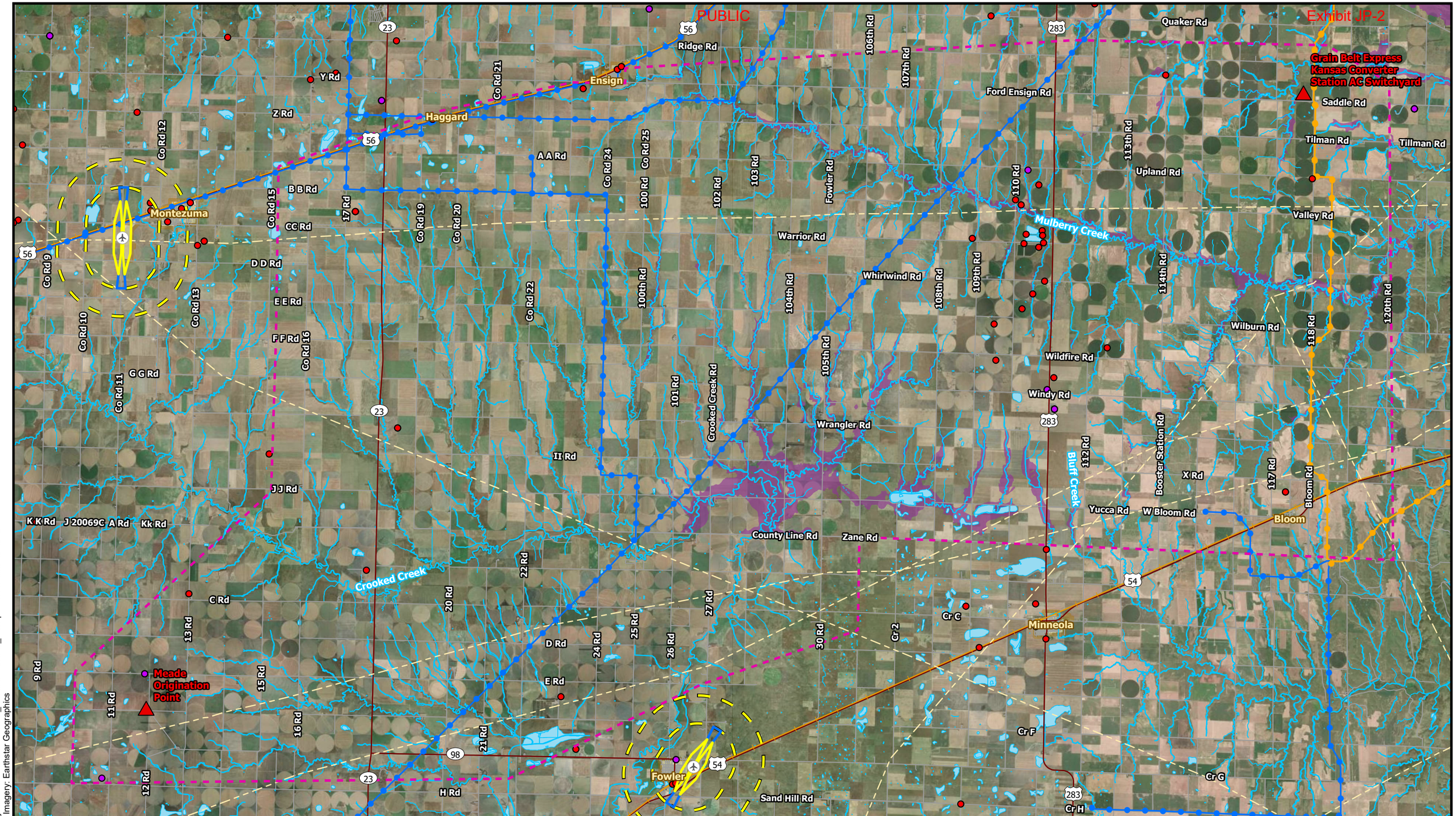
Service Layer Credits: World Imagery: Earthstar Geographics

Source: Grain Belt Express, Esri, NHD, FEMA, NWI, FAA, NTAD, HIFLD, FCC, Burns & McDonnell

Issued: 5/23/2024




- Project Endpoint
- Public Airport
- Microwave Service Tower
- Land Mobile Private Transmission Tower
- NHD Stream/River
- Existing Pipeline
- Railroad
- Highway
- Local Road
- Study Area
- NWI Wetland
- FEMA Floodplain
- Municipal Boundary

**Existing Transmission Line**
- 115kV
- 345kV

**Part 77 Surfaces**
- Approach
- Conical
- Transitional

NORTH

2 1 0 2

Miles

BURNS McDONNELL

Figure 1-4
Meade Line Study Area
Kansas AC Collector System
Grain Belt Express
Ford, Gray, and Meade Counties
Exhibit JP-2

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Service Layer Credits: World Imagery: Earthstar Geographics

Source: Grain Belt Express, Esri, NHD, FEMA, NWI, FAA, NTAD, HIFLD, FCC, Burns & McDonnell

# 2.0 Existing Environment

This chapter of the report includes information detailing both the natural and man-made resources within the study areas that could influence route evaluation for the proposed lines.

## 2.1 Bucklin Line

This section details the existing environment within the Bucklin Line study area.

### 2.1.1 Physiography

Physiography describes the physical terrain, geology, and soils of an area. The study area resides entirely within the physiographic region known as the High Plains. The High Plains are a subregion of the Great Plains and encompass most of western Kansas. The area is categorized by its high elevation, vast flatlands, and gently rolling plains that slope eastward. Any major topographic relief is restricted to waterways and riverways. Many of the geological formations are composed of unconsolidated deposits that were imported during the formation of the Rocky Mountains. When compacted, this material forms a porous rock informally known as mortar bed. Water-bearing portions of the geologic formations are known as the Ogallala Aquifer (Kansas Geological Survey, n.d.).

### 2.1.2 Hydrological Resources

According to the National Hydrography Dataset (NHD), the predominant hydrological feature in the study area is Mulberry Creek. Mulberry Creek is a primary tributary to the Arkansas River, which is north of the study area (USGS, 2019). The study area is contained entirely within the Middle Arkansas Watershed system. There are several unnamed tributary creeks and streams leading to both Mulberry Creek and the Arkansas River throughout the study area. The Federal Emergency Management Agency (FEMA) has designated floodplains associated with Mulberry Creek and other streams in the study area. Floodplains associated with the Arkansas River intersect the study area in its northeast corner. Throughout the study area, there are also several unnamed ponds (FEMA, 2023).

### 2.1.3 Biological Resources

The following section is a description of the biological resources found in the study area. These resources include vegetation, wildlife, threatened and endangered species, and wetlands.

#### 2.1.3.1 Vegetation

Vegetation to be expected in the High Plains region is drought tolerant short-grass prairie in uncultivated areas. Prairie grasses consist of big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), needle-and-thread grass (*Hesperostipa comata*), sideoats grama (*Bouteloua curtipendula*), and western wheatgrass (*Pascopyru smithii*). According to the National Land Cover Dataset (NLCD), hosted by the U.S. Geological Survey (USGS), approximately 24.7 percent of land in the study area is classified as grassland. Cultivated crops account for 67.6 percent of land in the study area (Dewitz, 2021). Trees are not common within the region but can occur in some areas of floodplain forests along major

riparian corridors (Chapman, 2001). Human-made windbreaks, composed of trees and shrubs intentionally planted in multiple rows, are found throughout the study area.

#### 2.1.3.1.1 Threatened and Endangered Species

According to data maintained by the U.S. Fish and Wildlife Service (USFWS) and the Kansas Department of Wildlife and Parks (KDWP), no threatened or endangered plant species occur in the study area. A review of the Kansas Natural Resource Planner and the Kansas Natural Heritage Inventory (KNHI) data hosted by the Kansas Biological Survey (KBS) produced no results for Federal or state-listed endangered plant species. Based on this review, there are no records of occurrences for Federal or state-listed plant species within the study area. However, the absence of records does not always indicate that rare species do not occur in a specific area (USFWS, 2023) (KBS, 2022).

### 2.1.3.2 Wildlife

Within the study area, mammals that are likely to occur include pronghorn antelope (*Antilocapra americana*), cottontail rabbit (*Sylvilagus floridanus*), white-tailed deer (*Odocoileus virginianus*), and coyote (*Canis latrans*). Burrowing rodents like gophers (*Geomys spp.*), black-tailed prairie dogs (*Cynomys ludovicianus*), squirrels (*Scuirus niger rufiventer*) and other smaller species are to be expected in undisturbed areas. Numerous bird species are found in the study area where suitable habitat is present. Bird species of the Prairie Parkland Province include belted kingfisher (*Megaceryle alcyon*), bank swallow (*Riparia riparia*), spotted sandpiper (*Actitis macularius*), green heron (*Butorides virescens*), horned lark (*Eremophila alpestris*), eastern meadowlark (*Sturnella magna*), and mourning dove (*Zenaida macroura*) (Bailey, 1995).

#### 2.1.3.2.1 Threatened and Endangered Species

According to KDWP's Terrestrial and Aquatic Species of Concern data, no state-listed species have been documented within the study area. However, one terrestrial species of concern was noted to occur in the study area: the lesser prairie-chicken (*Tympanuchus pallidicinctus*). Several state aquatic species of concern were noted to occur within the study area and include the orangethroat darter (*Etheostoma spectabile*), giant floater (*Pygandon grandis*), northern plains killfish (*Fundulus kansae*), pondhorn (*Uniomerus tetralasmus*), and white heelsplitter (*Lasmigona complanata*) (KBS, 2022). While no occurrences were reported in the Terrestrial and Aquatic Species of Concern data, the whooping crane (*Grus americana*) is both federally- and state-listed as endangered and KDWP has noted this species has the potential to occur within Ford County.

The routing team contacted USFWS early in the routing process, specifically to understand any threatened and endangered species with potential to occur in the study area. The USFWS noted in its response, included in Appendix C, to generate an Official Species list from the agency's Information for Planning and Consultation (IPaC) tool. Table 2-1 below highlights the species noted by the IPaC report, their Federal and state statuses, and if any critical habitat occurs within the study area. The USFWS IPaC report is included in Appendix A, along with the state-listed species known to occur in Ford County.

Table 2-1: Threatened and Endangered Animal Species with Potential to Occur in the Bucklin Line Study Area

| Common Name | Latin Name | Federal Status | State Status | Critical Habitat within Study Area |
|---|---|---|---|---|
| Tricolored bat | *Perimyotis subflavus* | Proposed Endangered | N/A | No |
| Lesser prairie-chicken | *Tympanuchus pallidicinctus* | Threatened | N/A | No |
| Whooping crane | *Grus americana* | Endangered | Endangered | No |
| Arkansas River shiner | *Notropis girardi* | Threatened | N/A | No |
| Peppered chub | *Macrhybopsis tetranema* | Endangered | N/A | No |
| Monarch butterfly | *Danaus plexippus* | Candidate | N/A | No |

Source: USFWS, 2023; KBS, 2022

#### 2.1.3.3 Wetlands

National Wetland Inventory (NWI) data indicate the presence of wetlands in the study area. There are approximately 1,091.46 acres of NWI wetlands, accounting for 1.27 percent of land, in the study area. These wetlands are primarily associated with tributaries throughout the study area. The most common wetland system type is riverine and makes up 54.85 percent of the NWI wetlands in the study area. Riverine wetland systems include wetlands occurring within or immediately adjacent to a channel. These wetlands can include rivers, brooks, creeks, streams, and tributaries and can either be naturally occurring or artificially created. Riverine wetlands can be categorized as tidal, lower perennial, upper perennial, or intermittent. Riverine wetlands within the study area are primarily associated with Mulberry Creek, the Arkansas River, and other tributaries and streams (U.S. Department of the Interior, USFWS, 2016).

### 2.1.4 Social and Community Resources

The following sections describe and quantify social and community resources found in the study area including demographics, agriculture, transportation, existing utilities, commercial and residential development, and known cultural resources.

#### 2.1.4.1 Demographics

The study area is predominantly rural in nature with residential density concentrated in the northwest edge of the study area around Dodge City, Kansas. Ford County encompasses Dodge City, resulting in a greater population compared to surrounding counties. Table 2-2 below shows statistics gathered from the American Community Survey (ACS) conducted by the U.S. Census Bureau in 2012 and 2022. Ford County has experienced a 1.4 percent growth in population, which is less than the rate of the State of Kansas's growth at 3.1 percent.

Table 2-2: Census Data

| Area | Population 2012 | Population 2022 | People Per Square Mile 2022 | Median Income 2022 |
|---|---|---|---|---|
| Ford County | 33,725 | 34,212 | 31.1 | $39,273 |
| Kansas | 2,851,183 | 2,935,922 | 35.7 | $40,502 |

Source: U.S. Census Bureau, 2022

### 2.1.4.2 Agriculture

According to the United States Department of Agriculture's (USDA) 2017 Agricultural Census (Table 2-3), Ford County, Kansas accounts for 3 percent of the state's agricultural sales. Within Ford County, 18 percent of land is categorized as pastureland, and 79 percent of land is categorized as cropland. Approximately 67,068 acres of land are irrigated, or about 10 percent of land in farms. Because of this, center pivot irrigation systems are common throughout the study area.

Table 2-3: USDA Agricultural Census Data

| County | Number of Farms (count) | Acreage of Farmland | Acreage of Farmland Irrigated | Primary Crops (in order by acres) |
|---|---|---|---|---|
| Ford | 505 | 669,832 | 67,068 | Wheat, sorghum, corn, forage |

Source: USDA, 2017

Predominant crops in Ford County are wheat, sorghum, and corn to be produced for grain. Cattle and calves are the predominant livestock. Horses, layer chickens, and goats are also livestock produced within the study area (USDA National Agriculture Statistics Service, 2019).

### 2.1.4.3 Transportation

Within the study area, roadways are predominantly smaller, county-maintained roads. State Highway 34 bisects the study area in the east, and State Highway 54 runs along the southeastern boundary (Figure 1-2). Also along the southeastern boundary of the study area is the St. Louis Southwestern Railway. The Boot Hill and Western Railway that runs between Dodge City and Bucklin cuts across the northeastern corner of the study area. The portion of track that is within the study area has been out of operation since 2005.

According to the Federal Aviation Administration's (FAA) Airport Facility Directory, there are no public-use airports, heliports, or runways within the study area. There are, however, Part 77 surfaces that overlap the boundaries of the study area. In the southeastern corner of the study area, Bucklin Airport, a public use airstrip in Bucklin, Kansas, creates a conical approach. The proposed Bucklin Origination Point is within this Part 77 surface area. The Dodge City regional airport has a secondary approach that encompasses the Grain Belt Express Kansas converter station AC switchyard in the northwest corner of the study area (National Geospatial Data Asset (NGDA), 2024).

### 2.1.4.4 Existing Utilities

There are three existing transmission lines within the study area. Along the western border is a double-circuited 345kV line, along a portion of the southern border there is a double-circuited 345kV line, and in the northeastern corner of the study area is a 115kV line. Based on

available data, transmission lines recorded in the study area appear to be owned primarily by Southern Pioneer Electric Company (Figure 1-2).

In addition to these larger energy transmission facilities, several lower voltage distribution lines exist throughout the study area. These are primarily located along roadsides. Other utilities include buried water, fiber optic, and telecommunications lines that service farms and residences throughout the study area. These utilities are predominantly located within road ROW or along the existing road network. According to the Federal Communication Commission (FCC), within the study area, there are two microwave service towers and three land mobile private transmission towers (Geospatial Mangement Office, 2024).

There are no oil pipelines recorded in the study area. Several operating, interstate, natural gas pipelines operated by Panhandle Eastern Pipeline Company, Southern Star Central Gas Pipeline Company, Northern Natural Gas Company, and Natural Gas Pipeline Company of America also cross through the study area (Hitachi ABB Power Grid, 2016).

#### 2.1.4.5 Commercial and Residential Development

Commercial and residential developments within the study area are minimal. The town of Ford is the largest incorporated area within the study area. In the 2020 U.S. Census, the population of the town of Ford was recorded as 203 people (U.S. Census Bureau, 2023). Structures within its limits are predominantly residential, but there are also businesses, churches, and public facilities such as a post office, fire department, and city hall. There is an unincorporated area within the study area, Kingsdown, Kansas, located along its southern border. Bucklin, Kansas is bordered by the southeastern corner of the study area.

#### 2.1.4.6 Cultural Resources

To identify cultural resources in the study area, an online search of the Kansas State Archeological Site and Survey GIS Coverage (KGIS) database housed by the Kansas Historical Society (KSHS) was conducted on February 16th, 2024. KGIS contained the following data: five archaeological sites, eight archaeological surveys, and one General Land Office (GLO) record. The GLO record is a mapped wagon trail. There are no National Register of Historic Places (NRHP) listings or pioneer cemeteries within the study area.

None of the previously documented archaeological sites have been evaluated for NRHP eligibility (Table 2-4). Four are precontact sites, one of which includes a historic component. One of those precontact sites is a single human bone identified in a pipeline trench. The fifth site is paleontological. It is a mammoth bone that was identified eroding out of a hillside.

Table 2-4: Previously Documented Archaeological Sites within the Bucklin Study Area

| Site ID | Site Type | Component | Construction/ Occupation | Notes | NRHP Status |
|---|---|---|---|---|---|
| 14FD00306 | Camp | Precontact and historic | Early Ceramic, unknown historic | Precontact on west side of creek, historic on east. Materials collected immediately following a flood. | Unevaluated |

| Site ID | Site Type | Component | Construction/ Occupation | Notes | NRHP Status |
|---|---|---|---|---|---|
| 14FD00326 | Camp | Precontact | Archaic, Middle Ceramic | Collection combined with 14FD00328, unsure what artifacts are from which site. | Unevaluated |
| 14FD00328 | Camp | Precontact | Archaic, Middle Ceramic | Collection combined with 14FD00326, unsure what artifacts are from which site. | Unevaluated |
| 14FD00338 | Burial | Precontact | Unknown | Human remains found in a pipeline trench. | Unevaluated |
| 14FD00501 | Place | Unknown | Unknown | Mammoth bone eroding from hillside. | Unevaluated |

The previous archaeological surveys undertaken in the study area were performed for many different project types (Table 2-5). They include two pipeline projects, three communications towers, a road project, and a wind farm project.

Table 2-5: Previous Archaeological Surveys within the Study Area

| KSHS Report Title | Submitted To | Report Author | Report Date | KSHS Report Number |
|---|---|---|---|---|
| An Archaeological Investigation for Northern Natural Gas Company, a Division of ENRON Gas Pipeline Operating Co., in Ford County, Kansas | Northern Natural Gas | David T. Hughes | 1990 | 478 |
| A Cultural Resources Survey for the Panhandle Eastern Pipe Line Company Liberal 100 Line Bi-Directional Flow Project Seward, Meade, Clark, Ford, and Kiowa Counties, Kansas | Panhandle Eastern Energy | Nancy Porter | 2005 | 1,843 |
| A Phase II Archaeological Survey of the Proposed Ellis Wireless Antenna Project (WC54XC206), Ford County, Kansas | Trileaf Corporation | Don L. Dycus | 2003 | 3,201 |
| A Phase II Archaeological Survey of the Proposed Sellard Wireless Antenna Project (WT54XC206), Ford County, Kansas | Trileaf Corporation | Don L. Dycus | 2003 | 3,245 |
| Phase I Cultural Resource Investigation of Proposed KS-Ford-1b Telecommunications Tower Project Area, Ford, Ford County, Kansas TCNS #43266 | Alltel Corporation | Jacquie Payett | 2008 | 4,166 |

| KSHS Report Title | Submitted To | Report Author | Report Date | KSHS Report Number |
|---|---|---|---|---|
| Archeological Survey of KDOT Project 29 C-4912-01 (C-4912-BRID-01), Ford County, Kansas | - | Eric Skov | 2018 | 6,540 |
| Cultural Resources Assessment of the Cherokee Weir - A Cellular Tower Cherokee County, Kansas | Terracon Consultants | Lindsay P. Dyle | 2018 | 6,651 |
| A Phase II Intensive Cultural Resource Inventory for the Iron Star Wind Project in Ford County, Kansas | Iron Star Wind Project | Amanda Baker | 2020 | 7,111 |

## 2.2 Meade Line

This section details the existing environment within the Meade Line study area.

### 2.2.1 Physiography

Physiography describes the physical terrain, geology, and soils of an area. The study area resides entirely within the physiographic region known as the High Plains. The High Plains are a subregion of the Great Plains and encompass most of western Kansas. The area is categorized by its high elevation, vast flatlands, and gently rolling plains that slope eastward. Any major topographic relief is restricted to waterways and riverways. Many of the geological formations are composed of unconsolidated deposits that were imported during the formation of the Rocky Mountains. When compacted, this material forms a porous rock informally known as mortar bed. Water-bearing portions of the geologic formations are known as the Ogallala Aquifer (Kansas Geological Survey, n.d.).

### 2.2.2 Hydrological Resources

The study area resides in both the Middle Arkansas Watershed and the Upper Cimarron Watershed. The Middle Arkansas Watershed comprises the northern half of the study area. Mulberry Creek is the most notable contributor to this watershed within the study area. It serves as a tributary to the much larger Arkansas River, which is north of the study area. The southern half of the study area occurs within the Upper Cimarron Watershed. Crooked Creek is a significant waterway within the study area that contributes to this watershed. Minimal floodplains are associated with these two creeks within the study area. Other hydrological resources include a few unnamed lakes and ponds (USGS, 2019).

Within the three counties included in this study area, FEMA has only mapped the floodplains in Ford County. FEMA has not completed a study to determine flood hazards for Gray County and Meade County. Of the land in the study area that is in Ford County, mapped floodplains comprise 4.74 percent, or 14,842 acres. All mapped floodplains in this area are categorized as Flood Zone Type A, meaning that these areas have a 1 percent annual chance of flooding (FEMA, 2023).

### 2.2.3 Biological Resources

The following section is a description of the biological resources found in the Meade Line study area. These resources include vegetation, wildlife, threatened and endangered species, and wetlands.

#### 2.2.3.1 Vegetation

Vegetation to be expected in the High Plains region is drought-tolerant short-grass prairie in uncultivated areas. Prairie grasses consist of big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), needle-and-thread grass (*Hesperostipa comata*), Sideoats grama (*Bouteloua curtipendula*), and western wheatgrass (*Pascopyru smithii*). According to the NLCD, hosted by the USGS, approximately 17.5 percent of land in the study area is classified as grassland. Cultivated crops account for 72.6 percent of land in the study area. Trees are not common within the region but can occur in some areas of floodplain forests along major riparian corridors (Chapman, 2001). Human-made windbreaks, composed of trees and shrubs intentionally planted in multiple rows, are found throughout the study area.

##### 2.2.3.1.1 Threatened and Endangered Plant Species

According to data maintained by USFWS and KDWP, no threatened or endangered plant species occur in the Meade Line study area. A review of the Kansas Natural Resource Planner and the KNHI data, hosted by the KBS, produced no results for Federal or state-listed plant species. Based on this review, there are no records of occurrences for Federal or state-listed plant species within the study area. However, the absence of records does not always indicate that rare species do not occur in a specific area (KBS, 2022).

#### 2.2.3.2 Wildlife

Within the Meade Line study area, mammals that are likely to occur include pronghorn antelope (*Antilocapra americana*), cottontail rabbit (*Sylvilagus floridanus*), white-tailed deer (*Odocoileus virginianus*), and coyote (*Canis latrans*). Burrowing rodents like gophers (*Geomys spp.*), black-tailed prairie dogs (*Cynomys ludovicianus*), squirrels (*Scuirus niger rufiventer*) and other smaller species are to be expected in undisturbed areas. Numerous bird species are found in the study area where suitable habitat is present. Bird species of the Prairie Parkland Province include belted kingfisher (*Megaceryle alcyon*), bank swallow (*Riparia riparia*), spotted sandpiper (*Actitis macularius*), green heron (*Butorides virescens*), horned lark (*Eremophila alpestris*), eastern meadowlark (*Sturnella magna*), and mourning dove (*Zenaida macroura*) (Bailey, 1995).

##### 2.2.3.2.1 Threatened and Endangered Species

According to KDWP's Terrestrial and Aquatic Species of Concern data, one state-listed threatened species has been documented once within the study area: eastern spotted skunk (*Spilogale putorius*). The state-listed threatened New Mexico threadsnake (*Rena dissecta*) and state-listed threatened plains minnow (*Hybognathus placitus*) do not have documented occurrences in the study area but were noted to have state-designated critical habitat in Meade County while the plains minnow also has state-designated critical habitat in Ford County.

Several terrestrial species of concern were noted to occur in the study area, lesser prairie-chicken (*Tympanuchus pallidicinctus*), western rattlesnake (*Crotalus oreganus*), Texas horned lizard (*Phrynosoma cornutum*), golden eagle (*Aquila chrysaetos*), and the burrowing owl (*Athene cunicularia*). State-listed aquatic species of concern do not occur within the Meade Line study area (KBS, 2022). While no occurrences were reported in the Terrestrial and Aquatic Species of Concern data, the whooping crane (*Grus americana*) is both federally- and state-listed as endangered and KDWP has noted this species has the potential to occur within Ford, Meade, and Gray counties.

The routing team contacted the USFWS was contacted early in the routing process, specifically to understand any potential Federal threatened and endangered species in the study area. The USFWS noted in its response, included in Appendix C, to generate an Official Species list from the agency's IPaC tool. Table 2-6 below highlights the species noted by the IPaC report, their federal status, and if any critical habitat occurs within the study area. The USFWS IPaC report is included in Appendix A along with the state-listed species known to occur in Ford, Meade, and Gray counties.

**Table 2-6: Threatened and Endangered Animal Species with Potential to Occur in the Meade Line Study Area**

| Common Name | Latin Name | Federal Status | State Status | Critical Habitat within Study Area |
|---|---|---|---|---|
| Tricolored bat | *Perimyotis subfalvus* | Proposed Endangered | N/A | No |
| Lesser prairie-chicken | *Tympanuchus pallidicinctus* | Threatened | N/A | No |
| Piping plover | *Charadrius melodus* | Threatened | N/A | No |
| Whooping crane | *Grus americana* | Endangered | Endangered | No |
| Arkansas river shiner | *Notropis girardi* | Threatened | Endangered | No |
| Peppered chub | *Macrhybopsis tetranema* | Endangered | N/A | No |
| Monarch butterfly | *Danaus plexippus* | Candidate | N/A | No |
| Eastern spotted skunk | *Spilogale putorius* | N/A | Threatened | No |
| New Mexico threadsnake | *Rena dissecta* | N/A | Threatened | No |
| Plains minnow | *Hybognathus placitus* | N/A | Threatened | No |

Source: USFWS, 2023

### 2.2.3.3 Wetlands

NWI indicate the presence of wetlands in the study area. There are approximately 4,513.76 acres of NWI wetlands, accounting for 1.44 percent of land, in the study area. These wetlands are primarily associated with tributaries throughout the study area. Of the NWI wetlands that are mapped within the study area, the most common wetland system type is Palustrine and makes up 59.6 percent of the NWI wetlands in the study area. Palustrine wetland systems include all non-tidal wetlands dominated by trees, shrubs, emergent plants, mosses, or

lichens, and can be grouped into the following categories: aquatic bed, emergent, forested, scrub-shrub, unconsolidated bottom, and unconsolidated shore. There also are some sections of riverine wetlands associated with Mulberry Creek, Crooked Creek, and other tributaries and streams found within the study area (U.S. Department of the Interior, USFWS, 2016).

### 2.2.4 Social and Community Resources

The following sections describe and quantify social and community resources found in the study area including demographics, agriculture, transportation, existing utilities, commercial and residential development, and known cultural resources.

#### 2.2.4.1 Demographics

The study area is predominantly rural in nature, with residential density concentrated north of the study area, around Dodge City, Kansas. Ford County encompasses Dodge City, resulting in a greater population compared to Meade County and Gray County. Table 2-7 below shows statistics gathered from the ACS conducted by the U.S. Census Bureau in 2012 and 2022. Ford County has experienced a 1.4 percent growth in population, Gray County's population change is a 4.4 percent decrease, and Meade County's population has decreased by 10.8 percent.

Table 2-7: Census Data

| Area | Population 2012 | Population 2022 | People Per Square Mile 2022 | Median Income 2022 |
|---|---|---|---|---|
| Ford County | 33,725 | 34,212 | 31.1 | $39,273 |
| Gray County | 5,982 | 5,719 | 6.58 | $35,395 |
| Meade County | 4,504 | 4,019 | 4.11 | $40,192 |
| Kansas | 2,851,183 | 2,935,922 | 35.7 | $40,502 |

Source: U.S. Census Bureau, 2022

#### 2.2.4.2 Agriculture

According to the NLCD, the predominant landcover type in the study area is cultivated crops. This data is also represented in the 2017 Census of Agriculture reported by the USDA. Table 2-8 below illustrates the abundance of agricultural activities that occur within Meade, Gray, and Ford counties. Together, these three counties account for 9 percent of Kansas's agriculture sales. The primary livestock of each county is cattle and calves.

Table 2-8: USDA Agricultural Census Data

| County | Number of Farms (count) | Acreage of Farmland | Acreage of Farmland Irrigated | Primary Crops (in order by acres) |
|---|---|---|---|---|
| Meade | 407 | 587,924 | 93,775 | Wheat, corn, sorghum, soybeans |
| Gray | 422 | 556,070 | 116,874 | Wheat, corn, sorghum, forage |
| Ford | 505 | 669,832 | 67,068 | Wheat, sorghum, corn, forage |

Source: USDA, 2017

Data in the table also details the potential occurrence of center-pivot irrigation in cultivated farmland practices. Of the total farmland in Meade County, 16 percent is irrigated. In Gray County, 21 percent is irrigated and in Ford County, 10 percent is irrigated.

#### 2.2.4.3 Transportation

Major highways in the study area include State Highway 283 which runs north-south on the eastern side of the study area and U.S. Highway 56 which parallels the northwestern corner of the study area. An abundance of local and county roads grids the study area. Based on the FAA's Aviation Facilities Data, there are no public use airports within the study area. A secondary approach of the Dodge City Regional Airport encompasses the Grain Belt Express Kansas converter station AC switchyard in the study area's northeastern corner. There are two railroads within the study area. The Atchison, Topeka, and Santa Fe Railroad runs along the northeastern boundary of the study and parallels U.S. Highway 59 on its north side. The St. Louis Southwestern Railroad cuts across the southeastern corner of the study area and parallels U.S. Highway 59 on its north side (Figure 1-4) (NGDA, 2024).

#### 2.2.4.4 Existing Utilities

There are several existing transmission lines that intersect the study area (Figure 1-4). These include a 345kV line from Dodge City to Minneola and a 115kV line from Dodge City to Liberal. There are also two parallel 345kV lines, one from the Ironwood Wind Substation to the Clark County Substation and the other from the Spearville Substation to the Clark County Substation. Based on available data, existing transmission lines recorded in the study area are owned by Southern Pioneer Electric Company (Hitachi ABB Power Grid, 2016).

Within the study area, there are also several renewable energy generation projects. In the northern region of the study area is the Iron Star Wind Farm. The Iron Star Wind Farm, owned by Engie, occupies 35,000 acres of land and consists of 62 turbines. Directly south of the Iron Star Wind Farm is the Bloom Wind Farm. It consists of 54 turbines and is owned by Capital Power. Both the Iron Star Wind Farm and the Bloom Wind Farm have correlating substations. The Ensign Wind Repower Farm, owned by NextEra Energy, is in the northwest corner of the study area. This wind farm consists of 43 turbines (FAA, 2024).

In addition to the above transmission lines, several lower voltage distribution lines exist throughout the study area. These are primarily located along roadsides. Other utilities include buried water, fiber optic, and telecommunications lines that service the study area. These utilities are predominantly located within road ROW or along the existing road network. There are no cellphone towers documented by the FCC within the study area. There are 35 private transmission towers and 15 microwave service towers within the study area (NGDA, 2024).

One crude oil pipeline, The Grand Mesa Pipeline owned by Grand Mesa Pipeline Company, crosses the study area. Several operating interstate natural gas pipelines operated by Panhandle Eastern Pipeline Company, Southern Star Central Gas Pipeline Company, Northern Natural Gas Company, and Natural Gas Pipeline Company of America also cross the study area (Hitachi ABB Power Grid, 2016).

#### 2.2.4.5 Commercial and Residential Development

The unincorporated community of Bloom, Kansas, is in the southeast corner of the study area. This community is composed of one grain-elevator business and private residences. Haggard, Kansas is an unincorporated area located along the northern boundary of the study area. It consists of a grain elevator and a residence. There are no other incorporated or

unincorporated areas within the study area. Residences and smaller farmsteads are scattered throughout the study area.

#### 2.2.4.6 Cultural Resources

On February 16, 2024, the routing team conducted an online search of the KGIS database, housed by the KSHS, to identify previously documented cultural resources in the study area. KGIS contained the following data: 17 archaeological sites, 10 archaeological surveys, 10 GLO records, and 2 pioneer cemeteries. There are no NRHP listings within the study area.

Two of the previously documented archaeological sites have been evaluated for NRHP eligibility and were found not to be eligible; the remaining sites have not been evaluated (Table 2-9). Eight are precontact sites, six are historic, two have historic and precontact components, and one is of unknown age. Three of the historic components are historic-age Native American camps. One of the historic sites is an Amish cemetery, and the site of unknown age is a reported human burial.

**Table 2-9: Previously Documented Archaeological Sites within the Study Area**

| Site ID | Site Type | Component | Construction/ Occupation | Notes | NRHP Status |
|---|---|---|---|---|---|
| 14FD00003 | Lithic scatter | Precontact and historic | Unknown | Historic portion is likely roadside trash. | Unevaluated |
| 14FD00004 | Agrarian | Historic | Unknown | - | Not eligible |
| 14FD00005 | Cemetery | Historic | 1900-1954 | Amish Cemetery | Unevaluated |
| 14FD00006 | Domestic | Historic | 1900-1954 | - | Not eligible |
| 14FD00306 | Camp | Precontact and historic | Early Ceramic, unknown historic | Precontact on west side of creek, historic on east. Materials collected immediately following a flood. | Unevaluated |
| 14FD00327 | Artifact scatter | Precontact | Unknown | - | Unevaluated |
| 14FD00402 | Camp | Historic | Historic Native American 1820-1875, Euro-American 1861-1900 | Euro-American component believed to be a bison hunting camp | Unevaluated |
| 14MD00302 | Camp | Precontact | Middle Ceramic | - | Unevaluated |
| 14MD00303 | Camp | Precontact | Middle Ceramic | - | Unevaluated |
| 14MD00304 | Mound | Precontact | Unknown | Stone mound on crest of ridge top overlooking south bank of Crooked Creek | Unevaluated |
| 14MD00306 | Camp | Precontact | Middle Ceramic | - | Unevaluated |
| 14MD00307 | Camp | Precontact | Late Ceramic | - | Unevaluated |
| 14MD00308 | Camp | Precontact | Unknown | - | Unevaluated |

| Site ID | Site Type | Component | Construction/ Occupation | Notes | NRHP Status |
|---|---|---|---|---|---|
| 14MD00312 | Workshop | Precontact | Middle Ceramic | Between 14MD302 and 14MD306, likely an activity area associated with those sites | Unevaluated |
| 14MD00401 | Burial | Unknown | Unknown | Human burial excavated by landowners on bluff | Unevaluated |
| 14MD00402 | Camp | Historic | Historic Native American 1820-1875, Euro-American 1861-1900 | Euro-American component believed to be a bison hunting camp | Unevaluated |
| 14MD00404 | Camp | Historic | Native American 1820-1875 | Records from Fort Dodge indicate this location was a frequent camping area for Southern Plains tribes | Unevaluated |

The archaeological surveys undertaken in the study area were performed for many different project types (Table 2-10). They include three pipeline projects, two communications towers, and three wind farm projects, among others.

**Table 2-10: Previous Archaeological Surveys within the Study Area**

| KSHS Report Title | Submitted To | Report Author | Report Date | KSHS Report Number |
|---|---|---|---|---|
| A Cultural Resources Survey for the Panhandle Eastern Pipe Line Company Liberal 100 Line Bi-Directional Flow Project Seward, Meade, Clark, Ford, and Kiowa Counties, Kansas | Panhandle Eastern Energy | Nancy Porter | 2005 | 1,843 |
| Phase II Cultural Resource Investigation FPL Energy - Wind Farm in Gray County, Kansas | Snyder & Associates, Inc. | Carolyn G. Johnson | 2001 | 2,850 |
| Intensive Archaeology Survey (Kansas Phase II) Proposed Verizon Wireless KS12 Ensign Wireless Communications Tower Project Ford County, Kansas | Terracon | Mark William Kelly | 2011 | 4,883 |
| Archaeological Site Detection Survey of Proposed Cimarron Bend Wind Project, Clark County, Kansas | Enel Green Power North America, Inc. | Mark A. Latham | 2016 | 6,061 |

| KSHS Report Title | Submitted To | Report Author | Report Date | KSHS Report Number |
|---|---|---|---|---|
| A Phase II Archaeological Survey for the Amarillo Line Nos. 2 and 3 AMA 122, AMA 143, and AMA 157 Cathodic Protection Systems Project, Ford County, Kansas | Natural Gas Pipeline of America, LLC | Melanie A. Medeiros | 2017 | 6,199 |
| Cultural Resources Assessment of the Cherokee Weir - A Cellular Tower Cherokee County, Kansas | Terracon Consultants | Lindsay P. Dyle | 2018 | 6,651 |
| Phase II Cultural Resources Survey of Four Cathodic Protection System Locations in Meade, Ford, and Pawnee Counties, Kansas | Natural Gas Pipeline of America | Tod C. Bevitt and Wendi M. Bevitt | 2020 | 6,846 |
| A Phase II Intensive Cultural Resource Inventory for the Iron Star Wind Project in Ford County, Kansas | Iron Star Wind Project | Amanda Baker | 2020 | 7,111 |
| Phase I and II Cultural Resources Investigation for the Proposed Northern Natural Gas Dodge City Biogas Pipeline Relocation 01240335 Project, Ford County, Kansas | Merjent, Inc. and Northern Natural Gas | Patrick O'Brien | 2022 | 7,534 |
| No-Effect Archaeological Report of NRCS Project 20220406150827 Ford County, Kansas | - | William D. Harris | 2022 | 7,868 |

All of the GLO records are roads or trails. Two are recorded as "Indian Trails", three are wagon trails, and one is listed as simply a trail. The remainder are recorded as roads. One of the pioneer cemeteries is in Meade County and the other is in Ford County; both are well marked.

# 3.0 Bucklin Line Route Evaluation

This chapter outlines the processes and rationale behind the identification of alternate routes and selection process of the final approved route for the Bucklin Line.

## 3.1 Overview of Routing Process

The following is an outline of the process in the identification of alternate routes and the selection of a final, approved route. Before any alternate routes were considered, a study area was established. This area is large enough to allow for numerous alternate routes, but not too large to overburden the analysis with unnecessary information. More information about the study area selection process and details about the study area boundary are included in Section 1.1.

Upon the creation of the study area, resources that could act as potential constraints to the selection process were identified. These resources were mapped and recorded using Geographic Information System (GIS) software and data. The objective was to identify economically and technically feasible alternate routes to connect the Bucklin Line endpoints, while avoiding or minimizing impacts to both social and natural resources.

Local, state, and Federal agencies were contacted to obtain information relevant to the selection process. This information, along with the constraints identified by GIS data, were used to create the alternate route network. Following its creation, the alternate route network was shown to local officials and the public to obtain input for further evaluation. Input gathered was used to create a refined alternate route network. The social and natural resources that would be potentially impacted by each refined alternate route link of the refined alternate route network were quantified. This data, along with public input and engineering factors, were used to evaluate the refined alternate route network and to select a proposed route for the transmission line. Following the conclusion of this study, the proposed route will be presented to the Kansas Corporation Commission (KCC) for consideration. Activities leading to the selection of the proposed route are described in more detail in the following sections.

## 3.2 Identification of Alternate Routes

The overall objective of the alternate route development and selection process was to identify economically feasible alternate routes between the connection points that would offer the most benefits in terms of providing reliable electric service while reducing adverse impacts to the social and natural environment. The alternate route development process included the following main components:

- Contact was made with local, state, and Federal agencies to identify factors in the study area that could affect the alternate route development process
- A GIS-based desktop review of the study area was conducted using information gathered from the agencies, recent aerial photography, USGS topographic maps, and other pertinent data to identify potential opportunities and constraint areas

- Alternate routes were developed based on the constraints map
- Field reconnaissance of the study area was conducted to verify the feasibility of the alternate routes that were identified during the desktop review

The major considerations during the development of alternate route network were to:

- Maximize the distance of the transmission line from residences, businesses, public facilities, parks, cemeteries, communication towers, and wind turbines
- Minimize crossing through cultivated land and center pivot irrigation arms
- Maximize the distance of the transmission line parallel to existing utilities, roads or railroads when practical
- Minimize crossing wetlands, riparian areas, conservation lands, and protected species and their habitats for both the transmission line corridor and access for construction and maintenance
- Maintain a reasonable length with as few angles as possible to control costs and minimize overall impacts

It was not possible to find an alternate route that avoided all potential impacts. To reduce impacts to land uses, alternate routes were located along existing lines of land division, such as field lines and section lines, or along existing transmission lines when possible.

The alternate routes consist of individual alternate route links that may be combined in different arrangements to form a continuous path to connect the two endpoints. Each alternate route link begins and ends at intersections with other alternate route links or the project endpoints. The Bucklin Line Alternate Route Network, comprised of the various individual alternate route links, are shown in Figure 3-1. A detailed map showing the alternate route network, overlaid on a USGS topography map background, is found in Appendix B (Figure B-1).

In total, 46 alternate route links were identified which could be used to create alternate routes between the Bucklin Origination Point and the Grain Belt Express Kansas converter station AC switchyard. These alternate route links identified were shown to the public at open houses on February 27th, 28th, and 29th, 2024 and during the simultaneous virtual public house. Additionally, the virtual open house remained open for two weeks after the conclusion of the in-person open houses, from February 27th to March 15th. Section 3.3 further describes the public involvement activities for the Bucklin Line.

The 46 identified alternate route links were edited to incorporate public input. The result of this process is a refined alternate route network. The refined alternate route links combined to form 696 refined alternate routes that would connect the Bucklin Line endpoints. Refined alternate route link combinations creating refined alternate routes that progress unnecessarily backward or away from the endpoint were not considered for evaluation. All forward-progressing refined alternate route combinations were evaluated to identify a proposed route.

Grain Belt Express Kansas Converter Station AC Switchyard

Bucklin Origination Point

Ford

Bucklin

Arkansas River

Rattlesnake Creek

Mulberry Creek

Lariat Way

Liberty Trail Rd

Ridge Rd

Ford Ensign Rd

Saddle Rd

Saddle Side Rd

Tilman Rd

Tillman Rd

Valley Rd

Warrior Rd

Upland Rd

Detour Rd

Kingsdown Ford Rd

Whirlwind Rd

Harness Rd

Wilburn Rd

Million Dollar Rd

Wildfire Rd

Windy Rd

Church St

Wrangler Rd

115th Rd

116 Rd

117 Rd

118 Rd

119 Rd

120th Rd

121 Rd

122nd Rd

123 Rd

124th Rd

125 Rd

126th Rd

127 Rd

128 Rd

129 Rd

130 Rd

131 Rd

132 Rd

133 Rd

134 Rd

400

34

54

94

Project Endpoint
Route Link Endpoint
Route Link
Route Link Number
Study Area

Public Airport
Microwave Service Tower
Land Mobile Private Transmission Tower
Existing Pipeline
Railroad

Highway
Local Road
NHD Stream/River
NWI Wetland
FEMA Floodplain

Municipal Boundary

**Existing Transmission Line**
115kV
345kV

**Part 77 Surfaces**
Approach
Conical
Transitional

NORTH

1 0.5 0 1
Miles

BURNS McDONNELL

Figure 3-1
Bucklin Line
Alternate Route Network
Kansas AC Collector System
Grain Belt Express
Ford County

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Service Layer Credits: World Imagery: Earthstar Geographics

Source: Grain Belt Express, Esri, NHD, FEMA, NWI, FAA, NTAD, HIFLD, FCC, Burns & McDonnell

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## 3.3 Bucklin Line Public Involvement Activities

Two forms of public input were used to determine community preferences and concerns relative to the proposed Bucklin Line. The first outreach effort included letters to state, Federal, and local agencies. Federal and state agencies were contacted by letter to provide input on threatened and endangered species, wetlands, wildlife resources, and other potential permitting issues. Federal agencies contacted included the U.S. Environmental Protection Agency (EPA), National Park Service (NPS), USACE Kansas City District Office, USFWS, Natural Resources Conservation Service (NRCS), and FAA. State agencies contacted included the Kansas Department of Agriculture (KDA), Kansas Department of Health and Environment (KDHE), KBS, Kansas Department of Transportation (KDOT), KSHS, and KDWP. Letters were also delivered to Ford County Commissioners and their respective Planning & Zoning Departments by a member of the Invenergy team. A summary of the responses received from these agencies is included in Chapter 5. A sample request letter and the responses received from the agencies are provided in Appendix C.

In addition, a public information meeting was held. Input from residents and public officials was recorded and a summary of the feedback received is located in Appendix D. The intent of the public participation program was to provide the potentially-affected landowners near the alternate route links with an understanding of the need for the Bucklin Line, the decision-making process used to select the proposed route, and a forum to voice concerns about the Bucklin Line as well as an opportunity for the Bucklin Line team to gain insight into the area resources and issues of landowners for consideration in the evaluation and selection process.

The public meetings were held by Grain Belt Express, HDR Inc., and Burns & McDonnell on February 27th, 28th, and 29th, 2024, at the Ford County Fair Building, the City of Plains Community Building, and the Gray County Recreation Center, respectively. Landowners within 1,000 feet of all alternate route centerlines were sent an informational letter notifying them of the date and location of the public open house. The landowner information used to mail letters was derived from the digital parcel and ownership data obtained from Gray, Ford, and Meade counties.

The public information meeting included display stations with information on alternate routes and environmental management, as well as a sign-in table with information on the Bucklin Line need and various informational handouts. Real estate and ROW personnel, engineers, and routing specialists from Invenergy and Burns & McDonnell were present to answer questions and take comments raised by the public. Several sets of large maps were displayed, showing the alternate route network, parcel boundaries, township/range/section data, roads, and other features overlaid on an aerial photograph background. In addition to these large, printed maps, the meeting also included three computer stations showing the same spatial data so that attendees could get a more detailed view of their property and provide more directed comments on their parcel. Three routing specialists from Burns & McDonnell were also equipped with tablets for the public to submit geospatially referenced comments. Figure 3-2 shows the comments that were submitted via the computer stations and tablets. Photographs and drawings showing the different types of structures that could be used for the Bucklin Line were also available.

Participants received a questionnaire soliciting their input on the potential routing factors, the alternate route link locations, and issues of concern regarding the Bucklin Line. They

Grain Belt Express Kansas Converter Station AC Switchyard

Bucklin Origination Point

Ford

Bucklin

Arkansas River

Mulberry Creek

Rattlesnake Creek

Lariat Way

Liberty Trail Rd

Ridge Rd

Saddle Side Rd

Detour Rd

Upland Rd

Ford Ensign Rd

Saddle Rd

Tilman Rd

Tillman Rd

115th Rd

116 Rd

Valley Rd

Bloom Rd

Kingsdown Ford Rd

Warrior Rd

121 Rd

123 Rd

132 Rd

133 Rd

134 Rd

120th Rd

118 Rd

Million Dollar Rd

Wilburn Rd

124th Rd

128 Rd

129 Rd

Whirlwind Rd

Harness Rd

131 Rd

130 Rd

125 Rd

126th Rd

127 Rd

Wildfire Rd

117 Rd

Windy Rd

122nd Rd

Church St

119 Rd

Wrangler Rd

400

34

54

94

144 145 143 142 141 140 139 138 137 136 135 134 133 132 131 125 129 130 128 126 124 127 122 123 118 117 108 120 119 121 116 107 114 115 109 113 106 112 110 105 100 111 104 101 102 103



Figure 3-2
Bucklin Line
Public Open House Comments
Kansas AC Collector System
Grain Belt Express
Ford County

PUBLIC

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Service Layer Credits: World Imagery: Earthstar Geographics

Source: Grain Belt Express, Esri, FAA, NTAD, HIFLD, Burns & McDonnell

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were asked to return their questionnaires at the open houses. Appendix D includes a copy of a sample questionnaire from the public information meeting.

A total of 14 questionnaires were received from the open house for the Bucklin Line. At the February 27th meetings, 7 were returned during the morning meeting, and 7 were returned during the afternoon meeting. No questionnaires were returned for the Bucklin Line during the February 28th and 29th meetings.

To supplement the in-person open houses, a virtual option was available between February 27th and March 15th. Participants had access to all information presented at the in-person open houses, including information about the Bucklin Line need, benefits, anticipated timeline, and structures. The website then offered participants the opportunity to leave geographically referenced comments on the Bucklin Line maps and fill out an online version of the Bucklin Line questionnaire. Comments left on the Bucklin Line maps are included in Figure 3-3. A summary of responses received from the online questionnaires are included in Table D-1 in Appendix D.

## 3.4 Bucklin Line Post-Public Involvement Activities

By taking information gathered from the public and local officials at the open house meetings, as well as information gathered from agencies contacted, the refined alternate route network was created. Comments received during the public open houses did not necessitate any changes to the alternate route network but instead will be considered during the final proposed route selection process. The refined alternate route network was the network used during the analysis process. Figure 3-4 details the refined alternate route network, made up of the refined alternate route links.

## 3.5 Bucklin Line Identification of the Proposed Route

The analysis of the alternate route network was based on social, environmental, and engineering factors. A proposed route, to be submitted to the KCC following this study, was identified that would connect the proposed Bucklin Origination Point and proposed Grain Belt Express Kansas converter station AC switchyard. The proposed route minimizes, to the extent practicable, the impacts of the proposed transmission line when compared to other refined alternate routes. The following is a description of the evaluation and selection process that resulted in the identification of a proposed route for the Bucklin Line.

### 3.5.1 Evaluation Factors

The analysis of alternate routes was based on social, environmental, and engineering factors. A proposed route was identified that would connect the proposed Bucklin Origination Point and proposed Grain Belt Express Kansas converter station AC switchyard while minimizing, to the extent practicable, the impacts of the proposed transmission line. The following is a description of the process that resulted in the identification of a proposed route for the Bucklin Line.

The primary source of imagery used in this analysis was Esri's Basemap (2023 Maxar) for color aerial imagery, supplemented with field reconnaissance of the study area and along each of the refined alternate routes developed. Digital data, such as roads, parcels, and land

Grain Belt Express Kansas Converter Station AC Switchyard

Bucklin Origination Point

Ford

Bucklin

Arkansas River

Rattlesnake Creek

Mulberry Creek

Lariat Way

Liberty Trail Rd

Ridge Rd

Ford Ensign Rd

Saddle Rd

Saddle Side Rd

Tilman Rd

Tillman Rd

Valley Rd

Warrior Rd

Upland Rd

Whirlwind Rd

Harness Rd

Million Dollar Rd

Wilburn Rd

Wildfire Rd

Windy Rd

Church St

Wrangler Rd

Detour Rd

Kingsdown Ford Rd

Bloom Rd

115th Rd

116 Rd

117 Rd

118 Rd

119 Rd

120th Rd

121 Rd

122nd Rd

123 Rd

124th Rd

125 Rd

126th Rd

127 Rd

128 Rd

129 Rd

130 Rd

131 Rd

132 Rd

133 Rd

134 Rd

400

54

94

34

144 145 143 142 141 140 139 138 137 136 135 134 133 132 131 130 129 128 127 126 125 124 123 122 121 120 119 118 117 116 115 114 113 112 111 110 109 108 107 106 105 104 103 102 101 100

Project Endpoint
Route Link Endpoint
Route Link
Route Link Number
Study Area

Public Airport
Railroad
Highway
Local Road
NHD Stream/River

Municipal Boundary

**Virtual Open House Comment**

General

NORTH

1 0.5 0 1

Miles

BURNS McDONNELL

Figure 3-3
Bucklin Line
Virtual Open House Comments
Kansas AC Collector System
Grain Belt Express
Ford County

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Source: Grain Belt Express, Esri, HDR, FAA, NTAD, HIFLD, Burns & McDonnell





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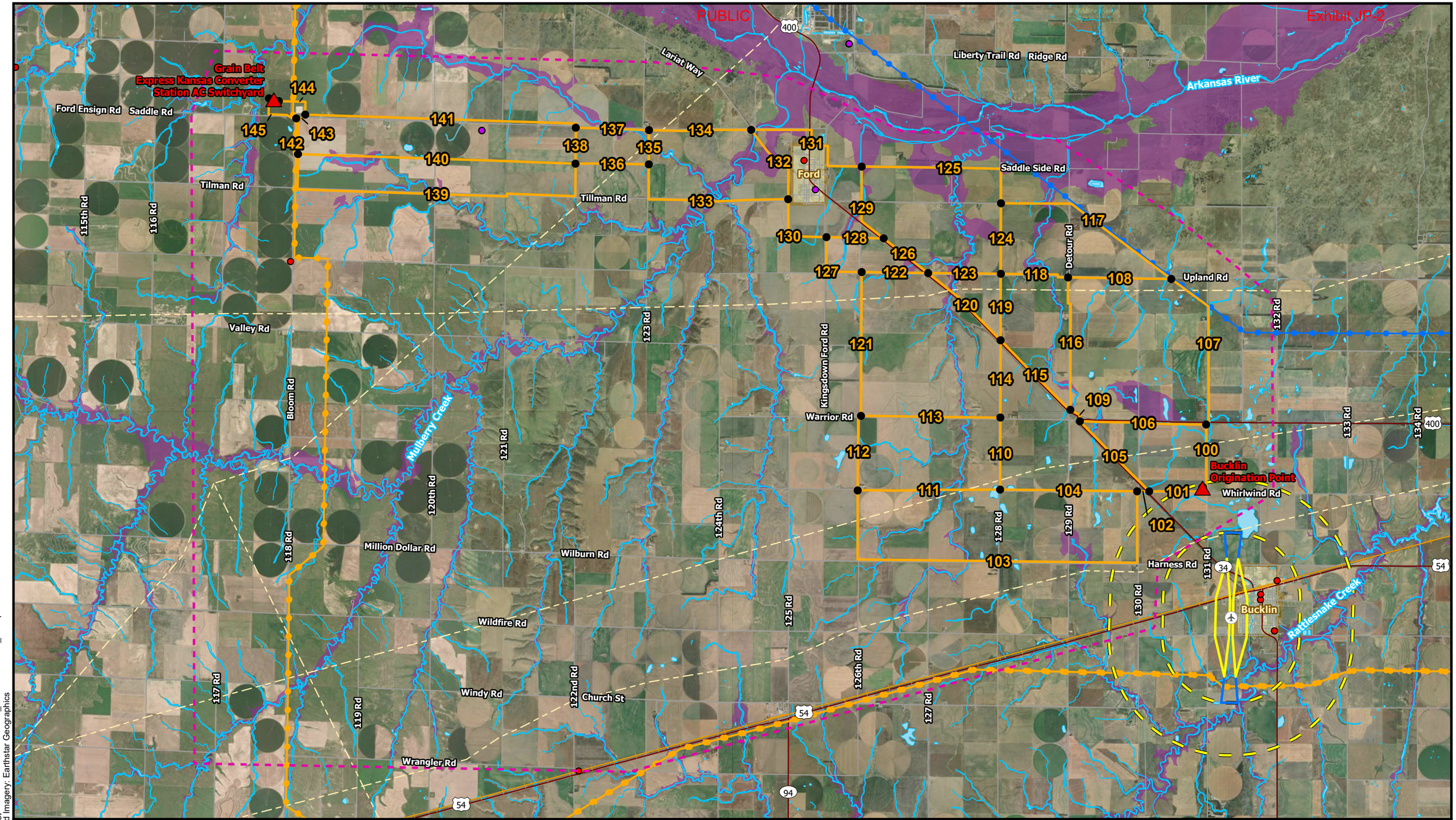


Project Endpoint
Refined Route Link Endpoint
Refined Route Link
Route Link Number
Study Area

Public Airport
Microwave Service Tower
Land Mobile Private Transmission Tower
Existing Pipeline
Railroad

Highway
Local Road
NHD Stream/River
NWI Wetland
FEMA Floodplain

Municipal Boundary

**Existing Transmission Line**
115kV
345kV

**Part 77 Surfaces**
Approach
Conical
Transitional

NORTH

1 0.5 0 1
Miles

BURNS McDONNELL

Figure 3-4
Bucklin Line
Refined Alternate Route Network
Kansas AC Collector System
Grain Belt Express
Ford County

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Service Layer Credits: World Imagery: Earthstar Geographics

Source: Grain Belt Express, Esri, NHD, FEMA, NWI, FAA, NTAD, HIFLD, FCC, Burns & McDonnell





Issued: 5/15/2024

use information, were acquired from various agencies. Table 3-1 lists out the factors, and a detailed description of each of the factors considered for the route analysis.

**Table 3-1: Bucklin Line Evaluation Factors**

| Routing Factor | Unit of Measure | Type |
|---|---|---|
| Length along existing distribution line | Feet | Engineering |
| Length not along roads | Feet | Engineering |
| Length not along existing transmission lines | Feet | Engineering |
| Transmission line crossings | Feet | Engineering |
| Road crossings | Count | Engineering |
| Heavy angles > 30 degrees | Count | Engineering |
| Length not along railroads | Feet | Engineering |
| Length through 1.1 X the turbine height | Acres | Engineering |
| Center pivot irrigation systems acres in ROW | Acres | Engineering |
| Total length | Feet | Engineering |
| Stream crossings (NHD) | Count | Environmental |
| Length through floodways/floodplains 100-year (FEMA) | Feet | Environmental |
| Woodland acres in ROW (NLCD) | Acres | Environmental |
| Lesser prairie-chicken score | Score | Environmental |
| Lesser prairie-chicken CHAT habitat category 1 (SGP) – acres in ROW | Acres | Environmental |
| Lesser prairie-chicken CHAT habitat category 2 (SGP) – acres in ROW | Acres | Environmental |
| Lesser prairie-chicken CHAT habitat category 3 (SGP) – acres in ROW | Acres | Environmental |
| Lesser prairie-chicken CHAT habitat category 4 (SGP) – acres in ROW | Acres | Environmental |
| Lesser prairie-chicken known active leks (SGP) – acres in ROW | Acres | Environmental |
| Lesser prairie-chicken known historic leks (SGP) – acres in ROW | Acres | Environmental |
| Wetland acres in ROW (NWI) | Acres | Environmental |
| Cultural sites within 1,320 feet of centerline (KSHS) | Count | Social |
| Non irrigated cropland acres in ROW | Acres | Social |
| Residential proximity score | Score | Social |
| Residences within 0-150 feet of centerline | Count | Social |
| Residences within 150-300 feet of centerline | Count | Social |
| Residences within 300-500 feet of centerline | Count | Social |
| Public facilities within 300 feet of centerline | Count | Social |

| Routing Factor | Unit of Measure | Type |
|---|---|---|
| Businesses within 300 feet of centerline | Count | Social |
| Length not along parcel boundary | Feet | Social |

**Length along distribution lines** was calculated to reflect the added engineering and construction challenges created by constructing next to or potentially underbuilding distribution along these refined alternate routes.

**Length not along roads** was calculated because following an existing corridor is generally considered more favorable than constructing through undeveloped lands to minimize potential impacts to land use and habitat fragmentation. Additionally, roads generally follow parcel lines which could maximize accessibility for construction and future maintenance, and because roads represent an opportunity to keep linear facilities in common corridors.

**Length not along existing transmission lines was** measured to reflect the added impacts that constructing the refined alternate route on undeveloped land would create. Paralleling transmission lines allows for linear facilities to be kept in common corridors.

**Road crossings** were counted to reflect the additional engineering and permitting required when crossing a road or highway.

**Heavy angles >30 degrees** represents the number of angles greater than 30 degrees, including dead-end structures that would be required for each refined alternate route. Aside from angles to avoid homes and other constraints, crossings of roads and other linear features may require dead-end structures. Heavy angles require a larger, more visible structure and may include the use of guy wires or other support features. These structures are more expensive and result in greater land disturbance during construction.

**Length not along railroads** was recorded to measure the amount of the refined alternate route network that would be kept in a common corridor with a linear facility. Length not along railroads was not used in the analysis because there were no active railroads paralleled by the network.

**Length through 1.1x turbine height** was measured to determine the amount of the refined alternate route that would be within the fall height of wind turbines in the study area. Locating the line too close to turbines could impact the reliability of the line should a turbine fall. Heights of the structures were collected from FAA filings. Ultimately, this factor was removed from the final analysis because none of the evaluated alternatives crossed through these areas.

**Acres of pivot irrigation within ROW** was derived for each refined alternate route by identifying pivot irrigation systems visible from available aerial imagery and from field reconnaissance of the area. The acres of refined alternate route links' ROW through pivot irrigation was summed for each refined alternate route.

**Total length** is a general indicator of the overall size of the Bucklin Line. Length is also an indicator of construction costs and potential for overall impacts. The longer the refined alternate route, the more expensive and more potential impacts it would have if all other factors were equal.

**Stream crossings** were identified using digital NHD data from the USGS and were verified using National Agriculture Imagery Program (NAIP) aerial photography, and ERSI's aerial base imagery. There are numerous small streams found within the study area, and these streams could be spanned. Stream impacts are expected to be minimal, especially with the implementation of erosion and sedimentation control procedures specified in a Stormwater Pollution Prevention Plan, which would be prepared for the Bucklin Line during the permitting phase. However, stream crossings must be considered for structure stability and clearance over the waterway.

**Length through floodways/floodplains 100-year** was derived for each refined alternate route by identifying floodplains and floodways using FEMA floodplain data. The length of refined alternate link through 100-year floodplains and floodways was summed for each refined alternate route. Length through floodplains was included as an evaluation factor to account for additional permitting efforts, structure design, and construction costs associated with building in a floodplain. Access for routine or emergency maintenance could also be limited by flood conditions which are more likely to occur in designated floodplains.

**Woodlands in ROW** consisted of forested areas within the ROW that would be cleared along each refined alternate route and were quantified using the deciduous forest, evergreen forest, mixed forest, and woody wetlands categories included in NLCD data. Clearing woodlands has the potential for increased loss of habitat for wildlife, land disturbance, loss of windbreaks, and increased costs for construction.

The **lesser prairie-chicken score** was derived for each refined alternate route by first identifying the areas of the study area that intercepted sensitive areas defined by the Southern Great Plains (SGP) Critical Habitat Assessment Tool (CHAT). Areas sensitive to the lesser prairie-chicken area categorized as CHAT 1, CHAT 2, CHAT 3, and CHAT 4, with CHAT 1 representing areas presumed to have the best quality habitat, and CHAT 4 representing areas that exist within a 10-mile buffer of the species' estimated occupied range. Also included in the lesser prairie-chicken score were known active leks and known historic leks.

The routing team rated the CHAT areas and lek areas as shown in Table 3-2. Scores were applied by multiplying the quantified length of each refined alternate route centerline through each area representative of potential occurrence category type by its multiplier. Areas that have the higher potential for species impacts, such as CHAT 1 area and known active or historic leks, were given a higher ranking than areas that would have lower potential for habitat impacts.

**Table 3-2: Lesser Prairie-chicken Score Ratings**

| Areas Representative of Potential Occurrence | Rating |
|---|---|
| CHAT 1 | 3 |
| CHAT 2 | 1 |
| CHAT 3 | 0.5 |

| | |
|---|---|
| CHAT 4 | 0.5 |
| Known active leks | 5 |
| Known historic leks | 5 |

**Wetlands acres in ROW** were measured using NWI data. All wetlands crossed by the proposed ROW were summed for each refined alternate route. Wetland areas crossed by the Bucklin Line were generally small enough in size that permanent impacts could be avoided by potentially spanning the resource though temporary impacts could occur during construction. Additionally, calculating wetlands crossed by the route alternative may provide an approximation of where whooping crane stopover habitat has the potential to exist.

Previously documented **cultural sites within 1,320 feet** (0.25 mile) of each refined alternate route were quantified based on GIS data of known historic and archaeological sites maintained by the KHS. No sites in the study area are listed as NRHP sites.

To account for cropland outside of pivoted irrigation areas, **non-irrigated cropland acres in ROW** were measured. This was done by using the NLCD's Cultivated Crops category and removing the recorded center pivot irrigation areas. Cropland was separated from other agricultural land for this analysis because transmission structures tend to be a greater obstacle for actively cultivated cropland than if the field were used for pasture or other passive agricultural operations.

The **residential proximity score** was derived for each refined alternate route by first identifying residences located at varying distances from the refined alternate routes using aerial photography supplemented with field verification. The consideration of residences varies depending on the distance from the refined alternate route. Closer houses would present the greater concern and therefore, receive greater consideration in the score. The score was derived by multiplying the number of residences quantified for each route by the appropriate rating listed in Table 3-3.

**Table 3-3: Residential Proximity Ratings**

| Distance to Route Centerline | Rating |
|---|---|
| 0-150 feet | 3 |
| 150-300 feet | 2 |
| 300-500 feet | 1 |

**Businesses within 300 feet** of refined alternate routes were identified in the study area. Because the study area is predominantly rural, there were no businesses identified, and therefore, this factor was not used in the final analysis.

**Public facilities within 300 feet** were also identified in the study area. Public facilities include cemeteries, churches and other places of worship, schools, parks, and other facilities used by the public. There was one public facility identified within 300 feet, however, this factor was not used in the final analysis because there was not a large enough sample size to warrant including in the analysis. Consideration of these facilities is included following the analysis and in the overall discussion of the proposed route selection post-analysis.

**Length not along a parcel boundary** was measured to account for length of the line that followed existing lines of land division. Impacts of the Bucklin Line can be minimized by reducing the potential impacts to land use by crossing through the middle of parcel tracts.

### 3.5.2 Weighting the Routing Factors

The evaluation factors in Section 3.5.1 were considered representative of the potential impact of construction and operation of the new transmission lines within this study area. Burns & McDonnell staff assigned weights to each of the factors based on input from the public via the questionnaires, input from Invenergy, and Burns & McDonnell's experience with transmission line projects across the region. The weights associated with each routing factor are presented in Table 3-4. The names of the routing factors may vary slightly from the descriptions on the public questionnaire but are the same in meaning.

**Table 3-4: Bucklin Line Factor Ranking and Weights**

| Routing Factor | Weight |
|---|---|
| Length along existing distribution line | 1 |
| Length not along roads | 9 |
| Length not along existing transmission lines | 2 |
| Transmission line crossings | 7 |
| Road crossings | 1 |
| Heavy angles > 30 degrees | 2 |
| Center pivot irrigation systems acres in ROW | 7 |
| Total length | 3 |
| Stream crossings (NHD) | 2 |
| Length through floodways/floodplains 100-year (FEMA) | 2 |
| Woodland acres in ROW (NLCD) | 3 |
| Lesser prairie-chicken score | 9 |
| Wetland acres in ROW | 3 |
| Cultural sites within 1,320 feet of centerline | 2 |
| Non irrigated cropland acres in ROW | 4 |
| Residential proximity score | 10 |
| Length not along parcel boundary | 8 |

The range of weights (1-10) was determined by the number of factors; the relative importance of each factor in relation to the others, included consideration of the public responses received at the open houses; and the need to differentiate among the refined alternate routes. By weighting the z-score, those factors determined to warrant greater consideration during the evaluation process were weighted higher and thus became more significant contributors to the overall analysis and screening of the potential routes. In this case, the residential proximity score was weighted the highest (10) and therefore, this factor received higher consideration to the overall screening analysis than road crossings which was weighted one of the lowest (1).

### 3.5.3 Evaluating the Alternate Routes

The following sections detail the evaluation process and selection of the proposed route for the Bucklin Line.

#### 3.5.3.1 Evaluation Process

The public feedback received at the open houses was organized and applied to create a refined alternate route network. Once this was completed, the first step in the evaluation process is to combine the refined alternate route link network into individual alternate routes to be analyzed. The refined alternate route links were connected only in ways that progressed the refined alternate routes towards the endpoint. Refined alternate route link connections that would progress the refined alternate route backwards or create unnecessary redundancy were not considered. The refined alternate route network yielded 696 potential refined alternate routes that would connect the proposed Bucklin Origination Point to the proposed Grain Belt Express Kansas converter station AC switchyard.

The evaluation factors identified in Section 3.5.1 were summed for each refined alternate route. These totals were used to calculate the standard deviation which measures individual refined alternate route's difference from the mean (or average) for each refined alternate route. This statistical z-score technique reflects the variability among the refined alternate routes for each factor. A negative score indicates that the score for that refined alternate route is lower than the mean for all the refined alternate routes for that specific factor (e.g., shorter overall length). A positive score indicates that the score for that refined alternate route is higher than the mean (e.g., longer overall length). Larger positive or negative numbers indicate that the alternate route values for that factor were further from the mean. These "raw" z-scores were next multiplied by the weights in Table 3-4 and then summed across all factors considered for each refined alternate route.

The z-score analysis allowed the refined alternate routes to be screened and the lower-impacting refined alternate routes identified for further consideration based on their total z-score. The weighted scores ranged 120.7 points, from a low of -65.43 (Route 432) to a high of 55.27 (Route 295). The scores are not necessarily considered a definitive comparison of alternate routes; rather, they are intended to provide an index of the relative overall impact associated with the alternatives. Typically, alternate routes with scores in the top 10 percent (least impacting) of total z-scores are determined to warrant closer evaluation. Given the range of scores for the Bucklin Line is 120.70 points, the top 10 percent of routes by z-score includes all routes within 12.07 points of the lowest scoring route. The score of the lowest scoring route is -65.43 and all routes within 10 percent would score between -53.36 and -65.43. In this case, 11 routes made up the top 10 percent of alternate routes considered by total z-score. The point of this methodology is to narrow the analysis to a few routes that can be considered further using the route data to make a final recommendation for a proposed route. Section 3.5.3.2 provides a description of the general scoring features of the Bucklin Line and the rationale for selecting the proposed route from these lowest-scoring refined alternate routes.

Table 3-5 shows the refined alternate route data for the top 11 least impactful refined alternate routes. Table 3-6 presents the weighted scores for the top 11 of the refined alternate routes, sorted from lowest to highest score. A lower score indicates fewer overall impacts, while a higher score typically indicates greater overall impacts. The refined alternate route

## Table 3-5: Bucklin Line Route Data

| Rank | Route | Segments | Length along existing distribution line (Feet) | Length not along roads (Feet) | Length not along existing transmission lines (Feet) | Transmission line crossings (Count) | Road Crossings (Count) | Heavy angles > 30 degrees (Count) | Length not along railroads (Feet) | Length through 1.1 X the turbine height (Feet) | Center pivot irrigation system acres in ROW (Acres) | Total length (Feet) | Stream crossings (NHD) (Count) | Length through Floodways/ Floodplains 100yr (FEMA) (Feet) | Woodlands Acres in ROW (NLCD) (Acres) | Lesser prairie-chicken Score | prairie-chicken CHAT Habitat Category 1 (SGP) - acres crossed (Acres) | prairie-chicken CHAT Habitat Category 2 (SGP) - acres crossed (Acres) | prairie-chicken CHAT Habitat Category 3 (SGP) - acres crossed (Acres) | prairie-chicken CHAT Habitat Category 4 (SGP) - acres crossed (Acres) | Lesser prairie-chicken Known Active Leks (SGP) - acres crossed (Acres) | Lesser prairie-chicken Known Historic Leks (SGP) - acres crossed (Acres) | Wetland acres in ROW (Acres) | Cultural sites within 1320ft (Count) | Nonirrigated Cropland acres in ROW (Acres) | Residential proximity score | Residences 0-150 feet (Count) | Residences 150-300 feet (Count) | Residences 300-500 feet (Count) | Public facilities within 300ft (Count) | Businesses within 300ft (Count) | Length not along parcel boundary (Feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 432 | 101, 105, 109, 115, 120, 122, 127, 130, 132, 134, 137, 141, 144 | 18,392.87 | 12,569.81 | 87,370.51 | 2 | 20 | 14 | 87,370.51 | 0 | 13.89 | 87,370.51 | 18 | 8,092.89 | 1.95 | 276.06 | 30.55 | 98.37 | 0 | 172.07 | 0 | 0 | 2.35 | 1 | 222.88 | 8 | 0 | 3 | 2 | 0 | 0 | 4,702.05 |
| 2 | 456 | 101, 105, 109, 115, 120, 126, 129, 131, 134, 137, 141, 144 | 27,753.78 | 7,371.62 | 86,626.15 | 2 | 23 | 14 | 86,626.15 | 0 | 15.65 | 86,626.15 | 19 | 10,898.97 | 1.84 | 262.48 | 30.55 | 73.85 | 0 | 193.97 | 0 | 0 | 3.16 | 1 | 212.79 | 11 | 0 | 4 | 3 | 1 | 0 | 1,812.09 |
| 3 | 444 | 101, 105, 109, 115, 120, 126, 128, 130, 132, 134, 137, 141, 144 | 19,991.62 | 16,896.12 | 85,657.99 | 2 | 20 | 12 | 85,657.99 | 0 | 13.89 | 85,657.99 | 17 | 6,948.62 | 1.95 | 266.97 | 30.55 | 86.04 | 0 | 178.56 | 0 | 0 | 2.24 | 1 | 225.22 | 8 | 0 | 3 | 2 | 0 | 0 | 6,483.49 |
| 4 | 436 | 101, 105, 109, 115, 120, 122, 127, 130, 133, 136, 138, 141, 144 | 24,017.27 | 11,725.41 | 89,189.76 | 2 | 22 | 15 | 89,189.76 | 0 | 6.10 | 89,189.76 | 19 | 5,034.79 | 4.10 | 336.32 | 53.42 | 98.37 | 0 | 155.39 | 0 | 0 | 2.00 | 2 | 223.74 | 6 | 0 | 2 | 2 | 0 | 0 | 4,702.05 |
| 5 | 636 | 101, 105, 109, 115, 120, 122, 127, 130, 132, 134, 137, 141, 143, 145 | 18,392.87 | 11,178.22 | 88,581.82 | 2 | 22 | 15 | 88,581.82 | 0 | 13.89 | 88,581.82 | 18 | 8,092.89 | 1.95 | 278.15 | 30.55 | 98.37 | 0 | 176.26 | 0 | 0 | 2.35 | 1 | 231.50 | 8 | 0 | 3 | 2 | 0 | 0 | 5,282.79 |
| 6 | 660 | 101, 105, 109, 115, 120, 126, 129, 131, 134, 137, 141, 143, 145 | 27,753.78 | 5,980.03 | 87,837.46 | 2 | 25 | 15 | 87,837.46 | 0 | 15.65 | 87,837.46 | 19 | 10,898.97 | 1.84 | 264.58 | 30.55 | 73.85 | 0 | 198.16 | 0 | 0 | 3.16 | 1 | 221.41 | 11 | 0 | 4 | 3 | 1 | 0 | 2,392.82 |
| 7 | 448 | 101, 105, 109, 115, 120, 126, 128, 130, 133, 136, 138, 141, 144 | 25,616.02 | 16,051.72 | 87,477.24 | 2 | 22 | 13 | 87,477.24 | 0 | 6.10 | 87,477.24 | 18 | 3,890.52 | 4.10 | 327.23 | 53.42 | 86.04 | 0 | 161.88 | 0 | 0 | 1.89 | 2 | 226.08 | 6 | 0 | 2 | 2 | 0 | 0 | 6,483.49 |
| 8 | 648 | 101, 105, 109, 115, 120, 126, 128, 130, 132, 134, 137, 141, 143, 145 | 19,991.62 | 15,504.53 | 86,869.30 | 2 | 22 | 13 | 86,869.30 | 0 | 13.89 | 86,869.30 | 17 | 6,948.62 | 1.95 | 269.06 | 30.55 | 86.04 | 0 | 182.74 | 0 | 0 | 2.24 | 1 | 233.83 | 8 | 0 | 3 | 2 | 0 | 0 | 7,064.23 |
| 9 | 640 | 101, 105, 109, 115, 120, 122, 127, 130, 133, 136, 138, 141, 143, 145 | 24,017.27 | 10,333.82 | 90,401.07 | 2 | 24 | 16 | 90,401.07 | 0 | 6.10 | 90,401.07 | 19 | 5,034.79 | 4.10 | 338.41 | 53.42 | 98.37 | 0 | 159.58 | 0 | 0 | 2.00 | 2 | 232.36 | 6 | 0 | 2 | 2 | 0 | 0 | 5,282.79 |
| 10 | 42 | 100, 106, 109, 115, 120, 122, 127, 130, 132, 134, 137, 141, 144 | 26,142.95 | 12,518.47 | 90,162.13 | 2 | 20 | 14 | 90,162.13 | 0 | 15.57 | 90,162.13 | 22 | 8,221.00 | 1.95 | 286.13 | 30.55 | 108.96 | 0 | 171.05 | 0 | 0 | 2.92 | 1 | 235.54 | 7 | 0 | 3 | 1 | 0 | 0 | 4,650.72 |
| 11 | 66 | 100, 106, 109, 115, 120, 126, 129, 131, 134, 137, 141, 144 | 35,503.86 | 7,320.28 | 89,417.78 | 2 | 23 | 14 | 89,417.78 | 0 | 17.33 | 89,417.78 | 23 | 11,027.08 | 1.84 | 272.56 | 30.55 | 84.44 | 0 | 192.95 | 0 | 0 | 3.74 | 1 | 225.45 | 10 | 0 | 4 | 2 | 1 | 0 | 1,760.75 |
| | | **Max** | 48,163.71 | 50,247.95 | 116,193.31 | 2 | 28 | 28 | 121,584.75 | 0 | 31.99 | 121,584.75 | 34 | 16,769.43 | 4.16 | 525.67 | 115.11 | 129.67 | 0 | 278.46 | 0 | 0 | 7.54 | 2 | 308.84 | 18 | 0 | 7 | 6 | 1 | 0 | 19,989.04 |
| | | **Average** | 25,036.21 | 19,963.78 | 96,857.57 | 2 | 21 | 18 | 100,146.85 | 0 | 13.85 | 100,146.85 | 20.91 | 8,970.96 | 2.71 | 385.57 | 65.91 | 96.76 | 0 | 182.15 | 0 | 0 | 3.43 | 1.36 | 253.44 | 9.32 | 0 | 3.21 | 2.91 | 0.16 | 0 | 8,298.21 |
| | | **Min** | 1,526.41 | 3,062.70 | 80,753.66 | 2 | 15 | 11 | 85,657.99 | 0 | 0 | 85,657.99 | 10 | 2,352.30 | 1.84 | 262.48 | 30.55 | 64.89 | 0 | 127.65 | 0 | 0 | 1.87 | 1 | 212.79 | 1 | 0 | 0 | 1 | 0 | 0 | 1,318.69 |
| | | **Standard Deviation** | 9,294.58 | 11,356.69 | 5,069.06 | 0 | 2.37 | 3.30 | 5,783.10 | 0 | 6.41 | 5,783.10 | 4.70 | 2,922.53 | 1.06 | 62.59 | 22.68 | 14.61 | 0 | 27.21 | 0 | 0 | 0.93 | 0.48 | 14.41 | 3.46 | 0 | 1.43 | 1.42 | 0.36 | 0 | 3,276.68 |

## Table 3-6: Bucklin Line Weighted Sorted Z-Scores

| Rank | Route | Segments | Length along existing distribution line | Length not along roads | Length not along existing transmission lines | Transmission line crossings | Road crossings | Heavy angles > 30 degrees | Center pivot irrigation system acres in ROW | Total length | Stream crossings (NHD) | Length through Floodways/ Floodplains 100yr (FEMA) | Woodland acres in ROW (NLCD) | Lesser prairie-chicken Score | Wetland acres in ROW | Cultural sites within 1320ft | Nonirrigated Cropland acres in ROW | Residential proximity score | Length not along parcel boundary | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 432 | 101, 105, 109, 115, 120, 122, 127, 130, 132, 134, 137, 141, 144 | -0.71 | -5.86 | -3.74 | 0 | -0.24 | -2.47 | 0.05 | -6.63 | -1.24 | -0.60 | -2.15 | -15.75 | -3.49 | -1.51 | -8.48 | -3.83 | -8.78 | -65.43 |
| 2 | 456 | 101, 105, 109, 115, 120, 126, 129, 131, 134, 137, 141, 144 | 0.29 | -9.98 | -4.04 | 0 | 1.03 | -2.47 | 1.97 | -7.01 | -0.81 | 1.32 | -2.48 | -17.70 | -0.85 | -1.51 | -11.29 | 4.85 | -15.84 | -64.50 |
| 3 | 444 | 101, 105, 109, 115, 120, 126, 128, 130, 132, 134, 137, 141, 144 | -0.54 | -2.43 | -4.42 | 0 | -0.24 | -3.68 | 0.05 | -7.52 | -1.66 | -1.38 | -2.15 | -17.05 | -3.84 | -1.51 | -7.84 | -3.83 | -4.43 | -62.48 |
| 4 | 436 | 101, 105, 109, 115, 120, 122, 127, 130, 133, 136, 138, 141, 144 | -0.11 | -6.53 | -3.03 | 0 | 0.61 | -1.86 | -8.46 | -5.68 | -0.81 | -2.69 | 3.93 | -7.08 | -4.61 | 2.65 | -8.25 | -9.62 | -8.78 | -60.32 |
| 5 | 636 | 101, 105, 109, 115, 120, 122, 127, 130, 132, 134, 137, 141, 143, 145 | -0.71 | -6.96 | -3.27 | 0 | 0.61 | -1.86 | 0.05 | -6.00 | -1.24 | -0.60 | -2.15 | -15.45 | -3.49 | -1.51 | -6.09 | -3.83 | -7.36 | -59.87 |
| 6 | 660 | 101, 105, 109, 115, 120, 126, 129, 131, 134, 137, 141, 143, 145 | 0.29 | -11.08 | -3.56 | 0 | 1.88 | -1.86 | 1.97 | -6.39 | -0.81 | 1.32 | -2.48 | -17.40 | -0.85 | -1.51 | -8.89 | 4.85 | -14.42 | -58.94 |
| 7 | 448 | 101, 105, 109, 115, 120, 126, 128, 130, 133, 136, 138, 141, 144 | 0.06 | -3.10 | -3.70 | 0 | 0.61 | -3.07 | -8.46 | -6.57 | -1.24 | -3.48 | 3.93 | -8.39 | -4.96 | 2.65 | -7.60 | -9.62 | -4.43 | -57.36 |
| 8 | 648 | 101, 105, 109, 115, 120, 126, 128, 130, 132, 134, 137, 141, 143, 145 | -0.54 | -3.53 | -3.94 | 0 | 0.61 | -3.07 | 0.05 | -6.89 | -1.66 | -1.38 | -2.15 | -16.75 | -3.84 | -1.51 | -5.44 | -3.83 | -3.01 | -56.91 |
| 9 | 640 | 101, 105, 109, 115, 120, 122, 127, 130, 133, 136, 138, 141, 143, 145 | -0.11 | -7.63 | -2.55 | 0 | 1.45 | -1.26 | -8.46 | -5.06 | -0.81 | -2.69 | 3.93 | -6.78 | -4.61 | 2.65 | -5.85 | -9.62 | -7.36 | -54.76 |
| 10 | 42 | 100, 106, 109, 115, 120, 122, 127, 130, 132, 134, 137, 141, 144 | 0.12 | -5.90 | -2.64 | 0 | -0.24 | -2.47 | 1.88 | -5.18 | 0.46 | -0.51 | -2.15 | -14.30 | -1.63 | -1.51 | -4.97 | -6.73 | -8.91 | -54.67 |
| 11 | 66 | 100, 106, 109, 115, 120, 126, 129, 131, 134, 137, 141, 144 | 1.13 | -10.02 | -2.94 | 0 | 1.03 | -2.47 | 3.80 | -5.57 | 0.89 | 1.41 | -2.48 | -16.25 | 1.00 | -1.51 | -7.77 | 1.95 | -15.96 | -53.74 |
| | | Max | 2.49 | 24.00 | 7.63 | 0 | 3.14 | 6.01 | 19.81 | 11.12 | 5.56 | 5.34 | 4.09 | 20.14 | 13.34 | 2.65 | 15.38 | 25.10 | 28.54 | 55.27 |
| | | Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Min | -2.53 | -13.39 | -6.35 | 0 | -2.35 | -4.28 | -15.11 | -7.52 | -4.64 | -4.53 | -2.48 | -17.70 | -5.05 | -1.51 | -11.29 | -24.09 | -17.04 | -65.43 |

combinations, refined alternate route link data, refined alternate route data, intermediate raw scores, and weighted sorted z-scores tables for all refined alternate routes evaluated are presented in Appendix E (Tables E-1, E-2, E-3, and E-4) for reference.

#### 3.5.3.2 Selection of the Proposed Route

The 11 lowest (least-impacting) scoring refined alternate routes for the proposed Bucklin Line are routes 432, 456, 444, 436, 636, 660, 448, 648, 640, 42, and 66. Of the lowest scoring routes, the top 9 refined alternate routes depart from the proposed Bucklin Origination Point to the west using route link 101 and continue north along route links 105, 109, 115, and 120 that parallel State Highway 34 on its north side. Routes 42 and 66 depart using route link 100, which parallels 131 Road, turn east along route link 106, which parallels W Trail St, and meet back up with the other retained refined alternate routes along route links 115 and 120.

Here, five refined alternate routes (routes 432, 436, 636, 640, and 42) deviate east along route links 122 and 127, which parallel Upland Road and Kingsdown Ford Road. The six other refined alternate routes (routes 456, 444, 660, 448, 648, and 66) continue north along U.S. Highway 400/State Highway 34 by route link 126. Routes 444, 448, and 648 turn east, taking route link 128 to 130 across a field. Routes 456, 660, and 66 deviate north of the town of Ford, utilizing route links 129 and 134. These route links use a combination of greenfield alignments and road parallels until they turn west, north of the town of Ford, along the south side of Saddle Road.

South of the town of Ford, the other 8 refined alternate routes (routes 432, 444, 436, 636, 448, 648, and 42) deviate, with routes 436, 448, and 640 stair-stepping northwest along route links 133, 136, and 138. This path takes the alternate routes west along Tilman Road, north along 123 Road, west through a field, and then again north along 122 Road. Routes 432, 444, 636, 648, and 42 continue north from route link 130 to 132. Route link 132 heads north by cutting through a field, and then turning west along the south side of a now-abandoned railroad corridor. Here, routes 432, 444, 636, 648, and 42 reconnect with the 3 route links that had previously deviated north of the town of Ford (Routes 456, 660, and 66). These 8 refined alternate routes continue west along route links 134 and 137. Here, all 11 refined alternate routes meet back up and continue west along route link 141.

As the refined alternate routes approach the Grain Belt Express Kansas converter station AC switchyard, routes 432, 456, 444, 436, 448, 42 and 66 turn north along route link 144 to then connect into the substation. Routes 636, 660, 448 and 648 cross Saddle Road to the south along route link 143 and then cross Saddle Road again to wrap around an existing ITC Transmission Substation and connect into the proposed Grain Belt Express Kansas converter station AC switchyard.

Upon review of the 11 least-impacting routes, the paths for routes 42 (ranked 10$^{th}$) and 66 (ranked 11$^{th}$) are the only alternate routes that follow route links 100 and 106 out of the Bucklin Origination Point. This link combination does not avoid the impacts that route link combinations 101 and 105, the route links that the other 9 least impacting routes follow, may create. Routes 42 and 66 gain an additional 0.5 mile following these route links, lose length along State Highway 34, and have one additional angle. Because these route links only create additional length with no additional benefits, routes 42 and 66 were removed from further consideration.

The 9 remaining routes left in consideration are among the shortest routes, with Route 444 being the shortest across all routes evaluated (85,657.99 feet long). They are relatively direct, utilizing long stretches along major roadways and all having above average length paralleling roads. Because these refined alternate routes are close to roadways, they have a slightly above-average number of road crossings compared to all the alternate routes. Of these 9 refined alternate routes, routes 432 and 444 have the lowest number of road crossings (20). All 9 of these least-impacting refined alternate routes have a relatively low number of heavy angles, all having a below-average count and Route 444 having only 1 more (12 angles) compared to the minimum count (11 angles). These 9 refined alternate routes all have an average length along existing distribution lines.

The 9 top routes all score well below average for their lesser prairie-chicken impact scores, with Route 456 scoring the best overall (262.48 points), Route 660 scoring the second best overall (264.58 points) and Route 444 scoring the third best overall (266.97 points). Route 640 scored 338.41 which is the most of the top routes, and still below the average of 385.57 points. Of the 9 least impacting routes, Route 448 has the least amount of length through floodplains (3,890.52 feet) and wetland acres in ROW (1.89 acres), and routes 444 and 648 have the least amount of stream crossings (17).

Of the remaining refined alternate routes, routes 456 and 660 have the least amount of woodlands in their ROW (1.83 acres). Routes 432, 444, 636, and 648 have close to the minimum amount of woodland impacts with only 1.95 acres in their ROW. For all of the refined alternate routes evaluated, there is a maximum of 2 cultural sites within 1,320 feet. Routes 436, 448, and 640 had 2 sites within 1,320 feet, while routes 432, 456, 444, 636, 660, and 648 only had 1 site. All refined alternate routes have at least 1 cultural site recorded within 1,320 feet.

No houses were located within 150 feet of any of the remaining refined alternate routes. Of the 9 routes remaining, routes 456 and 660 have the greatest number of residences within 300 to 500 feet, respectively. Their residential proximity scores are 11, which is above average impacts for all of the refined alternate routes evaluated. While public facilities were not included in the overall z-score analysis, it should be noted that Routes 456 and 660 are both located within 300 feet of a cemetery. Routes 432, 444, 436, 636, 448, 648, and 640 all score below average for their residential proximity scores. These routes also avoid all public facilities within 300 feet. Routes 448, 436, and 640 are the least impactful of the top routes to residences, with 2 homes within 150-300 feet and 2 homes within 300-500 feet. The remaining alternate routes, routes 432, 444, and 636, impact 1 additional residence within 150-300 feet.

There are routes that follow similar paths but with slight variations have similar patterns in their data. For example, routes 456 (ranked second) and 660 (ranked sixth), the refined alternate routes that go around the town of Ford to the north, contain the least amount of woodlands in the ROW but also have above-average scores for residential proximity, the most of the top routes. Compared to the other seven least impactful alternate routes, these two routes also have the greatest acreage of wetlands in their ROW, length through floodplains, acres of center pivot irrigation in ROW, and length along distribution lines. Because of these reasons, Routes 456 and 660 were removed from further consideration.

Of the 7 remaining top routes, routes 436, 448, and 640 have the least amount of acres of center pivots that their ROW crosses, with 6.10 acres. The 4 other top routes (routes 432, 444, 636, and 648) all have about the average acres of center pivot crossings. The 7 remaining top routes are below average scores for non-irrigated cropland acres within the ROW, with Route 456 having the least measurable impact (212.79 acres).

Routes 432, 444, 436, 636, 448, 648, and 640, the refined alternate routes that go south of the town of Ford, vary from each other in subtle ways in alignment, and score. Route link variations from the top 2 lowest scoring routes remaining (routes 432 and 444) mostly add additional length and other engineering constraints. In this instance, adding length to the lines does not minimize the scores across any of the factors evaluated, but rather increases scores for the refined alternate routes. For example, routes 636, 648, and 640, follow route links 143 and 145 into the Grain Belt Express Kansas converter station AC switchyard. This path into the Grain Belt Express Kansas converter station AC switchyard was not preferred due to the added road crossings, angles, and impacts to new parcels required to navigate around the existing ITC Transmission Substation. For this reason, routes 636, 648, and 640 provided no real benefit and were removed from further consideration.

The biggest difference in the remaining refined alternate routes (routes 432, 444, 436, and 448) is that routes 436 and 448 follow route links 133, 136, and 138, while routes 432 and 444 follow route links 132, 134, and 137. Because of this, routes 436 and 448 are slightly longer, have slightly more angles, more road crossings, more woodlands in their ROW, greater lesser prairie chicken scores, and more impacts to cultural sites. Though routes 436 and 448 have 1 fewer residence within 300-500 feet and 7.8 fewer acres of center pivot irrigation in their ROW compared to Routes 432 and 444, they were eliminated from further consideration.

Route 444 (ranked 3$^{rd}$) differs from Route 432 (ranked 1$^{st}$) by only 2 refined alternate route links; when turning west to navigate south of the town of Ford, Route 432 uses alternate route links 122 and 127, while Route 444 uses alternate route links 126 and 128. The major difference in this change is that route links 122 and 127 parallel roads for their entirety, while route link 128 is greenfield alignment through non-irrigated cropland. While Route 432 is along roads for this portion, they are smaller, county roads compared to U.S. Highway 400 which Route 444 parallels.

While this variation creates additional engineering constraints along Route 444 (2 more heavy angles, slightly more length along distribution lines, more length not along a parcel boundary), it avoids additional potential environmental impacts because it parallels a larger roadway (U.S. Highway 400). The environmental constraints that Route 444 favors, compared to Route 432, are streams crossed (1 fewer stream), length through floodplains (1,144.27 fewer feet), impacts to lesser prairie-chicken score (9.09 fewer points), wetland acres in the ROW (0.11 acres).

After reviewing all the refined alternate route data, Route 444 (the third-ranking route) was selected as the proposed route. A detailed map showing the proposed route is shown below (Figure 3-5) and overlaid on a USGS topographic map background in Appendix B (Figure B-2). Tables 3-5 and 3-6 present a summary of the analysis data associated with the proposed route, Route 444.

Grain Belt Express
Kansas Converter
Station AC Switchyard

144
141
137
134
132
130
128
126
120
115
109
105
101

Ford
Bucklin
Origination
Point

Ford Ensign Rd
Saddle Rd
Tilman Rd
Tillman Rd
Saddle Side Rd
Lariat Way
Liberty Trail Rd
Ridge Rd
Arkansas River
Detour Rd
Upland Rd
Valley Rd
Mulberry Creek
Warrior Rd
Whirlwind Rd
Harness Rd
Million Dollar Rd
Wilburn Rd
Wildfire Rd
Windy Rd
Church St
Wrangler Rd
Bucklin
Rattlesnake Creek

115th Rd
116 Rd
117 Rd
118 Rd
119 Rd
120th Rd
121 Rd
122nd Rd
123 Rd
124th Rd
125 Rd
126th Rd
127 Rd
128 Rd
129 Rd
130 Rd
131 Rd
132 Rd
133 Rd
134 Rd
Bloom Rd
Kingsdown Ford Rd

400
54
94
34

Project Endpoint
Proposed Route Link Endpoint
Proposed Route (Route 444)
Route Link Number
Study Area

Public Airport
Microwave Service Tower
Land Mobile Private Transmission Tower
Existing Pipeline
Railroad

Highway
Local Road
NHD Stream/River
NWI Wetland
FEMA Floodplain

Municipal Boundary

**Existing Transmission Line**
115kV
345kV

**Part 77 Surfaces**
Approach
Conical
Transitional

NORTH
1 0.5 0 1
Miles

BURNS McDONNELL

Figure 3-5
Bucklin Line Proposed Route
Kansas AC Collector System
Grain Belt Express
Ford County
Exhibit JP-2

Path: C:\Desktop\QI\Invenergy\GrainBeltAC\GrainBeltAC_Pro\GrainBeltAC_Pro.aprx catenbus 5/15/2024
Service Layer Credits: World Imagery: Earthstar Geographics

PUBLIC

Source: Grain Belt Express, Esri, NHD, FEMA, NWI, FAA, NTAD, HIFLD, FCC, Burns & McDonnell

## 3.6 Bucklin Line Proposed Route Summary

The final proposed route selected for the Bucklin Line is Route 444. Route 444 was selected for several key reasons:

- It minimizes acres of center pivot irrigation and has among the fewest acres of non-irrigated cropland in the ROW
- It is one of the shortest routes
- It minimizes impacts to land use because it parallels roads and parcel boundary lines
- It has among the fewest number of heavy angles
- It has the fewest number of recorded cultural sites within 1,320 feet
- While the route was not the lowest scoring for residential proximity, it has no homes within 150 feet of the route centerline and further reduces residential impacts by not crossing any driveways or parcels where residential structures were identified within 500 feet during the routing process or from public feedback
- It minimizes impacts to lesser prairie-chicken habitat by avoiding known historic or active lek locations and higher quality CHAT areas, and scored among the lowest in this category
- It minimizes impacts to wetlands and potential whooping crane stopover locations with only 2.24 acres of NWI wetlands located in the ROW
- It has among the fewest acres of woodland clearing with 1.95 acres of woodlands in the ROW

## 3.7 Bucklin Line Post Route Selection Adjustments

Following the proposed route filling with the KCC, route modifications could continue to take place based on negotiations with landowners, engineering revisions, and survey work. Local conditions may be identified or encountered during survey, final engineering, design, ROW acquisition, or construction which could result in minor adjustments to the proposed route alignment. Additional adjustments by Grain Belt Express would be to address specific, localized conditions or circumstances not readily apparent as part of the route selection process but would not be anticipated to result in substantial (if any) additional impacts. Any adjustments would generally be intended to reduce overall environmental impacts, reduce inconveniences to landowners, and/or protect public safety.

# 4.0 Meade Line Route Evaluation

This chapter outlines the processes and rationale behind the identification of alternate routes and selection process of the final approved route for the Meade Line.

## 4.1 Overview of Routing Process

The following is an outline of the process in the identification of alternate routes and the selection of a final, approved route. Before any alternate routes were considered, a study area was established. This area is large enough to allow for numerous alternate routes, but not too large to overburden the analysis with unnecessary information. More information about the study area selection process and details about the study area boundary are included in Section 1.2.

Upon the creation of the study area, resources that could act as potential constraints to the selection process were identified. These resources were mapped and recorded using GIS software and data. The objective was to identify economically and technically feasible alternate routes to connect the Meade Line endpoints, while avoiding or minimizing impacts to both social and natural resources.

Local, state, and Federal agencies were contacted to obtain information relevant to the selection process. This information, along with the constraints identified by GIS data, were used to create the alternate route network. Following its creation, the alternate route network was shown to local officials and the public to obtain input for the evaluation. Input gathered from the public and local officials was used to create a refined alternate route network. The social and natural resources that would be impacted by each refined alternate route link of the refined alternate route network were quantified. This data, along with public input and engineering factors, were used to evaluate the refined alternate route network and to select a proposed route for the transmission line. Following the conclusion of this study, the proposed route will be presented to the KCC for consideration. Activities leading to the selection of the proposed route are described in more detail in the following sections.

## 4.2 Identification of Alternate Routes

The overall objective of the alternate route development and selection process was to identify economically feasible alternate routes between the connection points that would offer the most benefits in terms of providing reliable electric service while reducing adverse impacts to the social and natural environment. The alternate route development process included the following main components:

- Contact was made with local, state, and Federal agencies to identify factors in the study area that could affect the alternate route development process
- A GIS-based desktop review of the study area was conducted using information gathered from the agencies, recent aerial photography, USGS topographic maps, and other pertinent data to identify potential opportunities and constraint areas
- Alternate routes were developed based on the constraints map

- Field reconnaissance of the study area was conducted to verify the feasibility of the alternate routes that were identified during the desktop review

The major considerations during the development of alternate route network were to:

- Maximize the distance of the transmission line from residences, businesses, public facilities, parks, cemeteries, communication towers, and wind turbines
- Minimize crossing through cultivated land and center pivot irrigation arms
- Maximize the distance of the transmission line parallel to existing utilities, roads or railroads when practical
- Minimize crossing wetlands, riparian areas, conservation lands, and protected species and their habitats for both the transmission line corridor and access for construction and maintenance
- Maintain a reasonable length with as few angles as possible to control costs and minimize overall impacts

It was not possible to find an alternate route that avoided all potential impacts. To reduce impacts to land uses, alternate routes were located along existing lines of land division, such as field lines and section lines, or along existing transmission lines when possible.

The alternate routes consist of individual alternate route links that may be combined in different arrangements to form a continuous path to connect the two endpoints. Each alternate route link begins and ends at intersections with other alternate route links or the project end points. The alternate route network, comprised of the various individual alternate route links, are shown in Figure 4-1. A detailed map showing the alternate route network, overlaid on a USGS topography map background, is found in Appendix B (Figure B-3).

In total, 75 alternate route links were identified which could be used to create alternate routes between the Meade Origination Point and the Grain Belt Express Converter Station AC Switchyard. These alternate route links identified were shown to the public at open houses on February 27th, 28th, and 29th, 2024 and during the simultaneous virtual open house. Additionally, the virtual open house remained open for two weeks after the conclusion of the in-person open houses, from February 27th to March 15th. Section 4.3 further describes the public involvement activities for the Meade Line.

The 75 identified alternate route links were edited to incorporate public input. The result of this process is a refined alternate route network. The refined alternate route links combined to form 6,152 refined alternate routes that would connect the Meade Origination Point with the Grain Belt Express Converter Station AC Switchyard. Refined alternate route link combinations creating refined alternate routes that progress unnecessarily backward or away from the endpoint were not considered for evaluation. All forward-progressing refined alternate route combinations were evaluated to identify a proposed route.

Grain Belt Express
Kansas Converter
Station AC Switchyard

Project Endpoint
Route Link Endpoint
Route Link
Route Link Number
Study Area

Public Airport
Microwave Service Tower
Land Mobile Private Transmission Tower
Existing Pipeline
Railroad

Highway
Local Road
NHD Stream/River
NWI Wetland
FEMA Floodplain

Municipal Boundary

**Existing Transmission Line**
115kV
345kV

**Part 77 Surfaces**
Approach
Conical
Transitional

NORTH
2 1 0 2
Miles

BURNS McDONNELL

Figure 4-1
Meade Line
Alternate Route Network
Kansas AC Collector System
Grain Belt Express
Ford, Gray, and Meade Counties

Path: C:\Desktop\QI\Invenergy\GrainBeltAC\GrainBeltAC_Pro\GrainBeltAC_Pro.aprx catenbus 5/23/2024
Service Layer Credits: World Imagery: Earthstar Geographics

Source: Grain Belt Express, Esri, NHD, FEMA, NWI, FAA, NTAD, HIFLD, FCC, Burns & McDonnell





Issued: 5/23/2024

## 4.3 Meade Line Public Involvement Activities

Two forms of public input were used to determine community preferences and concerns relative to the proposed Meade Line. The first outreach effort included letters to state, Federal, and local agencies. Federal and state agencies were contacted by letter to provide input on threatened and endangered species, wetlands, wildlife resources, and other potential permitting issues. Federal agencies contacted included the EPA, NPS, USACE Kansas City District Office, USFWS, NRCS, and FAA. State agencies contacted included the Kansas KDA, KDHE, KBS, KDOT, KSHS, and KDWP. Letters were also delivered to Meade, Gray, and Ford County Commissioners and their respective Planning & Zoning Departments by a member of the Invenergy team. A summary of the responses received from these agencies is included in Chapter 5. A sample request letter and the actual responses received from the agencies are provided in Appendix C.

In addition, a public information meeting was held. Input from residents and public officials helped the Meade Line team identify the appropriate factors to use in the evaluation and selection process. The intent of the public participation program was to provide the potentially affected landowners near the alternate route links with an understanding of the need for the Meade Line, the decision-making process used to select the proposed route, and a forum to voice concerns about the Meade Line as well as gain insight into the area resources and issues of landowners for consideration in the evaluation and selection process.

The public meetings were held by Grain Belt Express, HDR Inc., and Burns & McDonnell on February 27th, 28th, and 29th, 2024, at the Ford County Fair Building, the City of Plains Community Building, and the Gray County Rec Center, respectively. Landowners within 1,000 feet of all alternate route centerlines were sent an informational letter notifying them of the date and location of the public open houses. The landowner information used to mail letters was derived from the digital parcel and ownership data obtained from Gray, Ford, and Meade counties.

The public information meeting included display stations with information on alternate routes and environmental management, as well as a sign-in table with information on the Meade Line need and various informational handouts. Real estate and ROW personnel, engineers, and routing specialists from Invenergy and Burns & McDonnell were present to answer questions and take comments raised by the public. Several sets of large maps were displayed, showing the alternate route network, parcel boundaries, township/range/section data, roads, and other features overlaid on an aerial photograph background. In addition to these large, printed maps, the meeting also included three computer stations showing the same spatial data so that attendees could get a more detailed view of their property and provide more directed comments on their parcel. Three routing specialists from Burns & McDonnell were also equipped with tablets for the public to submit geospatially referenced comments. Figure 4-2 shows the comments that were submitted via the computer stations and tablets. Photographs and drawings showing the different types of structures that could be used for the Meade Project were also available.

Participants received a questionnaire soliciting their input on the potential routing factors, the alternate route link locations, and issues of concern regarding the Meade Line. They were asked to return their questionnaires at the open houses. Appendix D includes a

Exhibit JP-2

Grain Belt Express
Kansas Converter
Station AC Switchyard

Ensign
Haggard
Montezuma
Meade
Origination
Point
Fowler
Minne

Project Endpoint
Route Link Endpoint
Route Link
Route Link Number
Study Area

Public Airport
FAA Private Airport
Railroad
Highway
Local Road
NHD Stream/River

Municipal Boundary

**Public Comment Type**

Agricultural
General
Right-of-Way
Residences and Residential Use Areas

Agricultural
General
Agricultural
Engineering
General
Right-of-Way

Residences and Residential Use Areas

NORTH
2 1 0 2
Miles

BURNS McDONNELL

Figure 4-2
Meade Line
Public Open House Comments
Kansas AC Collector System
Grain Belt Express
Ford, Gray, and Meade Counties

Path: C:\Desktop\QI\Invenergy\GrainBeltAC\GrainBeltAC_Pro\GrainBeltAC_Pro.aprx catenbus 5/23/2024
Service Layer Credits: World Imagery: Earthstar Geographics

Source: Grain Belt Express, Esri, FAA, NTAD, HIFLD, Burns & McDonnell

copy of a sample questionnaire from the public information meeting. A total of 15 questionnaires were received from the open houses; 6 were collected in the morning, and 1 was collected in the afternoon of the February 27th meeting, 3 were collected in the morning, and 2 were collected in the afternoon at the February 28th meeting, and none were collected in the morning, and 3 were collected in the afternoon at the February 29th meeting.

To supplement the in-person open houses, a virtual option was available between February 27th and March 15th. Participants had access to all information presented at the in-person open houses, including information about the Meade Line need, benefits, anticipated timeline, and structures. The website then offered participants the opportunity to leave geographically referenced comments on Meade Line maps and fill out an online version of the Meade Line questionnaire. Comments left on the Meade Line maps are included in Figure 4-3. Responses received from the online questionnaires are included in Table D-2 in Appendix D.

## 4.4 Meade Line Post-Public Involvement Activities

By taking information gathered from the public and local officials at the open house meetings, as well as additional information gathered from agencies contacted, the refined alternate route network was created. Some comments received during the public open houses did not necessitate a change to the alternate route network, such as the location of several private airstrips, but instead will be considered during the final proposed route selection process.

Overall, two changes did result from information gathered at the public open houses. Alternate route link 210 was modified to more closely follow a nearby existing transmission line to avoid spanning a field that that is already bordered by an existing line. Additionally, alternate route link 266 was eliminated due to the discovery of a wind turbine located immediately adjacent to the proposed route link.

The refined alternate route network was the network used during the analysis process. Figure 4-4 details the refined alternate route network, made up of the refined alternate route links.

## 4.5 Meade Line Identification of the Proposed Route

The analysis of alternate route network was based on social, environmental, and engineering factors. A refined alternate route to be proposed to the KCC following this study was identified that would connect the proposed Meade Origination Point and proposed Grain Belt Express Kansas converter station AC switchyard while minimizing, to the extent practicable, the impacts of the proposed transmission line. The following is a description of the evaluation and selection process that resulted in the identification of a proposed route for the Meade Line.

### 4.5.1 Evaluation Factors

The analysis of alternate routes was based on social, environmental, and engineering factors. A proposed route was identified that would connect the proposed Meade Origination Point and proposed Grain Belt Express Kansas converter station AC switchyard while minimizing, to the extent practicable, the impacts of the proposed transmission line. The following is a description of the process that resulted in the identification of a proposed route for the Meade Line.

Grain Belt Express
Kansas Converter
Station AC Switchyard

Project Endpoint
Route Link Endpoint
Route Link
Route Link Number
Study Area

Public Airport
FAA Private Airport
Railroad
Highway
Local Road

NHD Stream/River
Municipal Boundary

**Virtual Open House Comment**
Agricultural
General
Residences and Residential Use Areas

NORTH
2 1 0 2
Miles

BURNS McDONNELL

Figure 4-3
Meade Line
Virtual Open House Comments
Kansas AC Collector System
Grain Belt Express
Ford, Gray, and Meade Counties

Path: C:\Desktop\QI\nvenergy\GrainBeltAC\GrainBeltAC_Pro\GrainBeltAC_Pro.aprx catenbus 5/23/2024
Service Layer Credits: World Imagery: Earthstar Geographics

Source: Grain Belt Express, Esri, HDR, FAA, NTAD, HIFLD, Burns & McDonnell

Issued: 5/23/2024

Grain Belt Express
Kansas Converter
Station AC Switchyard

Ensign
Haggard
Montezuma
Meade
Origination
Point
Minneola
Fowler
Bloom

Ridge Rd
Saddle Rd
Y Rd
Z Rd
A A Rd
B B Rd
CC Rd
D D Rd
E E Rd
F F Rd
G G Rd
H Rd
J J Rd
K K Rd
J 20069C
A Rd
Kk Rd
C Rd
D Rd
E Rd
II Rd
X Rd
W Bloom Rd
Yucca Rd
Quaker Rd
Ford Ensign Rd
Tilman Rd
Upland Rd
Valley Rd
Warrior Rd
Whirlwind Rd
Wilburn Rd
Wildfire Rd
Windy Rd
Wrangler Rd
Zane Rd
County Line Rd
Sand Hill Rd
Cr C
Cr F
Cr G
Cr H
Cr 2
Co Rd 9
Co Rd 10
Co Rd 11
Co Rd 12
Co Rd 13
Co Rd 15
Co Rd 16
Co Rd 17
Co Rd 19
Co Rd 20
Co Rd 21
Co Rd 22
Co Rd 24
Co Rd 25
100th Rd
101 Rd
102 Rd
103 Rd
104th Rd
105th Rd
106th Rd
107th Rd
108th Rd
109th Rd
110 Rd
112 Rd
113th Rd
114th Rd
117 Rd
118 Rd
120th Rd
Fowler Rd
Booster Station Rd
Bluff Creek
Crooked Creek
Mulberry Creek
9 Rd
11 Rd
12 Rd
13 Rd
15 Rd
16 Rd
17 Rd
20 Rd
21 Rd
22 Rd
24 Rd
25 Rd
26 Rd
27 Rd
30 Rd

201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 267 268 269 270 271 272 273 274 275

Project Endpoint
Refined Route Link Endpoint
Refined Route Link
Route Link Number
Study Area

Public Airport
FAA Private Airport
Microwave Service Tower
Land Mobile Private Transmission Tower
Existing Pipeline

Railroad
Highway
Local Road
NHD Stream/River
NWI Wetland

FEMA Floodplain
Municipal Boundary

**Existing Transmission Line**
115kV
345kV

**Part 77 Surfaces**
Approach
Conical
Transitional

NORTH
2 1 0 2
Miles

BURNS McDONNELL

Figure 4-4
Meade Line
Refined Alternate Route Network
Kansas AC Collector System
Grain Belt Express
Ford, Gray, and Meade Counties

Path: C:\Desktop\QI\Invenergy\GrainBeltAC\GrainBeltAC_Pro\GrainBeltAC_Pro.aprx catenbus 5/23/2024
Service Layer Credits: World Imagery: Earthstar Geographics

Source: Grain Belt Express, Esri, NHD, FEMA, NWI, FAA, NTAD, HIFLD, FCC, Burns & McDonnell





Issued: 5/23/2024

The primary source of the imagery used in this analysis was Esri's Basemap (2023 Maxar) for color aerial imagery, supplemented with field reconnaissance of the study area and along each of the refined alternate routes developed. Digital data, such as roads, parcels, and land use information, were acquired from various agencies. Following is Table 4-1 which lists out the factors, and a detailed description of each of the factors considered for the route analysis.

**Table 4-1: Meade Line Evaluation Factors**

| Routing Factor | Unit of Measure | Type |
|---|---|---|
| Length along existing distribution line | Feet | Engineering |
| Length not along roads | Feet | Engineering |
| Length not along existing transmission lines | Feet | Engineering |
| Transmission line crossings | Feet | Engineering |
| Road crossings | Count | Engineering |
| Heavy angles > 30 degrees | Count | Engineering |
| Length not along railroads | Feet | Engineering |
| Length through 1.1 X the turbine height | Acres | Engineering |
| Center pivot irrigation systems in ROW | Acres | Engineering |
| Total length | Feet | Engineering |
| Stream crossings (NHD) | Count | Environmental |
| Length through floodways/floodplains 100-year (FEMA) | Feet | Environmental |
| Woodlands acres in ROW (NLCD) | Acres | Environmental |
| Lesser prairie-chicken Score | Score | Environmental |
| Lesser prairie-chicken CHAT habitat category 1 (SGP) - acres crossed | Acres | Environmental |
| Lesser prairie-chicken CHAT habitat category 2 (SGP) - acres crossed | Acres | Environmental |
| Lesser prairie-chicken CHAT habitat category 3 (SGP) - acres crossed | Acres | Environmental |
| Lesser prairie-chicken CHAT habitat category 4 (SGP) - acres crossed | Acres | Environmental |
| Lesser prairie-chicken known active leks (SGP) - acres crossed | Acres | Environmental |
| Lesser prairie-chicken known historic leks (SGP) - acres crossed | Acres | Environmental |
| Wetland acres in ROW | Acres | Environmental |
| Cultural sites within 1,320 feet of centerline | Count | Social |
| Non irrigated cropland acres in ROW | Acres | Social |
| Residential proximity score | Score | Social |
| Residences 0-150 feet of centerline | Count | Social |

| Routing Factor | Unit of Measure | Type |
|---|---|---|
| Residences 150-300 feet of centerline | Count | Social |
| Residences 300-500 feet of centerline | Count | Social |
| Public facilities within 300 feet of centerline | Count | Social |
| Businesses within 300 feet of centerline | Count | Social |
| Length not along parcel boundary | Feet | Social |

**Length along distribution lines** was calculated to reflect the added engineering and construction challenges created by constructing next to or potentially underbuilding distribution along these refined alternate links.

**Length not along roads** was calculated because following an existing corridor is generally considered more favorable than constructing though undeveloped lands to minimize potential impacts to land use and habitat fragmentation. Additionally, roads generally follow parcel lines, and it could maximize accessibility for construction and future maintenance, and because roads represent an opportunity to keep linear facilities in common corridors.

**Road crossings** were counted to reflect the additional engineering and permitting required when crossing a road or highway.

**Heavy angles >30 degrees** represents the number of angles greater than 30 degrees, including dead-end structures that would be required for each refined alternate route. Aside from angles to avoid homes and other constraints, crossings of roads and other linear features typically require two dead-end structures. Heavy angles require a larger, more visible structure and may include the use of guy wires or other support features. These structures are more expensive and result in greater land disturbance during construction.

**Length not along railroads was** recorded to measure the amount of the refined alternate route network that would be kept in a common corridor with a linear facility. Length not along railroads was not used in the analysis because there were no active railroads paralleled by the network.

**Length through 1.1x turbine height** was measured to determine the amount of the alternate route network that would be within the fall height of wind turbines in the study area. Locating the line too close to turbines could create disruption to power transmission if the turbine were to collapse. Heights of the structures were collected from FAA filings.

**Acres of pivot irrigation within ROW** was derived for each refined alternate route by identifying pivot irrigation systems visible from available aerial imagery and from field reconnaissance of the area. The acres of refined alternate route links' ROW through pivot irrigation were summed for each refined alternate route.

**Total length** is a general indicator of the overall size of the Meade Line. Length is also an indicator of construction costs. The longer the refined alternate route, the more expensive and more potential impacts it would have if all other factors were equal.

**Stream crossings** were identified using digital NHD data from the USGS and were verified using NAIP aerial photography, and Esri's aerial base imagery. There are numerous small streams found within the study area, and these streams could be spanned where they are crossed by a refined alternate route. Stream impacts are expected to be minimal, especially with the implementation of erosion and sedimentation control procedures specified in a Stormwater Pollution Prevention Plan, which would be prepared for the Meade Line during the permitting phase. However, stream crossings must be considered for structure stability and clearance over the waterway.

**Length through floodways/floodplains 100-year** was derived for each refined alternate route by identifying floodplains and floodways using FEMA floodplain data. The length of refined alternate link through 100-year floodplains and floodways was summed for each refined alternate route. Length through floodplains was included as an evaluation factor to account for additional permitting efforts, structure design, and construction costs associated with building in a floodplain.

**Woodlands in ROW** consisted of forested areas within the ROW that would be cleared along each refined alternate route and were quantified using the Deciduous Forest, Evergreen Forest, Mixed Forest, and Woody Wetlands categories included in NLCD data. Clearing of woodlands has the potential for increased loss of habitat for wildlife, land disturbance, loss of windbreaks, and increased costs for construction.

The **lesser prairie-chicken score** was derived for each refined alternate route by first identifying the areas of the study area that intercepted sensitive areas defined by the SGP CHAT. Areas sensitive to the lesser prairie-chicken area categorized as CHAT 1, CHAT 2, CHAT 3, and CHAT 4, with CHAT 1 representing areas presumed to have the best quality habitat, and CHAT 4 representing areas that exist withing a 10-mile buffer of the species' estimated occupied range. Also included in the lesser prairie-chicken score were known active leks and known historic leks.

The routing team rated the CHAT areas and lek areas as shown in Table 4-2. Scores were applied by multiplying the quantified length of each refined alternate route centerline through each area representative of potential occurrence category type by its multiplier. Areas that have the higher potential for species impacts, such as CHAT 1 area and known active and historic leks, were given a higher ranking than areas that would have lower potential for habitat impacts.

**Table 4-2: Lesser Prairie-chicken Score Ratings**

| Areas Representative of Potential Occurrence | Rating |
|---|---|
| CHAT 1 | 3 |
| CHAT 2 | 1 |
| CHAT 3 | 0.5 |
| CHAT 4 | 0.5 |
| Known active leks | 5 |
| Known historic leks | 5 |

**Wetlands in ROW** were measured using NWI data. All wetlands crossed by the proposed ROW were summed for each refined alternate route. Wetland areas crossed by the Meade Line were generally small enough in size that permanent impacts could be avoided by potentially spanning the resource though temporary impacts could occur during construction. Additionally, calculating wetlands crossed by the route alternative may provide an approximation of where whooping crane stopover habitat has the potential to exist.

Previous documented **cultural sites within 1,320 feet** (0.25 mile) of each refined alternate link were quantified based on GIS data of known historic and archaeological sites maintained by the KHS. No sites in the study area are listed as NRHP sites.

To account for cropland outside of pivoted irrigation areas, **non-irrigated cropland acres in ROW** were measured. This was done by using the NLCD's Cultivated Crops category and removing the recorded center pivot irrigation circles. Cropland was separated from other agricultural land for this analysis because transmission structures tend to be a greater obstacle for actively cultivated land than if the field were used for pasture or other passive agricultural operations.

The **residential proximity score** was derived for each refined alternate route by first identifying residences located at varying distances from the refined alternate routes using aerial photography supplemented with field verification. The consideration of residences varies depending on the distance from the refined alternate route. Closer houses would present the greater concern. The score was derived by multiplying the number of residences quantified for each route by the appropriate rating listed in Table 4-3.

**Table 4-3: Residential Proximity Ratings**

| Distance to Route Centerline | Rating |
|---|---|
| 0-150 feet | 3 |
| 150-300 feet | 2 |
| 300-500 feet | 1 |

**Businesses within 300 feet** of refined alternate routes were identified in the study area. Because the study area is predominantly rural, there were no businesses identified, and therefore, this factor was not used in the final analysis.

**Public facilities within 300 feet** were also identified in the study area. Public facilities include cemeteries, churches and other places of worship, schools, parks, and other facilities used by the public. There were two public facilities, both cemeteries, identified within 300 feet, however, this factor was not used in the final analysis because there was not a large enough sample size to warrant including in the analysis. Consideration of these facilities is included following the analysis and in the overall discussion of the proposed route selection post-analysis.

**Length not along a parcel boundary** was measured to account for length of the line that followed existing lines of land division. Creating new easements within larger parcels (farmland, pastureland, etc.) is not favorable.

### 4.5.2 Weighting the Routing Factors

The evaluation factors in Section 4.5.1 were considered representative of the potential impact of construction and operation of the new transmission lines within this study area. The level of public concern for the factors varied, as indicated by the ratings in the questionnaires. Burns & McDonnell staff assigned weights to each of the factors based on input from the public via the questionnaires, input from Invenergy engineers, and Burns & McDonnell's experience with transmission line projects across the region. The weights associated with each routing factor, are presented in Table 4-4. The names of the routing factors may vary slightly from the descriptions on the public questionnaire but are the same in meaning.

Table 4-4: Meade Line Factor Ranking and Weights

| Routing Factor | Weight |
|---|---|
| Length along existing distribution line | 1 |
| Length not along roads | 9 |
| Length not along existing transmission lines | 2 |
| Transmission line crossings | 7 |
| Road crossings | 1 |
| Heavy angles > 30 degrees | 2 |
| Length through 1.1 X the turbine height | 1 |
| Center pivot irrigation systems in ROW | 7 |
| Total length | 3 |
| Stream crossings (NHD) | 2 |
| Length through floodways/floodplains 100-year (FEMA) | 2 |
| Woodland acres in ROW (NLCD) | 3 |
| Lesser prairie-chicken score | 9 |
| Wetland acres in ROW | 3 |
| Cultural sites within 1,320 feet | 2 |
| Non irrigated cropland acres in ROW | 4 |
| Residential proximity score | 10 |
| Length not along parcel boundary | 8 |

The range of weights (1-10) was determined by the number of factors; the relative importance of each factor in relation to the others, included consideration of the public responses received at the virtual open house; and the need to differentiate among the routes. By weighting the z-score, those factors determined to warrant greater consideration during the evaluation process were weighted higher and thus became more significant contributors to the overall analysis and screening of the potential routes. In this case, the residential proximity score was weighted the highest (10) and therefore, this factor received higher consideration to the overall screening analysis than road crossings which was weighted one of the lowest (1).

### 4.5.3 Evaluating the Alternate Routes

The following sections detail the evaluation process and selection of the proposed route for the Meade Line.

#### 4.5.3.1 Evaluation Process

The first step in the evaluation process is to combine the refined alternate route link network into individual refined alternate routes to be analyzed. Refined alternate route links were connected only in ways that progressed the refined alternate routes towards the endpoint. Refined alternate route link connections that would progress the refined alternate route backwards or create unnecessary redundancy were not considered. The refined alternate route network yielded 6,152 potential alternate routes that would connect the proposed Meade Origination Point to the proposed Grain Belt Express Kansas converter station AC switchyard.

The evaluation factors identified in Section 4.5.1 were summed for each refined alternate route. These totals were used to calculate the standard deviation which measures individual refined alternate route's difference from the mean (or average) for each refined alternate route. This statistical z-score technique reflects the variability among the refined alternate routes for each factor. A negative score indicates that the score for that refined alternate route is lower than the mean for all the alternate routes for that specific factor (e.g., shorter overall length). A positive score indicates that the score for that refined alternate route is higher than the mean (e.g., longer overall length). Larger positive or negative numbers indicate that the refined alternate route values for that factor were further from the mean. These "raw" z-scores were next multiplied by the weights and then summed across all factors for each refined alternate route.

The z-score analysis allowed the refined alternate routes to be screened and the lower-impacting alternate routes identified for further consideration. The weighted scores ranged 126.31 points, from a low of -56.29 (Route 2114) to a high of 70.02 (Route 5395). The scores are not necessarily considered a definitive comparison of alternate routes; rather, they are intended to provide an index of the relative overall impact associated with the alternatives. Typically, alternate routes with scores in the top 10 percent (least impacting) of total z-scores are determined to warrant closer evaluation. Given the range of scores for the Meade Line is 126.31 points, the top 10 percent of routes by z-score includes all routes within 12.63 points of the lowest scoring route. The score of the lowest scoring route is -56.29 and all routes within 10 percent would score between -43.66 and -56.29. In this case, 51 routes made up the top 10 percent of alternate routes considered by total z-score. The point of this methodology is to narrow the analysis to a few routes that can be considered further using the route data to make a final recommendation for a proposed route. Section 4.5.3.2 provides a description of the general scoring features of the Project and the rationale for selecting the proposed route from these lowest-scoring refined alternate routes.

Table 4-5 shows the unmodified alternate route data for the top 51 least impactful alternate routes. Table 4-6 presents the weighted scores for the top 51 of alternate routes, sorted from lowest to highest score. A lower score indicates fewer overall impacts, while a higher score typically indicates greater impacts. The alternate route combinations, alternate route link data, alternate route data, intermediate raw scores, and weighted sorted scores tables for all routes evaluated are presented in Appendix E (Tables E-5, E-6, E-7, and E-8) for reference.

## Table 4-5: Meade Line Route Data

| Rank | Route | Segments | Length along existing distribution line (Feet) | Length not along roads (Feet) | Length not along existing transmission lines (Feet) | Transmission line crossings (Count) | Road crossings (Count) | Heavy angles > 30 degrees (Count) | Length not along railroads (Feet) | Length through 1.1X the turbine height (Feet) | Acres of center pivot irrigation systems crossed (Acres) | Total length (Feet) | Streams crossings (NHD) (Count) | Length through Floodways/ Floodplains 100yr (FEMA) (Feet) | Woodland acres in ROW (NLCD) (Acres) | Lesser prairie-chicken Score | Lesser prairie-chicken CHAT Habitat Category 1 (SGP) - acres crossed (Acres) | Lesser prairie-chicken CHAT Habitat Category 2 (SGP) - acres crossed (Acres) | Lesser prairie-chicken CHAT Habitat Category 3 (SGP) - acres crossed (Acres) | Lesser prairie-chicken CHAT Habitat Category 4 (SGP) - acres crossed (Acres) | Lesser prairie-chicken Known Active Leks (SGP) - acres crossed (Acres) | Lesser prairie-chicken Known Historic Leks (SGP) - acres crossed (Acres) | Wetland acres in ROW (Acres) | Cultural sites within 1,320ft (Count) | Nonirrigated Cropland acres in ROW (Acres) | Residential proximity score | Residences 0-150 feet (Count) | Residences 150-300 feet (Count) | Residences 300-500 feet (Count) | Public facilities within 300ft (Count) | Businesses within 300ft (Count) | Length not along parcel boundary (Feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2114 | 200, 202, 203, 205, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 62,008.08 | 30,017.07 | 204,032.90 | 4 | 43 | 20 | 248,123.45 | 1,035.18 | 63.19 | 248,123.45 | 45 | 2,906.47 | 0.73 | 427.12 | 0 | 0 | 191.98 | 662.25 | 0 | 0 | 5.53 | 4 | 402.71 | 15 | 0 | 6 | 3 | 1 | 0 | 15,652.13 |
| 2 | 2113 | 200, 202, 203, 205, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 56,876.73 | 24,826.31 | 204,059.40 | 4 | 43 | 20 | 248,149.95 | 1,035.18 | 62.60 | 248,149.95 | 48 | 3,171.84 | 0.73 | 427.17 | 0 | 0 | 191.98 | 662.35 | 0 | 0 | 6.10 | 5 | 403.51 | 15 | 0 | 6 | 3 | 1 | 0 | 15,652.13 |
| 3 | 3598 | 200, 202, 204, 206, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 82,913.65 | 30,017.07 | 204,055.64 | 4 | 44 | 20 | 248,146.19 | 1,035.18 | 66.10 | 248,146.19 | 44 | 2,906.47 | 0.73 | 427.16 | 0 | 0 | 191.98 | 662.33 | 0 | 0 | 6.22 | 4 | 401.65 | 14 | 0 | 5 | 4 | 1 | 0 | 15,652.13 |
| 4 | 2112 | 200, 202, 203, 205, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | 50,987.11 | 34,833.75 | 201,861.28 | 4 | 42 | 20 | 242,634.11 | 1,035.18 | 57.56 | 242,634.11 | 45 | 3,749.14 | 0.73 | 417.68 | 0 | 0 | 191.98 | 643.37 | 0 | 0 | 5.92 | 3 | 415.69 | 14 | 0 | 6 | 2 | 2 | 1 | 29,621.71 |
| 5 | 3597 | 200, 202, 204, 206, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 77,782.30 | 24,826.31 | 204,082.14 | 4 | 44 | 20 | 248,172.69 | 1,035.18 | 65.51 | 248,172.69 | 47 | 3,171.84 | 0.73 | 427.20 | 0 | 0 | 191.98 | 662.42 | 0 | 0 | 6.80 | 5 | 402.45 | 14 | 0 | 5 | 4 | 1 | 0 | 15,652.13 |
| 6 | 3596 | 200, 202, 204, 206, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | 71,892.68 | 34,833.75 | 201,884.03 | 4 | 43 | 20 | 242,656.86 | 1,035.18 | 60.47 | 242,656.86 | 44 | 3,749.14 | 0.73 | 417.72 | 0 | 0 | 191.98 | 643.45 | 0 | 0 | 6.62 | 3 | 414.63 | 13 | 0 | 5 | 3 | 2 | 1 | 29,621.71 |
| 7 | 2116 | 200, 202, 203, 205, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 60,207.21 | 20,868.83 | 199,333.25 | 4 | 43 | 22 | 248,560.08 | 1,035.18 | 58.83 | 248,560.08 | 49 | 3,853.79 | 0.73 | 427.85 | 0 | 0 | 191.98 | 663.72 | 0 | 0 | 6.52 | 5 | 417.68 | 15 | 0 | 6 | 3 | 2 | 1 | 15,652.13 |
| 8 | 2362 | 200, 202, 204, 206, 207, 208, 209, 212, 215, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 77,425.70 | 35,568.11 | 217,118.50 | 4 | 44 | 16 | 248,169.52 | 753.88 | 60.99 | 248,169.52 | 53 | 2,366.71 | 3.29 | 336.80 | 0 | 0 | 59.38 | 614.23 | 0 | 0 | 7.57 | 3 | 409.02 | 14 | 0 | 4 | 6 | 1 | 0 | 15,652.13 |
| 9 | 1498 | 200, 202, 203, 205, 207, 208, 209, 212, 215, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 56,520.13 | 35,568.11 | 217,095.75 | 4 | 43 | 18 | 248,146.78 | 753.88 | 58.08 | 248,146.78 | 54 | 2,366.71 | 3.29 | 336.74 | 0 | 0 | 59.38 | 614.09 | 0 | 0 | 6.87 | 3 | 410.08 | 15 | 0 | 5 | 5 | 1 | 0 | 15,652.13 |
| 10 | 3600 | 200, 202, 204, 206, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 81,112.78 | 20,868.83 | 199,355.99 | 4 | 44 | 22 | 248,582.83 | 1,035.18 | 61.74 | 248,582.83 | 48 | 3,853.79 | 0.73 | 427.89 | 0 | 0 | 191.98 | 663.79 | 0 | 0 | 7.22 | 5 | 416.62 | 14 | 0 | 5 | 4 | 2 | 1 | 15,652.13 |
| 11 | 2981 | 200, 202, 204, 206, 207, 208, 209, 212, 215, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 72,294.35 | 30,377.35 | 217,145.00 | 4 | 44 | 16 | 248,196.02 | 753.88 | 60.40 | 248,196.02 | 56 | 2,632.08 | 3.29 | 336.85 | 0 | 0 | 59.38 | 614.32 | 0 | 0 | 8.15 | 4 | 409.82 | 14 | 0 | 4 | 6 | 1 | 0 | 15,652.13 |
| 12 | 1497 | 200, 202, 203, 205, 207, 208, 209, 212, 215, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 51,388.78 | 30,377.35 | 217,122.25 | 4 | 43 | 18 | 248,173.27 | 753.88 | 57.49 | 248,173.27 | 57 | 2,632.08 | 3.29 | 336.78 | 0 | 0 | 59.38 | 614.19 | 0 | 0 | 7.45 | 4 | 410.88 | 15 | 0 | 5 | 5 | 1 | 0 | 15,652.13 |
| 13 | 2754 | 200, 202, 203, 205, 217, 220, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 62,008.08 | 30,017.07 | 204,168.42 | 4 | 43 | 20 | 248,258.97 | 1,928.23 | 57.07 | 248,258.97 | 43 | 2,906.47 | 0.73 | 427.35 | 0 | 0 | 191.98 | 662.71 | 0 | 0 | 5.40 | 11 | 402.09 | 16 | 0 | 6 | 4 | 1 | 0 | 15,652.13 |
| 14 | 2980 | 200, 202, 204, 206, 207, 208, 209, 212, 215, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | 66,404.73 | 40,384.79 | 214,946.88 | 4 | 43 | 16 | 242,680.18 | 753.88 | 55.36 | 242,680.18 | 53 | 3,209.38 | 3.29 | 327.36 | 0 | 0 | 59.38 | 595.34 | 0 | 0 | 7.96 | 2 | 422.00 | 13 | 0 | 4 | 5 | 2 | 1 | 29,621.71 |
| 15 | 1496 | 200, 202, 203, 205, 207, 208, 209, 212, 215, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | 45,499.16 | 40,384.79 | 214,924.14 | 4 | 42 | 18 | 242,657.44 | 753.88 | 52.45 | 242,657.44 | 54 | 3,209.38 | 3.29 | 327.29 | 0 | 0 | 59.38 | 595.21 | 0 | 0 | 7.27 | 2 | 423.06 | 14 | 0 | 5 | 4 | 2 | 1 | 29,621.71 |
| 16 | 2753 | 200, 202, 203, 205, 217, 220, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 56,876.73 | 24,826.31 | 204,194.92 | 4 | 43 | 20 | 248,285.47 | 1,928.23 | 56.47 | 248,285.47 | 46 | 3,171.84 | 0.73 | 427.39 | 0 | 0 | 191.98 | 662.80 | 0 | 0 | 5.98 | 12 | 402.89 | 16 | 0 | 6 | 4 | 1 | 0 | 15,652.13 |
| 17 | 4238 | 200, 202, 204, 206, 217, 220, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 82,913.65 | 30,017.07 | 204,191.16 | 4 | 44 | 20 | 248,281.72 | 1,928.23 | 59.97 | 248,281.72 | 42 | 2,906.47 | 0.73 | 427.39 | 0 | 0 | 191.98 | 662.79 | 0 | 0 | 6.10 | 11 | 401.03 | 15 | 0 | 5 | 5 | 1 | 0 | 15,652.13 |
| 18 | 2752 | 200, 202, 203, 205, 217, 220, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | 50,987.11 | 34,833.75 | 201,996.80 | 4 | 42 | 20 | 242,769.64 | 1,928.23 | 51.44 | 242,769.64 | 43 | 3,749.14 | 0.73 | 417.91 | 0 | 0 | 191.98 | 643.83 | 0 | 0 | 5.79 | 10 | 415.07 | 15 | 0 | 6 | 3 | 2 | 1 | 29,621.71 |
| 19 | 2128 | 200, 202, 203, 205, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 257, 261, 265, 270, 271, 274, 275 | 66,317.22 | 31,204.24 | 217,908.75 | 3 | 43 | 24 | 248,756.57 | 1,035.18 | 59.36 | 248,756.57 | 48 | 4,025.93 | 0.73 | 428.16 | 0 | 0 | 191.98 | 664.34 | 0 | 0 | 6.00 | 3 | 425.14 | 16 | 0 | 6 | 4 | 1 | 1 | 15,504.04 |
| 20 | 4237 | 200, 202, 204, 206, 217, 220, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 77,782.30 | 24,826.31 | 204,217.66 | 4 | 44 | 20 | 248,308.21 | 1,928.23 | 59.38 | 248,308.21 | 45 | 3,171.84 | 0.73 | 427.43 | 0 | 0 | 191.98 | 662.88 | 0 | 0 | 6.68 | 12 | 401.83 | 15 | 0 | 5 | 5 | 1 | 0 | 15,652.13 |
| 21 | 630 | 200, 201, 205, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 51,247.02 | 30,017.07 | 203,998.33 | 4 | 43 | 18 | 248,088.88 | 1,035.18 | 61.68 | 248,088.88 | 43 | 2,906.47 | 0.73 | 427.09 | 0 | 0 | 191.98 | 662.19 | 0 | 0 | 5.30 | 4 | 404.02 | 19 | 0 | 8 | 3 | 1 | 0 | 15,652.13 |
| 22 | 4236 | 200, 202, 204, 206, 217, 220, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | 71,892.68 | 34,833.75 | 202,019.55 | 4 | 43 | 20 | 242,792.38 | 1,928.23 | 54.34 | 242,792.38 | 42 | 3,749.14 | 0.73 | 417.94 | 0 | 0 | 191.98 | 643.90 | 0 | 0 | 6.49 | 10 | 414.01 | 14 | 0 | 5 | 4 | 2 | 1 | 29,621.71 |
| 23 | 629 | 200, 201, 205, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 46,115.67 | 24,826.31 | 204,024.83 | 4 | 43 | 18 | 248,115.38 | 1,035.18 | 61.09 | 248,115.38 | 46 | 3,171.84 | 0.73 | 427.13 | 0 | 0 | 191.98 | 662.28 | 0 | 0 | 5.88 | 5 | 404.82 | 19 | 0 | 8 | 3 | 1 | 0 | 15,652.13 |
| 24 | 3612 | 200, 202, 204, 206, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 257, 261, 265, 270, 271, 274, 275 | 87,222.79 | 31,204.24 | 217,931.49 | 3 | 44 | 24 | 248,779.31 | 1,035.18 | 62.27 | 248,779.31 | 47 | 4,025.93 | 0.73 | 428.20 | 0 | 0 | 191.98 | 664.42 | 0 | 0 | 6.70 | 3 | 424.08 | 15 | 0 | 5 | 5 | 1 | 1 | 15,504.04 |
| 25 | 2984 | 200, 202, 204, 206, 207, 208, 209, 212, 215, 254, 255, 256, 262, 264, 267, 269, 271, 274, 275 | 75,624.83 | 26,419.87 | 212,418.85 | 4 | 44 | 18 | 248,606.15 | 753.88 | 56.63 | 248,606.15 | 57 | 3,314.03 | 3.29 | 337.53 | 0 | 0 | 59.38 | 615.69 | 0 | 0 | 8.57 | 4 | 423.99 | 14 | 0 | 4 | 6 | 2 | 1 | 15,652.13 |
| 26 | 1500 | 200, 202, 203, 205, 207, 208, 209, 212, 215, 254, 255, 256, 262, 264, 267, 269, 271, 274, 275 | 54,719.26 | 26,419.87 | 212,396.10 | 4 | 43 | 20 | 248,583.41 | 753.88 | 53.72 | 248,583.41 | 58 | 3,314.03 | 3.29 | 337.47 | 0 | 0 | 59.38 | 615.56 | 0 | 0 | 7.87 | 4 | 425.05 | 15 | 0 | 5 | 5 | 1 | 1 | 15,652.13 |
| 27 | 628 | 200, 201, 205, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | 40,226.05 | 34,833.75 | 201,826.71 | 4 | 42 | 18 | 242,599.54 | 1,035.18 | 56.05 | 242,599.54 | 43 | 3,749.14 | 0.73 | 417.64 | 0 | 0 | 191.98 | 643.30 | 0 | 0 | 5.69 | 3 | 417.01 | 18 | 0 | 8 | 2 | 2 | 1 | 29,621.71 |
| 28 | 2110 | 200, 202, 203, 205, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 269, 268, 273, 275 | 52,787.97 | 43,991.32 | 206,570.25 | 4 | 42 | 20 | 252,479.37 | 1,035.18 | 61.92 | 252,479.37 | 41 | 2,801.82 | 0.73 | 434.62 | 0 | 0 | 191.98 | 677.25 | 0 | 0 | 5.41 | 4 | 412.09 | 14 | 0 | 6 | 2 | 1 | 0 | 29,621.71 |
| 29 | 2756 | 200, 202, 203, 205, 217, 220, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 269, 271, 274, 275 | 60,207.21 | 20,868.83 | 199,468.77 | 4 | 43 | 22 | 248,695.61 | 1,928.23 | 52.71 | 248,695.61 | 47 | 3,853.79 | 0.73 | 428.08 | 0 | 0 | 191.98 | 664.17 | 0 | 0 | 6.40 | 12 | 417.06 | 16 | 0 | 6 | 4 | 2 | 1 | 15,652.13 |
| 30 | 2109 | 200, 202, 203, 205, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 269, 268, 272, 274, 275 | 47,656.63 | 38,800.55 | 206,596.75 | 4 | 42 | 20 | 252,505.87 | 1,035.18 | 61.33 | 252,505.87 | 44 | 3,067.19 | 0.73 | 434.67 | 0 | 0 | 191.98 | 677.35 | 0 | 0 | 5.98 | 5 | 412.89 | 14 | 0 | 6 | 2 | 1 | 0 | 29,621.71 |
| 31 | 3594 | 200, 202, 204, 206, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 269, 268, 273, 275 | 73,693.55 | 43,991.32 | 206,593.00 | 4 | 43 | 20 | 252,502.11 | 1,035.18 | 64.83 | 252,502.11 | 40 | 2,801.82 | 0.73 | 434.66 | 0 | 0 | 191.98 | 677.33 | 0 | 0 | 6.10 | 4 | 411.03 | 13 | 0 | 5 | 3 | 1 | 0 | 29,621.71 |
| 32 | 4240 | 200, 202, 204, 206, 217, 220, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 269, 271, 274, 275 | 81,112.78 | 20,868.83 | 199,491.51 | 4 | 44 | 22 | 248,718.35 | 1,928.23 | 55.61 | 248,718.35 | 46 | 3,853.79 | 0.73 | 428.12 | 0 | 0 | 191.98 | 664.25 | 0 | 0 | 7.10 | 12 | 416.00 | 15 | 0 | 5 | 5 | 2 | 1 | 15,652.13 |
| 33 | 3593 | 200, 202, 204, 206, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 269, 268, 272, 274, 275 | 68,562.20 | 38,800.55 | 206,619.49 | 4 | 43 | 20 | 252,528.61 | 1,035.18 | 64.24 | 252,528.61 | 43 | 3,067.19 | 0.73 | 434.70 | 0 | 0 | 191.98 | 677.42 | 0 | 0 | 6.68 | 5 | 411.83 | 13 | 0 | 5 | 3 | 1 | 0 | 29,621.71 |
| 34 | 632 | 200, 201, 205, 217, 219, 221, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 269, 271, 274, 275 | 48,446.16 | 20,868.83 | 199,296.68 | 4 | 43 | 20 | 248,525.51 | 1,035.18 | 57.32 | 248,525.51 | 47 | 3,853.79 | 0.73 | 427.82 | 0 | 0 | 191.98 | 663.65 | 0 | 0 | 6.29 | 5 | 418.99 | 19 | 0 | 8 | 3 | 2 | 1 | 15,652.13 |
| 35 | 2972 | 200, 202, 204, 206, 207, 208, 209, 211, 214, 258, 260, 270, 271, 274, 275 | 73,263.77 | 28,038.19 | 231,240.08 | 3 | 45 | 18 | 252,312.65 | 753.88 | 62.34 | 252,312.65 | 65 | 9,112.15 | 3.29 | 264.17 | 0 | 0 | 0.00 | 528.34 | 0 | 0 | 12.44 | 2 | 422.56 | 14 | 0 | 4 | 6 | 1 | 2 | 14,625.09 |
| 36 | 2996 | 200, 202, 204, 206, 207, 208, 209, 212, 215, 254, 257, 261, 265, 270, 271, 274, 275 | 81,734.84 | 36,755.28 | 230,994.35 | 3 | 44 | 20 | 248,802.64 | 753.88 | 57.16 | 248,802.64 | 56 | 3,486.17 | 3.29 | 337.84 | 0 | 0 | 59.38 | 616.31 | 0 | 0 | 8.05 | 2 | 431.45 | 15 | 0 | 4 | 7 | 1 | 1 | 15,504.04 |
| 37 | 1488 | 200, 202, 203, 205, 207, 208, 209, 211, 214, 258, 260, 270, 271, 274, 275 | 52,358.20 | 28,038.19 | 231,217.33 | 3 | 44 | 20 | 252,289.91 | 753.88 | 59.43 | 252,289.91 | 66 | 9,112.15 | 3.29 | 264.11 | 0 | 0 | 0.00 | 528.21 | 0 | 0 | 11.74 | 2 | 423.62 | 15 | 0 | 5 | 5 | 1 | 2 | 14,625.09 |
| 38 | 1512 | 200, 202, 203, 205, 207, 208, 209, 212, 215, 254, 257, 261, 265, 270, 271, 274, 275 | 60,829.27 | 36,755.28 | 230,971.60 | 3 | 43 | 22 | 248,779.89 | 753.88 | 54.25 | 248,779.89 | 57 | 3,486.17 | 3.29 | 337.78 | 0 | 0 | 59.38 | 616.18 | 0 | 0 | 7.35 | 2 | 432.51 | 16 | 0 | 5 | 6 | 1 | 1 | 15,504.04 |
| 39 | 4878 | 200, 202, 204, 218, 223, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 66,934.10 | 30,017.07 | 204,134.57 | 4 | 45 | 18 | 248,225.12 | 1,035.18 | 69.94 | 248,225.12 | 47 | 2,906.47 | 1.56 | 427.32 | 0 | 0 | 191.98 | 662.66 | 0 | 0 | 8.56 | 4 | 412.13 | 13 | 0 | 4 | 5 | 1 | 0 | 15,652.13 |
| 40 | 14 | 200, 201, 205, 207, 208, 209, 212, 215, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 45,759.07 | 35,568.11 | 217,061.18 | 4 | 43 | 16 | 248,112.21 | 753.88 | 56.57 | 248,112.21 | 52 | 2,366.71 | 3.29 | 336.70 | 0 | 0 | 59.38 | 614.03 | 0 | 0 | 6.65 | 3 | 411.39 | 19 | 0 | 7 | 5 | 1 | 0 | 15,652.13 |
| 41 | 2142 | 200, 202, 203, 205, 217, 219, 221, 222, 223, 234, 236, 242, 250, 253, 255, 256, 262, 264, 267, 268, 273, 275 | 64,752.32 | 30,017.07 | 203,915.32 | 4 | 43 | 22 | 248,005.87 | 1,035.18 | 63.19 | 248,005.87 | 51 | 4,430.19 | 0.73 | 426.89 | 0 | 0 | 176.52 | 677.25 | 0 | 0 | 6.36 | 4 | 427.76 | 15 | 0 | 6 | 3 | 1 | 0 | 15,652.13 |
| 42 | 4877 | 200, 202, 204, 218, 223, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 61,802.75 | 24,826.31 | 204,161.07 | 4 | 45 | 18 | 248,251.62 | 1,035.18 | 69.35 | 248,251.62 | 50 | 3,171.84 | 1.56 | 427.37 | 0 | 0 | 191.98 | 662.75 | 0 | 0 | 9.14 | 5 | 412.93 | 13 | 0 | 4 | 5 | 1 | 0 | 15,652.13 |
| 43 | 2768 | 200, 202, 203, 205, 217, 220, 222, 223, 234, 236, 242, 247, 254, 257, 261, 265, 270, 271, 274, 275 | 66,317.22 | 31,204.24 | 218,044.27 | 3 | 43 | 24 | 248,892.09 | 1,928.23 | 53.24 | 248,892.09 | 46 | 4,025.93 | 0.73 | 428.39 | 0 | 0 | 191.98 | 664.80 | 0 | 0 | 5.88 | 10 | 424.52 | 17 | 0 | 6 | 5 | 1 | 1 | 15,504.04 |
| 44 | 13 | 200, 201, 205, 207, 208, 209, 212, 215, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 40,627.72 | 30,377.35 | 217,087.68 | 4 | 43 | 16 | 248,138.70 | 753.88 | 55.98 | 248,138.70 | 55 | 2,632.08 | 3.29 | 336.75 | 0 | 0 | 59.38 | 614.12 | 0 | 0 | 7.22 | 4 | 412.19 | 19 | 0 | 7 | 5 | 1 | 0 | 15,652.13 |
| 45 | 1270 | 200, 201, 205, 217, 220, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 51,247.02 | 30,017.07 | 204,133.85 | 4 | 43 | 18 | 248,224.40 | 1,928.23 | 55.55 | 248,224.40 | 41 | 2,906.47 | 0.73 | 427.32 | 0 | 0 | 191.98 | 662.65 | 0 | 0 | 5.18 | 11 | 403.40 | 20 | 0 | 8 | 4 | 1 | 0 | 15,652.13 |
| 46 | 4876 | 200, 202, 204, 218, 223, 221, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | 55,913.13 | 34,833.75 | 201,962.96 | 4 | 44 | 18 | 242,735.79 | 1,035.18 | 64.31 | 242,735.79 | 47 | 3,749.14 | 1.56 | 417.88 | 0 | 0 | 191.98 | 643.77 | 0 | 0 | 8.95 | 3 | 425.11 | 12 | 0 | 4 | 4 | 2 | 1 | 29,621.71 |
| 47 | 2134 | 200, 202, 203, 205, 217, 219, 221, 222, 223, 234, 236, 242, 250, 251, 252, 256, 262, 264, 267, 268, 273, 275 | 60,632.57 | 45,625.45 | 183,773.50 | 4 | 42 | 18 | 242,034.53 | 1,035.18 | 60.28 | 242,034.53 | 49 | 4,644.30 | 0.73 | 416.67 | 0 | 0 | 176.52 | 656.81 | 0 | 0 | 6.17 | 4 | 423.61 | 15 | 0 | 6 | 3 | 0 | 0 | 29,622.61 |
| 48 | 12 | 200, 201, 205, 207, 208, 209, 212, 215, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | 34,738.10 | 40,384.79 | 214,889.57 | 4 | 42 | 16 | 242,622.87 | 753.88 | 50.94 | 242,622.87 | 52 | 3,209.38 | 3.29 | 327.26 | 0 | 0 | 59.38 | 595.14 | 0 | 0 | 7.04 | 2 | 424.37 | 18 | 0 | 7 | 4 | 2 | 1 | 29,621.71 |
| 49 | 2141 | 200, 202, 203, 205, 217, 219, 221, 222, 223, 234, 236, 242, 250, 253, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 59,620.97 | 24,826.31 | 203,941.82 | 4 | 43 | 22 | 248,032.37 | 1,035.18 | 62.60 | 248,032.37 | 54 | 4,695.56 | 0.73 | 426.94 | 0 | 0 | 176.52 | 677.35 | 0 | 0 | 6.94 | 5 | 428.56 | 15 | 0 | 6 | 3 | 1 | 0 | 15,652.13 |
| 50 | 3626 | 200, 202, 204, 206, 217, 219, 221, 222, 223, 234, 236, 242, 250, 253, 255, 256, 262, 264, 267, 268, 273, 275 | 85,657.89 | 30,017.07 | 203,938.07 | 4 | 44 | 22 | 248,028.62 | 1,035.18 | 66.10 | 248,028.62 | 50 | 4,430.19 | 0.73 | 426.93 | 0 | 0 | 176.52 | 677.33 | 0 | 0 | 7.06 | 4 | 426.70 | 14 | 0 | 5 | 4 | 1 | 0 | 15,652.13 |
| 51 | 1269 | 200, 201, 205, 217, 220, 222, 223, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 46,115.67 | 24,826.31 | 204,160.35 | 4 | 43 | 18 | 248,250.90 | 1,928.23 | 54.96 | 248,250.90 | 44 | 3,171.84 | 0.73 | 427.36 | 0 | 0 | 191.98 | 662.74 | 0 | 0 | 5.75 | 12 | 404.20 | 20 | 0 | 8 | 4 | 1 | 0 | 15,652.13 |
| 52 | 4252 | 200, 202, 204, 206, 217, 220, 222, 223, 234, 236, 242, 247, 254, 257, 261, 265, 270, 271, 274, 275 | 87,222.79 | 31,204.24 | 218,067.01 | 3 | 44 | 24 | 248,914.84 | 1,928.23 | 56.15 | 248,914.84 | 45 | 4,025.93 | 0.73 | 428.43 | 0 | 0 | 191.98 | 664.87 | 0 | 0 | 6.58 | 10 | 423.46 | 16 | 0 | 5 | 6 | 1 | 1 | 15,504.04 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max | 110,464.27 | 124,586.81 | 265,197.95 | 8 | 53 | 34 | 266,102.86 | 1,928.23 | 135.43 | 266,102.86 | 68 | 10,886.31 | 3.29 | 602.86 | 0 | 0 | 238 | 783 | 30 | 0 | 14.93 | 12 | 529.24 | 29 | 1 | 11 | 8 | 2 | 2 | 115,143.76 |
| Average | 56,270.90 | 60,296.32 | 185,318.62 | 5 | 43.95 | 21.97 | 243,021.55 | 1,194.71 | 76.88 | 243,021.55 | 50.44 | 6,003.19 | 0.50 | 431.52 | 0 | 0 | 138.04 | 694.99 | 3 | 0 | 7.74 | 5.85 | 459.54 | 16.99 | 0.10 | 6.18 | 4.34 | 0.72 | 0.62 | 42,554.03 |
| Min | 16,854.76 | 7,100.45 | 92,298.22 | 3 | 38 | 12 | 208,081.61 | 753.88 | 47.01 | 208,081.61 | 36 | 2,262.06 | 0 | 257.46 | 0 | 0 | 0 | 515 | 0 | 0 | 4.99 | 1 | 401.03 | 10 | 0 | 3 | 1 | 0 | 0 | 1,888.41 |
| St. Dev | 17,370.39 | 22,990.02 | 32,244.08 | 1.26 | 2.88 | 3.77 | 11,367.51 | 470.76 | 19.05 | 11,367.51 | 5.50 | 1,684.69 | 0.53 | 52.01 | 0 | 0 | 44.71 | 36.92 | 9.06 | 0 | 1.46 | 3.60 | 21.01 | 3.99 | 0.30 | 1.92 | 1.44 | 0.65 | 0.60 | 25,285.10 |

## Table 4-6: Meade Line Weighted Sorted Z-Scores

| Rank | Route | Segments | Length along existing distribution line (Feet) | Length not along roads (Feet) | Length not along existing transmission lines (Feet) | Transmission line crossings (Count) | Road crossings (Count) | Heavy angles > 30 degrees (Count) | Length through 1.1X the turbine height (Feet) | Center pivot irrigation systems in ROW (Acres) | Total length (Feet) | Stream crossings (NHD) (Count) | Length through Floodways/ Floodplains 100yr (FEMA) (Feet) | Woodlands in ROW (NLCD) (Acres) | Lesser prairie-chicken Score | Wetland acres in ROW (Acres) | Cultural sites within 1,320ft (Count) | Nonirrigated Cropland acres in ROW (Acres) | Residential proximity score | Length not along parcel boundary (Feet) | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2114 | 200, 202, 203, 205, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 0.33 | -11.85 | 1.16 | -5.55 | -0.33 | -1.05 | -0.34 | -5.03 | 1.35 | -1.98 | -3.68 | 1.30 | -0.76 | -4.53 | -1.03 | -10.82 | -4.98 | -8.51 | -56.29 |
| 2 | 2113 | 200, 202, 203, 205, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 0.03 | -13.89 | 1.16 | -5.55 | -0.33 | -1.05 | -0.34 | -5.25 | 1.35 | -0.89 | -3.36 | 1.30 | -0.75 | -3.34 | -0.47 | -10.66 | -4.98 | -8.51 | -55.52 |
| 3 | 3598 | 200, 202, 204, 206, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 1.53 | -11.85 | 1.16 | -5.55 | 0.02 | -1.05 | -0.34 | -3.96 | 1.35 | -2.34 | -3.68 | 1.30 | -0.76 | -3.10 | -1.03 | -11.02 | -7.48 | -8.51 | -55.29 |
| 4 | 2112 | 200, 202, 203, 205, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | -0.30 | -9.97 | 1.03 | -5.55 | -0.68 | -1.05 | -0.34 | -7.10 | -0.10 | -1.98 | -2.68 | 1.30 | -2.40 | -3.73 | -1.58 | -8.35 | -7.48 | -4.09 | -55.04 |
| 5 | 3597 | 200, 202, 204, 206, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 1.24 | -13.89 | 1.16 | -5.55 | 0.02 | -1.05 | -0.34 | -4.18 | 1.36 | -1.25 | -3.36 | 1.30 | -0.75 | -1.91 | -0.47 | -10.87 | -7.48 | -8.51 | -54.52 |
| 6 | 3596 | 200, 202, 204, 206, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | 0.90 | -9.97 | 1.03 | -5.55 | -0.33 | -1.05 | -0.34 | -6.03 | -0.10 | -2.34 | -2.68 | 1.30 | -2.39 | -2.30 | -1.58 | -8.55 | -9.99 | -4.09 | -54.04 |
| 7 | 2116 | 200, 202, 203, 205, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 269, 271, 274, 275 | 0.23 | -15.43 | 0.87 | -5.55 | -0.33 | 0.01 | -0.34 | -6.63 | 1.46 | -0.53 | -2.55 | 1.30 | -0.64 | -2.49 | -0.47 | -7.97 | -4.98 | -8.51 | -52.54 |
| 8 | 2982 | 200, 202, 204, 206, 207, 208, 209, 212, 215, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 1.22 | -9.68 | 1.97 | -5.55 | 0.02 | -3.17 | -0.94 | -5.84 | 1.36 | 0.93 | -4.32 | 15.71 | -16.39 | -0.33 | -1.58 | -9.62 | -7.48 | -8.51 | -52.20 |
| 9 | 1498 | 200, 202, 203, 205, 207, 208, 209, 212, 215, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 0.01 | -9.68 | 1.97 | -5.55 | -0.33 | -2.11 | -0.94 | -6.91 | 1.35 | 1.29 | -4.32 | 15.71 | -16.40 | -1.77 | -1.58 | -9.41 | -4.98 | -8.51 | -52.14 |
| 10 | 3600 | 200, 202, 204, 206, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 269, 271, 274, 275 | 1.43 | -15.43 | 0.87 | -5.55 | 0.02 | 0.01 | -0.34 | -5.56 | 1.47 | -0.89 | -2.55 | 1.30 | -0.63 | -1.06 | -0.47 | -8.17 | -7.48 | -8.51 | -51.55 |
| 11 | 2981 | 200, 202, 204, 206, 207, 208, 209, 212, 215, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 0.92 | -11.71 | 1.97 | -5.55 | 0.02 | -3.17 | -0.94 | -6.06 | 1.37 | 2.02 | -4.00 | 15.71 | -16.38 | 0.85 | -1.03 | -9.46 | -7.48 | -8.51 | -51.43 |
| 12 | 1497 | 200, 202, 203, 205, 207, 208, 209, 212, 215, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | -0.28 | -11.71 | 1.97 | -5.55 | -0.33 | -2.11 | -0.94 | -7.13 | 1.36 | 2.38 | -4.00 | 15.71 | -16.39 | -0.58 | -1.03 | -9.26 | -4.98 | -8.51 | -51.37 |
| 13 | 2754 | 200, 202, 203, 205, 217, 220, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 0.33 | -11.85 | 1.17 | -5.55 | -0.33 | -1.05 | 1.56 | -7.28 | 1.38 | -2.71 | -3.68 | 1.30 | -0.72 | -4.78 | 2.86 | -10.93 | -2.47 | -8.51 | -51.26 |
| 14 | 2980 | 200, 202, 204, 206, 207, 208, 209, 212, 215, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | 0.58 | -7.79 | 1.84 | -5.55 | -0.33 | -3.17 | -0.94 | -7.91 | -0.09 | 0.93 | -3.32 | 15.71 | -18.03 | 0.47 | -2.14 | -7.14 | -9.99 | -4.09 | -50.95 |
| 15 | 1496 | 200, 202, 203, 205, 207, 208, 209, 212, 215, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | -0.62 | -7.79 | 1.84 | -5.55 | -0.68 | -2.11 | -0.94 | -8.98 | -0.10 | 1.29 | -3.32 | 15.71 | -18.04 | -0.96 | -2.14 | -6.94 | -7.48 | -4.09 | -50.89 |
| 16 | 2753 | 200, 202, 203, 205, 217, 220, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 0.03 | -13.89 | 1.17 | -5.55 | -0.33 | -1.05 | 1.56 | -7.50 | 1.39 | -1.62 | -3.36 | 1.30 | -0.71 | -3.60 | 3.41 | -10.78 | -2.47 | -8.51 | -50.50 |
| 17 | 4238 | 200, 202, 204, 206, 217, 220, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 1.53 | -11.85 | 1.17 | -5.55 | 0.02 | -1.05 | 1.56 | -6.21 | 1.39 | -3.07 | -3.68 | 1.30 | -0.72 | -3.35 | 2.86 | -11.14 | -4.98 | -8.51 | -50.27 |
| 18 | 2752 | 200, 202, 203, 205, 217, 220, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | -0.30 | -9.97 | 1.03 | -5.55 | -0.68 | -1.05 | 1.56 | -9.35 | -0.07 | -2.71 | -2.68 | 1.30 | -2.36 | -3.98 | 2.30 | -8.46 | -4.98 | -4.09 | -50.02 |
| 19 | 2128 | 200, 202, 203, 205, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 257, 261, 265, 270, 271, 274, 275 | 0.58 | -11.39 | 2.02 | -11.11 | -0.33 | 1.07 | -0.34 | -6.44 | 1.51 | -0.89 | -2.35 | 1.30 | -0.58 | -3.55 | -1.58 | -6.55 | -2.47 | -8.56 | -49.64 |
| 20 | 4237 | 200, 202, 204, 206, 217, 220, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 1.24 | -13.89 | 1.17 | -5.55 | 0.02 | -1.05 | 1.56 | -6.43 | 1.40 | -1.98 | -3.36 | 1.30 | -0.71 | -2.17 | 3.41 | -10.98 | -4.98 | -8.51 | -49.50 |
| 21 | 630 | 200, 201, 205, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 273, 275 | -0.29 | -11.85 | 1.16 | -5.55 | -0.33 | -2.11 | -0.34 | -5.59 | 1.34 | -2.71 | -3.68 | 1.30 | -0.77 | -5.00 | -1.03 | -10.57 | 5.04 | -8.51 | -49.47 |
| 22 | 4236 | 200, 202, 204, 206, 217, 220, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | 0.90 | -9.97 | 1.04 | -5.55 | -0.33 | -1.05 | 1.56 | -8.28 | -0.06 | -3.07 | -2.68 | 1.30 | -2.35 | -2.55 | 2.30 | -8.67 | -7.48 | -4.09 | -49.02 |
| 23 | 629 | 200, 201, 205, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | -0.58 | -13.89 | 1.16 | -5.55 | -0.33 | -2.11 | -0.34 | -5.80 | 1.34 | -1.62 | -3.36 | 1.30 | -0.76 | -3.81 | -0.47 | -10.41 | 5.04 | -8.51 | -48.70 |
| 24 | 3612 | 200, 202, 204, 206, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 257, 261, 265, 270, 271, 274, 275 | 1.78 | -11.39 | 2.02 | -11.11 | 0.02 | 1.07 | -0.34 | -5.37 | 1.52 | -1.25 | -2.35 | 1.30 | -0.57 | -2.12 | -1.58 | -6.75 | -4.98 | -8.56 | -48.65 |
| 25 | 2984 | 200, 202, 204, 206, 207, 208, 209, 212, 215, 254, 255, 256, 262, 264, 267, 269, 271, 274, 275 | 1.11 | -13.26 | 1.68 | -5.55 | 0.02 | -2.11 | -0.94 | -7.44 | 1.47 | 2.38 | -3.19 | 15.71 | -16.26 | 1.70 | -1.03 | -6.77 | -7.48 | -8.51 | -48.46 |
| 26 | 1500 | 200, 202, 203, 205, 207, 208, 209, 212, 215, 254, 255, 256, 262, 264, 267, 269, 271, 274, 275 | -0.09 | -13.26 | 1.68 | -5.55 | -0.33 | -1.05 | -0.94 | -8.51 | 1.47 | 2.75 | -3.19 | 15.71 | -16.28 | 0.27 | -1.03 | -6.56 | -4.98 | -8.51 | -48.40 |
| 27 | 628 | 200, 201, 205, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | -0.92 | -9.97 | 1.02 | -5.55 | -0.68 | -2.11 | -0.34 | -7.66 | -0.11 | -2.71 | -2.68 | 1.30 | -2.40 | -4.20 | -1.58 | -8.10 | 2.54 | -4.09 | -48.22 |
| 28 | 2110 | 200, 202, 203, 205, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 269, 268, 273, 275 | -0.20 | -6.38 | 1.32 | -5.55 | -0.68 | -1.05 | -0.34 | -5.50 | 2.50 | -3.43 | -3.80 | 1.30 | 0.54 | -4.78 | -1.03 | -9.03 | -7.48 | -4.09 | -47.68 |
| 29 | 2756 | 200, 202, 203, 205, 217, 220, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 269, 271, 274, 275 | 0.23 | -15.43 | 0.88 | -5.55 | -0.33 | 0.01 | 1.56 | -8.89 | 1.50 | -1.25 | -2.55 | 1.30 | -0.60 | -2.74 | 3.41 | -8.09 | -2.47 | -8.51 | -47.52 |
| 30 | 2109 | 200, 202, 203, 205, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 269, 268, 272, 274, 275 | -0.50 | -8.42 | 1.32 | -5.55 | -0.68 | -1.05 | -0.34 | -5.72 | 2.50 | -2.34 | -3.49 | 1.30 | 0.54 | -3.59 | -0.47 | -8.88 | -7.48 | -4.09 | -46.92 |
| 31 | 3594 | 200, 202, 204, 206, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 269, 268, 273, 275 | 1.00 | -6.38 | 1.32 | -5.55 | -0.33 | -1.05 | -0.34 | -4.43 | 2.50 | -3.80 | -3.80 | 1.30 | 0.54 | -3.34 | -1.03 | -9.23 | -9.99 | -4.09 | -46.69 |
| 32 | 4240 | 200, 202, 204, 206, 217, 220, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 269, 271, 274, 275 | 1.43 | -15.43 | 0.88 | -5.55 | 0.02 | 0.01 | 1.56 | -7.82 | 1.50 | -1.62 | -2.55 | 1.30 | -0.59 | -1.31 | 3.41 | -8.29 | -4.98 | -8.51 | -46.53 |
| 33 | 3593 | 200, 202, 204, 206, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 269, 268, 272, 274, 275 | 0.71 | -8.42 | 1.32 | -5.55 | -0.33 | -1.05 | -0.34 | -4.65 | 2.51 | -2.71 | -3.49 | 1.30 | 0.55 | -2.16 | -0.47 | -9.08 | -9.99 | -4.09 | -45.92 |
| 34 | 632 | 200, 201, 205, 217, 219, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 269, 271, 274, 275 | -0.39 | -15.43 | 0.87 | -5.55 | -0.33 | -1.05 | -0.34 | -7.19 | 1.45 | -1.25 | -2.55 | 1.30 | -0.64 | -2.96 | -0.47 | -7.72 | 5.04 | -8.51 | -45.72 |
| 35 | 2972 | 200, 202, 204, 206, 207, 208, 209, 211, 214, 258, 260, 270, 271, 274, 275 | 0.98 | -12.63 | 2.85 | -11.11 | 0.36 | -2.11 | -0.94 | -5.34 | 2.45 | 5.29 | 3.69 | 15.71 | -28.96 | 9.64 | -2.14 | -7.04 | -7.48 | -8.84 | -45.60 |
| 36 | 2996 | 200, 202, 204, 206, 207, 208, 209, 212, 215, 254, 257, 261, 265, 270, 271, 274, 275 | 1.47 | -9.22 | 2.83 | -11.11 | 0.02 | -1.05 | -0.94 | -7.25 | 1.53 | 2.02 | -2.99 | 15.71 | -16.21 | 0.65 | -2.14 | -5.35 | -4.98 | -8.56 | -45.56 |
| 37 | 1488 | 200, 202, 203, 205, 207, 208, 209, 211, 214, 258, 260, 270, 271, 274, 275 | -0.23 | -12.63 | 2.85 | -11.11 | 0.02 | -1.05 | -0.94 | -6.41 | 2.45 | 5.66 | 3.69 | 15.71 | -28.97 | 8.21 | -2.14 | -6.84 | -4.98 | -8.84 | -45.54 |
| 38 | 1512 | 200, 202, 203, 205, 207, 208, 209, 212, 215, 254, 257, 261, 265, 270, 271, 274, 275 | 0.26 | -9.22 | 2.83 | -11.11 | -0.33 | 0.01 | -0.94 | -8.32 | 1.52 | 2.38 | -2.99 | 15.71 | -16.22 | -0.79 | -2.14 | -5.14 | -2.47 | -8.56 | -45.50 |
| 39 | 4878 | 200, 202, 204, 218, 223, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 273, 275 | 0.61 | -11.85 | 1.17 | -5.55 | 0.36 | -2.11 | -0.34 | -2.55 | 1.37 | -1.25 | -3.68 | 6.00 | -0.73 | 1.69 | -1.03 | -9.02 | -9.99 | -8.51 | -45.40 |
| 40 | 14 | 200, 201, 205, 207, 208, 209, 212, 215, 254, 255, 256, 262, 264, 267, 268, 273, 275 | -0.61 | -9.68 | 1.97 | -5.55 | -0.33 | -3.17 | -0.94 | -7.47 | 1.34 | 0.57 | -4.32 | 15.71 | -16.41 | -2.23 | -1.58 | -9.16 | 5.04 | -8.51 | -45.32 |
| 41 | 2142 | 200, 202, 203, 205, 217, 219, 221, 222, 229, 234, 236, 242, 250, 253, 255, 256, 262, 264, 267, 268, 273, 275 | 0.49 | -11.85 | 1.15 | -5.55 | -0.33 | 0.01 | -0.34 | -5.03 | 1.32 | 0.20 | -1.87 | 1.30 | -0.80 | -2.81 | -1.03 | -6.05 | -4.98 | -8.51 | -44.67 |
| 42 | 4877 | 200, 202, 204, 218, 223, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 0.32 | -13.89 | 1.17 | -5.55 | 0.36 | -2.11 | -0.34 | -2.77 | 1.38 | -0.16 | -3.36 | 6.00 | -0.72 | 2.87 | -0.47 | -8.87 | -9.99 | -8.51 | -44.63 |
| 43 | 2768 | 200, 202, 203, 205, 217, 220, 222, 229, 234, 236, 242, 247, 254, 257, 261, 265, 270, 271, 274, 275 | 0.58 | -11.39 | 2.03 | -11.11 | -0.33 | 1.07 | 1.56 | -8.69 | 1.55 | -1.62 | -2.35 | 1.30 | -0.54 | -3.80 | 2.30 | -6.67 | 0.03 | -8.56 | -44.62 |
| 44 | 13 | 200, 201, 205, 207, 208, 209, 212, 215, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | -0.90 | -11.71 | 1.97 | -5.55 | -0.33 | -3.17 | -0.94 | -7.68 | 1.35 | 1.66 | -4.00 | 15.71 | -16.40 | -1.05 | -1.03 | -9.01 | 5.04 | -8.51 | -44.55 |
| 45 | 1270 | 200, 201, 205, 217, 220, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 273, 275 | -0.29 | -11.85 | 1.17 | -5.55 | -0.33 | -2.11 | 1.56 | -7.84 | 1.37 | -3.43 | -3.68 | 1.30 | -0.73 | -5.25 | 2.86 | -10.68 | 7.55 | -8.51 | -44.44 |
| 46 | 4876 | 200, 202, 204, 218, 223, 221, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | -0.02 | -9.97 | 1.03 | -5.55 | 0.02 | -2.11 | -0.34 | -4.62 | -0.08 | -1.25 | -2.68 | 6.00 | -2.36 | 2.49 | -1.58 | -6.55 | -12.49 | -4.09 | -44.15 |
| 47 | 2134 | 200, 202, 203, 205, 217, 219, 221, 222, 229, 234, 236, 242, 250, 251, 252, 256, 262, 264, 267, 268, 273, 275 | 0.25 | -5.74 | -0.10 | -5.55 | -0.68 | -2.11 | -0.34 | -6.10 | -0.26 | -0.53 | -1.61 | 1.30 | -2.57 | -3.21 | -1.03 | -6.84 | -4.98 | -4.03 | -44.11 |
| 48 | 12 | 200, 201, 205, 207, 208, 209, 212, 215, 254, 255, 256, 262, 263, 265, 270, 271, 274, 275 | -1.24 | -7.79 | 1.83 | -5.55 | -0.68 | -3.17 | -0.94 | -9.54 | -0.11 | 0.57 | -3.32 | 15.71 | -18.04 | -1.43 | -2.14 | -6.69 | 2.54 | -4.09 | -44.07 |
| 49 | 2141 | 200, 202, 203, 205, 217, 219, 221, 222, 229, 234, 236, 242, 250, 253, 255, 256, 262, 264, 267, 268, 272, 274, 275 | 0.19 | -13.89 | 1.16 | -5.55 | -0.33 | 0.01 | -0.34 | -5.25 | 1.32 | 1.29 | -1.55 | 1.30 | -0.79 | -1.63 | -0.47 | -5.90 | -4.98 | -8.51 | -43.91 |
| 50 | 3626 | 200, 202, 204, 206, 217, 219, 221, 222, 229, 234, 236, 242, 250, 253, 255, 256, 262, 264, 267, 268, 273, 275 | 1.69 | -11.85 | 1.15 | -5.55 | 0.02 | 0.01 | -0.34 | -3.96 | 1.32 | -0.16 | -1.87 | 1.30 | -0.79 | -1.38 | -1.03 | -6.25 | -7.48 | -8.51 | -43.68 |
| 51 | 1269 | 200, 201, 205, 217, 220, 222, 229, 234, 236, 242, 247, 254, 255, 256, 262, 264, 267, 268, 272, 274, 275 | -0.58 | -13.89 | 1.17 | -5.55 | -0.33 | -2.11 | 1.56 | -8.06 | 1.38 | -2.34 | -3.36 | 1.30 | -0.72 | -4.06 | 3.41 | -10.53 | 7.55 | -8.51 | -43.68 |
| 52 | 4252 | 200, 202, 204, 206, 217, 220, 222, 229, 234, 236, 242, 247, 254, 257, 261, 265, 270, 271, 274, 275 | 1.78 | -11.39 | 2.03 | -11.11 | 0.02 | 1.07 | 1.56 | -7.62 | 1.56 | -1.98 | -2.35 | 1.30 | -0.54 | -2.37 | 2.30 | -6.87 | -2.47 | -8.56 | -43.63 |
| | | **Max** | 3.12 | 25.17 | 4.95 | 16.71 | 3.14 | 6.37 | 1.56 | 21.52 | 6.09 | 6.38 | 5.80 | 15.71 | 29.65 | 14.74 | 3.41 | 13.27 | 30.09 | 22.97 | 70.02 |
| | | **Average** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | **Minmum** | -2.27 | -20.82 | -5.77 | -11.11 | -2.06 | -5.29 | -0.94 | -10.98 | -9.22 | -5.25 | -4.44 | -2.81 | -30.12 | -5.63 | -2.69 | -11.14 | -17.50 | -12.87 | -56.29 |

#### 4.5.3.2 Selection of the Proposed Route

The 51 lowest (least-impacting) scoring refined alternate routes for the proposed Meade Line scored within 12.61 points of each other. These alternate routes followed more through the center of the alternate route network and largely avoided portions of the existing transmission line corridor where several alternative links received negative public feedback because of the potential for additional impacts to land use. Additionally, the alternate routes that used route links along the eastern and western portions did not score as well as more central alternate routes. All of the alternate routes exited the Meade Origination Point using alternate route link 200, followed by either route link 202 which turned east, or route link 201 which continued north. Refined alternate routes using alternate route link 202 to the east either used link 203 and connected back north to the terminus of route link 201 or continued east along route link 204. Routes using link 202 and 203 instead of 201 had more length along distribution (additional 10,761 feet), 2 more heavy angles, 1.51 more acres of center-pivot irrigation in the ROW, 2 more stream crossings and 0.23 more acres of wetlands in the ROW. While refined alternate routes using route links 202 and 203 had 2 fewer residences from 150-300 feet, the homes along route link 201 were all located on the opposite side of the road as the alternate routes and would not be crossed by the easement. For these reasons, alternate routes using route link 201 were preferred over those using a combination of route link 202 and 203. Continuing further east from route link 202, the only remaining route link option was route link 204. Following the open houses, the project team took a closer look at the potential impacts of route link 204 on an existing outbuilding structure within the ROW. Evaluating the impacts to that structure, along with the constraints of a residence on the south side of the road which prohibited potential modifications to route link 204. Alternate routes using link 204 were removed from further consideration. Subsequently, this also removed route links 206, 218, 223, 224, 225, 226, 227, and 228 from consideration as they were only used in combination with route link 204. With the elimination of these route links, 9 routes remained for further consideration.

Of the remaining 9 refined alternate routes in consideration, these alternate routes utilized either route link 207, which turned due north from route link 205, or continued east along route link 217. During the open house meetings, several private airstrips were noted. Of these private airstrips, all feedback received indicated that they were for personal use and primarily for agricultural purposes. One such private airstrip was noted immediately south of route link 217 and southwest of the intersection of route links 217, 220, and 219. This private airport was registered with the FAA during the duration of the Meade Line in November 2023. While the FAA does not provide oversight of private airports, the concern from the public over these special use areas and the potential impacts to their use for agricultural practices was noted at several open houses. With the runway running north/south and route links 217 and 219 running east/west, there were no reasonable modifications that could be made to these links that would eliminate the potential for impacts. For this reason, refined alternate routes that used route link 217, 219 or 220 were removed from further consideration. With the removal of these route links, only 3 refined alternate routes remained over the retained 51 refined alternate routes. The remaining refined alternate routes in consideration are alternate routes 12, 13, and 14.

Routes 12, 13, and 14 all start with the route link combination of 200, 201, 205, 207, 208, 209, 212, 215, 254, 255, 256, and 262. Following route link 262, Route 12 continued along route links

263 and 265 which paralleled an existing transmission line corridor before turning east on route link 270 and 271. Alternatively, Routes 13 and 14 headed east along route link 264 and then turned north along 267 before heading back east again along route link 268. Route 13 then traverses north on route link 272 while Route 14 continued east along route link 273. Routes 12 and 13 continued east along link 274 where all three routes then utilized route link 275 to enter the Grain Belt Express Kansas converter station AC switchyard. In comparing these 3 remaining refined alternate routes, all 3 scored within 1.25 points of each other. The most notable differences between the 3 alternate routes were for length not along roads (the best being Route 13 with 30,377.35 feet), acres of center pivot in the ROW (the best being Route 12 with 50.94 acres), lesser prairie-chicken score (Route 12 the best with 327.26 points), acres of non-irrigated cropland in the ROW (Route 14 had the least with 411.39 acres), and residential proximity score (Route 12 scored best with 18 points). With these refined alternate routes being relatively equal across the majority of factors evaluated, a closer review of the impacts to residences along these alternate routes revealed that not only did Routes 13 and 14 have greater residential proximity compared to Route 12, these alternate routes would also cross directly in front of a residence along route link 268 which was avoided entirely by Route 12. Upon closer review of route link 268, it was determined that there was no opportunity to avoid impacting the residence on the north side of Tillman Road without impacting a different residence in the same way on the south side of Tillman Road. Route link 268 was also further constrained by wind turbines to the north and additional pivot irrigation systems to the south which reduced the opportunity to modify the route link.

After review of all the refined alternate route data, Route 12 (the 48$^{th}$ ranking route) was selected as the proposed route. A detailed map showing the proposed route is shown below (Figure 4-5) and overlaid on a USGS topography map background in Appendix B (Figure B-4). A summary of the analysis data associated with the proposed route, Route 12, are found in Tables 4-5 and 4-6.

## 4.6 Meade Line Proposed Route Summary

The final proposed route selected for the Meade Line is Route 12. Route 12 was selected for several key reasons:

- It has among the fewest acres of center pivot irrigation and minimizes acres of non-irrigated cropland in the ROW
- It minimizes impacts to land use because it parallels roads
- It has among the fewest number of heavy angles
- It has among the fewest number of recorded cultural sites within 1,320 feet
- While the route had a higher than average residential proximity score, it has no homes within 150 feet of the route centerline and further reduces residential impacts by not crossing any driveways. Additionally, no parcels were crossed where residential structures were identified within 500 feet during the routing process or from public feedback
- It minimizes impacts to lesser prairie-chicken habitat by avoiding known historic or active lek locations and higher quality CHAT areas

Project Endpoint
Proposed Route Link Endpoint
Proposed Route (Route 12)
Route Link Number
Study Area

Public Airport
FAA Private Airport
Microwave Service Tower
Land Mobile Private Transmission Tower
Existing Pipeline

Railroad
Highway
Local Road
NHD Stream/River
NWI Wetland

FEMA Floodplain
Municipal Boundary

**Existing Transmission Line**
115kV
345kV

**Part 77 Surfaces**
Approach
Conical
Transitional

NORTH
2 1 0 2
Miles

BURNS McDONNELL

Figure 4-5
Meade Line Proposed Route
Kansas AC Collector System
Grain Belt Express
Ford, Gray, and Meade Counties
Exhibit JP-2

Path: C:\Desktop\QI\Invenergy\GrainBeltAC\GrainBeltAC_Pro\GrainBeltAC_Pro.aprx catenbus 5/23/2024
Service Layer Credits: World Imagery: Earthstar Geographics

Source: Grain Belt Express, Esri, NHD, FEMA, NWI, FAA, NTAD, HIFLD, FCC, Burns & McDonnell



Issued: 5/23/2024

- It minimizes impacts to private airports identified from public feedback
- It minimizes impacts to wetlands and potential whooping crane stopover locations with only 7.04 acres of NWI wetlands located in the ROW

## 4.7 Meade Line Post Route Selection Adjustments

Following the proposed route filling with the KCC, route modifications could continue to take place based on negotiations with landowners, engineering revisions, and survey work. Local conditions may be identified or encountered during survey, final engineering, design, ROW acquisition, or construction which could result in minor adjustments to the proposed route alignment. Additional adjustments by Grain Belt Express would be to address specific, localized conditions or circumstances not readily apparent as part of the route selection process but would not be anticipated to result in substantial (if any) additional impacts. Any adjustments would generally be intended to reduce overall environmental impacts, reduce inconveniences to landowners, and/or protect public safety.

# 5.0 Agency Responses

Burns & McDonnell contacted agencies by letter to gather their input on potential constraints within the study area and to determine what permits, clearances, and approvals would be required for both the Bucklin Line and the Meade Line. The following is a description of the letters sent and a summary of the responses received by the agencies.

In December 2023, Burns & McDonnell contacted several federal, state, and local agencies. The contact materials included a letter detailing project information and requested input on study area resources or concerns. Also included with the letter was a study area map and a table including all Public Land Survey System (PLSS) township, section, and ranges within the study area. Letters were mailed to the following agencies: EPA, NPS, USFWS, USACE, KDWP, KDA, KDHE, KSHS, NRCS, FAA, KBS, and KDOT. Letters were also delivered to the Ford County, Gray County, and Meade County Commissioners and the Ford County, Gray County, and Meade County Planning and Zoning Directors.

## 5.1 Bucklin Line Agency Responses

Responses were received from the FAA, USACE, NRCS, USFWS, KDWP, KDOT, and KBS for the Bucklin Line. A summary of these responses received is provided below. A copy of all agency correspondence received is in Appendix C.

### 5.1.1 Federal Aviation Administration

The FAA advised the Bucklin Line team that formal notice and review for airspace considerations could be required under 14 Code of Federal Regulation (CFR) Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace. It was recommended to use their "Notice Criteria Tool" available on their website to determine if filing is necessary. Grain Belt Express will coordinate with the FAA following the selection of the proposed route.

### 5.1.2 U.S. Army Corps of Engineers

The USACE stated that, should the Bucklin Line require construction in waters of the U.S., including wetlands or streams, a Department of the Army (DA) permit may be required as stated by 33 CFR 320-332. If required, a DA permit will need to be issued prior to the initiation of any construction occurring within the USACE's regulatory jurisdiction. Grain Belt Express will coordinate with the USACE following the selection of the proposed route.

### 5.1.3 Natural Resource Conservation Service

The Agriculture and Food Act of 1981 regulates the impact of federal programs on unnecessary and irreversible conversion of prime and important farmland to nonagricultural uses. Upon review of the project, the NRCS advised that the proposed project would not result in the conversion of farmland to non-agriculture use and, therefore, the Farmland Protection Policy Act (FPPA) would not apply. If necessary, Grain Belt Express will coordinate with the NRCS upon the selection of the proposed route.

### 5.1.4 U.S. Fish and Wildlife Service

In its response, USFWS requested the Bucklin Line team to generate an IPaC report and a shapefile for the Bucklin Line study area and to send those materials to USFWS for review. USFWS identified candidate, proposed endangered, threatened, and endangered species within Ford County. They also identified that there are no designated critical habitats within the study area. USFWS also noted to consider the monarch butterfly, lesser prairie-chicken, and whooping crane as additional species to consider during project planning. Several links to geospatial information were also sent along to the Project team for further review. Based on the information provided, USFWS indicated that it was not possible to identify the necessary permits or clearances that may be required. A copy of the IPaC report generated for the Bucklin Line is located in Appendix A of this report.

### 5.1.5 Kansas Department of Wildlife and Parks

KDWP reviewed the project area for potential impacts to critical wildlife habitats, current state-listed threatened or endangered species and species in need of conservation, as well as KDWP managed areas. It noted that the study area includes designated critical habitat for the state-listed threatened eastern spotted skunk and gave information about locations of potential occurrence for the federally-listed threatened lesser prairie-chicken. KDWP recommended measures for locating and constructing the project to minimize impacts to habitat. Following the decision of the proposed route, KDWP requests submission of the route for further review and determination of the appropriate permits.

### 5.1.6 Kansas Department of Transportation

On December 4th, 2023, Burns & McDonnell's Bucklin Line lead, spoke with Mr. Ron Hall via phone call. KDOT indicated that the Bucklin Line would require the appropriate permits for it to be located within road ROW. KDOT also requested that roads not be blocked during the Bucklin Line's construction.

### 5.1.7 Kansas Biological Survey

KBS responded to notify the Bucklin Line team that it had reviewed the KNHI for records of state and federal threatened, endangered, and special concern species. It indicated that the Bucklin Line falls within the known range of the lesser prairie-chicken and that no protected plant species occur within the county. KBS no longer maintains precise location data for the lesser prairie-chicken, and it indicated that KDWP would be able to provide this data.

KBS also indicated that most of Kansas has not been surveyed for rare species and their habitats, and therefore, absence of records should not be interpreted as an indication that rare species or natural habitats do not occur in any particular area.

## 5.2 Meade Line Agency Responses

Responses were received from the FAA, USACE, NRCS, USFWS, KDWP, KDOT, and KBS for the Meade Line. A summary of these responses received is provided below. A copy of all agency correspondence received is in Appendix C.

### 5.2.1 Federal Aviation Administration

The FAA advised the Meade Line team that formal notice and review for airspace considerations could be required under 14 CFR Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace. It was recommended to use their "Notice Criteria Tool" available on their website to determine if filing is necessary. Grain Belt Express will coordinate with the FAA following the selection of the proposed route.

### 5.2.2 U.S. Army Corps of Engineers

The USACE stated that, should the Meade Line require construction in waters of the U.S., including wetlands or streams, a Department of the Army (DA) permit may be required as stated by 33 CFR 320-332. If required, a DA permit will need to be issued prior to the initiation of any construction occurring within the USACE's regulatory jurisdiction. Grain Belt Express will coordinate with the USACE following the selection of the proposed route.

### 5.2.3 Natural Resource Conservation Service

The Agriculture and Food Act of 1981 regulates the impact of federal programs on unnecessary and irreversible conversion of prime and important farmland to nonagricultural uses. Upon review of the Project, the NRCS advised that the proposed Project would not result in the conversion of farmland to non-agriculture use and, therefore, the FPPA would not apply. If necessary, Grain Belt Express will coordinate with the NRCS upon the selection of the proposed route.

### 5.2.4 U.S. Fish and Wildlife Service

In its response, the USFWS requested the Meade Line team to generate an IPaC report and a shapefile for the Meade Line study area and to send those materials to USFWS for review. USFWS identified candidate, proposed endangered, threatened, and endangered species within the Gray, Meade, and Ford counties. They also identified that there are no designated critical habitats within the study area. USFWS also provided monarch butterfly, lesser prairie-chicken, and whooping crane as additional species to consider during Meade Line planning. Several links to geospatial information were also sent along to the project team for further review. Based on the information provided, USFWS indicated that it was not possible to identify the necessary permits or clearances that may be required. A copy of the IPaC report generated for the Meade Line is located in Appendix A of this report.

### 5.2.5 Kansas Department of Wildlife and Parks

KDWP reviewed the project areas for potential impacts to critical wildlife habitats, current state-listed threatened or endangered species and species in need of conservation, as well as KDWP managed areas. They noted that area includes designated critical habitat for the state-listed threatened New Mexico threadsnake and the plains minnow in Meade County and also critical habitat for the plains minnow in Ford County. KDWP also gave information about locations of potential occurrence for the federally-listed lesser prairie-chicken. KDWP recommended measures for locating and constructing the project so that impacts to habitat areas may be minimal. Following the decision of the proposed route, KDWP requests submission of the route for further review and determination of the appropriate permits.

### 5.2.6 Kansas Department of Transportation

On December 4th, 2023, Burns & McDonnell's Meade Line lead, spoke with Mr. Ron Hall via phone call. KDOT indicated that the project would require the appropriate permits for it to be located within road ROW. They also requested that roads not be blocked during the Meade Line's construction.

### 5.2.7 Kansas Biological Survey

KBS responded to notify the Meade Line team that they had reviewed the KNHI for records of state and federal threatened, endangered, and special concern species. They indicated that the Meade Line falls within the known range of the lesser prairie-chicken and that no protected plant species occur within the counties. Their office no longer maintains precise location data for this species, and they indicated that KDWP would be able to provide this data.

KBS also indicated that most of Kansas has not been surveyed for rare species and their habitats, and therefore, absence of records should not be interpreted as an indication that rare species or natural habitats do not occur in any particular area.

# 6.0 References

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# APPENDIX A – USFWS INFORMATION FOR PLANNING AND CONSULTATION TOOL

Bucklin Line

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
Kansas Ecological Services Field Office
2609 Anderson Avenue
Manhattan, KS 66502-2801
Phone: (785) 539-3474 Fax: (785) 539-8567

In Reply Refer To:
Project Code: 2024-0024513
Project Name: Eastern AC Collector Line

December 08, 2023

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through IPaC by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at: https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

**Migratory Birds**: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see Migratory Bird Permit | What We Do | U.S. Fish & Wildlife Service (fws.gov).

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

# OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

**Kansas Ecological Services Field Office**
2609 Anderson Avenue
Manhattan, KS 66502-2801
(785) 539-3474

# PROJECT SUMMARY

Project Code: 2024-0024513
Project Name: Eastern AC Collector Line
Project Type: Transmission Line - New Constr - Above Ground
Project Description: Construction of a new 345-kV overhead transmission line
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@37.592108499999995,-99.77292594324652,14z


Counties: Ford County, Kansas

# ENDANGERED SPECIES ACT SPECIES

There is a total of 6 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

## MAMMALS

| NAME | STATUS |
|---|---|
| Tricolored Bat *Perimyotis subflavus*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/10515 | Proposed Endangered |

## BIRDS

| NAME | STATUS |
|---|---|
| Lesser Prairie-chicken *Tympanuchus pallidicinctus*<br>Population: Northern DPS<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/1924 | Threatened |
| Whooping Crane *Grus americana*<br>Population: Wherever found, except where listed as an experimental population<br>There is **final** critical habitat for this species. Your location does not overlap the critical habitat.<br>Species profile: https://ecos.fws.gov/ecp/species/758 | Endangered |

## FISHES

| NAME | STATUS |
|---|---|
| Arkansas River Shiner *Notropis girardi*<br>Population: Arkansas River Basin (AR, KS, NM, OK, TX)<br>There is **final** critical habitat for this species. Your location does not overlap the critical habitat.<br>Species profile: https://ecos.fws.gov/ecp/species/4364 | Threatened |
| Peppered Chub *Macrhybopsis tetranema*<br>There is **final** critical habitat for this species. Your location does not overlap the critical habitat.<br>Species profile: https://ecos.fws.gov/ecp/species/532 | Endangered |

## INSECTS

| NAME | STATUS |
|---|---|
| Monarch Butterfly *Danaus plexippus*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/9743 | Candidate |

## CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

Kansas Department of Wildlife and Parks

# Ford County

Print This Page | Back to Site


## Threatened and Endangered (T&E) Species

### Critical Habitat Designated

**EASTERN SPOTTED SKUNK** *Spilogale putorius*
**State:** Threatened **Federal:** N/A **Critical Habitat:** Yes

**PLAINS MINNOW** *Hybognathus placitus*
**State:** Threatened **Federal:** N/A **Critical Habitat:** Yes

### No Critical Habitat Designated

**WHOOPING CRANE** *Grus americana*
**State:** Endangered **Federal:** Endangered **Critical Habitat:** No

**LEAST TERN** *Sterna antillarum*
**State:** Endangered **Federal:** Endangered **Critical Habitat:** No

**PIPING PLOVER** *Charadrius melodus*
**State:** Threatened **Federal:** Threatened **Critical Habitat:** No

**SNOWY PLOVER** *Charadrius alexandrinus*
**State:** Threatened **Federal:** N/A **Critical Habitat:** No

## Species In Need of Conservation (SINC)

**There are no SINC species with critical habitat in Ford county**

**Western Hognose Snake** *Heterodon nasicus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Black Tern** *Chlidonias niger*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Short-eared Owl** *Asio flammeus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Chihuahuan Raven** *Corvus cryptoleucus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Curve-billed Thrasher** *Toxostoma curvirostre*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Ferruginous Hawk** *Buteo regalis*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Golden Eagle** *Aquila chrysaetos*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Glossy Snake** *Arizona elegans*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Eastern Hognose Snake** *Heterodon platirhinos*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Long-billed Curlew** *Numenius americanus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Yellow-throated Warbler** *Setophaga dominica*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**LONGNOSE SNAKE** *Rhinocheilus lecontei*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

Meade Line

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
Kansas Ecological Services Field Office
2609 Anderson Avenue
Manhattan, KS 66502-2801
Phone: (785) 539-3474 Fax: (785) 539-8567

In Reply Refer To:
Project Code: 2024-0024516
Project Name: Western AC Collector Line

December 08, 2023

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through IPaC by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at: https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

**Migratory Birds**: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see Migratory Bird Permit | What We Do | U.S. Fish & Wildlife Service (fws.gov).

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

# OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

**Kansas Ecological Services Field Office**
2609 Anderson Avenue
Manhattan, KS 66502-2801
(785) 539-3474

# PROJECT SUMMARY

Project Code: 2024-0024516
Project Name: Western AC Collector Line
Project Type: Transmission Line - New Constr - Above Ground
Project Description: Construction of a new 345-kV overhead Transmission Line
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@37.517678700000005,-100.12118473841296,14z


Counties: Kansas

# ENDANGERED SPECIES ACT SPECIES

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

## MAMMALS

| NAME | STATUS |
|---|---|
| Tricolored Bat *Perimyotis subflavus*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/10515 | Proposed Endangered |

## BIRDS

| NAME | STATUS |
|---|---|
| Lesser Prairie-chicken *Tympanuchus pallidicinctus*<br>Population: Northern DPS<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/1924 | Threatened |
| Piping Plover *Charadrius melodus*<br>Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered.<br>There is **final** critical habitat for this species. Your location does not overlap the critical habitat.<br>Species profile: https://ecos.fws.gov/ecp/species/6039 | Threatened |
| Whooping Crane *Grus americana*<br>Population: Wherever found, except where listed as an experimental population<br>There is **final** critical habitat for this species. Your location does not overlap the critical habitat.<br>Species profile: https://ecos.fws.gov/ecp/species/758 | Endangered |

## FISHES

| NAME | STATUS |
|---|---|
| Arkansas River Shiner *Notropis girardi*<br>Population: Arkansas River Basin (AR, KS, NM, OK, TX)<br>There is **final** critical habitat for this species. Your location does not overlap the critical habitat.<br>Species profile: https://ecos.fws.gov/ecp/species/4364 | Threatened |
| Peppered Chub *Macrhybopsis tetranema*<br>There is **final** critical habitat for this species. Your location does not overlap the critical habitat.<br>Species profile: https://ecos.fws.gov/ecp/species/532 | Endangered |

## INSECTS

| NAME | STATUS |
|---|---|
| Monarch Butterfly *Danaus plexippus*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/9743 | Candidate |

## CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

Kansas Department of Wildlife and Parks

# Ford County

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## Threatened and Endangered (T&E) Species

### Critical Habitat Designated

**EASTERN SPOTTED SKUNK** *Spilogale putorius*
**State:** Threatened **Federal:** N/A **Critical Habitat:** Yes

**PLAINS MINNOW** *Hybognathus placitus*
**State:** Threatened **Federal:** N/A **Critical Habitat:** Yes

### No Critical Habitat Designated

**WHOOPING CRANE** *Grus americana*
**State:** Endangered **Federal:** Endangered **Critical Habitat:** No

**LEAST TERN** *Sterna antillarum*
**State:** Endangered **Federal:** Endangered **Critical Habitat:** No

**PIPING PLOVER** *Charadrius melodus*
**State:** Threatened **Federal:** Threatened **Critical Habitat:** No

**SNOWY PLOVER** *Charadrius alexandrinus*
**State:** Threatened **Federal:** N/A **Critical Habitat:** No

## Species In Need of Conservation (SINC)

**There are no SINC species with critical habitat in Ford county**

**Western Hognose Snake** *Heterodon nasicus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Black Tern** *Chlidonias niger*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Short-eared Owl** *Asio flammeus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Chihuahuan Raven** *Corvus cryptoleucus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Curve-billed Thrasher** *Toxostoma curvirostre*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Ferruginous Hawk** *Buteo regalis*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Golden Eagle** *Aquila chrysaetos*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Glossy Snake** *Arizona elegans*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Eastern Hognose Snake** *Heterodon platirhinos*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Long-billed Curlew** *Numenius americanus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Yellow-throated Warbler** *Setophaga dominica*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**LONGNOSE SNAKE** *Rhinocheilus lecontei*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

Kansas Department of Wildlife and Parks

# Gray County

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## Threatened and Endangered (T&E) Species

### Critical Habitat Designated

**EASTERN SPOTTED SKUNK** *Spilogale putorius*
**State:** Threatened **Federal:** N/A **Critical Habitat:** Yes

### No Critical Habitat Designated

**WHOOPING CRANE** *Grus americana*
**State:** Endangered **Federal:** Endangered **Critical Habitat:** No

**LEAST TERN** *Sterna antillarum*
**State:** Endangered **Federal:** Endangered **Critical Habitat:** No

**PIPING PLOVER** *Charadrius melodus*
**State:** Threatened **Federal:** Threatened **Critical Habitat:** No

**SNOWY PLOVER** *Charadrius alexandrinus*
**State:** Threatened **Federal:** N/A **Critical Habitat:** No

## Species In Need of Conservation (SINC)

**There are no SINC species with critical habitat in Gray county**

**Western Hognose Snake** *Heterodon nasicus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Black Tern** *Chlidonias niger*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Short-eared Owl** *Asio flammeus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Chihuahuan Raven** *Corvus cryptoleucus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Curve-billed Thrasher** *Toxostoma curvirostre*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Ferruginous Hawk** *Buteo regalis*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Golden Eagle** *Aquila chrysaetos*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Glossy Snake** *Arizona elegans*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Eastern Hognose Snake** *Heterodon platirhinos*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Bobolink** *Dolichonyx oryzivorus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Long-billed Curlew** *Numenius americanus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Eastern Whip-poor-will** *Antrostomas vociferus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**LONGNOSE SNAKE** *Rhinocheilus lecontei*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

Kansas Department of Wildlife and Parks

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# Meade County


## Threatened and Endangered (T&E) Species

### Critical Habitat Designated

**ARKANSAS RIVER SHINER** *Notropis girardi*
**State:** Endangered **Federal:** Threatened **Critical Habitat:** Yes

**LEAST TERN** *Sterna antillarum*
**State:** Endangered **Federal:** Endangered **Critical Habitat:** Yes

**SNOWY PLOVER** *Charadrius alexandrinus*
**State:** Threatened **Federal:** N/A **Critical Habitat:** Yes

**NEW MEXICO THREADSNAKE** *Rena dissecta*
**State:** Threatened **Federal:** N/A **Critical Habitat:** Yes

**PLAINS MINNOW** *Hybognathus placitus*
**State:** Threatened **Federal:** N/A **Critical Habitat:** Yes

### No Critical Habitat Designated

**CHECKERED GARTER SNAKE** *Thamnophis marcianus*
**State:** Threatened **Federal:** N/A **Critical Habitat:** No

**FLATHEAD CHUB** *Platygobio gracilis*
**State:** Threatened **Federal:** N/A **Critical Habitat:** No

**WHOOPING CRANE** *Grus americana*
**State:** Endangered **Federal:** Endangered **Critical Habitat:** No

**PIPING PLOVER** *Charadrius melodus*
**State:** Threatened **Federal:** Threatened **Critical Habitat:** No

**EASTERN SPOTTED SKUNK** *Spilogale putorius*
**State:** Threatened **Federal:** N/A **Critical Habitat:** No

## Species In Need of Conservation (SINC)

**ARKANSAS DARTER** *Etheostoma cragini*
**State:** SINC **Federal:** Candidate **Critical Habitat:** Yes

**Southern Bog Lemming** *Synaptomys cooperi*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Western Hognose Snake** *Heterodon nasicus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Black Tern** *Chlidonias niger*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Short-eared Owl** *Asio flammeus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Chihuahuan Raven** *Corvus cryptoleucus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Curve-billed Thrasher** *Toxostoma curvirostre*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Ferruginous Hawk** *Buteo regalis*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Golden Eagle** *Aquila chrysaetos*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Glossy Snake** *Arizona elegans*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Eastern Hognose Snake** *Heterodon platirhinos*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Black Rail** *Laterallus jamaicensis*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

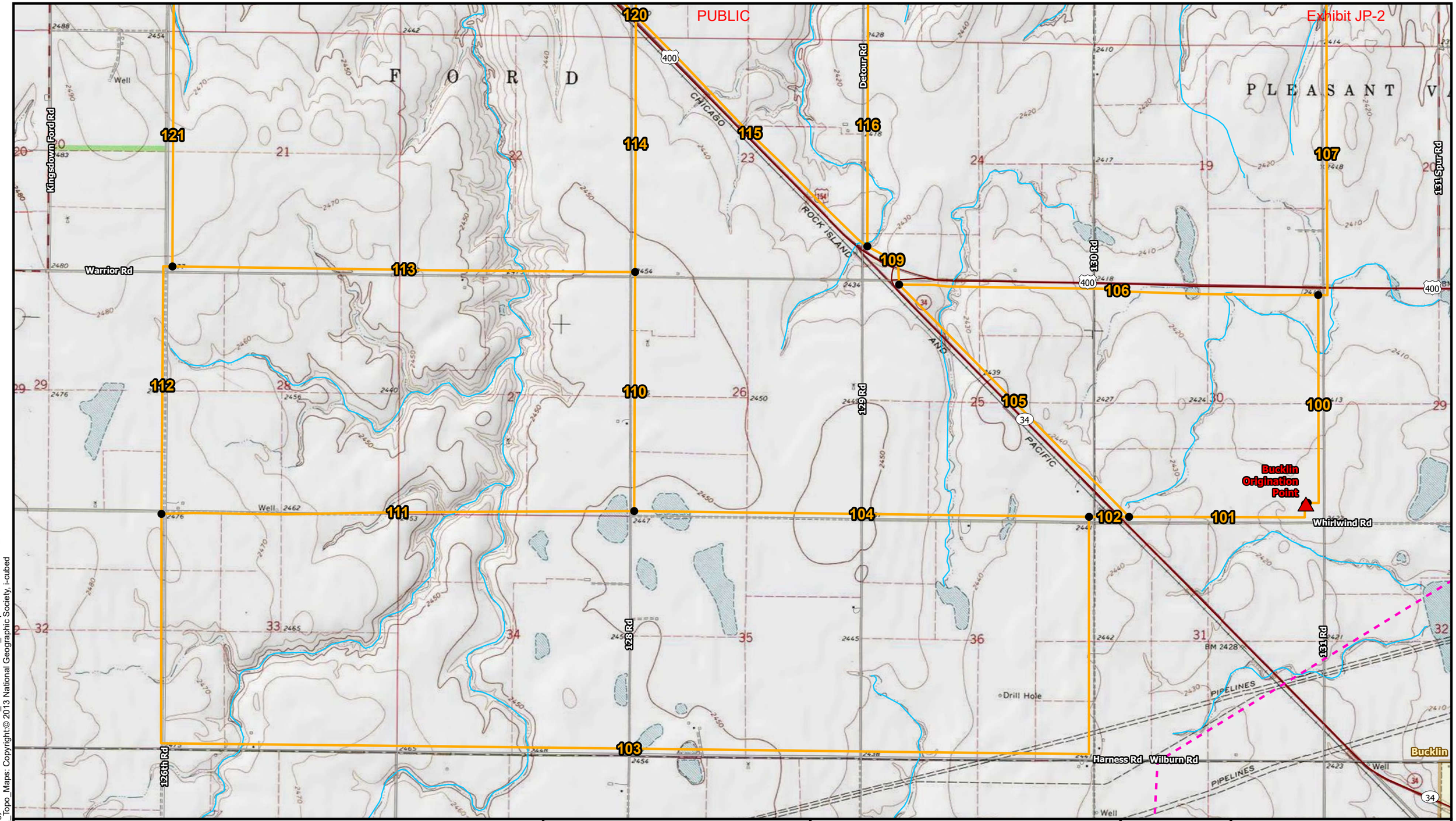
**Bobolink** *Dolichonyx oryzivorus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Long-billed Curlew** *Numenius americanus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

**Mountain Plover** *Charadrius montanus*
**State:** SINC **Federal:** N/A **Critical Habitat:** No

# APPENDIX B – DETAILED ROUTE MAPS

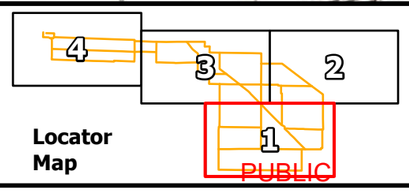
Bucklin Line




Project Endpoint
Refined Route Link Endpoint
Refined Route Link
Route Link Number
Study Area

Railroad
Highway
Local Road
NHD Stream/River
Municipal Boundary

**Existing Transmission Line**
115kV
345kV




NORTH
3,000 1,500 0 3,000
US Feet

BURNS McDONNELL

Figure B-1
Bucklin Line
Refined Alternate Route Network
Kansas AC Collector System
Grain Belt Express
Ford County
Page 1 of 4

Path: C:\Desktop\QI\Invenergy\GrainBeltAC\GrainBeltAC_Pro\GrainBeltAC_Pro.aprx catenbus 5/15/2024
Service Layer Credits: USA_Topo_Maps: Copyright© 2013 National Geographic Society, i-cubed

Source: Grain Belt Express, Esri, NHD, NTAD, HIFLD, Burns & McDonnell

Issued: 5/15/2024

Project Endpoint
Refined Route Link Endpoint
Refined Route Link
Route Link Number
Study Area

Railroad
Highway
Local Road
NHD Stream/River
Municipal Boundary

**Existing Transmission Line**
115kV
345kV

**Locator Map**



NORTH

3,000 1,500 0 3,000

US Feet

BURNS McDONNELL

Figure B-1
Bucklin Line
Refined Alternate Route Network
Kansas AC Collector System
Grain Belt Express
Ford County

Source: Grain Belt Express, Esri, NHD, NTAD, HIFLD, Burns & McDonnell

Issued: 5/15/2024