BURLINGTON-WRAY 230-KILOVOLT TRANSMISSION PROJECT

YUMA AND KIT CARSON COUNTIES, COLORADO

TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC.

ENVIRONMENTAL ASSESSMENT

October 2013

Prepared for:

U.S. Department of Agriculture
Rural Utilities Service

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ABBREVIATIONS AND ACRONYMS

AAA	Agricultural Adjustment Administration
AES	Alternative Evaluation Study
AM	Amplitude Modulated
APE	Area of Potential Effect
BMP	Best Management Practice
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulation
cfs	Cubic Feet Per Second
CPCN	Certificate of Public Convenience and Necessity
CPUC	Colorado Public Utilities Commission
CPW	Colorado Parks and Wildlife
CR	County Road
dBA	Decibels on the A-Weighted Scale
EA	Environmental Assessment
EO	Executive Order
EDNA	Elevation Derivatives for National Application
EMF	Electric and Magnetic Fields
EPM	Environmental Protection Measure
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FM	Frequency Modulated
FPPA	Farmland Protection Policy Act
GDA	Generation Development Area
GIS	Geographic Information System
GLO	General Land Office
GWh	Gigawatt Hour
HUC	Hydrologic Unit Code
Hz	Hertz
IO	Isolated Occurrence
IPaC	Information Planning and Conservation
kcmil	Thousand Circular Mils
kHz	Kilohertz
kV	Kilovolt
kV/m	Kilovolt Per Meter
MBTA	Migratory Bird Treaty Act
MCS	Macro Corridor Study
mG	Magnetic Field
MLRA	Major Land Resource Area
MVA	Mega Volt Amperes

MW	Megawatt
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NDIS	Natural Diversity Information System
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
NWP	Nationwide Permit
ROW	Right-of-Way
RUS	Rural Utilities Service
SHPO	State Historic Preservation Office
SWA	State Wildlife Area
SWMP	Stormwater Management Plan
TRC	TRC Environmental Corporation
Tri-State	Tri-State Generation and Transmission Association, Inc.
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
V/m	Volts/Meter
WECC	Western Electricity Coordinating Council
Western	Western Area Power Administration
WOUS	Waters of the United States

EXECUTIVE SUMMARY

This Environmental Assessment (EA) was prepared for a project proposed by Tri-State Generation and Transmission Association, Inc. (Tri-State) to construct a new 230-kilovolt (kV) single-circuit electric transmission line between the existing electrical substations in Wray and Burlington, Colorado. This project is referred to as the Burlington-Wray 230-kV Transmission Project (Project) and is located in Kit Carson and Yuma counties, Colorado. Tri-State is requesting financial assistance for the Project from the U.S. Department of Agriculture (USDA), Rural Utilities Service (RUS).

The existing Tri-State transmission system in northeastern Colorado, as depicted in Figure 1-1, consists of a 230-kV line between the Story (near Brush, Colorado) and Wray substations and a 230-kV line extending from the Burlington to Big Sandy to Midway (located between Colorado Springs and Pueblo, Colorado) substations. These two 230-kV transmission lines are linked together by a 115-kV line between Burlington and Wray substations. The lower voltage 115-kV line has a lower transmission capacity than the 230-kV lines and severely restricts Tri-State's ability to fully utilize its 230-kV transmission system to dispatch its existing generation resources and serve its native load. The purpose of the proposed Project is to alleviate transmission systems limitations in eastern Colorado, improve Tri-State's ability to dispatch generation resources in eastern Colorado, and to improve Tri-State's ability to deliver energy to native load customers. Specifically, the proposed Project would remedy the following existing system deficiencies:

1. The Burlington-Wray 115-kV transmission line limits Tri-States ability to dispatch existing Limon and Burlington generation resources.
2. Operating restrictions have been placed on the new 51-megawatt (MW) Kit Carson Windpower Project due to thermal limitations on the 115-kV transmission line.
3. Thermal limits on the 115-kV line restrict present and future deliverability of power from Tri-State generation resources (on the north side of the bottleneck) to serve Tri-State's electric load in southeastern Colorado (on the other side of the bottleneck).

Tri-State is prevented from fully and most efficiently dispatching its generation resources in this area because it could result in overloading the 115-kV Burlington-Wray transmission line. Therefore, those generation resources are not fully available during normal operations or in the event of an outage. The proposed Project is designed to remedy these deficiencies by increasing the thermal limits and transmission capability on the Burlington-Wray link, thus relieving the transmission bottleneck and thereby increasing Tri-State's system reliability and transmission capacity, and improving Tri-State's ability to deliver energy from existing generation resources to its Member Systems.

The Project would meet these needs by providing a 230-kV path between the Burlington and Wray substations that would remove the system restrictions imposed by the lower capacity 115-kV line and allow for full utilization of the existing 230-kV systems that exist on either side of the Project (see Figure 1-1). An added benefit to the Project is that it would additionally strengthen the power delivery infrastructure and thereby support potential renewable energy development projects in the region.

Serving as the lead federal agency, the RUS is responsible for compliance with the National Environmental Policy Act (NEPA). This EA will enable the RUS to evaluate the environmental effects of the proposed Project. This EA describes the public involvement process, including tribes, individuals, organizations, and agencies consulted in accordance with NEPA It also will enable the RUS to fulfill its

requirements under NEPA and other environmental laws and regulations. This EA includes a Project description, the purpose and need for the Project, system routing alternatives to the Project that were analyzed, and an analysis of the affected environment and potential effects to the natural and human environment. Finally, the EA outlines environmental protection measures that are to be built into the Project design to minimize and avoid impacts to the natural and built environment.

The proposed Project is expected to have no significant impacts to the natural or built environment. No significant impacts to natural resources, cultural resources, recreation, or land use are anticipated. The proposed Project is not expected to result in significant impacts to public health and safety or to the social values and economies of the communities within the Project Study Area. No significant cumulative impacts are expected to result from the Project.

1.0 INTRODUCTION

Tri-State Generation and Transmission Association, Inc. (Tri-State) is a not-for-profit wholesale electric power supplier owned by the 44 member cooperatives that it serves in a 200,000-square mile service area in Colorado, Nebraska, New Mexico, and Wyoming. Tri-State owns (wholly or jointly) or has maintenance responsibilities for more than 5,300 miles of transmission lines across Colorado, Nebraska, New Mexico, and Wyoming. Tri-State provides power for approximately 1.5 million consumers in its member systems through a combination of owned baseload and peaking generation facilities, purchased power, federal hydroelectric allocations, and renewable resources. Tri-State's member cooperative consumers include rural residences, farms, ranches, towns, suburban communities, commercial businesses, and industry. Tri-State's mission is to provide its members a reliable, cost-based supply of electricity while maintaining a sound financial position through effective use of human, capital, and physical resources in accordance with cooperative principles.

Tri-State is proposing to construct the Burlington-Wray 230-kV Transmission Project (Project). The Project consists of a new, single-circuit, 230-kilovolt (kV) transmission line extending from the existing Burlington Substation in Kit Carson County, Colorado, to the existing Wray Substation in Yuma County, Colorado. The general Project location and Tri-State's existing transmission and generation systems in northeastern Colorado are depicted in Figure 1-1. Figure 1-2 depicts the Project Study Area. This Environmental Assessment (EA) provides a description of the Project, the need for the Project, the system routing alternatives considered (including the Preferred Alternative and the No Action Alternative for the Project), alternatives considered but eliminated, an analysis of the affected environment and potential effects to the natural and human environment, mitigation and monitoring measures, and supporting materials.

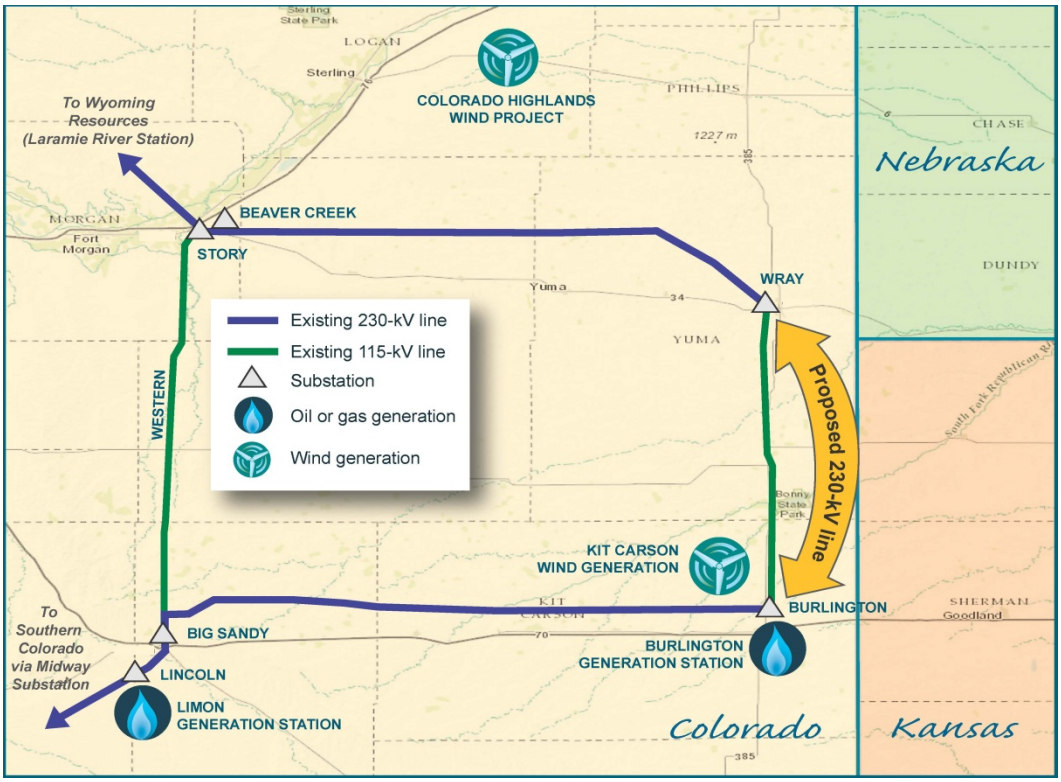

Figure 1-1: General Project Location

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Burlington-Wray 230-kV Transmission Project

Figure 1-2

Project/ Study Area

Legend

- Study Area
- Wray Substation (End Point)
- Burlington Substation (End Point)
- Interstate Highway
- U.S. Highway
- Major Roads
- Local Roads
- Railroads
- State Line
- County Line

1 inch = 19,800 feet

0 1 2 3

Miles

1 inch = 3.75 miles

Sources:

CDOT - Highways, Major and Local Roads Railroads, Municipal Limits
USGS - Elevation

Acronyms:

BNSF: Burlington Northern Santa Fe
CDOT: Colorado Department of Transportation
USGS: United States Geological Survey

TRI-STATE Generation and Transmission Association, Inc.
A Touchstone Energy® Cooperative

WRAY SUBSTATION
BURLINGTON SUBSTATION
COLORADO
KANSAS
NEBRASKA
YUMA COUNTY
KIT CARSON COUNTY
KYLE
BNSF
34
36
385
70
County Road T
County Road PP .5
County Road 32
County Road 30
County Road PP
County Road 26
County Road U
County Road CC
County Road KK
County Road 20
County Road Z
County Road AA
County Road LL
County Road RR
County Road 7
County Road V
County Road JJ
County Road 53
County Road HH
County Road GG
County Road 44
County Road 55
County Road 59
County Road BB
County Road 40

2.0 PURPOSE AND NEED FOR THE PROJECT

The overall purpose and need of the Proposed Project is to relieve a bottleneck in Tri-State's transmission system in northeastern Colorado that constrains Tri-State's ability to efficiently and reliably operate its transmission system and dispatch existing generation to serve its Member Systems.

The existing Tri-State transmission system in northeastern Colorado consists of a 230-kV line between the Story and Wray substations and a 230-kV line extending from Burlington to Big Sandy to Midway (located between Colorado Springs and Pueblo) substations. These two 230-kV transmission lines are linked by a 115-kV line between the Burlington and Wray substations, as depicted on Figure 1-1. The 115-kV line has a lower thermal rating and less transmission capacity than the 230-kV lines. That means the 115-kV line transmits less energy than the 230-kV lines, and therefore severely restricts Tri-State's ability to fully utilize its 230-kV transmission system to dispatch its existing generation resources (on one side of the bottleneck) for service to Member Systems on the other side of the bottleneck.

In 2010, Tri-State completed a transmission study and determined that there are three specific system deficiencies in the northeast Colorado area which are directly attributable to the transmission bottleneck (Tri-State 2010). Two of the deficiencies are related to current operating restrictions on generation resources due to thermal limitations on the 115-kV transmission line. The third deficiency is related to the transmission path constraint imposed by the 115-kV line.

These deficiencies are as follows and discussed in detail in sections 2.1–2.3:

1. The Burlington-Wray 115-kV transmission line limits Tri-States ability to dispatch existing Limon and Burlington generation resources as shown on Figure 1-1.
2. Operating restrictions have been placed on the new 51-megawatt (MW) Kit Carson Windpower Project limit due to thermal limitations on the 115-kV transmission line.
3. Thermal limits on the 115-kV line restrict present and future deliverability of power from Tri-State generation resources (on the north side of the bottleneck) to serve Tri-State's electric load in southeastern Colorado (on the other side of the bottleneck).

Tri-State is prevented from fully and most efficiently dispatching its generation resources in this area because it could result in overloading the 115-kV Burlington-Wray transmission line. Therefore, those generation resources are not fully available during normal operations or in the event of an outage. The proposed Project is designed to remedy these deficiencies by increasing the thermal limits and transmission capability on the Burlington-Wray link, thus relieving the transmission bottleneck and thereby increasing Tri-State's system reliability and transmission capacity, and improving Tri-State's ability to deliver energy from existing generation resources to its Member Systems. In doing so, Tri-State must comply with Federal reliability and tariff requirements, discussed below.

The Project would accomplish Tri-State's objectives by providing a 230-kV path between the Burlington and Wray substations to link and fully utilize the 230-kV system that exists on both sides of the existing bottleneck (see Figure 1-1). A 230-kV link between the Burlington and Wray substations would increase thermal limits on the transmission line and relieve the operating restrictions on Tri-State's generation resources in the area. The 230-kV line would expand Tri-State's transmission path capabilities to more efficiently dispatch generation resources to serve load during normal operations and in event of a system

outage. An added benefit of the project is that it would further strengthen the power delivery infrastructure and thereby support potential renewable energy generation that may develop in the region.

Two of Tri-State's Member Systems are located in the vicinity of the Project: K.C. Electric Association, Inc. and Y-W Electric Association, Inc. K.C. Electric Association serves Kit Carson and Cheyenne counties and a portion of Lincoln County. Y-W Electric Association serves members in Yuma and Washington counties. While the Project geographically affects only these two members, it has far-reaching benefits for other Member Systems as well, and would increase load-serving capabilities across the Tri-State system.

Further detail in support of the Project's purpose and need is provided below, including background on Tri-State's system, reliability and tariff requirements that must be met, the need to relieve operating restrictions, the need to relieve constraints on transmission capacity, and additional Project benefits.

2.1 TRI-STATE'S SYSTEM

Tri-State serves 44 Member Systems and operates its generation and transmission system across four Rocky Mountain region states. This project addresses Tri-State's facilities in the northeast portion of its system. Tri-State's generation and transmission system in this area is shown in Figure 1-1. Tri-State has ownership, partial ownership, or power purchasing agreements with five generation resources in this area:

1. Two oil-fired combustion turbine units (120–140-MW) at the Burlington Generation Station located near Burlington, Colorado;
2. Two gas-fired combustion turbine units (100–120-MW) at the Limon Generation Station near Limon, Colorado;
3. The Kit Carson Wind Power Project (51-MW) located near the new Landsman Creek Substation west of Burlington (51-MW);
4. The Colorado Highlands Wind Project (67-MW); near Fleming, Colorado; and
5. The three unit coal-fired unit Laramie River Generating Station (410-MW Tri-State share) near Wheatland, Wyoming.

While the Colorado Highlands Wind Project and Laramie River Generating Station contribute energy to the area, their generation dispatch is not limited by the existing 115-kV path between Burlington and Wray. The other three Network Resources listed above are limited by the transmission constraint.

Among other things, these generation resources contribute to serving Tri-State's member loads in southeastern Colorado. However, to accomplish this, Tri-State must provide sufficient transmission capacity from the generation resources to the load they serve. Sufficient transmission capacity includes not only the capacity to serve loads on a day-to-day basis, but also to maintain service during outages, such as those required for planned maintenance and due those due to severe weather, without exceeding the thermal limits of the transmission system and causing additional overloads and outages.

The proposed Project would not require new generation resources, but it would relieve constraints on existing resources and thereby result in improved availability of those resources and allow an increase in generation from existing renewable or non-renewable generation facilities. Existing generation would be used to supply the target loads via the proposed transmission line once the bottleneck is relieved. Tri-State does not anticipate any substantive changes in the way it operates its generation resources as a result of

the Project, other than more efficient dispatch of generation resources that can be accommodated by the higher-rated 230-kV transmission line. The regional electric system that the Project would connect with is capable of supporting the new transmission line without additional generation resources.

2.2 RELIABILITY REQUIREMENTS AND OBJECTIVES

Tri-State and other operators of the nation's bulk power system must comply with mandatory reliability requirements established by the Federal Energy Regulatory Commission (FERC) and North American Electric Reliability Corporation (NERC), some of which are delegated to the Western Electricity Coordinating Council (WECC), which is the regional entity where Tri-State's facilities are located. NERC and WECC implement various mandatory reliability standards relating to bulk system planning, operations, and maintenance, with the potential for fines to reach up to $1 million per day for serious violations that could impact the integrity of the bulk power system.

Tri-State plans, designs, and operates its system to comply with all NERC and WECC reliability criteria. However, the constraints of the existing system in eastern Colorado require that operating restrictions must be placed on certain facilities and under certain circumstances to avoid violations of mandatory reliability criteria and to provide reliable electric service to its Member Systems.

Under NERC's electric reliability criteria, an outage of a single transmission element is called an "N-1" contingency. Such a contingency may occur when a link in the transmission system is out of service. NERC's system performance criteria under an N-1 contingency require operators to maintain a stable system with line loadings and voltage limits within their applicable ratings, avoiding loss of load or curtailment of firm transfers of power, and avoiding cascading outages.[1]

Presently, if a single outage event (an N-1 contingency) occurs along the 230-kV Burlington to Big Sandy to Midway transmission path, the existing Burlington-Wray 115-kV line can experience overloads that can cause a disruption in transmission service if the outage event is not quickly resolved. In addition, an outage event along the 230-kV line between Lincoln and Midway substations can cause overloads on the existing Big Sandy to Beaver Creek 115-kV line that is owned by Western Area Power Administration (Western). Therefore, Tri-State has implemented the operating restrictions described above and discussed further below in order to avoid overloads. Under these circumstances, relief from the operating restrictions will require, at a minimum, transmission system capabilities that meet or exceed NERC reliability criteria, including for N-1 contingencies.

It is important to understand that NERC and WECC establish minimum reliability criteria. Tri-State's objectives for this Project, however, are not driven solely by compliance with these minimum criteria. Tri-State is obligated to efficiently provide reliable, cost-based wholesale power to its 44 Member Systems, who in turn provide retail electric service to their end-use customers. This obligation is set forth in Tri-State's Board policies and in its Wholesale Electric Service Contracts with its Member Systems.

The proposed Project will enhance Tri-State's capabilities to provide reliable electric service to its Member Systems in Colorado in a variety of ways. Completing a 230-kV path in northeast Colorado will allow for the possibility of serving loads bi-directionally along this path. The addition of this line will also assist Tri-State in its ability to conduct maintenance on the existing Burlington-Wray 115-kV line,

[1] NERC's reliability criteria are available at: http://www.nerc.com/pa/stand/Pages/ReliabilityStandardsUnitedStates.aspx?jurisdiction=United States.

thereby ensuring Tri-State's operations and maintenance groups have the flexibility to schedule outages when required, without interrupting Tri-State load-serving path to southeastern Colorado or limiting Tri-State's generation resources in the area. This increases the overall safety and reliability of operating the electric transmission system.

2.2.1 TARIFF AND NETWORK REQUIREMENTS

FERC's Order 890 requires transmission system providers to offer service pursuant to an Open Access Transmission Tariff (OATT), under which providers may designate Network Resources and apply for and receive Network Integration Transmission Service.[2] This allows generator operators to integrate, economically dispatch, and regulate current and planned Network Resources in a compatible manner with resources and loads within the transmission system.

Provision of Network Integration Transmission Service pursuant to an OATT obligates the transmission provider to plan, construct, operate, and maintain its transmission system in accordance with good utility practice, and endeavor to construct and place into service sufficient transfer capability to deliver the Network Customer's Network Resources to serve its Network Load.

Tri-State's five generation resources of concern in this Project are Network Resources, which means they are designated to serve Tri-State's Network (end use) Customers under Tri-State's Network Integration Transmission Service Tariff. Accordingly, Tri-State must endeavor to provide sufficient transfer capability (i.e., transmission facilities and capacity) to deliver that power to end users. Currently, operating restrictions apply due to the transmission constraints imposed by the Burlington-Wray 115-kV bottleneck. As a result, Tri-State proposes the transmission upgrades in this Project to help it meet its Network obligations under its OATT.

2.2.2 OPERATING RESTRICTIONS

To prevent excessive flow on the 115-kV system, operating procedures are currently in place to limit the total amount of Network Resource generation in the area. In particular, due to the existing Burlington-Wray transmission system bottleneck, simultaneous operation of the Limon and Burlington generation units is limited. In addition, the Kit Carson Windpower Project and Burlington Generation Station are currently subject to a Restricted Operating Procedure. These operating restrictions limit the availability of these generation resources and prevent Tri-State from utilizing their full output in order to avoid potential thermal overloads on the Burlington-Wray 115-kV line.

Combined, these operating restrictions and procedures can limit Tri-State's ability to fully utilize existing generating resources at the time when they are most needed - during potential outages. Tri-State's studies showed the most critical single-contingency outage is a loss of the existing Lincoln to Midway 230-kV line. Under this outage, and during light loading conditions, the existing generation resources at Limon and Burlington cannot be simultaneously operated at their full output without reliability criteria violations (Tri-State, 2010). Therefore, those resources may not always be available to provide reserve power during critical generation unit outages. This is an important function, and portions of the Limon and Burlington resources are used to meet Tri-State's reserve obligations. The existing Burlington generators have the

[2] FERC's Order 890 is available at: http://www.ferc.gov/legal/maj-ord-reg.asp. Tri-State's OATT is available at: http://www.oasis.oati.com/tsgt/index.html.

added operating advantage of quick start capability, that is, they can be called upon, made available, and dispatched much faster than typical combustion turbine generation in the event of an outage.

By adding a 230-kV transmission path that is electrically parallel to the existing Burlington-Wray 115-kV line, the Project will allow existing generation resources to be dispatched during outages of the Burlington to Big Sandy to Midway or the Lincoln to Midway lines without overloading the existing Burlington-Wray 115-kV line.

In addition, relieving operating restrictions would allow Tri-State to more fully utilize wind generation from the Kit Carson Windpower Project. The Kit Carson wind project is currently subject to operating restrictions until such time as transmission upgrades can be made. As a Network Resource, the wind project must meet reliability criteria which are required under Tri-State's OATT, described above. Therefore, the transmission upgrade must be accomplished so that the Kit Carson wind project can be operated without the current operating restrictions, meet all reliability criteria, and meet Tri-State's obligations to its Network Customers under its OATT.

2.2.3 TRANSMISSION CAPACITY

Tri-State needs additional transmission capacity on its southbound path from Story, through North Yuma, Wray, Burlington, and Big Sandy to Midway substations to deliver power into the eastern and southern Colorado areas from its existing generation resources. Some of Tri-State's most economical base-load generation available to serve native loads in southeastern Colorado is located in western Colorado and Wyoming. The existing Burlington to Wray 115-kV line constitutes a portion of a primary contractual transmission path utilized by Tri-State to serve its native load in eastern and southern Colorado from these resources, and that path is limited by the current thermal capacity of the 115-kV line.

Tri-State's native load obligation in eastern and southern Colorado includes service to K.C. Electric Association, Mountain View Electric Association, San Isabel Electric Association, San Luis Valley Rural Electric Cooperative, Southeast Colorado Power Association, and Gunnison County Electric Association. In addition to the limited 115-kV transmission path between the Burlington and Wray substations, Tri-State purchases transmission service from Western and Public Service Company of Colorado for delivery to Tri-State's native loads in southern and eastern Colorado.

Similarly, the Burlington, Limon, and Kit Carson Windpower resources could be used to serve loads from south to north via this transmission path. However, under current circumstances, that load-serving ability is constrained by the thermal capacity of the existing 115-kV line.

Through the 10-year planning horizon, Tri-State projects a shortfall of 159-MW of transmission capacity with the existing system, i.e., not enough capacity to serve native load on the south and eastern Colorado area for the 10-year planning horizon. As a consequence, without the Project, Tri-State would be unable to supply its native load with existing transmission resources and would be forced to operate under the existing transmission constraints and purchase transmission from other transmission providers, which may or may not be available when needed.

2.3 ADDITIONAL PROJECT BENEFITS

An added benefit is that the Project would provide additional transmission capacity for future renewable energy projects. While Tri-State has not identified specific renewable development projects that are

reasonably certain to be built in this area, potential new generation resources would require additional transmission capacity. Without the Project, there is presently no transmission capacity available for power delivery from potential renewable generation resources in the region.

The Report of the Colorado Senate Bill 07-091 Renewable Resource Generation Development Areas Task Force (2007) identified Generation Development Areas (GDAs) that have significant wind generation potential. The proposed Project would add transmission capacity in areas designated as GDAs 4 and 5 (on a GDA scale of 2-7; 7 having the highest wind speeds and therefore energy potential), near Wray and Burlington, as depicted in Figure 2-1.

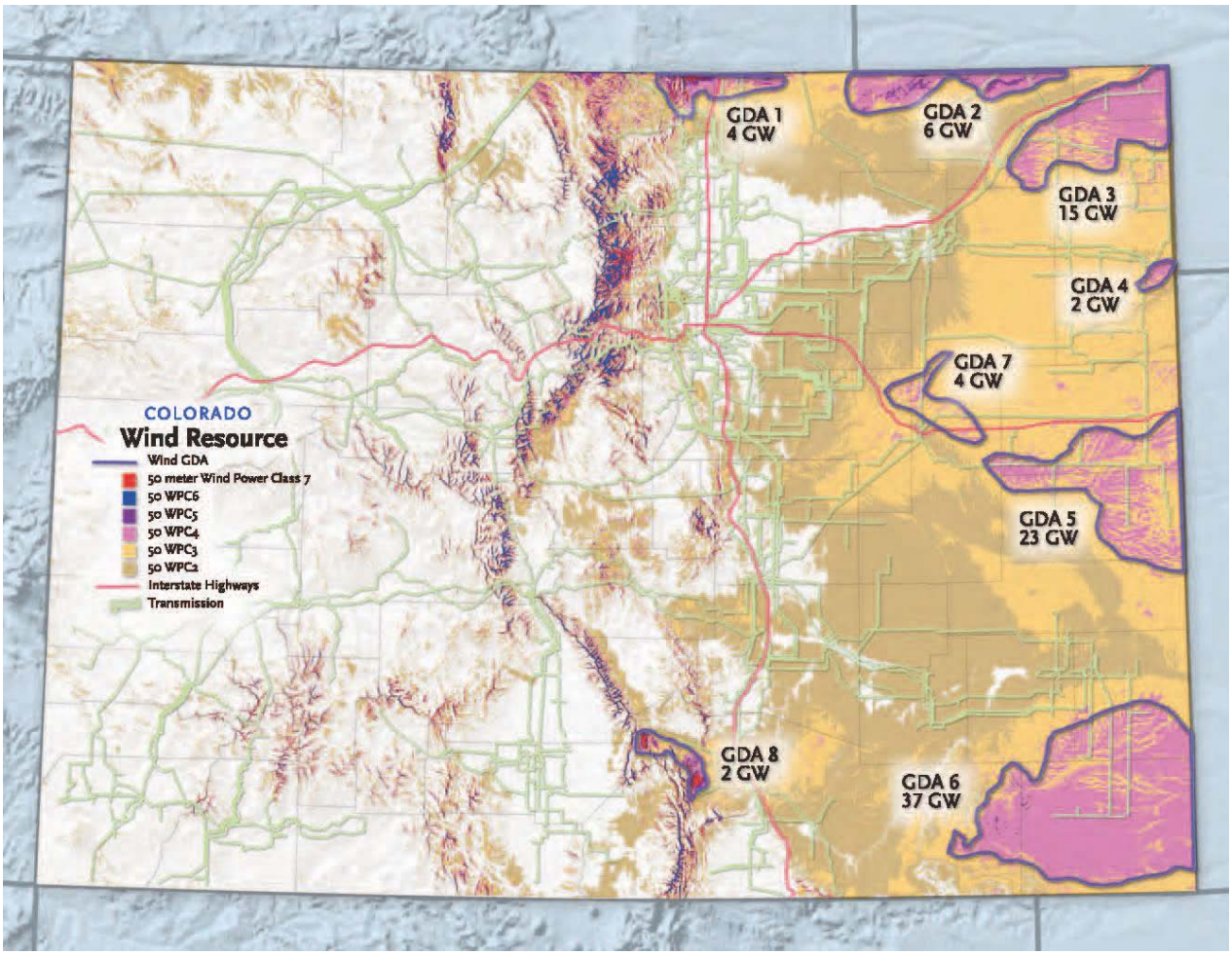

Figure 2-1: SB07-091 Wind Generation Development Areas

Source: Figure from "Connecting Colorado's Renewable Resources to the Markets." Report of the Colorado Senate Bill 07-091 Renewable Resource Generation Development Areas Task Force.

Tri-State's Kit Carson Windpower Project has contributed to the ability of Tri-State (and its Members Systems) to meet the renewable portfolio standard that would reach 10 percent by the year 2020. Even though Tri-State has not identified specific wind or other generation projects that are reasonably certain to be developed in this area, the Project will strengthen an important link in the transmission system and improve renewable generation injection capability, thereby contributing to Tri-State's and Colorado's attainment of renewable energy goals.

The Project would also allow Tri-State to own and control the contractual transmission path to serve its Member Systems' load, rather than depend upon transmission purchased from and provided over lines owned and controlled by others. The Project therefore contributes to achieving Tri-State's long-term objective of owning and controlling the resources with which it fulfills its obligations to serve its Member Systems.

Finally, the Project provides additional system-wide benefits in allowing Tri-State greater flexibility to operate its system more reliably, efficiently, and cost-effectively.

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3.0 ALTERNATIVES AND FEDERAL DECISION TO BE MADE

Tri-State has requested financial assistance from the Rural Utilities Service (RUS) for the proposed construction of the Project. The proposed federal action related to Tri-State's proposed Project would be RUS' granting of financial assistance for the construction of the Project. The RUS has been requested to make a decision to implement the proposed Project and grant the financial assistance for its construction based on the environmental analysis outlined in this EA.

3.1 ALTERNATIVES DEVELOPMENT PROCESS

A collaborative and comprehensive process was used to develop and consider a wide range of alternatives for the Project. The alternatives development process began with the development of an Alternatives Evaluation Study (AES), which assessed different ways to meet electrical system needs.

3.1.1 Alternatives Considered but Eliminated

The AES was completed to assess different solutions to meet electrical system needs. Tri-State reviewed the following alternatives for meeting the establishing system needs for new projects:

- Adding generation in lieu of a transmission solution
- Managing demand (Energy Efficiency and Demand Side Management Alternatives)
- Additional Transmission Capacity Alternatives

A brief summary of the alternatives presented in the AES are provided below. For additional information, please see the AES, which can be found on the RUS website (http://www.rurdev.usda.gov/UWP-EA-Burlington-Wray.html). The AES established that the best way to meet electrical system needs is to build a new 230-kV transmission line between the existing Burlington Substation in Kit Carson County, Colorado, and the existing Wray Substation in Yuma County, Colorado.

3.1.2 Additional Generation Alternative

Additional generation was examined as a possible alternative to the Project in an effort to consider all potential solutions. However, the nature of the Project's purpose and need is of transmission constraint, not lack of generation. Additional generation would not alleviate the operating constraints that already exist upon the generation resources in the area and that limit Tri-States ability to dispatch existing generation. Adding additional generation to the region would only serve to compound the current transmission deficiencies in the Project Study Area and would fail to address the Project's purpose and need.

3.1.3 Energy Efficiency and Demand Side Management Alternatives

Energy efficiency and demand response are both measures/alternatives aimed at reducing electrical loads. Since 1985, Tri-State (through its member cooperatives to end customers) has been offering financial assistance toward the purchase of high efficiency motors and pumps to reduce electrical demand to support agricultural operations (which is the primary load served in the project area). Tri-State's Energy Efficiency Credits (EEC) program offers cash rebates to encourage and reward wise use of energy through energy-efficient purchases and practices. Additional efficiency measures and programs have been offered by Tri-State since early 2009, with a number of demand response programs added in 2013.

Tri-State contracted with the engineering consulting firms Nexant and the Cadmus Group in 2010 to perform an Energy Efficiency and Demand Response Potential Study across its entire system (Nexant 2010). This analysis, the Nexant/Cadmus study, examined technical, economic, and practically achievable energy and demand reduction potential for Tri-State across the collective territories of its 44 member distribution systems. The Nexant/Cadmus study estimated efficiency and demand reduction potential by customer class as well as by geographic region, including Eastern Colorado.

In 2010, the Nexant/Cadmus study estimated Tri-State could practically achieve—in a maximum case—about 200 (gigawatt hour) GWh of efficiency savings, along with approximately 37 MW of demand savings by 2020. Nexant/Cadmus attributed 8 percent of these estimates to be achievable in Eastern Colorado, and about 33 percent to Front Range Colorado, for a total of 41 percent combined. Though these regions do not exactly equate to the region at issue here from a transmission planning perspective, even if Tri-State achieved the combined full 41 percent energy and demand savings of 82 GWh and 15 MW projected by Nexant/Cadmus by 2020, these measures would do little to address the conditions driving Tri-State to augment Burlington-Wray, namely:

1. **Generation constraints**. Tri-State had to curtail its Burlington generating unit by more than 60-MW, which is over 50 percent of this unit's rated capacity, for periods totaling about 3 full months in 2013 in order to accommodate transmission maintenance outages. With the proposed Burlington-Wray project in place, these curtailments would not be necessary.
2. **Load serving obligations**. Over the ten-year planning horizon, Tri-State projects a 159-MW shortfall of transmission capacity to serve its native load obligation in eastern and southern Colorado, a figure which outstrips Nexant/Cadmus' maximum achievable estimates for Eastern + Front Range Colorado by more than tenfold.
3. **Access to new renewable generation**. Again, while Tri-State has not yet determined where new renewable capacity will be located, it is likely Tri-State will look to wind to help satisfy the increased Renewable Energy Standard it is now subject to under Colorado Senate Bill 252. Because it is known that the best wind resources in this region are in southern Wyoming and Eastern Colorado, there is some likelihood that a new Burlington-Wray line could be put into service by Tri-State for interconnection to new renewable generation.

In addition, the primary efficiency and demand response opportunity in Eastern Colorado is irrigation and limitation on availability through the summer months would preclude its effective use for the referenced generation limits. In summary, even aggressive programs are not effective in eliminating or controlling the reliability issues. The Burlington-Wray Project is being proposed to address transmission constraints and operating restrictions of Tri-State Resources. Review of this Demand Side Management study determined that energy efficiency or demand side management alone would not have a large enough impact to reduce the transmission constraint in the area and also would not be able to accommodate the forecasted member loads across the10-year planning horizon, including the interconnection of future renewable energy development.

3.1.4 Additional Transmission Capacity Alternatives

The existing 115-kV transmission line connects the 230-kV system from Wray to the 230-kV system at Burlington, a delivery route that serves the Tri-State member load in southeastern and southern Colorado. Because of the voltage and size difference, the 115-kV line is the most limiting element of the transmission path. This is true with respect to all of the constraints on reliability, dispatch capability for

load service, as well as potential generation injection. Transmission line construction connecting to sources other than Burlington and Wray were considered but not studied as part of this effort since the transmission limitation being addressed is a path limitation and not a local load-serving limitation. The immediate system need is to increase the capacity of the constrained path and resolve the existing system deficiencies previously described. While some of the transmission deficiencies identified could individually be met with other transmission alternatives, including transmission connection to other stations, these alternatives did not resolve all of the identified deficiencies with a common solution.

Tri-State used eight evaluation criteria to identify transmission alternatives between Burlington and Wray that would meet the entire purpose and need for the project. These are detailed in the A.E.S as previously discussed. The first three of these criteria apply to deficiencies in the northeastern Colorado area and were considered to be the primary criteria in evaluating the alternatives. These three criteria are detailed below.

1. Ability to eliminate operating restrictions on Tri-State's existing Limon and Burlington Generation Facilities, without considering the new Kit Carson Windpower Project generation.
2. Ability to eliminate operating restrictions on Tri-State's Limon, Burlington, and Kit Carson Windpower generation facilities.
3. Ability to eliminate Tri-State's load serving constraints for southern and eastern Colorado as identified in the Load Serving Analysis in this study, using a 10-year forecast period.

Three alternatives were analyzed to determine their suitability in resolving the system deficiencies:

1. Existing Line and Right-of-Way Alternatives
   a. Thermal upgrade of the existing Burlington-Wray 115-kV line.
   b. Re-conductor the existing Burlington-Wray 115-kV line.
   c. Re-build the existing Burlington-Wray 115-kV line.

System planning evaluated three alternatives associated with upgrading the existing Burlington-Wray 115-kV transmission line. Potential upgrades included three alternatives: a rebuild, re-conductoring, and thermal upgrade.

The Big Sandy to Beaver Creek 115-kV line, which is owned and operated by Western, line runs directly north from the Big Sandy Substation approximately 67 miles to the Beaver Creek Substation located near Brush, Colorado. A power flow analysis of the northeastern Colorado system found that under certain system conditions the existing Big Sandy to Beaver Creek 115-kV line experiences unacceptable overload conditions. For example, an outage event between Lincoln and Midway can cause overloads on both the Big Sandy to Beaver Creek 115-kV line and the Burlington to Wray 115-kV line. The lighter the load in eastern Colorado (which occurs most days in the early morning hours, and between the fall and early summer time period when there is no summer irrigation load), and the greater the generation injection in the Burlington area, then the greater the overload potential is on the Big Sandy to Beaver Creek 115-kV line. This overload cannot be mitigated with a rebuild or re-conductoring of the Burlington-Wray 115-kV line, but can be entirely mitigated with the construction of a new 230-kV transmission line circuit from Burlington-Wray.

Considering this fundamental northeastern Colorado 115-kV system overload problem, this first set of transmission alternatives (1.a through 1.c) that consider the re-use of the existing 115-kV line and associated ROW were eliminated from further analysis.

The upgrade or re-build of the existing Burlington-Wray 115-kV line also presents construction and operation problems since rebuilding the line would be very difficult during certain times of the year since Bonny Creek, South Fork, Idalia, and Vernon Tap substations would need to be served radially (or from only one source) for extended periods of time during construction. When a substation is served radially and that single transmission source is lost, then the customers served from that substation are susceptible to outage conditions that could be lengthy. Furthermore, if the line is taken out of service for construction, it would interrupt the primary contractual transmission path utilized by Tri-State to serve its member load in eastern Colorado.

2. New Line Using Existing Right-of-Way Alternatives (including removal of existing Burlington-Wray 115-kV line)

a. New Burlington-Wray 230-kV single-circuit line, operated at 115- or 230-kV.
b. New Burlington-Wray 115/230-kV double-circuit line.

Alternative 2.a was eliminated from further consideration due to a number of factors. First, to allow for 230-kV operation, several distribution substations tapping the existing line (Bonny Creek, South Fork, Idalia, and Vernon Tap substations) would require major construction and significant cost to convert them from 115-kV to 230-kV. Second, the same construction and operation problems that exist in Alternatives 1.a through 1.c would occur in Alternative 2.a, as related to radial service to the substations and associated potential risk for outages mentioned above, and disruption of the primary contractual path that serves member load. Finally, the 115-kV operation option of Alternative 2.a also would not address the fundamental south-to-north overloading issue on the combined Big Sandy to Beaver Creek and Burlington to Wray 115-kV lines.

While alternative 2.b would meet the purpose and need for the Project, the same problems associated with construction and operation as in Alternative 2.a, together with increased costs, eliminated it from further analysis. The cost estimate for Alternative 2.b is significantly more than the expected cost of constructing the proposed single-circuit 230-kV line in a new ROW which would provide an electrically equivalent option under normal system operating conditions. Finally, Alternative 2.b would also introduce an outage contingency in which essentially both the 115-kV and the 230-kV transmission lines could be simultaneously out of service, because both transmission lines make use of a common tower. For these reasons, no alternatives utilizing the existing ROW were considered further.

3. New Line Using New Right-of-Way Alternatives (with Existing Burlington-Wray 115-kV Line Staying In Service)

a. New Burlington-Wray 115-kV single-circuit line.
b. New Burlington-Wray 230-kV double-circuit line, with either one circuit or two circuits installed.
c. New Burlington-Wray 345-kV single- or double-circuit line, considering 230-kV or 345-kV operation and whether one or two circuits are installed on the double-circuit option.

A new 115-kV line (Alternative 3.a) would eliminate the operating restrictions on Tri-State's Limon, Burlington, and Kit Carson Windpower generation facilities. However, it would not eliminate Tri-State load serving constraints for southern and eastern Colorado. Additional transformer capacity would be required at both Burlington and Wray substations to be able to utilize the combined capacity provided by a new 115-kV line and the existing 115-kV line. This would require the installation of new transformers and other substation equipment and, once completed, the combined transmission path with the new line

and the existing line would still create a system with less capacity than that of the proposed Project. Finally, this alternative was not further considered because the 115-kV line would not provide as much load serving support or allow as much additional generation injection as the proposed project.

The remaining Alternatives 3.b and 3.c consider double-circuit 230-kV construction alternatives and 345-kV construction alternatives. Similar to the new single-circuit 230-kV line, these alternatives would each be expected to alleviate existing operating restrictions of the Burlington-Wray 115-kV transmission line, improve Tri-States ability to dispatch existing Limon and Burlington generation resources, resolve existing operating restrictions related to the new 51-MW Kit Carson Windpower Project and its designation and utilization as a Tri-State Network Resource, and improve the present and future deliverability of Tri-State resources to Tri-State's native electric load. However, when evaluating compatibility with the existing transmission system in the area, such as the lack of 345-kV facilities in service today, these alternatives are shown to have deficiencies and would require substantial upgrades, such as the upgrade of substations to the 345-kV voltage. As the construction of a new single-circuit 230-kV line has been shown to address Tri-State's purpose and need, Alternatives 3.b and 3.c were eliminated from further consideration as they would reach beyond the purpose and need for the Project.

For further reference, Tri-State has performed complete power flow studies that evaluate the proposed new Burlington-Wray 230-kV transmission line. The study scope, criteria, method, and results are discussed in more detail in the AES, which can be found on the RUS project website.

3.2 ALTERNATIVES CARRIED FORWARD FOR ANALYSIS

The AES identified that a new Burlington-Wray single-circuit 230-kV line is the best and preferred transmission alternative in order to effectively meet the Tri-State's purpose and need. This alternative would:

1. Remove the reliability operating limits that affect existing Tri-State generation in the area;
2. Provide a load-serving path consistent with the long term potential capacity of the existing transmission path in the area and Tri-State's forecasted need for increased use of that path;
3. Facilitate additional generation development in this part of Colorado to access potentially excellent wind energy resources, as illustrated by the Kit Carson Windpower Project; and
4. Anticipate long term plans in the region by providing a 230-kV electrical path between Burlington and Wray and removing the reliability and capacity constraint of the existing 115-kV line.

3.3 TRANSMISSION LINE ROUTING PROCESS

Once the best project to meet Tri-State's purpose and need had been identified, transmission line corridors and later routes were identified and evaluated by collecting resource data and public input. A more detailed explanation of the routing selection process is included below.

To identify a transmission alignment that would minimize impacts to the natural and built environment, Tri-State followed eight distinct steps:

Marco-Corridor Study:

1. Definition of the Study Area
2. Data Collection and Evaluation
3. Opportunities and Constraints Analysis
4. Preliminary Alternative Corridor Identification
5. Public involvement

Route Refinement:

6. Route Identification
7. Comparative Analysis
8. Field Reconnaissance
9. Public involvement

Public outreach and involvement were critical throughout the routing process and is discussed in greater detail in Section 4.

3.3.1 Macro-Corridor Study

RUS guidance regarding NEPA implementation requires that a Macro-Corridor Study (MCS) is prepared and accepted by RUS prior to the start of the official NEPA process. The full MCS report can be found on the RUS website (http://www.rurdev.usda.gov/UWP-EA-Burlington-Wray.html). The first step of the MCS involved identifying the geographic area in which the new transmission line would be located. The extent of a study area is determined primarily by the location of the endpoints of the Project (electrical system requirements that are needed to meet the project's purpose and need) and a reasonable area around those endpoints within which to identify feasible transmission line corridors.

The Project's Study Area (Figure 1-2) was delineated based on the proposed interconnections at the existing Burlington and Wray substations, which are owned and operated by Tri- State. The boundaries of the Study Area are influenced by the location of the existing substations, the engineering constraints for a line to enter or exit the substations, other existing ROW (i.e., associated with roads, highways, pipelines, existing or planned transmission lines, canals, etc.), and existing political and geographic boundaries. The objective in defining a Study Area is to (1) focus the areas for corridor identification to those that would be feasible for construction of a transmission line relative to the length of line and cost of construction and (2) identify an area large enough to provide the opportunity to identify alternative corridors that avoid areas not suitable for the construction and operation of a transmission line (constraints) and minimize potential impacts to the natural and human environment.

The Project Study Area is generally defined as an area 18 miles in width (east to west) between the Burlington and Wray substations in portions of Kit Carson and Yuma counties.

The second step of the MCS involved collecting resource data within the Study Area from relevant management agencies and state and local governments. No new field data were collected as part of the MCS process. The resource data were mapped in geographic information system (GIS) format and combined with aerial photography of the Study Area. Resource data obtained from municipalities, counties, state and federal agencies, and utilities were used to prepare GIS-based resource maps in the following categories:

- Land Cover and Surface Water
- Land Use and Jurisdiction
- Existing Linear Transportation and Utility Corridors
- Cultural and Historic Resources
- Biological Resources

The next step in the MCS process was to identify various land uses, resource types, jurisdictions, etc. as an opportunity (suitable area), an avoidance area, or an exclusion area. For this Project, opportunities were identified as existing linear facilities or physical features providing suitable routing possibilities. The opportunities were further categorized as greater opportunity (such as existing linear corridors), opportunity (such as compatible land uses), and lower opportunity to reflect the specific feature in the specific geographic setting (areas where specific constraints are absent, such as cropland). Opportunities for transmission routing in the Study Area include those in proximity to existing transmission lines, other utility corridors, transportation corridors, compatible land uses, and other linear features such as property lines.

Constraints are resources, features, or land uses that present unfavorable attributes for locating and constructing a transmission line. Constraints include factors that would negatively affect site access, affect design or construction, or add additional licensing/permitting requirements. Routing constraints may also include items such as habitable structures, hospitals, schools, and sensitive areas such as wetlands, protected species' habitats, and cultural resources.

As described in the MCS, once resource data had been collected, a GIS model was created to illustrate those areas within the Study Area identified as opportunities, avoidance areas, and exclusion areas (USDA 2012a).

Avoidance areas include sensitive areas that are likely to incur environmental impacts or result in land use conflicts if directly affected by the Project. It is preferable to avoid these areas if opportunity areas are available elsewhere. If a sensitive area cannot be completely avoided, impacts can be minimized through route refinement, careful placement of the transmission structures and access roads, seasonal restrictions and other mitigation measures.

Exclusion areas include locations with the highest level of sensitivity, including those areas with regulatory or legislative designations or extreme physical constraints not compatible with transmission line construction and/or operation. In general, locating a transmission line in these areas could result in increased environmental impacts, significantly higher costs, and/or additional regulatory approvals.

Major constraints within the Study Area included (1) the Bonny Lake State Park and adjacent recreation area; (2) the Natural Resources Conservation Service (NRCS)-designated wetland preservation area east of Wray; (3) the Wray Municipal Airport; (4) State Wildlife Areas (SWAs), (5) the existing wind energy facility near Burlington; (6) areas with a high density of traveling irrigation systems; and (7) areas with a high density of oil and gas development.

Tables 3-1 and 3-2 describe the resources evaluated as part of the opportunities and constraints analysis. Tri-State's MCS includes a detailed discussion of the resources presented in these tables.

Table 3-1: Transmission Routing Opportunities

Resource	Opportunity Area (Optimize Use for Routing)
Existing Transmission Lines	Within 0.25 mile of existing transmission line corridors (69-kV and above)
Compatible Land Uses	Open land or rangeland, along edges of fields; federal or state land with existing disturbance and otherwise compatible use; designated energy corridors
Roads (interstate, state, county)	Within 0.25 mile of road, but not within road ROW
Railroads	Within 0.25 mile of railway, but not on railroad ROW
Canals/Ditches	Within 100 feet of a canal or ditch

Table 3-2: Transmission Routing Constraints

Type of Constraint	Avoidance Area	Exclusion Area
Land Use and Jurisdiction		
Land Cover and Surface Water	Developed, medium intensity; developed, high intensity; within boundary of emergent and woody wetlands; within 660 feet of perennial waterways and lakes; within floodplain	Open water; within 100 feet of perennial waterways, springs and lakes
Residences (identified at this time only as Existing Structures)	500 feet	100 feet
Cemeteries	250 feet	Within boundary
Commercial businesses*	250 feet	100 feet
Churches	500 feet	100 feet
Hospitals, nursing homes	1,320 feet (0.25 mile)	100 feet
Schools, kindergartens, nurseries (including registered day care facilities)	1,320 feet (0.25 mile)	100 feet
Municipal boundaries	Within incorporated or unincorporated municipal boundaries	—
Private airstrips	—	5,000 feet or within Federal Aviation Administration (FAA) prescribed boundaries described in 14 Code of Federal Regulations (CFR) 77
FAA-registered airports	10,000 feet	7,000 feet or within FAA prescribed boundaries described in 14 CFR 77
Heliports	—	2,000 feet
Directional beacon such as those used by the FAA	—	1,320 feet (0.25 mile)
Radio transmitters	Amplitude modulated (AM)—1,000 feet, Frequency modulated (FM)—500 feet	150 feet
Television transmitters	—	500 feet
Communication towers	Within 150 feet of Federal Communications Commission (FCC) structure	Within 50 feet of FCC structure
Cell phone towers	—	75 feet
Oil and gas wells	—	75 feet

Table 3-2: Transmission Routing Constraints

Type of Constraint	Avoidance Area	Exclusion Area
Wind energy turbines	—	500 feet
Federally designated lands not compatible with transmission lines—NRCS, Wetland Reserve Program	Within Boundary	—
State Lands not compatible with transmission lines—State Parks, SWAs	Within Boundary	—
Municipal boundaries	Within incorporated or unincorporated municipal boundaries	
Agricultural Land		
Cropland	Farmland of statewide importance	Within mechanical irrigation footprint
Animal feed lots	—	100 feet
Historic and Archaeological Sites		
Recorded prehistoric/historical and archeological sites	1,000 feet	100 feet
Sites listed on the National Register of Historic Places (NRHP)-listed or determined eligible for listing -	1,000 feet	100 feet
Publicly mapped historic cemeteries*	1,000 feet	100 feet
State historic markers*	1,000 feet	100 feet
Areas of high and moderate prehistoric and historic site potential*	1,000 feet	100 feet
Biological Resources		
Greater prairie chicken production areas	Within Boundary of Production Area	—
Raptor habitat	Within 0.25 mile of known active nests for most raptors.	—
Bald eagle habitat	— Within 0.50 miles of active nests, active winter night roosts. Also hunting perches are determined site specifically.	—
Burrowing owl habitat	150 feet from March 15 to October 31. Also efforts to eradicate prairie dogs should occur outside this time period (CPW 2007).	—
Great blue heron habitat	Nesting area	—
Geology and Soils		
Slopes	Areas with greater than 15 percent slope	—

* The same criteria used to identify macro corridors were also used for route refinement.

The MCS resulted in the creation of 56, 1-mile-wide alternative corridor segments in areas that had the greatest opportunity for routing a transmission line based on the criteria discussed above in Table 3-2. These alternatives were identified to the public for comment at meetings held on September 20–21, 2011. After review of agency input and public comment, alternative corridors were modified and eight were removed entirely from consideration. The revised corridors were taken back to the public during meetings held in both Burlington and Wray on March 6 and 7, 2012. These corridors and the revised corridors are shown in detail in the MCS report found on the RUS website. These revised corridors were carried forward into the route refinement process.

3.3.2 Route Refinement

After completion of the MCS and public involvement activities, Tri-State initiated the route refinement process. A desktop analysis was used to assess and quantify impacts to resources from each of the preliminary alternative corridors. This analysis was used to identify specific route alternatives within each of the corridors. This process also allowed for the quantification of Project-related impacts associated with each of the alternative routes. From here, landowners provided input to further refine route locations during a third and final round of public scoping meetings held on August 22 and 23, 2012, in Burlington and Wray. Every effort was made to parallel existing roads and other linear features as well as staying on sections lines to avoid bisecting agricultural fields and impacting sensitive resources. Alternative route selection was based on the following criteria:

- Provide a connection to the Burlington and Wray Substation
- Are compatible with the existing electric systems
- Maximize opportunities and minimize constraints (as outlined in the MCS)
- Are compatible with existing land uses
- Responds to public comment
- Are cost-effective

The route refinement process included a desktop analysis using GIS to compare routing criteria by alternative. As a result of a comparative desktop analysis, field reconnaissance, and public and agency involvement, six Route Alternatives were identified. These routes are identified on Figure 3-1. Each of the Route Alternatives was identified by considering areas that maximized routing opportunities and minimized routing constraints. Tables 3-1 and 3-2 present these opportunities and constraints, respectively. A summary of the route alternatives are discussed in detail below.

3.3.3 Route Alternatives A West, A East, B West, and B East

Route Alternatives A West and A East are the westernmost route alternatives identified for the Project. They follow the same path from the Burlington Substation, north into Yuma County. Route Alternative A West follows a western path to cross Chief Creek, and Route Alternative A East follows the eastern option to cross Chief Creek. Similarly, Route Alternatives B West and B East only differ from one another in the path followed across Chief Creek; Route Alternative B West crosses Chief Creek via the westernmost option, and Route Alternative B East crosses Chief Creek via the eastern option. Route Alternatives A and B differ from each other in the west-central portion of the Project Area, the former maintaining the westernmost path from Burlington to Wray, and the latter taking a path that has an eastern segment in the central portion of the routes.

Figure 3-1

Project Route Alternatives

Legend

- Study Area
- Preferred Route
- Route Alternatives
- Wray Substation (End Point)
- Burlington Substation (End Point)
- Existing 115 kV Transmission Line
- Existing 230 kV Transmission Line
- Interstate Highway
- U.S. Highway
- Major Roads
- Local Roads
- Railroads
- State Line
- County Line

1 inch = 19,800 feet

0 1 2 3 Miles

1 inch = 3.75 miles

Sources:
CDOT - Highways, Major and Local Roads Railroads, Municipal Limits
USGS - Elevation

Acronyms:
BNSF: Burlington Northern Santa Fe
CDOT: Colorado Department of Transportation
USGS: United States Geological Survey

TRI-STATE Generation and Transmission Association, Inc.
A Touchstone Energy® Cooperative

Burlington-Wray 230-kV Transmission Project

WRAY SUBSTATION
BURLINGTON SUBSTATION
COLORADO
KANSAS
NEBRASKA
YUMA COUNTY
KIT CARSON COUNTY
BNSF
Alternative A West
Alternative B West
Alternative A East
Alternative B East
Alternative C
Alternative D
County Road T
County Road PP .5
County Road PP
County Road 32
County Road 30
County Road JJ
County Road 26
County Road U
County Road CC
County Road KK
County Road 20
County Road Z
County Road AA
County Road LL
County Road RR
County Road 7
County Road V
County Road 53
County Road 55
County Road 59
County Road GG
County Road 40
County Road 44
County Road HH
County Road BB
KYLE
34
385
36
70

3.3.4 Route Alternatives C (Preferred) and D

Route Alternatives C and D also depart from the Burlington Substation following the same path to the east; however, the routes soon divide, with Route Alternative D turning north and Route Alternative C continuing further east before it turns north. The routes rejoin and follow the same alignment north to the South Fork of the Republican River. The routes follow the same alignment to cross the river, and at Sand Creek, Route Alternatives C and D again divide. Both route alternatives travel north and eventually cross the Arikaree River, providing two different choices for crossing this waterway. Just south of the North Fork Republican River, Route Alternatives C and D again rejoin, cross the North Fork of the Republican River, and continue along the same alignment into the Burlington Substation.

3.3.5 No Action Alternative

Under the No Action Alternative, a new transmission line would not be constructed.

3.4 SELECTION OF THE PREFERRED ALTERNATIVE

Table 3-3 provides a comparative analysis of routing criteria by alternative. This comparative analysis was analyzed in addition to comments received during public and agency scoping to identify the route that maximized opportunities and reduced impacts to the natural and human environment. This analysis, coupled with comment obtained during the route refinement public meetings showed that Alternative C is the preferred alternative.

Table 3-3: Summary of Comparative Analysis of Route Alternatives

Criteria	Route Alternative					
	A East	**A West**	**B East**	**B West**	**C**	**D**
Total Length	67.1	66.3	69.9	69.1	**72.0**	74.8
Length Adjacent to County/Local Roads (miles)	14.5	14.5	16.7	16.7	**23.1**	8.9
Length Adjacent to Parcel Boundaries (miles)	14.7	15.1	13.5	14.0	**18.7**	17.9
Length Crossing State Lands (miles)	3.3	3.8	1.6	2.1	**1.7**	4.8
Length Crossing Private Lands (miles)	63.0	61.7	66.8	65.5	**65.8**	68.2
Length Crossing SWAs	0.8	0.8	1.5	1.5	**4.6**	1.8
Length Crossing Cultivated Croplands (miles)	17.6	17.6	27.4	27.3	**18.4**	12.5
Acreage of Cultivated Croplands Removed From Use	1.1	1.1	1.7	1.7	**1.1**	0.8
Length Crossing Prime Farmland (miles)	25.8	25.7	32.6	32.5	**27.6**	19.2
Acreage of Prime Farmland Removed From Use	1.6	1.6	2.0	2.0	**1.7**	1.2
Length Crossing Center Pivots (miles)	1.3	1.3	1.7	1.7	**0.5**	0.1
Length Crossing Native Grassland (miles)	46.2	45.5	38.8	38.1	**46.1**	57.3
Number of Drainages Crossed	49	50	33	34	**22**	32
Number of Palustrine Wetlands Crossed	23	22	12	11	**8**	16
Number of Riverine Wetlands Crossed	12	12	13	13	**11**	15
Residences Within 150 feet of Centerline	0	0	0	0	**0**	0
Residences Within 150-300 feet of Centerline	2	1	2	1	**1**	1
Residences Within 300-1,320 feet of Centerline	10	7	11	8	**11**	7

Throughout the course of public scoping, as described in Section 4, a total of 27 comments were received. Of these 27 comments, 16 comments were directed towards routing considerations. The majority of these comments suggested that Tri-State move the route to maximize following section lies, avoid splitting up individual parcels, and to avoid irrigation systems and agricultural uses. Colorado Parks and Wildlife (CPW) also indicated in its scoping letter (Appendix A) that they would prefer to see a route that paralleled existing facilities to reduce overall and cumulative impacts to land use and biological resources.

Route Alternative C accomplishes these tasks to the greatest extent relative to the other Route Alternatives. Route Alternative C maximizes linear routing opportunities (parcels and county roads) to the greatest extent of all the Route Alternatives; 32 percent of the route is adjacent (within 200 feet) to county roads as shown below in Table 3-4. Table 3-4 focuses specifically on the length each alternative parallels or is in close proximity to an existing linear feature. Alternative C was ranked the highest for three out of the four categories identified.

Table 3-4: Length of Route Alternatives Adjacent to Linear Features

Route Alternatives	Length (miles) Adjacent to State Highways (within 200 feet)	Length (miles) Adjacent to County Roads (within 200 feet)	Percent of Total Route Length Adjacent to County Roads	Length (miles) Adjacent to Parcel Boundaries (within 75 feet)
A West	0.3	14.5	22	15.1
A East	0.3	14.5	22	14.7
B West	0.2	16.7	24	14.0
B East	0.2	16.7	24	13.5
C (Preferred)	**0.3**	**23.1**	**32**	**18.7**
D	0.3	8.9	12	17.9

After route refinement meetings were held, five comments were received in support of the selection of Route Alternative C as the Preferred Alternative. In May 2013, public hearings were held before the Board of Commissioners of Yuma and Kit Carson counties. Both counties voted to approve the Preferred Route and have issued Tri-State a Major Land Use Permit (Yuma County) and a Development Permit (Kit Carson County) for the construction of Route Alternative C.

Of all the Route Alternatives, Route Alternative C would impact the second least amount of cultivated cropland, cross the fewest number of drainages, and impact the least amount of mapped palustrine wetland and riverine wetland (riparian) areas.

Although Route Alternative C would cross the greatest length of SWAs, to the greatest extent feasible, Tri-State would design the alignment to minimize impacts to the SWAs and associated recreational opportunities. EPMs outlined in Table 3-7 would minimize impacts to wildlife resources in the Project area. Recreational opportunities within the SWAs would be temporarily impacted during Project construction. There would be a long-term impact to visual resources where lines would occur within the SWAs. These impacts are discussed further below in Section 6.

In all, Route Alternative C was selected as the Preferred Alternative because it would meet Tri-State's Project's purpose and need, addresses the most common concerns raised during public scoping, and minimizes impacts to the natural and human environment to greatest extent practicable.

3.4.1 Description of the Proposed Action

The Project would include the following components:

1. A new single-circuit 230-kV transmission line from the existing Burlington Substation in Kit Carson County, Colorado, to the existing Wray Substation in Yuma County, Colorado.
2. One new 230-kV circuit breaker and associated equipment upgrades at the Burlington Substation to accommodate the new transmission line.
3. Three new 230-kV circuit breakers, associated equipment, and configuration at the Wray Substation to accommodate the new transmission line.

The proposed single-circuit 230-kV line would vary depending on alternative but would be approximately 72 miles in length. The conductor would be one 1,272 thousand circular mils (kcmil) ACSR per phase with a maximum design temperature of 100°C. The Burlington Substation would be expanded from the existing two breaker arrangement to a three breaker ring bus arrangement to allow for the new 230-kV line bay. The Wray Substation would require a new 230-kV ring bus configuration with three new 230-kV circuit breakers.

Tri-State submitted a Certificate of Public Convenience and Necessity (CPCN) application to the Colorado Public Utilities Commission (CPUC) in December 2010. The CPUC approved the application in January 2011 (CPUC 2011).

3.4.1.1 Project Location

The Project is located in Yuma and Kit Carson counties, Colorado. The proposed transmission line would extend from the existing Burlington Substation in Kit Carson County, Colorado, to the existing Wray Substation in Yuma County, Colorado. The Project Study Area was delineated based on the proposed interconnections at the existing Burlington and Wray substations. The boundaries of the Project Study Area were influenced by the location of the existing substations, the engineering constraints for a line to enter or exit the substations, other existing ROW (such as ROW associated with roads, highways, pipelines, existing or planned transmission lines, canals, etc.), and existing and political and geographic boundaries. The Project Study Area was generally defined as an area approximately 18 miles in width (east to west) between the two substations, with U.S. 385 running north-south roughly down the center of the Project Study Area. The Project Study Area, as defined for purposes of analysis in this EA, includes six Route Alternatives including one Preferred Alternative.

3.4.1.2 Right-of-Way

The new transmission line is proposed to be constructed within a new ROW that typically would be 150 feet wide. The alignment of the transmission line would essentially be in the center of any acquired ROW. Wider ROW may be required for long spans that may be associated with river crossings or difficult terrain. Tri-State representatives would work with the landowners along the selected route to obtain the necessary land rights to allow for access, construction, operation, and maintenance of the new transmission line.

3.4.1.3 Structures

Table 3-5 summarizes the typical physical design characteristics for the transmission structures.

Table 3-5: Typical 230-kV Transmission Line Characteristics

Description of Design Component	Wood H-Frame Structures
Voltage	230-kV
ROW Width	150 feet
Average Span	800 feet
Typical Range of Structure Heights	65–110 feet
Number of Structures	6–9 per mile
Minimum Ground Clearance Beneath Conductor at Maximum Operating Temperature	28 feet
Long-term Ground Disturbance by One H-Frame Structure	300 square feet

Tri-State proposes to use two-pole wood, H-frame structures to support the conductors on straight-line tangent sections of the transmission line. These structures typically range in height above ground from 65 to 110 feet. Structure height is dependent on the distance between structures, conductor tensions, and the area topography. Taller structures may be used for spanning features such as wetlands, crossing streams, roads, other distribution or transmission lines, or where unusual terrain exists. The distance between structures typically ranges from 650 feet to 1,100 feet, depending on topography.

The H-frame structures would be designed to support three conductors on individual insulators located approximately 17 to 19 feet from the top of the structure. At the top of the structure, two overhead ground wires, or shield wires, would be installed to protect the transmission line from lightning strikes. One of the shield wires would contain fiber optics that is planned for use by Tri-State and its partners for internal (not commercial) communication needs.

Depending on local conditions, other types of structures may be used as well. For example, three-pole wood structures with guy wires would be used where the transmission line changes direction or where wire tensions change. For long sections of the tangent line where the proposed wood H-frame structures are used, three-pole wood dead-end structures with guy wires would be installed every 5 to 10 miles to contain wide-scale damage to the structures in the event of an extreme unforeseeable storm event.

Figure 3-2 depicts a representative diagram of the proposed H-frame structures.

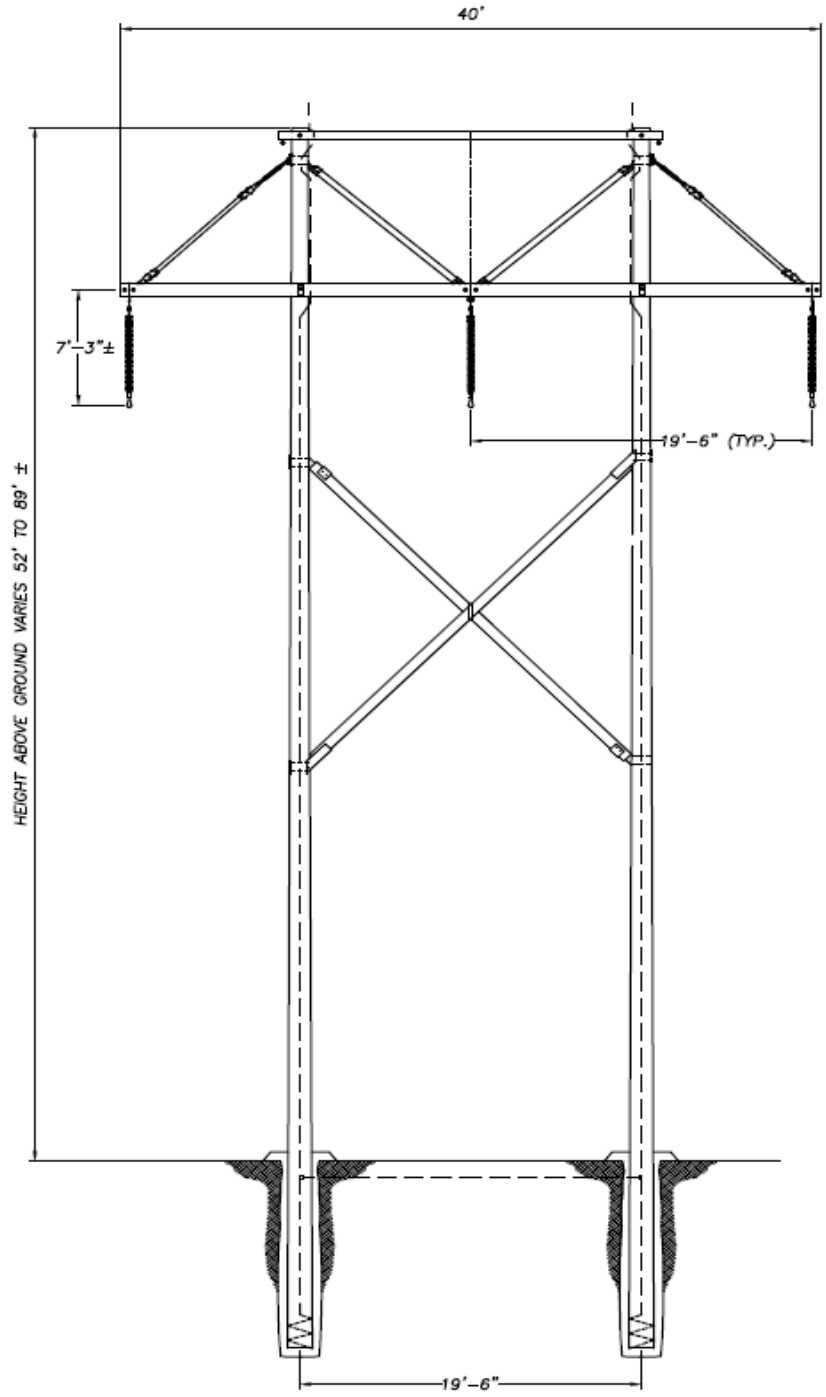

Figure 3-2: Proposed 230-kV Transmission Structure

3.4.1.4 Construction and Maintenance Procedures

Tri-State would hire licensed contractors specializing in construction of transmission systems to construct the proposed Project. Construction of the transmission line would include the major activities described below. These activities would be performed in sequence by construction crews. Seasonal or environmental requirements would influence the location of construction activities.

ROW Clearing and Construction Preparation: Prior to construction, the ROW would be cleared of any vegetation that might interfere with the safe and reliable construction and operation of the transmission line. This would normally apply to all trees within the ROW that might have the potential of growing into the energized conductor as well as possible trees that may fall into or blow into the conductor. Low ground cover may be removed or driven over during construction depending on the size of the vegetation. Attempts would be made to minimize crop damage in active agricultural fields by using the most direct access to the structure site and minimizing the area required for structure installation. In addition, access roads and structure pads would be installed or upgraded to allow for construction vehicles in accordance with the improvement levels suggested in Section 3.4.1.6. In areas where construction matting has been identified to support construction equipment, mats would be installed immediately prior to construction in that area. Given the time lags associated between the various construction activities, mats would be removed after the structures have been installed. Temporary ground access to the site for conductor stringing operations would be by tracked vehicle, light duty trucks, or other approved means.

Materials Hauling: Wood poles, cross arms, bracing, insulators, and the necessary hardware would be staged and delivered to each individual structure site using approved access routes. Deliveries of materials are normally made using flatbed trucks. Owing to the amount of material, multiple deliveries may be required to fully stock the construction site. In certain areas where dictated by terrain difficulties or access limitations, materials may be delivered to individual structure sites via helicopter. For material deliveries to structures located near county roads, materials may be off loaded and set along the road ROW out of the ditch line and any travel way.

Foundation Excavation: It is anticipated various excavation methods would be required for the foundations. Foundation holes would be drilled with an auger. In areas having soft soils prone to sloughing, the excavation may need to be temporarily cased until the structure is installed or the casing may be left permanently. Dewatering methods would need to be employed on excavations having a high water table prior to setting the structure. It is anticipated that blasting techniques would need to occur to help facilitate drilling in an unspecified number of locations. Blasting would be conducted by a qualified blaster and blast mats may be employed to prevent the flight of blasting debris. In the event holes need to be left open overnight, the holes would be covered, flagged, and fenced to protect the safety and welfare of livestock and the public.

Structure Assembly and Erection: Structure assembly would occur at the pole location. Structure assembly would include attaching cross arms, braces, stringing blocks, insulators, and down guys if required. The installation of the structure would be by aerial methods where each individual component of the structure is installed and assembled in place. The structure would be straightened to the appropriate degree and the excavations backfilled with native material if it is deemed suitable, or with imported fill. The fill is tamped into place with a hydraulic-powered tamper.

Conductor Stringing: Installation of the conductor, shield wire, and fiber optic wire would require establishing pull sites at various intervals along the alignment for equipment setup. The maximum anticipated distance between the pull sites would be approximately 4 miles for the conductor being used. Pulling sites for the fiber optic wire would be closer together based upon the manufacturer's stringing requirements and may not coincide with the conductor pulling sites. Temporary guard structures would be installed, at a minimum, at all overhead utility crossings, highway crossings, and railroad crossings. All wires would be installed using aerial stringing techniques and none of the wires would be allowed to come into contact with the ground. Installation of the initial pilot line that would eventually lead to pulling in the wires would be by overland methods. Depending on construction restrictions, helicopters may be used to pull in the pilot line. Once the wires have been installed between the pulling sites, the conductor would be properly tensioned and brought up to the appropriate sag. After sagging, clipping crews would move down the sagged line and clamp the wires in place at each structure location, and the stringing blocks removed. Any additional attachments such as vibration dampers would be installed at this time. Fiber optic wire would also require the installation of splice boxes at various locations. Locations of splice boxes would be as accessible as possible.

Cleanup, Reclamation, and Revegetation: Trash would be removed from the construction site daily. Any remaining or extra materials would be removed from the ROW at the conclusion of construction. Slash piles or woody debris would be disposed of in a manner acceptable to the applicable county and landowner. Spoils leftover from the pole excavations would be removed or spread around the site depending on private or state requirements. Areas disturbed by construction activities would be disked and brought back to the original grade and revegetated with a certified weed-free seed mix. Seed mixes would be coordinated with individual landowners.

Table 3-6 summarizes the equipment and personnel required per construction activity.

Table 3-6: Equipment and Personnel Required Per Activity

Activity	Number of Workers*	Possible Equipment Requirements
ROW Clearing and Access Roads	5–10	Pickup truck, tracked dozer, backhoe, dump truck
Materials Hauling	5–10	Tractor trailers, flatbed pickup trucks, helicopter
Structure Assembly and Erection	10–15	Line truck, bucket truck, pickup truck, boom truck
Conductor Stringing	12–18	Reel trailer, tensioner, puller, winch truck, flatbed truck, bucket trucks, pickup trucks, stringing cat, helicopter
Cleanup, Reclamation, and Revegetation	5–10	Tractor, flatbed truck, Bobcat, disc, drill seeder, pickup truck, bucket truck

* The number of workers for each activity would vary depending on the contractor's crew composition. Workers also would participate in multiple activities such as a structure setting crew would also be involved in the conductor stringing activity.

3.4.1.5 Construction Schedule

Construction on the proposed transmission line is anticipated to begin in early-mid 2015 and be completed in early-mid 2016. It is expected that work at a single structure location would involve 2–4 days of labor. However, these days are expected to be discontinuous as various stages of construction would require revisiting a structure. Tri-State and its construction contractor would work with the landowners to keep them informed whenever requested as to when and how long the workers would be on the property. Construction may be interrupted by weather events, wildlife constraints, or agricultural production. These issues as listed above also could result in the line not being constructed in a continuous manner. Construction could be extended up to period of six months.

3.4.1.6 Access Road Improvements

Access roads for the construction and maintenance of the transmission line may be required in certain locations. Final access road alignment would be determined once final engineering is complete. However, below are the access road improvement categories that are typical of a transmission line construction.

Existing Roads. The existing road category includes public and private paved, gravel-surfaced, well-defined two-track, or natural surface access roads that require no improvement (grading, widening, fill, drainage etc.) to facilitate construction of a transmission line and/or substation facilities. Post-construction, the only reclamation required is expected to be fixing any damage that might have occurred during construction.

Improvement Level I (Overland Access). Roads falling under this improvement category are overland access only or roads that require minor vegetation removal. No soil disturbance or grading is permitted in this category. Vegetation must be removed by hand and cut at the ground level. Post construction or future maintenance activity, reclamation may require re-seeding and restoration of the access road ROW to natural pre-construction conditions. Revegetation would require the planting of low-growing plant species that would continue to facilitate vehicle access in the future.

Improvement Level II (Minor Grading). This category includes new or existing access roads that require minor grading (one foot or less) and vegetation removal with the use of hand tools and/or mechanical equipment. Post-construction, reclamation would depend on whether the road would be a permanent or temporary access road. Revegetation would require the planting of low-growing plant species that would continue to facilitate vehicle access in the future.

Improvement Level III (Moderate to Heavy Grading). This category includes new or existing access roads that require more substantial grading to accommodate construction and maintenance vehicles. For construction contracting purposes, this category has been broken into two sub-categories:

- Level III (A): Existing or new access roads requiring 1-3 feet of grading
- Level III (B): Existing or new access roads requiring greater than 3 feet of grading.

Post-construction, reclamation would depend on whether the road would be a permanent or temporary access road.

Surface Water Crossings. Within access roads ROWs, there could be a surface water crossing such as ephemeral, intermittent, or perennial drainage, arroyos, and wetlands. Those areas requiring improvement to facilitate construction, such as a culvert, armored rock crossing, or pulled back banks, would fall under this category and would be identified as such on the associated construction drawings.

3.4.1.7 Environmental Protection Measures

Table 3-7 describes the Environmental Protection Measures (EPMs) that would be implemented for the proposed Project.

Table 3-7: Environmental Protection Measures

Category	Description
General	
G-1	The Contractor shall comply with all federal, state, and local environmental laws, orders, and regulations. Prior to construction, all supervisory construction personnel will be instructed on the protection of cultural and ecological resources (e.g., wetlands, Waters of the U.S. [WOUS], wildlife).
G-2	Prior to construction, Tri-State shall discuss with the Contractor sensitive environmental areas within the project area (e.g., wetlands) and, particularly, those areas where an Environmental Monitor must be present during construction.
G-3	Emergency access will be allowed during any time of the year for the purposes of long-term maintenance. In the event of an emergency, Tri-State will notify the appropriate agencies or landowners as soon as possible. Reclamation and revegetation will be implemented, as required, as soon as practical after any emergency road access or maintenance work needed to repair the transmission line.
G-4	Only the minimum amount of soils and vegetation necessary for the construction and maintenance of the access routes and the safe and reliable operation of the transmission line will be disturbed. If excavation is necessary, topsoil will be conserved and reused as cover on temporarily disturbed areas to facilitate re-growth of vegetation. Vegetation will be cleared from those areas necessary to obtain adequate working width and turning radius space for maintenance equipment and allow for the safe operation of the transmission line.
Air Quality	
AQ-1	The Contractor shall utilize practicable methods and devices as are reasonably available to control, prevent, and otherwise minimize atmospheric emissions or discharges of air contaminants. Speed limits on access routes will be required to minimize dust.
AQ-2	Possible construction related dust disturbance shall be controlled by the periodic application of water to all disturbed areas along the ROW and access roads.
AQ-3	Vehicles and equipment showing excessive emission of exhaust gases due to poor engine adjustments or other inefficient operating conditions shall not be operated until corrective adjustments or repairs are made.
AQ-4	As appropriate post seeding, mulch or other viable stabilization alternatives shall be utilized during reclamation activities to help reduce wind erosion and blowing dust. The mulch/stabilization will be performed as soon as possible after completion of Project activities to minimize potential fugitive dust generation as revegetation occurs.
Access Routes	
AR-1	No construction activities shall be performed during periods when the soil is too wet to adequately support equipment and vehicles. If equipment or vehicles create ruts in excess of 4–6 inches deep for a distance of 10 feet on native surface roads, the soil shall be deemed too wet to adequately support construction equipment. If equipment or vehicles create ruts in excess of 1-inch-deep on graveled roads, the roads shall be deemed too wet to support construction equipment.

Table 3-7: Environmental Protection Measures

Category	Description
Cultural Resources	
CR-1	Prior to construction, all supervisory construction personnel shall be instructed on the protection of cultural resources with reference to relevant laws and penalties, and the need to cease work in the location if cultural resource items are discovered. Sensitive locations will be flagged prior to construction to avoid areas in proximity to the construction ROW. A monitor will be on site when construction activities are planned in proximity to cultural resources to ensure the sites are not disturbed.
CR-2	Should any previously unknown historic/prehistoric sites or artifacts be encountered during construction, all land altering activities at that location shall be immediately suspended and the discovery left intact until such time that Tri-State is notified and appropriate measures taken to assure compliance with the National Historic Preservation Act (NHPA) and enabling legislation. A similar process shall apply if paleontological resources are discovered during excavations.
Fire Prevention/Control	
FP-1	Construction vehicles shall be equipped with government approved spark arresters.
FP-2	The Contractor shall maintain in all construction vehicles a current list of local emergency response providers and methods of contact/communication.
Hazardous Materials	
HM-1	Tri-State and its contractors shall comply with all applicable federal laws and regulations existing or hereafter enacted or promulgated regarding toxic substances or hazardous materials. In any event, Tri-State shall comply with the Toxic Substance Control Act of 1976, as amended (15 United States Code [U.S.C.] 2601, et seq.) with regard to any toxic substances that are used, generated by, stored on the ROW, or on facilities (see 40 CFR, Part 702-799 and especially, provisions on polychlorinated biphenyls, 40 CFR 761.1-761.193.). In addition, any release of toxic substances (leaks, spills, etc.) in excess of the reportable quantity established by 40 CFR, Part 117 shall be reported as required by the Comprehensive Environmental Response, Compensation and Liability Act of 1980, section 102b. A copy of any report required or requested by any federal agency or state government as a result of a reportable release or spill of any toxic substance shall be furnished to the authorized officer concurrent with the filing of the reports to the involved federal agency or state government.
HM-2	No bulk fuel storage shall occur within the public lands portion of the project ROW. All fuel and fluid spills within this area will be handled in accordance with appropriate state and federal spill reporting and response requirements. Contractor shall notify Tri-State of any spills so appropriate notifications can be made to regulatory authorities.
HM-3	Any waste generated as a result of the proposed project shall be properly disposed in a permitted facility. Solid waste generated during construction and periodic maintenance periods will be minimal. All hazardous materials will be handled in accordance with applicable local, state, and federal hazardous material statutes and regulations.
Land Use	
LU-1	All activities associated with the construction, operation, and maintenance of the transmission line shall occur within the authorized limits of the transmission line ROW and access routes. Additional access routes or cross-country travel shall not be allowed outside of the authorized routes prior to review and approval by Tri-State and the authorized landowner managing authority.
LU-2	The Contractor shall maintain all fences, brace panels, and gates during the construction period. Any fence, brace panel, or gate damaged during construction will be repaired immediately by the Contractor.

Table 3-7: Environmental Protection Measures

Category	Description
LU-3	The Contractor shall eliminate, at the earliest opportunity, all construction ruts that are detrimental to agricultural operations and/or hazardous to movement of vehicles and equipment. Such ruts shall be leveled, filled, and graded or otherwise eliminated in an approved manner. Damage to ditches, tile drains, culverts, terraces, local roads, and other similar land use features shall be corrected, as necessary, by the Contractor. The land and facilities shall be restored as nearly as practicable to their original condition.
LU-4	Structure foundation holes will be covered if the hole must be left open overnight. Covers will be secured in place and will be strong enough to prevent livestock, wildlife, or the public from falling through and into the excavation.
Noise	
N-1	Construction vehicles and equipment shall be maintained in proper operating condition and shall be equipped with manufacturers' standard noise control devices or better (e.g., mufflers, engine enclosures).
N-2	Tri-State shall address complaints about radio or television noise interference associated with Project operation.
Noxious Weeds	
NW-1	Weed control on disturbed areas within the limits of the ROW shall be implemented and the appropriate landowner/manager shall be contacted regarding planning acceptable weed control measures on noxious and invasive weed infestations within the limits of the ROW.
NW-2	To minimize introduction and spread of noxious weed seed sources to the Project area, the following measures shall be performed: All heavy equipment utilized during construction will be washed prior to departure from the equipment storage facility. Washing of equipment prior to transport from one work site to another is not recommended because on-site washing of equipment increases the chance of weed seed dispersal by drainage of water off of the site, and across an area greater than the size of the work site. Equipment will have accumulations of mud removed instead. This method promotes containment of weed seeds on the work site; all seed mixes and mulch used for reclamation activities will be certified weed-free.
NW-3	In order to prevent the spread of noxious weeds from the ROW, noxious weed populations that have resulted from Project construction shall be annually monitored and treated, as required by the appropriate land manager or the property owner. This will include weed treatments of access routes along the power line ROW. The use of pesticides shall comply with federal and state laws governing their proper use, storage, and disposal, and any limitations imposed by state or federal regulations.
Soils and Geology	
S-1	The Contractor shall mitigate soils compacted by movement of construction vehicles and equipment, by loosening, leveling, harrowing or disking to approximate pre-construction contours and reseeded with certified weed-free grasses and mulched (except in cultivated fields). The specific seed mix(s) and rate(s) of application will be determined in coordination with specific landowners.
S-2	Movement of construction vehicles and equipment shall be limited to the ROW and approved access routes to minimize soil disturbance.
S-3	Excavated material not used in the backfilling of poles shall be spread around each pole, evenly spread on the access routes in the immediate vicinity of the pole structure, or transported off site to approved fill sites or a Tri-State approved disposal location. Disturbed areas shall then be regraded to approximate pre-construction contours and reseeded, as specified in EPM S-1.
S-4	Topsoil shall be removed, stockpiled, and re-spread at temporarily disturbed areas not needed for maintenance access.

Table 3-7: Environmental Protection Measures

Category	Description
Stormwater	
SW-1	If the Project will result in more than 1 acre of ground disturbance, a Stormwater Management Plan (SWMP) meeting all Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Division standards shall be developed and maintained on site. The SWMP will ensure that stormwater runoff is managed such that applicable water quality standards are not exceeded.
SW-2	Stormwater Best Management Practices (BMPs) shall be implemented according to the standards set forth in Storm Drainage Criteria Manual, Vol. 3, as recommended in the Regional Water Quality Management Plan. BMPs will be implemented with the goal of minimizing erosion from disturbed areas. Barriers shall be placed, as warranted, to delineate buffer zones around sensitive areas (e.g., potential erosion areas, wetlands, other WOUS).
SW-3	Stormwater BMPs shall be inspected every 14 days, or within 24 hours of high precipitation or snowmelt events to ensure that BMPs are fully functional. Impaired BMPs will receive maintenance as soon as practical.
SW-4	All construction personnel shall receive stormwater awareness training, as recommended in the Regional Water Quality Management Plan. Relevant personnel will receive additional stormwater training.
Transportation	
T-1	The Contractor shall make all necessary provisions for conformance with federal, state, and local traffic safety standards and shall conduct construction operations so as to offer the least possible obstruction and inconvenience to public traffic.
Vegetation Management	
VEG-1	Vegetation shall be preserved and protected from damage by construction operations to the maximum extent practicable. Removal of trees will be limited to those necessary for the safe and reliable construction and operation of the line. Within the boundaries of wetlands or other WOUS, tree stumps will be left in place unless otherwise requested by the landowner and approved by the U.S. Army Corps of Engineers (USACE). In all areas of the ROW, stumps will be cut off to ground level, and the stumps and roots will be left to minimize ground disturbance. To the greatest extent possible, material will be chipped at a depth not to exceed 18 inches and spread within the ROW. No material will be permitted to be spread or placed into areas delineated as wetlands or other WOUS.
VEG-2	Upon completion of the work, work areas, except any access roads/trails, pad sites or wetland crossings not required for the long-term maintenance of the transmission line shall be regraded, as required, so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that will facilitate natural revegetation, provide for proper drainage, and prevent erosion.
VEG-3	Disturbed areas where vegetation has been removed by construction activities to the extent that the potential for soil erosion is increased to a detrimental level shall be subject to seedbed preparation techniques, reseeded to an approved seed mixture, and mulched, if necessary, during a recognized planting season. All seed mixes and mulch used for reclamation activities will be certified weed-free.
Visual Resources	
VR-1	The Contractor shall exercise care to preserve the natural landscape and shall conduct construction operations so as to prevent unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the work. Except where clearing is required for structure installation, approved temporary or long-term construction roads, staging areas, or excavation operations, vegetation shall be preserved and shall be protected from damage by the Contractor's construction operations and equipment.

Table 3-7: Environmental Protection Measures

Category	Description
VR-2	The Contractor shall minimize scarring, defacing, damage, or destruction of the natural landscape resulting from construction operations and any unnecessary or unauthorized shall be repaired by the Contractor to the satisfaction of Tri-State.
VR-3	All construction materials, waste, and debris shall be removed from the Project area in a timely manner. Burning or burying of waste materials on the ROW or at the construction site will not be allowed. All materials resulting from the Contractor's clearing operations shall be removed from the ROW.
VR-4	Structures shall be located and designed to conform to the terrain and minimize visual impacts whenever possible. Leveling and benching of the structure sites will be done to the minimum necessary to allow structure assembly and erection.
Wetlands and other Waters of the U.S.	
WET-1	Access roads, material yards, and the transmission line ROW shall be surveyed for wetlands and other WOUS by a qualified wetlands scientist prior to construction. In addition, wetlands and other WOUS boundaries shall be mapped with GIS sub-foot accuracy and flagged in the field prior to construction. Permanent (long-term) impacts to surface waters, wetlands, and riparian areas shall be avoided, unless authorized under a Nationwide Permit (NWP) 12: Utility Line Activities (NWP 12), issued by the USACE. Impacts to surface waters, wetlands, and riparian communities will be minimized to the greatest extent feasible and all stipulations of the NWP 12 will be followed. Temporary impacts will be restored per USACE guidelines.
WET-2	Construction vehicles and equipment shall be restricted near wetlands and other WOUS except to cross at designated points, build crossings, or complete site restoration. Crossing may be allowed when soils are protected by snow cover, soils are dry or frozen, and/or timber matting techniques are used. Refueling of construction vehicles shall take place a minimum of 100 feet from the delineated boundaries. Excavated material or other construction materials shall not be stockpiled or deposited within 100 feet of delineated wetlands or other WOUS.
WET-3	Construction within surface waters and wetland communities may require wetland mats, culverts, or pulling back banks. Wetland mats may be required at wetland crossings unless soils are protected by snow cover, or soils are dry or frozen. If excavation work is required in wetland areas, the top 12 inches of soil shall be removed at the excavation location and stockpiled adjacent to the wetland prior to excavation. Upon completion of construction at that location, wetland mats or other non-permanent structures will be removed and the topsoil will be redistributed on the wetland. Temporary impacts will be restored per USACE guidelines.
Water Quality	
WQ-1	Construction activities shall be performed by methods that prevent entrance or accidental spillage of solid matter, contaminants debris, and other objectionable pollutants and wastes into flowing streams or dry water courses, lakes and underground water sources. Such pollutants and wastes include, but are not restricted to, refuse, garbage, cement, concrete, sanitary waste, industrial waste, radioactive substances, oil and other petroleum products, aggregate processing tailings, mineral salts, and thermal pollution.
WQ-2	If required, dewatering work for structure foundations or earthwork operations adjacent to, or encroaching on, streams or water courses shall be in conformance with state regulations and a permit will be obtained from the Colorado Department of Health and Environment. Water and eroded materials will be prevented from entering the streams or watercourses by constructing intercepting ditches, bypass channels, barriers, settling ponds, or other approved methods.
WQ-3	Borrow pits shall be so excavated that water will not collect and stand therein. Before being abandoned, the sides of borrow pits will be brought to stable slopes, with slope intersections shaped to carry the natural contour of adjacent, undisturbed terrain into the pit or borrow area, giving a natural appearance. Waste piles will be shaped to provide a natural appearance.

Table 3-7: Environmental Protection Measures

Category	Description
WQ-4	Excavated material or other construction materials shall not be stockpiled or deposited near or on stream banks, lake shorelines or other water course perimeters where they can be washed away by high water or storm runoff or can in any way encroach upon the actual water source itself.
WQ-5	Waste waters from construction operations shall not enter streams, water courses, or other surface waters without use of such turbidity control methods as settling ponds, gravel-filter entrapment dikes, approved flocculating processes that are not harmful to fish, recirculation systems for washing of aggregates, or other approved methods. Any such waste waters discharged into surface waters shall be essentially free of settle-able material. Settle-able material is defined as that material that will settle from the water by gravity during a 1-hour quiescent period.
WQ-6	Water required for construction, revegetation, or dust suppression shall be purchased from a municipal source or construction water provider with a private well. No water will be withdrawn from surface water resources.
Wildlife Resources	
WR-1	Should construction extend into the lekking season for greater prairie chickens (March–April), lek surveys would be conducted by a qualified specialist and if found, construction timing will be limited to minimize disturbance during key lekking times (typically within two hours of sunrise).
WR-2	Project construction is proposed to occur outside the raptor breeding season to the extent feasible. In the event construction were to extend February 15 through August 31 (or December 15 for eagles and great-horned owls), raptor nest clearance surveys shall be conducted prior to construction occurring in those areas. If active raptor nests occur within 0.25 to 0.5 mile (eagles) of the Project area, a restricted buffer area will be established around the nest site until the young have fledged. The applicable buffer area will be determined on a site-specific basis, as warranted by the species involved, nest location, proposed construction activities, and line of sight to construction activities or personnel.
WR-3	In order to preclude avian electrocutions and minimize collision risk, Tri-State will incorporate recommendations developed by the Avian Power Line Interaction Committee and U.S. Fish and Wildlife Service (USFWS) to protect birds on power lines (APLIC and USFWS 2012 and 2005).
WR-4	An Avian Collision Risk Assessment will be completed once final engineering is completed. Line segments identified within the risk assessment as a potential hazard to avian species will be marked with Swan Flight Diverters or a similarly effective device to minimize risk. Transmission lines shall be designed in accordance with recommendations outlined in *Reducing Avian Collisions with Power Lines: The State of the Art in 2012* (APLIC and USFWS 2012).
WR-5	Western burrowing owls are known to occur within the Project Study Area. Construction is currently planned outside the breeding season for burrowing owls. Should construction extend into the breeding season between March 15 and October 31, surveys will be conducted within prairie dog colonies. Should a nest be located, a buffer of 150 feet around the burrowing owl nest will be implemented.

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4.0 PUBLIC INVOLVEMENT

Tri-State conducted an open and comprehensive public involvement process, including three rounds of public meetings. Public involvement for the Project began in September 2011 with two informational public meetings. In March 2012, joint agency and public scoping meetings were conducted by the RUS. In August 2012, Tri-State held two route refinement meetings to present the Preferred Route and other alternatives to the public. Each round of meetings was held in both Burlington and Wray, Colorado. The timing and purposes of these meetings is summarized in Table 4-1 and discussed in more detail in the following sections. The full scoping report that was prepared for the Project can be found on the RUS website at http://www.rurdev.usda.gov/UWP-EA-Burlington-Wray.html.

4.1 INDIVIDUALS, ORGANIZATIONS, TRIBES, AND AGENCIES CONSULTED

The scoping report (USDA 2012b) summarizes the coordination and consultation completed for this Project. Agencies that were included in the notification for scoping are:

- U.S. Fish and Wildlife Service
- Colorado Department of Transportation
- Colorado Parks and Wildlife
- National Park Service
- Colorado State Land Board
- Kit Carson County
- Yuma County
- City of Burlington
- City of Wray

The RUS has solicited Native American Tribes that may have an interest in the Project and results of the environmental analysis. To date no comments have been received from any tribes. Tribes contacted include:

- Arapaho Tribe of the Wind River Reservation
- Cheyenne and Arapaho Tribes of Oklahoma
- Northern Cheyenne Tribal Council
- Comanche Tribe of Oklahoma
- Apache Tribe of Oklahoma
- Pawnee Tribe of Oklahoma
- Southern Ute Indian Tribe of the Southern Ute Reservation, Colorado
- Ute Mountain Ute Tribe of the Ute Mountain Reservation, Colorado, New Mexico, and Utah
- Kiowa

Table 4-1: Summary of Public Meetings

Meeting Type	Date (Location)	Invitees	Information Provided
Informational Public Meeting	September 20, 2011 (Burlington) September 21, 2011 (Wray)	The general public was invited through public newspaper notices. Every landowner within the Study Area was noticed through postcards. County, State, and Federal Agencies were sent letters.	The approximately 1,100-square-mile Study Area was depicted on maps, and preliminary macro corridors were also identified on maps. Posters and fact sheets discussing the topics below were available to the public for review: • Project Overview • Federal Review Process • Natural and Cultural Resources • Siting and Permitting Process • Electric and Magnetic Fields • Engineering and Electric Transmission • Transmission Siting Opportunities and Constraints • Working with Landowners
Joint Agency and Public Scoping Meeting	March 6, 2012 (Burlington) March 7, 2012 (Wray)	The general public was invited through public newspaper notices and advertisements. Every landowner within the Study Area was noticed through postcards. County, state, and federal agencies were sent letters. A *Federal Register* Notice of Intent (NOI) was published on February 22, 2012.	Refined macro corridors and preliminary route segments were depicted on maps. Posters and fact sheets discussing the topics below were available to the public for review: • Project Overview • Federal Review Process • Natural and Cultural Resources • Siting and Permitting Process • Electric and Magnetic Fields • Engineering and Electric Transmission • Transmission Siting Opportunities and Constraints • Working with Landowners • A GIS mapping station was set up to allow the public to have maps made specific to their needs.
Route Refinement Meeting	August 22, 2012 (Burlington) August 23, 2012 (Wray)	The general public was invited through public newspaper notices. Every landowner within 0.25 mile of a route alternative was sent a letter identifying the land parcels potentially affected by the Project. County, state, and federal agencies were sent letters.	Following the Joint Agency and Public Scoping Meeting, a quantitative analysis was conducted for each route segment and based on this information and public input, from the scoping meetings, route segments were added, deleted, or adjusted and used to form Alternative Routes, including the Preferred Alternative. These complete routes were depicted on maps and displayed at the Route Refinement Meeting. Posters and fact sheets were displayed and provided that discussed: • Project Overview • Federal Review Process • Natural and Cultural Resources • Siting and Permitting Process • Electric and Magnetic Fields • Engineering and Electric Transmission • Transmission Siting Opportunities and Constraints • Working with Landowners • GIS mapping station was set up to allow the public to have maps made specific to their needs.

4.2 INFORMATIONAL PUBLIC MEETING

Tri-State hosted informational public meetings on September 20 and 21, 2011, in Burlington and Wray, respectively. A postcard was sent to every landowner in the Study Area, regardless of whether they owned property within any of the preliminary macro corridors. The mailing list was developed using county landowner data from the Kit Carson and Yuma County Tax Assessors' Offices. An open house format was used to encourage discussion and information sharing and to ensure that the public had opportunities to speak with Project representatives. Various information stations and eight large aerial map boards were staffed by either representatives of Tri-State or consultants of Tri-State. The maps displayed depicted the Project Study Area and preliminary macro corridors. Following the informational public meetings, Tri-State refined the macro corridors based on public input and information gleaned from field reconnaissance.

4.3 JOINT AGENCY AND PUBLIC SCOPING MEETING

The purpose of the joint agency and public scoping meeting is to provide the public, public agencies, and other interested stakeholders with information regarding the proposed Project, answer questions, identify concerns regarding the potential environmental impacts that may result from construction and operation of the Project, and gather information to determine the scope of issues to be addressed in the RUS environmental review and documentation of the Project (USDA 2002).

Tri-State completed two preliminary documents in preparation for scoping, an AES and an MCS. These documents are required by the RUS when an environmental analysis for a proposed electric transmission line project is conducted. The AES explains the need for the proposed Project, discusses the alternative methods that have been considered to meet that need, and recommends an alternative that is considered the best for fulfilling the need. The MCS defines the Project Study Area and illustrates the Project end points. Within the Project Study Area, macro corridors were developed based on environmental, engineering, economic, and land use data as well as consideration of regulatory constraints. These documents are available for review on the RUS website at http://www.rurdev.usda.gov/UWP-EA-Burlington-Wray.html or upon request to RUS.

Following the Informational Public Meetings held in September 2011, Tri-State revised, added, and deleted macro corridors from consideration, and within these macro corridors, identified preliminary route segments based on criteria identified in Tables 3-1 and 3-2. Complete route alternatives had not been identified at this point; and so only potential route segments were presented during the Joint Agency and Public Scoping Meetings.

4.3.1 Notification

An NOI was published in the *Federal Register* on February 22, 2012, informing the public of the intent by the RUS to prepare an EA with scoping and included the dates for public scoping meetings during March 2012. A copy of the NOI is included in the Scoping Report for the Project, which is available athttp://www.rurdev.usda.gov/UWP-EA-Burlington-Wray.html.

A postcard was mailed to all landowners within the Project Study Area (approximately 1,860 landowners), regardless of whether they owned property within the identified macro corridors. The mailing list was developed using county landowner data from the Kit Carson and Yuma County tax

assessors' offices. The Project website contained details on the public scoping schedule and the maps and fact sheets that were available at the Scoping Meetings.

The RUS conducted two joint agency and public scoping meetings as listed in Table 4-2 using an open house format. RUS requires that public scoping meetings be held after regular business hours and at a reasonable distance for all people in the Project area to attend.

Table 4-2: Public Scoping Meetings

Date	Time	Location
March 6, 2012	5:00–8:00 PM	Burlington Community and Education Center 340 South 14th Street Burlington, Colorado 80807
March 7, 2012	5:00–8:00 PM	Wray Roundhouse 245 West 4th Street Wray, Colorado 80758

4.3.2 Public Comments

A total of 27 public comments were received during the scoping comment period beginning on March 6, 2012, and ending on April 6, 2012, as summarized in Table 4-3. The RUS provided a 30-day comment period following the scoping meetings that would begin the date of the latest meeting and extend through the 30th calendar day following the meeting (USDA 2002). Public comments were submitted using comment forms, letters, emails, and phone calls. All comments were submitted at the public meeting, directly delivered to RUS, or forwarded to the RUS if they were submitted to the Project proponent by the commenter. Each of the comments was entered into the comment management database. The scoping report (USDA 2012b) includes an index of comments received during the scoping comment period.

Table 4-3: Summary of Public Comments Received During the Scoping Period (March 6–April 6, 2012)

Category	Description	Number of Comments
Government		
NPS	Has no comment on the Project.	1
CPW	Noted areas of avian habitat and suggested routing the transmission line along existing roads, transmission line corridors, and developed lands to minimize environmental impacts.	1
Public		
Route Alternatives	Suggestions to move a route segment to follow section lines.	2
	Requested other segments be chosen over a segment that would be near a sprinkler system.	1
	Objected to a particular segment because of planned (private) campsite development.	1
	Objected to a segment because of the size of the corridors.	1
	Suggestions to develop a new segment alternative to avoid splitting up land parcels.	2

Table 4-3: Summary of Public Comments Received During the Scoping Period (March 6–April 6, 2012)

Category	Description	Number of Comments
	Suggested other alternatives to avoid having a line located on a particular property.	1
	Objected to a segment but did not specify a reason.	1
	Expressed preferences not to have a transmission line located on the commenters' respective properties. Two comments noted that route segments would interfere with current agricultural land uses and two others noted that a segment alternative would pass through an old family ranch.	6
	Suggested the final route should parallel the existing 115-kV transmission line. Noted concerns about impacts to sandhill cranes if the line were constructed in the western portion of the Project Study Area.	1
Project Support	Stated no opposition to the Project and expressed a desire for the Project to be located on their respective lands.	3
	Noted that a segment was located on the commenter's land and expressed support for the Project.	1
NEPA Process	Expressed general support for the Project.	3
	Comment from a Limited Liability Corporation regarding various aspects of the NEPA process suggesting an Environmental Impact Statement may be more appropriate for the Project than an EA.	1
General	Generally stated that compensation should be provided for access for transmission line and resource surveys	1
	Total	**27**

4.4 ROUTE REFINEMENT PUBLIC MEETINGS

After the Public Scoping Meetings, Tri-State conducted field reconnaissance to identify any on-the-ground routing opportunities or constraints associated with the route segments. Tri-State used this information and also evaluated public comments from public and agency scoping to identify the Project Route Alternatives, including a Preferred Route. A third round of public meetings was held in August 2012 to present the Route Alternatives, including a Preferred Route, to the public and solicit input. A letter was sent to every landowner within 0.25 mile of a route alternative (approximately 933 letters were mailed). These letters identified the land parcel(s) potentially affected by one of route alternatives under consideration and the dates, times, and locations of the route refinement public meetings. An open house format was again used to encourage discussion among meeting attendees with the Project staff. Sixteen written and oral (voicemail) comments were received following the Route Refinement Meetings and are generally summarized in Table 4-4. In addition, several individuals requested additional information about whether the Preferred Route or any Route Alternatives would go through their property.

Table 4-4: Summary of Public Comments Received During the Route Refinement Public Meetings (August 2012)

Description	Number of Comments
Comments indicating approval of the Preferred Route.	5
Indicated support for the Project, but indicated a desire to not have the transmission line go by their house.	1
Request for information about easement acquisitions.	1
Objected to the Preferred Route because a portion of the Project Study Area already has power lines crossing it and the commenter would prefer existing ROWs be used.	1
Objected to the impact the Preferred Route would have on their view.	2
Expressed opposition to one or more of the Route Alternatives (non-Preferred) because of direct impacts to their property.	6
Total	**16**

5.0 EXISTING ENVIRONMENT

5.1 LAND USE

The Project Study Area (as shown in Figure 1-1 and described in Section 3.3.1) is an approximately 1,100-square-mile area located in rural northeastern Colorado. Guidance for land use planning is provided by the Kit Carson County Comprehensive Plan (Community Matters 2000) and the Yuma County Comprehensive Plan (Yuma County Board of County Commissioners 2001). Route Alternatives are located in the unincorporated areas of Kit Carson and Yuma counties. Unincorporated areas are designated by both counties as agricultural use areas.

The Project Study Area includes the cities of Wray and Burlington; the census-designated places of Vernon and Idalia; and the unincorporated town of Hale. All of the Project alternatives are located outside these municipal boundaries. Each of the Route Alternatives crosses SWAs and State Trust lands but does not cross federal lands. The locations of municipalities in the area and land jurisdiction are depicted on Figure 5-1. Table 5-1 summarizes the length of each Route Alternative that crosses State Trust, SWA, and private land.

Table 5-1: Length of State and Private Lands Crossed

Route Alternative	Length of Route (miles)	State Trust Land (miles crossed)	SWA (miles crossed)	Private Land (miles crossed)
A West	66.3	3.8	0.8	61.7
A East	67.1	3.4	0.8	63.0
B West	69.1	2.1	1.5	65.5
B East	69.9	1.6	1.5	66.8
C (Preferred)	72.0	1.7	4.6	65.8
D	74.8	4.8	1.8	68.2

The majority of the land along each of the Route Alternatives is grassland and privately owned. Existing land uses in the Project Study Area include scattered rural residences and farms, animal husbandry, pivot irrigation, and large undeveloped open spaces. Oil and gas development occurs throughout the Project Study Area. All of the Project alternatives were routed so that any existing oil and gas wells would be outside the transmission line ROW.

The existing Burlington and Wray substations are owned and operated by Tri-State. Construction within the substations to accommodate the new circuits for the new transmission line would occur on lands already owned by Tri-State.

The federal Farmland Protection Policy Act (FPPA) requires federal agencies to identify and take into account the impacts of their actions on prime or unique farmland. Under the FPPA, farmland is defined:

- **Prime Farmland**. Land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion, as determined by the Secretary of Agriculture. Prime farmland includes land that possesses the above characteristics but is being used

currently to produce livestock and timber. It does not include land already in or committed to urban development or water storage (7 U.S.C. 4201 (c)(1)(a)).

- **Unique Farmland**. Land other than prime farmland that is used for production of specific high-value food and fiber crops, as determined by the Secretary of Agriculture. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of specific crops when treated and managed according to acceptable farming methods. Examples of such crops include citrus, tree nuts, olives, cranberries, fruits, and vegetables (7 U.S.C. 4201 (c)(10(B)).
- **Farmland of Statewide or Local Importance**. Farmland, other than prime or unique farmland, that is of statewide or local importance for the production of food, feed, fiber, forage, or oilseed crops, as determined by the appropriate state or local government agency or agencies, and that the Secretary of Agriculture determines should be considered as farmland (7 U.S.C. 4201 (c)(1)(C)).

Agricultural lands with farmland designations in the Project Study Area are depicted on Figure 5-2. Table 5-2 summarizes the length of prime farmland crossed by each Route Alternative. Table 5-3 summarizes the lengths of cultivated croplands and center pivot-irrigated areas crossed by each Route Alternative.

Table 5-2: Prime Farmland Crossed By Route Alternatives

Route Alternative	Prime Farmland, If Irrigated (miles crossed)	Farmland of Statewide Importance (miles crossed)	Total Prime Farmland (miles crossed)	Total Prime Farmland (percent of total route length)
A West	14.2	11.5	25.7	39
A East	14.2	11.6	25.8	38
B West	30.0	2.5	32.5	47
B East	30.0	2.6	32.6	47
C (Preferred)	23.5	4.1	27.6	38
D	16.4	2.8	19.2	26

Table 5-3: Cultivated Cropland Crossed By Route Alternatives

Route Alternative	Cultivated Cropland (miles crossed)	Cultivated Cropland (percent of total route length)	Center Pivot Irrigation (miles crossed)
A West	17.6	27	1.3
A East	17.6	26	1.3
B West	27.3	40	1.7
B East	27.4	39	1.7
C (Preferred)	18.4	25	0.5
D	12.5	17	0.1

Figure 5-1

Land Jurisdiction and Municipalities

Legend

- Study Area
- Preferred Route
- Route Alternatives
- Wray Substation (End Point)
- Burlington Substation (End Point)

Transportation

- Interstate Highway
- U.S. Highway
- Major Roads
- State Line
- County Line

Land Jurisdiction

- NRCS (WRP)
- Bonny Lake State Park
- State Land
- Municipal Bounds

1 inch = 19,800 feet

0 1 2 3 Miles

1 inch = 3.75 miles

Sources:

CDOT - Highways, Major Roads, Municipal Bounds
CDOW - Bonny Lake State Park, State Wildlife Areas
NRCS - Wetland Reserve Program Lands
SLB - Surface Ownership, State Land Trust

Acronyms:

CDOT: Colorado Department of Transportation
CDOW: Colorado Department of Wildlife
NRCS: Natural Resources Conservation Service
NRHP: Natural Register of Historic Places
SHA: State Habitat Area
SLB: State Land Board
STL: State Trust Land
SWA: State Wildlife Area
WRP: Wetland Reserve Program

TRI-STATE Generation and Transmission Association, Inc.
A Touchstone Energy® Cooperative

Wray 230-kV Transmission Project

Burlington-Wray

Burlington-Wray 230-kV Transmission Project

Figure 5-2

Agricultural Land

Legend

- Study Area
- Preferred Route
- Route Alternatives
- Wray Substation (End Point)
- Burlington Substation (End Point)

Transportation

- Interstate Highway
- U.S. Highway
- Major Roads
- State Line
- County Line

Farmland

- Farmland of statewide importance
- Prime farmland if irrigated
- Irrigated Cropland

1 inch = 19,800 feet

0 1 2 3 Miles

1 inch = 3.75 miles

Sources:
CDOT - Highways, Major Roads, Municipal Bounds
NRCS - Soils
USGS - Elevation

Acronyms:
CDOT: Colorado Department of Transportation
NRCS: Natural Resources Conservation Service
USGS: United States Geological Survey

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A Touchstone Energy® Cooperative

WRAY SUBSTATION
BURLINGTON SUBSTATION
YUMA COUNTY
KIT CARSON COUNTY
COLORADO
KANSAS
NEBRASKA
Alternative A West
Alternative B West
Alternative A East
Alternative B East
Alternative C
Alternative D
County Road T
County Road 32
County Road 30
County Road 26
County Road 20
County Road U
County Road Z
County Road AA
County Road CC
County Road V
County Road 7
County Road 40
County Road GG
County Road 44
County Road CC
County Road BB
County Road JJ
County Road KK
County Road LL
County Road HH
County Road 53
County Road 55
County Road 59
County Road PP
County Road PP .5
County Road RR
34
36
385
70

5.2 GEOLOGY, MINERALS, AND SOILS

5.2.1 Geology and Minerals

The geology and minerals are expected to be similar across all Route Alternatives. The Project Study Area is in extreme eastern Kit Carson and Yuma counties, Colorado, which is within the High Plains subregion of the Great Plains Physiographic Province. The High Plains is a nearly flat landscape punctuated by occasional sandhills, canyons, cliffs, and escarpments (Fitzgerald et al. 1994). It borders the eastern and northern edges of the Denver Basin. "The High Plains are primarily the remnant of a large fluviatile plain that originally covered an area from the Rocky Mountains eastward beyond its present borders" (Tate and Gilmore 1999:7). A Tertiary mantle, the dominant feature, consists of several Paleocene to Pliocene formations. Innumerable small depressions (lesser features) are present. The Tertiary mantle forms an escarpment on the south and west that separates the High Plains from the Colorado Piedmont (Fenneman 1931; Tate and Gilmore 1999).

Cretaceous-age rocks underlie much of the Great Plains, but Tertiary rocks, occurring as a veneer, are often present. Ogallala alluvium, Tertiary terrestrial deposits originating in the Rocky Mountains, was deposited across the plains during a series of erosional cycles. The Ogallala Formation, the uppermost formation in the mantle, consists of sandy alluvium and beds of gravel, silt, clays, and freshwater lime and can extend to depths of hundreds of meters. The Ogallala capstone is 10–30 feet thick and separates the High Plains from the Colorado Piedmont. Quaternary deposits consist of local accumulations of gravels, sands, clays, and silts. In addition, scattered deposits of volcanic ash, loess, Pleistocene terrace gravels, and recent alluvium are also present (Tate and Gilmore 1999; Thornbury 1965). The terrain of the Project Study Area varies from flat uplands to rolling, undulating, and dissected terrain with large arroyos and small canyons along the major drainages, including the north and south forks of the Republican and Arikaree Rivers.

Oil and gas development occurs throughout the Project Study Area, but is concentrated in the northwestern portion of the Project Study Area that is located in Yuma County.

5.2.2 Soils

Most of the soils in Kit Carson and Yuma counties formed beneath native prairie grasses. Perennial grasses contribute to the accumulation of organic matter in the upper part of the soil. The Project Study Area is found in the NRCS Major Land Resource Area (MLRA) 72. Dominant soil orders in MLRA 72 are Entisols and Mollisols. These soils are usually very deep and moderately well-drained to excessively drained with varied textures (NRCS 2012). Soils are expected to be similar across all of the proposed Route Alternatives.

5.3 AIR QUALITY

Federal air quality standards are established by the Clean Air Act and administered by the CDPHE. There are no active CDPHE airs monitoring sites in Kit Carson or Yuma counties. An attainment area is a geographic area in which levels of a criteria air pollutant meet the health-based primary standard (national ambient air quality standard). Attainment areas are defined using federal pollutant limits set by the Environmental Protection Agency (EPA). Air quality in the Project Study Area and across all Route Alternatives is classified as attainment for all criteria pollutants (CDPHE 2012a).

5.4 NOISE

The primary land use in the Project Study Area is rural agriculture. Ambient noise is similar for all Route Alternatives and in rural areas commonly consists of farm equipment and infrequent automobile traffic. Intermittent sources of noise may include aircraft flyovers and construction and road maintenance activities. Other common noise sources in rural areas are location dependent and may include noise associated with roadways, railroads, and industrial operations (e.g., oil and gas wells and processing facilities). The primary noise-sensitive receptors in the Project Study Area are rural residents as outlined in Table 5-12 in Section 5.4.

5.4.1 Corona Characteristics

Corona is the electrical ionization of the air that occurs near the surface of the energized conductor and suspension hardware as a result of very high electric field strength. Corona may result in audible noise being produced by the transmission lines.

The amount of corona produced by a transmission line is a function of the voltage of the line, the diameter of the conductors, the locations of the conductors in relation to each other, the elevation of the line above sea level, the condition of the conductors and hardware, and the local weather conditions. Power flow does not affect the amount of corona produced by a transmission line. Corona typically becomes a design concern for transmission lines at 345-kV and above and is less noticeable from lower voltage lines such as the 230-kV line proposed for the Project.

The electric field gradient is greatest at the surface of the conductor. Large-diameter conductors have lower electric field gradients at the conductor surface and, hence, lower corona than smaller conductors, everything else being equal.

Irregularities (such as nicks and scrapes on the conductor surface or sharp edges on suspension hardware) concentrate the electric field at these locations and thus increase the electric field gradient and the resulting corona at these spots. Similarly, foreign objects on the conductor surface, such as dust or insects, can cause irregularities on the surface that are a source for corona.

Corona also increases at higher elevations where the density of the atmosphere is less than at sea level. Audible noise will vary with elevation with the relationship of A/300 where A is the elevation of the line above sea level measured in meters (EPRI 2005). Audible noise at 600 meters elevation will be twice the audible noise at 300 meters, all other things being equal. The Project was modeled with an elevation of 4,000 feet.

Raindrops, snow, fog, hoarfrost, and condensation accumulated on the conductor surface are also sources of surface irregularities that can increase corona. During fair weather, the number of these condensed water droplets or ice crystals is usually small and the corona effect is also small. However, during wet weather, the number of these sources increases (e.g., to the number of rain drops standing on the conductor) and corona effects are therefore greater. During wet or foul weather conditions, the conductor will produce the greatest amount of corona noise. However, during heavy rain, the noise generated by the falling rain drops hitting the ground will typically be greater than the noise generated by corona and thus will mask the audible noise from the transmission line.

Corona produced on a transmission line can be reduced by the design of the transmission line and the selection of hardware and conductors used for the construction of the line. For example, the use of conductor clamps that hold the conductor in place should have rounded rather than sharp edges and no protruding bolts with sharp edges to reduce corona. The conductors should have smooth surfaces without nicks or burrs or scrapes in the conductor strands and should be handled carefully during construction.

5.4.1.1 Modeling Methodology

The audible noise for the Project was predicted using EMF Workstation: ENVIRO (Version 3.52), the same program used to predict magnetic fields from the Project.

The data presented in this EA were input into the ENVIRO program to calculate the corona audible noise, with the addition of elevation of the line above sea level. The Project was modeled with an elevation of 4,000 feet. Because the equations that predict audible noise were created from empirical measurements, the accuracy of the model is as good as these measurements that produced the original equations. In addition, the model is as good as the accuracy of the parameters input to the model (e.g., the actual elevation of the transmission line at a particular location rather than the average elevation of the entire Project). Therefore, given these potential uncertainties, the resulting field plots are within a few percentage points of the true value for the conditions modeled.

5.4.1.2 Modeling Results

The corona audible noise results for a new 230-kV line located on a 150-foot-wide ROW scenario are presented in Figure 5-3. The outer edges of the ROW are shown as vertical dashed lines in the figure.

The figure depicts two weather conditions for the corona audible noise results, fair and rain. This is to show the range in corona effects due to changing weather. CPCN rule 3206(f)(I) specifies that the audible noise modeling must assume "that the proposed facility is operating at its highest continuous design voltage under L_{50}[3] rain conditions." The figures present the audible noise results for L_{50} rain conditions.

The results of the corona audible noise modeling plotted in Figure 5-3 show that on both the left and right edges of the ROW, the audible noise is approximately 17 decibels on the A-weighted scale (dBA) in fair weather and 42 dBA in wet weather. The figure also shows that 25 feet from both the left and right edges of the ROW, the audible noise is approximately 15 dBA in fair weather and 40 dBA in wet weather. The maximum noise that occurs within the ROW is 22 dBA in fair weather and 47 dBA in wet weather.

[3] L_{50} refers to the sound level (in decibels on the A-weighted scale) that is exceeded 50 percent of the time during a one hour survey.

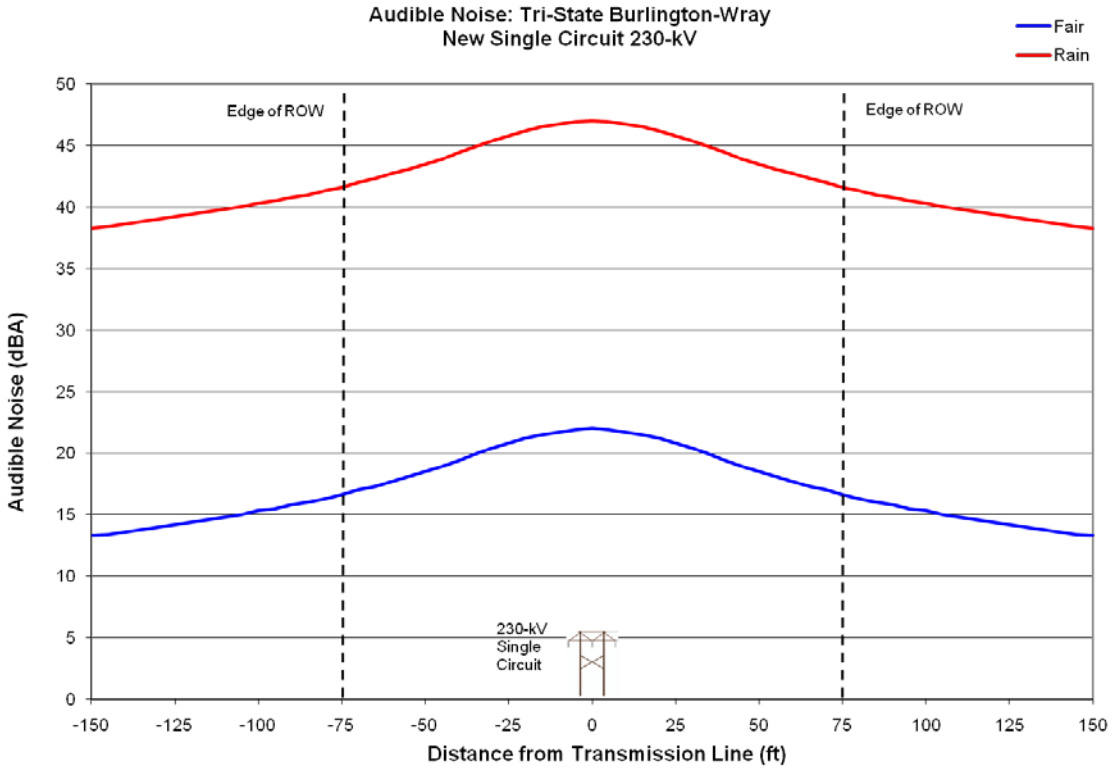

Figure 5-3: Audible Noise Modeling Results

5.5 WATER RESOURCES

According to the U.S. Geological Survey's (USGS) Elevation Derivatives for National Application (EDNA) Watershed Atlas database (USGS 2012a), the Project Study Area lies entirely within the Kansas River Watershed. The Project Study Area includes four hydrologic unit codes (HUCs), which are further described in Table 5-4.

Table 5-4: Hydrologic Units in the Project Study Area

Watershed Name	Hydrologic Unit Code	Drainage Area (square miles)	Recent Flow Data (cubic feet per second [cfs])	2011 Peak Flow Data
Arikaree	10250001	1,726	0.0 cfs at Haigler, Nebraska on January 3, 2013	39 cfs at Haigler, Nebraska
North Fork Republican	10250002	5,086	29.0 cfs at the Colorado-Nebraska State Line on January 3, 2013	197 cfs at the Colorado-Nebraska State Line
South Fork Republican	10250003	2,778	4.7 cfs at the Colorado-Kansas state line on January 3, 2013	55 cfs Colorado-Kansas state line
Little Beaver	10250013	608	None available	None available

Source: USGS (2012b)

In Colorado, the South Fork of the Republican and the Arikaree rivers are within the water-bearing Ogallala Formation; west of U.S. Highway 385, the Arikaree River has downcut into the Pierre Shale. The hydrogeologic units in the Republican/Arikaree River basin are Pleistocene alluvial and eolian deposits. The alluvial deposits consist of poorly sorted gravel, sand, and clay with caliche. Eolian sand and silt cover much of the land surface outside of the stream valleys and overlap the alluvial deposits. The alluvial deposits in these river basins are generally less than 100 feet thick, and are often in hydraulic connection with the underlying bedrock formation. Sixty-seven wells have been completed in these HUCs, and groundwater levels range 5 to 64 feet below ground surface. Ninety percent of the alluvial recorded wells are completed at depths of less than 60 feet, with a mean depth of 46 feet (Colorado Geologic Survey 2012).

According to the USGS's EDNA database (USGS 2012a), there are 22 drainage crossings along Route Alternative C (the Preferred Alternative). Table 5-5 summarizes the number of drainage crossings by each Route Alternative.

Table 5-5: Drainages Crossed By Route Alternatives

Route Alternative	Total Number of Drainages Crossed	Number of Drainages Crossed (flows of 0–17.66 cfs)	Number of Drainages Crossed (flows of 17.66–353.15 cfs)
A West	50	46	4
A East	49	45	4
B West	34	31	3
B East	33	30	3
C (Preferred)	22	19	3
D	32	29	3

Source: USGS (2012a)

Stream courses within the Project Study Area are primarily ephemeral washes that flow with snowmelt or significant rainfall events. A minority of the drainages are perennial, with water sources coming from aquifers, springs, and/or irrigation runoff. Named streams bisecting the Route Alternatives include the Arikaree River, Beaver Creek, Black Wolf Creek, Bonny Creek, Chief Creek, Copperkettle Creek, Cowpe Creek, Dry Willow Creek, Hays Gulch, Horse Creek, Landsman Creek, North Fork of the Republican River, North Sand Creek, Sand Creek (immediately northeast of Burlington), Sand Creek (northern tributary to the South Fork of the Republican River), South Fork of the Republican River, and Spring Canyon Creek. Surface water crossings are depicted on Figure 5-4 and summarized by route alternative below in Table 5-6.

Table 5-6: Major Stream Crossings by Project Alternative

Streams Crossed	Route Alternatives					
	A West	A East	B West	B East	C	D
Arikaree River	✓	✓	✓	✓	✓	✓
Beaver Creek	✓	✓	✓	✓	✓	✓
North Fork Black Wolf Creek			✓	✓		
South Fork Black Wolf Creek			✓	✓		
Bonny Creek	✓	✓	✓	✓	✓	✓
Chief Creek	✓	✓	✓	✓		
Copperkettle Creek	✓	✓				
Cowpe Creek						✓
Dry Willow Creek					✓	✓
Hay Gulch	✓	✓				
Horse Creek						✓
Landsman Creek	✓	✓	✓	✓		
North Fork of the Republican River	✓	✓	✓	✓	✓	✓
North Sand Creek	✓	✓	✓	✓		
Sand Creek (tributary to the South Fork of the Republican River)					✓	✓
South Fork of the Republican River	✓	✓	✓	✓	✓	✓
Spring Canyon Creek	✓	✓				

According to the U.S. Environmental Protection Agency (USEPA), the North and South Forks of the Republican River watersheds have good water quality standards, while the Little Beaver Watershed was not assessed (USEPA 2010a). Only the Arikaree River does not exceed water quality standards. The Arikaree River has impaired status for recreation primary contact due to high *Escherichia coli* levels, but the Arikaree River meets water quality standards for agriculture and for Class I Aquatic Life Warm Water (USEPA 2010b).

Stalker Lake, located just west of Wray in Yuma County, is the largest lake in the Project Study Area. The former Bonny Lake or Bonny Reservoir, located in southern Yuma County, was drained in the fall of 2011 under state water rights obligations to Kansas as part of the Republican River Compact. As of February 2013, the U.S. Bureau of Reclamation indicates Bonny Reservoir is 0.0 percent full (U.S. Department of the Interior 2013).

Figure 5-4

Land Cover & Surface Water

Legend

- Study Area
- Preferred Route
- Route Alternatives
- Wray Substation (End Point)
- Burlington Substation (End Point)

Transportation

- Interstate Highway
- U.S. Highway
- Major Roads

Surface Water

- Canal / Ditch
- Intermittent Stream
- Perennial Stream/River
- Lake/ Reservoir

Land Cover

- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intenisty
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Shrub/Scrub
- Grassland/ Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetland
- Emergent Herbaceous Wetlands

- State Line
- County Line

1 inch = 19,800 feet

0 1 2 3 Miles

1 inch = 3.75 miles

Sources:
CDOT - Highways, Major Roads
USGS - Elevation, Land Cover, Hydrogrpahy

Acronyms:
CDOT: Colorado Department of Transportation
USGS: United States Geological Survey

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5.6 WETLANDS AND FLOODPLAINS

5.6.1 Wetlands

The purpose of Executive Order (EO) 11990, Protection of Wetlands, is to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. To meet these objectives, the EO requires federal agencies, in planning their actions, to consider alternatives to wetland sites and limit the potential damage if any activity affecting a wetland cannot be avoided. Where wetlands cannot be avoided, measures to minimize adverse impacts to wetlands must be examined.

Digitized wetland map data is not available for the Project Study Area from the USFWS National Wetlands Inventory (NWI) Geodatabase. Electronic scans of hard-copy maps of NWI maps and the National Landcover Dataset (Fry et al. 2011) were reviewed to identify wetland occurrence in the Project area. According to the National Landcover Dataset, there are limited wetland areas in the Project Study Area.

According to NWI data (USFWS 2012), wetlands (mapped as Palustrine on the NWI map) are associated with the Arikaree River, Chief Creek, Copperkettle Creek, Dry Willow Creek, Hays Gulch, Horse Creek, Landsman Creek, Little Beaver Creek, North Fork of the Republican River, South Fork of the Republican River, Spring Canyon Creek, and several unnamed drainages that are tributaries to the aforementioned drainages. Table 5-7 summarizes the number of wetland areas crossed by each Route Alternative. Riparian communities (mapped as Riverine on the NWI map) are associated with Arikaree River, Beaver Creek, Bonny Creek, Landsman Creek, Little Beaver Creek, North Sand Creek, Sand Creek (northern tributary to the South Fork of the Republican River), and the South Fork of the Republican River. Some of the unnamed drainages in the Project Study Area are so high in elevation in the watershed that they do not have mapped wetlands or riparian areas, and sometimes do not even have a defined bed and bank. Figure 5-4 depicts the wetland areas in the Project Study Area (Fry et al., 2011).

Table 5-7: Number of NWI-Mapped Palustrine and Riverine Areas Crossed By Route Alternatives

	Route Alternatives					
	A East	**A West**	**B East**	**B West**	**C**	**D**
Wetlands Crossed (Palustrine on NWI Map*)	23	22	12	11	8	16
Riparian Areas Crossed (Riverine on NWI Map*)	12	12	13	13	11	15

Source: USFWS (2012).

* Contiguous palustrine areas (such as palustrine emergent wetlands and palustrine forested wetlands) were counted as one wetland, as were contiguous types of riverine areas. Non-contiguous palustrine or riverine areas, regardless of type, were individually counted.

Since the distance between transmission structures would be 650 to 1,100 feet, it is anticipated these wetland and riparian areas would be spanned by any of the Route Alternatives.

5.6.2 Floodplains

EO 11988, Floodplain Management, directs federal agencies to ensure that the potential effects of any action it may take in a floodplain are evaluated. Federal agencies, therefore, are required to avoid direct or indirect support of development in a floodplain or new construction in a wetland whenever there is a practicable alternative.

Most of the Project Study Area has not been mapped by the Federal Emergency Management Agency (FEMA). The only two FEMA-mapped sections in or near the Project Study Area occur along Chief Creek (west of Wray) and the North Fork of the Republican River, from its confluence with Chief Creek east through the City of Wray, to the Kansas state line (FEMA 1985).

Alternatives A West and A East and B West and B East would cross the floodplain of the North Fork of the Republican River to the south of the Wray Substation. Alternatives C and D would also cross the floodplain of the North Fork of the Republican River further to the east. The Project alternatives relative to the mapped floodplains are depicted on Figure 5-5.

It is assumed that the other streams and tributaries in the Project Study Area (for which floodplain data are not available) may have associated floodplains.

Figure 5-5

Floodplains

Legend

- Study Area
- Preferred Route
- Route Alternatives
- Wray Substation (End Point)
- Burlington Substation (End Point)
- Existing 115 kV Transmission Line
- Existing 230 kV Transmission Line
- 100-Year Floodplain

Surface Water

- Canal / Ditch
- Intermittent Stream
- Perennial Stream/River
- Lake/ Reservoir

- Interstate Highway
- U.S. Highway
- Major Roads
- Local Roads
- Railroads
- State Line
- County Line

1 inch = 5,000 feet

0 0.25 0.5

Miles

1 inch = 0.95 miles

Sources:

CDOT - Highways, Major and Local Roads Railroads, Municipal Limits
FEMA - Floodplains
USGS - Elevation

Acronyms:

BNSF: Burlington Northern Santa Fe
CDOT: Colorado Department of Transportation
FEMA: Federal Emergency Management Agency
USGS: United States Geological Survey

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5.7 VEGETATION RESOURCES

5.7.1 Vegetation

The Project Study Area is located in the High Plains Level III ecoregion, which is higher and drier than the eastern adjacent Central Plains ecoregion, and has flatter topography and more cropland than the northern Northwestern Great Plains ecoregion. Native portions of this High Plains ecoregion are dominated by grama and buffalo grasses. This ecoregion is also typically the northern limit of cultivated winter wheat and sorghum and the southern limit of spring wheat. Gas and oil fields are scattered throughout this ecoregion. This ecoregion is further divided into four Level IV ecoregions, three of which are crossed by the proposed Route Alternatives: Rolling Sand Plains, Moderate Relief Plains, and the Flat to Rolling Plains (Chapman et al., 2006).

The Rolling Sand Plains Level IV ecoregion is composed of grass-stabilized sand plains, sand dunes, and sand sheets, and differ from adjacent loess-covered plains. These sandy soils support a sandsage prairie in native areas and are typically dominated by sand sagebrush, rabbitbrush, sand bluestem, prairie sandreed, and Indian ricegrass. These areas are typically used for rangeland, although a few scattered irrigated cropland areas are present (Chapman et al., 2006).

The Moderate Relief Plains Level IV ecoregion typically has less sandy soils than discussed above, but has more varied topography than the ecoregion discussed below. These soils are typically silty and clayey loams, which limit the establishment of cropland, but allow for rangeland. Native areas are dominated by blue grama and buffalograss (Chapman et al., 2006).

The Flat to Rolling Plains Level IV ecoregion is flatter than the other two ecoregions and is typically silty with a thin layer of loess. Because of its flat nature, dry land farming (primarily winter wheat) is dominant in this ecoregion, with scattered areas dominated by irrigated cropland (forage crops) (Chapman et al., 2006).

The riparian environments along the north and south forks of the Republican River and the Arikaree River are mostly uncultivated and are used for grazing. The fields have plains cottonwood (*Populus sargentii*), narrowleaf cottonwood (*P. angustifolia*), mountain willow (*Salix monticola*), Geyer willow (*S. geyeriana*), peach-leaved willow (*S. amygdaloides*), sandbar willow (*S. exigua*), broad-leaved cattail (*Typha latifolia*), great bulrush (*Scirpus lacustris*), field horsetail (*Equisetum arvense*), salt-grass (*Distichlis spicata*), sand dropseed (*Sporbolus cryptandrus*), alder (*Alnus tenuifolia*), river birch (*Betula fontinalis*), rushes (*Juncus* spp.), water sedge (*Carex quatilis*), and beaked sedge (*C. utriculata*) (Fitzgerald et al. 1994:22).

Figure 5-4 depicts land cover in the Project Study Area and across each of the Route Alternatives.

5.7.2 Noxious and Invasive Weeds

Colorado prioritizes the manner in which noxious weeds are managed and categorizes noxious weeds into List A, B, and C weeds as follows (CDA 2012):

- **List A species** in Colorado that are designated by the Commissioner for eradication.
- **List B species** are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, develops and implements state noxious weed management plans designed to stop the continued spread of these species.
- **List C species** are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, will develop and implement state noxious weed management plans designed to support the efforts of local governing bodies to facilitate more effective integrated weed management on private and public lands. The goal of such plans will not be to stop the continued spread of these species but to provide additional education, research, and biological control resources to jurisdictions that choose to require management of List C species.

Surveys for noxious weeds were not conducted to support this EA. However, while collecting other information for the Project, noxious weeds were observed in the Project Study Area, including two List B species Canada thistle (*Cirsium arvense)* and, musk thistle (*Carduus nutans*), and one List C species, field bindweed (*Convolvulus arvensis).* The invasive species kochia (*Bassia prostrate*) also was observed.

5.8 WILDLIFE AND WILDLIFE HABITAT

The CPW was contacted as part of project scoping to identify wildlife and wildlife habitats of concern in the study area. CPW's letter summarized the agency's concerns regarding potential Project impacts to area wildlife and habitat. The letter pointed out areas of bird habitat and suggested that routing a transmission line along existing roads, transmission line corridors, and developed lands are ways to minimize environmental impacts that may be associated with the Project.

Most of the shortgrass prairie habitat throughout the Project Study Area has been moderately to heavily disturbed by livestock grazing and agricultural production. The grassland habitat and open nature of the Project Study Area provide habitat for wildlife compatible with agricultural and range land uses. Wildlife in the Project Study Area includes coyote, mule deer, white-tailed deer, and small mammals such as skunk, badger, rabbit, prairie dog, and fox.

Information regarding big game habitats in the Project Study Area came from CPW's National Diversity Information Source (NDIS) database (NDIS 2013). The Project Study Area and all Project alternatives include overall range, winter range, summer range and winter concentration areas for white-tailed and mule deer. The majority of the Project Study Area has been mapped as overall range for pronghorn. Pronghorn winter range is found to the east of Route Alternatives A West and A East. Figure 5-6 depicts big game habitats in the Project Study Area. Table 5-8 summarizes the length and type of habitat crossed for big game by Route Alternative.

Figure 5-6

Big Game Habitats

Legend

- Study Area
- Preferred Route
- Route Alternatives
- Wray Substation (End Point)
- Burlington Substation (End Point)
- Interstate Highway
- U.S. Highway
- Major Roads
- Local Roads
- Railroads
- State Line
- County Line
- White-tailed Deer Winter Range
- White-tailed Deer Concentration
- Pronghorn Winter Range
- Pronghorn Winter Concentration
- Mule Deer Winter Range
- Mule Deer Winter Concentration

1 inch = 19,800 feet

0 1 2 3 Miles

1 inch = 3.75 miles

Sources:
CDOT - Highways, Major Roads, Municipal Bounds
NDIS - Pronghorn, White-tailed Deer, Mule Deer Areas
USGS - Elevation

Acronyms:
CDOT: Colorado Department of Transportation
NDIS: Natural Diversity Information Source
NRCS: Natural Resources Conservation Service
USGS: United States Geological Survey

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Table 5-8: Length Crossing Game and Avian Habitat (in Miles)

	White-tailed Deer Winter Range	White-tailed Deer Concentration Areas	Pronghorn Winter Range	Pronghorn Concentration Areas	Mule Deer Winter Range*	Mule Deer Concentration Areas	Bald Eagle Winter Concentration Areas	Greater Prairie Chicken Production Areas
Alternative A East	20.5	13.9	0	0	67.1	22.8	0.6	2.0
Alternative A West	19.7	14.2	0	0	66.3	22.0	0.6	2.3
Alternative B East	21.3	13.5	0	0	70.0	22.9	0.6	2.0
Alternative B West	20.4	13.8	0	0	69.1	22.0	0.6	2.3
Alternative C (Preferred)	18.2	14.1	0	0	72.0	25.9	0.6	11.5
Alternative D	19.6	17.1	0	0	74.8	28.6	0.6	13.4

* Mule deer winter range encompasses the entire Project Study Area.

Comments on the proposed Project were received from CPW in a letter dated April 30, 2012. In the letter, CPW noted that species of concern within the Project Study Area are raptors, waterfowl, greater prairie chickens, swift foxes, and song birds. The CPW noted that impacts to avian species would likely be higher in riparian corridors and near bodies of water including Stalker Lake and Bonny Reservoir (Bonny Reservoir was drained in the fall of 2011). The letter also states that by selecting transmission corridors that consist of development along existing roads, developed agriculture, and existing transmission line corridors, the impacts of the Project to wildlife and wildlife habitat may be considered minimal. CPW's letter is included as Appendix A. Tri-State identifies existing linear corridors as opportunities during the routing process to minimize impacts to natural and human resources.

Raptors are present throughout the Project Study Area, as are ground-nesting birds and other migratory birds. The CPW identified Stalker Lake and Bonny Lakes as areas with high concentrations of waterfowl during the fall and winter migrations. Bonny Reservoir is also used by sandhill cranes during spring and fall migration. A historic whooping crane occurrence was also documented at Bonny Reservoir.

A great blue heron rookery (nesting area) is located approximately 0.73 mile to the east of Route Alternative D and 4.0 miles from Route Alternative C (preferred alignment) near the Colorado/Nebraska border along Black Wolf Creek.

Ospreys are known to occur around Stalker Lake and Bonny Reservoir in the summer. Golden eagles, ferruginous hawks, sharp-shinned hawks, prairie falcons, Swainson's hawks, red-tailed hawks, rough-legged hawks (winter), merlins, kestrels, great-horned owls, burrowing owls, barn owls, and long-eared and short-eared owls are known to occur in the Project area.

The northern and western end of the Project Study Area includes overall range and production habitat for the greater prairie chicken (Figure 5-7). Route Alternatives C and D would occur within greater prairie chicken production habitat according to data provided by CPW's NDIS database. Production areas also occur to the north of Route Alternatives A East and A West and B East and West. CPW's scoping letter indicated that greater-prairie chicken can be found through the Project study area. A potential lek site may

be found within Willow Creek SWA, which is spanned by Alternative C. Greater prairie-chickens are fairly common local residents in the sandhills of northern and central Yuma County. They are found in mid-grass sandsage grasslands on sandhills, mixed with corn fields (CPW 2013a). The greater prairie chicken was formerly listed as a state endangered species, but in 1998, as a result of recovery efforts, populations have increased. They are now considered a special concern/non-game species status.

Figure 5-7 shows avian habitats within the Project Study Area. Table 5-8 summarizes the length and type of habitat crossed by avian species by Route Alternative.

Aquatic habitats in the Project area include Bonny Reservoir (limited), Stalker Lake, and the North and South Fork of the Republican River. Generally power lines can be designed to span open surface waters to avoid impacts to aquatic species and habitats.

5.9 SPECIAL STATUS SPECIES AND MIGRATORY BIRDS

On December 21, 2011, Tri-State sent a letter to the USFWS to request comments regarding the proposed macro corridors identified for the Project and their potential impacts to threatened and endangered species. The USFWS responded on February 1, 2012, with a letter providing the website address for the Information, Planning and Conservation (IPaC) system, which could be used to generate a species list for the Project. According to the IPaC system, no federally listed species are found in Yuma or Kit Carson counties.

On February 15, 2012, Tri-State sent a letter to USFWS requesting concurrence that the Project alternatives would have no impact on federally listed species or their habitats. The USFWS concurred that the Project is not likely to adversely affect federally listed species in a letter dated April 1, 2013 (included in Appendix B). Tri-State agreed to the following EPMs to minimize impacts to migratory birds and bald and golden eagles:

- If construction were to occur within the avian breeding season, Tri-State would complete a raptor nest survey on-site prior to Project construction to ensure active nests are not impacted by the proposed Project. Tri-State would either restrict specific activities near the nests that may result in nest abandonment or provide a qualified monitor to observe the nest and ensure construction activities do not result in nest abandonment.
- The transmission line will be designed with the incorporation of the Avian Power Line Interaction Committee's suggested practices for avian protection on power lines. Tri-State will not place any structures in streambeds, wetlands, or other water features. These features will be spanned by the proposed transmission line.
- Tri-State will conduct an avian collision risk assessment once the final route has been engineered. Areas that pose a collision risk to avian species will be marked using swan or other type of flight diverter device.
- If construction occurs during the burrowing owl breeding season (March 15 through October 31), survey of the transmission line ROW and in areas where new access roads are required will be conducted in accordance with CPW protocols.

In Kit Carson and Yuma counties, there are three species listed as state threatened, four species listed as state endangered, and 19 species of state special concern (which is not a statutory category). Table5-9 lists the Colorado state special status species that could occur in the Project Study Area and summarizes their preferred habitat.

Figure 5-7

Bald Eagle, Greater Prairie Chicken & Great Blue Heron Habitat

Legend

- Study Area
- Preferred Route
- Route Alternatives
- Wray Substation (End Point)
- Burlington Substation (End Point)
- Interstate Highway
- U.S. Highway
- Major Roads
- Local Roads
- Railroads
- State Line
- County Line
- Bald Eagle Nest Sites (Undetermined)
- Bald Eagle Communal Roosts
- Bald Eagle Winter Concentration
- Bald Eagle Winter Forage
- Bald Eagle Winter Range
- Greater Prairie Chicken Production Area
- Greater Prairie Chicken Overall Range
- Great Blue Heron Nesting Area
- Great Blue Heron Historic Nest Area

1 inch = 19,800 feet

0 1 2 3 Miles

1 inch = 3.75 miles

Sources:
CDOT - Highways, Major Roads, Municipal Bounds
NDIS - Bald Eagle, Prairie Chicken, Heron areas
USGS - Elevation

Acronyms:
CDOT: Colorado Department of Transportation
NDIS: Natural Diversity Information Source
NRCS: Natural Resources Conservation Service
USGS: United States Geological Survey

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Table 5-9: Special Status Species with Potential for Occurrence in Project Study Area

Common Name, Scientific Name	County	Colorado State Status	Preferred Habitat	Occurrence
Northern cricket frog, *Acris crepitans*	Yuma, Kit Carson	State Special Concern	Sunny, muddy, and marshy edges of semi- to permanent ponds, streams, and irrigation ditches, in pastures and sandhills along the South Platte and Republican Rivers (Hammerson 1999).	Historically, this species was known to occur in Yuma County and was likely to occur in Kit Carson County; however, it is unknown if this species still occurs in Colorado as the last known sighting was in 1979 (Young 2011).
Northern leopard frog, *Rana pipiens*	Kit Carson, Yuma	State Special Concern	Wet meadows, banks, and shallows of marshes, ponds, streams, irrigation ditches, and lakes. Hibernate in water > 85 cm deep. Prefer semi-permanent wetlands with aquatic shoreline vegetation (Colorado Herpetofaunal Atlas 2013).	Species is known to occur in Kit Carson County; likely to occur in Yuma County (Young 2011).
Plains leopard frog, *Rana blairi*	Kit Carson, Yuma	State Special Concern	Prefers clean water and pools with no algae and cattails along the Arkansas and Republican rivers (displaced by bullfrogs which like cattails and woody vegetation and algae). Observed in and along streams, ponds (natural and artificial), irrigation ditches in the plains, grasslands, sandhills, stream valleys, and canyon bottoms (Hammerson 1999).	Species is known to occur in Kit Carson County; likely to occur in Yuma County (Young 2011).
American Peregrine falcon, *Falco peregrinus anatum*	Yuma, Kit Carson	State Special Concern	Peregrines usually nest on ledges of high cliffs at elevations of 4,500 to greater than 9,000 feet, though most nests are located at the lower end of this range, near pinyon, juniper, and ponderosa pines.	This species does not nest on the eastern plains (Craig and Enderson 2004). Although the CPW's NDIS lists this species as known to occur in both counties (CPW 2013b), its potential occurrence in Project Study Area would be as an occasional migrant.

Table 5-9: Special Status Species with Potential for Occurrence in Project Study Area

Common Name, Scientific Name	County	Colorado State Status	Preferred Habitat	Occurrence
Bald eagle, *Haliaeetus leucocephalus*	Kit Carson, Yuma	State Special Concern	Bald eagles are seldom seen far from water—large rivers, lakes, and seacoasts. In Colorado they are often found near reservoirs and along major rivers (South Platte, Arkansas, Rio Grande, Yampa, Colorado) during both the summer and winter. During the breeding season bald eagles defend territories and most frequently can be found nesting in large cottonwood trees. In the winter, bald eagles communally roost in large trees for warmth and protection (CPW 2013c).	This species is known to occur in both counties. Winter concentration, winter range, and winter foraging habitat areas exist along the North and South Fork of the Republican River, Bonny Reservoir, and Stalker Lake. There are no documented bald or golden eagle nest sites within 0.5 miles of the Project Study Area. There are no communal roost sites documented within 0.5 miles of the Project Study Area.
Ferruginous hawk, *Buteo regalis*	Kit Carson, Yuma	State Special Concern	Prefers grasslands, rangelands, sagebrush shrublands and agricultural fields that offer abundant prey (prairie dog towns) and nesting sites with a view. Will also use artificial nesting platforms (Kingery 1998).	This species is known and likely to occur in both counties.
Greater sandhill crane, *Grus Canadensis tabida*	Yuma	State Special Concern	Prefers croplands, grasslands, flooded fields, beaver ponds, marshes, wet meadows, hayfields (Kingery 1998).	Could occur as migrants March–May; known to occur in Yuma County. No nesting pairs recorded in Yuma or Kit Carson counties (Kingery 1998).
Least tern, *Sterna antillarum*	Yuma	State Endangered	Sparsely vegetated sandy, gravelly, or silty beaches or islands on lakes or reservoirs with a healthy small fish population (Kingery 1998).	The NDIS lists this species as known to occur in Yuma County (CPW 2013b). In Colorado, nesting least terns are only known in the Arkansas Valley (Kingery 1998). It is unlikely this species would occur in the Project Study Area due to lack of preferred habitat. In addition, this species is a federally endangered species, and does not appear on the USFWS list for either county.

Table 5-9: Special Status Species with Potential for Occurrence in Project Study Area

Common Name, Scientific Name	County	Colorado State Status	Preferred Habitat	Occurrence
Long-billed curlew, *Numenius americanus*	Kit Carson, Yuma	State Special Concern	Prefers short to mixed-grass prairie, with prickly pear and small scattered shrubs. Also observed on short grass uplands, grazed mixed-grass prairie, meadows, arid scrub prairies, and short-open sagebrush grassy floodplains that are < 0.25 mile from standing water. Does not use areas dominated by sand sagebrush. Nests in open areas with wide view and short vegetation (<1 foot) (Kingery 1998).	NDIS lists this species as known to occur in both counties, but rare in abundance (CPW 2013b).
Mountain plover, *Charadrius montanus*	Kit Carson, Yuma	State Special Concern	Prefers flat terrain with spaced plants and at least 30 percent bare ground. The rest comprised of blue grama, buffalograss, birdsfoot sagebrush, thread-leaved sedge, saltbush, wild buckwheat, fringed sagebrush, needle-and-thread, junegrass, Sandburg's bluegrass (Kingery 1998).	This species is known to occur in both counties and known to breed in Kit Carson County (Kingery 1998).
Piping plover, *Charadrius melodu*	Yuma	State Threatened	In Colorado, nests on broad, sandy beaches, preferably on island (Kingery 1998).	NDIS lists this species as known to occur in Yuma County, although it is only known to nest in the Arkansas Valley (Kingery 1998). Although it could occur as a transient, it is unlikely this species would occur in the Project Study Area due to lack of habitat. Also, this is a federally endangered species, but was not listed on the USFWS lists for either county.
Plains sharp-tailed grouse, *Tympanuchus phasianellus jamesii*	Yuma	State Endangered	In Colorado, this subspecies is found in rolling hills with scrub oak thickets and grassy glades (Kingery 1998).	While NDIS lists this subspecies as known to occur in Yuma County, Kingery (1998) indicates that the only remaining population of this species in Colorado is in Douglas County.

Table 5-9: Special Status Species with Potential for Occurrence in Project Study Area

Common Name, Scientific Name	County	Colorado State Status	Preferred Habitat	Occurrence
Western burrowing owl, *Athene cunicularia*	Kit Carson, Yuma	State Threatened	Well-drained and gently sloping grasslands, dry prairies, meadows, open sagebrush, agricultural lands, vacant lots with native mixed or shortgrass prairie (< ankle high) and prairie dog, badger, or other small mammal towns consisting of buffalograss and blue grama and high sand content in the soil (Kingery 1998).	This species is known to occur in both counties and within the Project Study Area.
Western snowy plover, *Charadrius alexandrines nivosus*	Yuma	State Special Concern	Inland, the species prefers ephemeral alkali playas and will use man-made sewage and evaporative ponds. In southeastern Colorado, breeds only in man-made habitats (reservoir edges) (Kingery 1998).	While NDIS lists this species as known to occur in Yuma County, Kingery (1998) has only documented nesting snowy plovers in the lower Arkansas River Valley and the San Luis Valley. Given lack of suitable habitat, it is unlikely this species would occur in the Project Study Area.
Whooping crane, *Grus Americana*	Kit Carson	State Endangered	The species lives in mudflats around reservoirs and in agricultural areas. While wintering, they live on salt flats that are dominated by coastal salt grass. Their nesting grounds are wetland communities dominated by bulrush. The species nests at Wood Buffalo National Park in Canada and winters at Aransas National Wildlife Refuge Texas.	According to a letter received from CPW regarding the Project, there has been one whooping crane observed in the past in Kit Carson County around Bonny Reservoir. This state and federally endangered species was not listed on USFWS's lists for either county. According to the species profile available on CPW's website, the species has not been seen in Colorado since 2002 (CPW 2013d). It is possible but unlikely that a whooping crane could occur in the Project area during migration.
Brassy minnow, *Hybognathus hankinsoni*	Yuma and Kit Carson County	State Threatened	Pools of sluggish, clear creeks and small rivers, usually over sand and gravel with abundant aquatic vegetation, along the Colorado, South Platte and Republican River basins (Woodling 1985).	Known to occur in the Republican River and tributaries in Yuma and Kit Carson County (Hanophy 2006).

Table 5-9: Special Status Species with Potential for Occurrence in Project Study Area

Common Name, Scientific Name	County	Colorado State Status	Preferred Habitat	Occurrence
Plains minnow, *Hybognathus placitus*	Yuma	State Endangered	Prefer main channel areas with some current and sandy bottoms. Eats aquatic plants such as algae (Hanophy 2006).	Species appears to be very rare. A few specimens were collected in the Republican River Basin in 1980 (CPW 2013e).
Plains orangethroat darter, *Etheostoma spectabile*	Kit Carson, Yuma	State Special Concern	Republican River Basin streams where shallow riffles and runs pass over sand and gravel substrate. Prefer undercut banks (Woodling 1985).	Known to occur in the Republican River basin (Hanophy 2006).
Stonecat, *Noturus flavus*	Yuma	State Special Concern	Fast water riffles and runs of streams. Hides under rocks, woody debris or sand bars, or sand/gravel bottoms (Woodling 1985).	The distribution in Colorado is not well known; in 1980 one specimen was collected from the North Fork of the Republican River in Yuma County (CPW 2013f).
Black-tailed prairie dog, *Cynomys ludovicianus*	Kit Carson, Yuma	State Special Concern	Short to mid-grass prairie, or vacant/disturbed weedy sites and sites overgrazed by livestock. Preferred sites have roots, seeds, broad-leaf forbs and grasses and clay mixtures. Preferred plants include buffalograss, grama grass, western wheatgrass and sand dropseed (Armstrong et al. 1994).	Known to occur in both counties and in the Project Study Area.
Northern pocket gopher, *Thomomys talpoides*	Kit Carson	State Special Concern	This species is found in many different habitat types including agricultural and pasture lands, semi-desert shrublands, and grasslands at lower elevations down to 5,000 feet upwards into alpine tundra (14,500 feet). Preferred habitats are grass-forb rangelands that have composites, legumes, cinquefoil, prickly pear cactus, mallows, saltbush, and knotweeds (Armstrong et al. 1994).	NDIS lists this species as common in Kit Carson County (CPW 2013b).
Swift fox, *Vulpes velox*	Kit Carson, Yuma	State Special Concern	Eastern Colorado short to mid-grass prairie with flat to gently rolling terrain with blue grama, buffalograss, as well as jackrabbits and black-tailed prairie dogs (Armstrong et al. 1994).	The species is known to occur in both counties. In Yuma County, NDIS lists the species' abundance as "rare," and in Yuma County, as "uncommon" (CPW 2013b).
Common garter snake, *Thamnophis sirtalis*	Yuma	State Special Concern	Marsh, ponds, ditches, edge of streams – closer to water. Dens underground or underwater. Eats frogs, toads and fish (Hammerson 1999).	Species is known to occur along the North Fork of the Republican River in Yuma County (Young 2011).

Table 5-9: Special Status Species with Potential for Occurrence in Project Study Area

Common Name, Scientific Name	County	Colorado State Status	Preferred Habitat	Occurrence
Massasauga, *Sistrurus catenatus*	Kit Carson	State Special Concern	Grassland and sandhill areas supporting rodent and lizard populations. Hibernate nearby in firm, loamy soils (Hammerson 1999).	NDIS and Young (2011) list this species as known to occur and likely to occur, respectively, in Kit Carson County.
Midget faded rattlesnake	Kit Carson, Yuma	State Special Concern	Observed in plains grasslands, sandhills, semi-desert and mountain shrublands, prairie dog towns, riparian areas, pinyon-juniper and montane woodlands. This species also will use woodpiles for cover (Hammerson 1999).	Although NDIS lists this species as known to occur in both counties, Young (2011) indicates the species distribution only in west-central Colorado (Mesa, Delta, and Garfield counties). This species is unlikely to occur in the Project Study Area.
Yellow mud turtle, *Kinosternon flavescens*	Kit Carson, Yuma	State Special Concern	Slow moving freshwater (Irrigation ditches, permanent and intermittent streams and ponds) with muddy and sandy bottoms with areas of aquatic vegetation. Also uses sandhills in the summer (Hammerson 1999).	NDIS lists this species as fairly common in Yuma County and likely to occur in Kit Carson County (CPW 2013b).

5.9.1 Migratory Birds

The rangeland, riparian, and wetland communities within the Project area provide nesting habitat for a variety of species protected under the Migratory Bird Treaty Act (MBTA). Birds observed in the Project Study Area during general field reconnaissance for reviewing macro corridors and alternative routes include mourning dove, barn owl, great-horned owl, burrowing owl, golden and bald eagles, ferruginous hawk, red-tailed hawk, sandhill crane, Bullock's oriole, western kingbird, western meadowlark, lark bunting, wild turkey, ring-necked pheasant, mallard, cormorant, and common nighthawk.

Raptors such as red-tailed hawk, Swainson's hawk, northern harrier, ferruginous hawk, and golden and bald eagles occur and may potentially be nesting in the Project Study Area.

While golden and bald eagles are no longer federally listed as threatened or endangered, they are still afforded federal protection under the Bald and Golden Eagle Protection Act and the MBTA. Route Alternatives were chosen to avoid known active eagle nest or communal roost sites. There are no documented golden eagle nest sites in the Project Study Area. The former Bonny Reservoir provided a communal winter roost site for bald eagles. Up to 50 eagles have been observed in the past in this area (CPW 2012). With the recent complete draining of the reservoir, few eagles remain in this area (TRC 2013a). This communal roost site is the only documented communal roost site in the Project Study Area and is approximately 3.8 miles from the closest Route Alternative (Route Alternative C).

Bald eagles are observed up and down the North and South Fork of the Republican. There is a historic bald eagle nest located along the South Fork of the Republican River approximately 1.2 miles from Route Alternatives C and D. There closest active bald eagle nest site is located 3.6 miles from Alternative C across the Kansas border. Bald eagle winter concentration and foraging areas are found along the North and South Fork of the Republican River and Black Wolf Creek. All of the Project alternatives would span portions of bald eagle winter concentration and foraging areas.

The National Bald Eagle Management Guidelines and the CPW specify no surface occupancy (beyond that which historically occurred in the area) within 0.25 mile radius of a bald eagle nest site and associated alternate nests. The "Recommended Buffers and Seasonal Restrictions for Colorado Raptors" (Craig 2008) also recommend seasonal restrictions to human encroachment within 0.50 mile of the nest and any alternate nests from December 15 to July 15.

5.10 RECREATION

Within the Project Study Area, recreation opportunities include dispersed hunting and fishing on state-managed and private lands. SWAs provide opportunities for hunting, fishing, hiking, and wildlife viewing. Table 5-10 summarizes the facilities of each recreation site in the Project Study Area**.** The locations of SWAs and State Trust lands are depicted on Figure 5-1 and recreation areas spanned by each Project alternative is included in Table 5-11.

Table 5-10: Recreation Areas within the Project Study Area

Name of Recreation Area	Agency	Facilities and Recreation
Willow Creek SWA	CPW	No facilities. Hunting (deer, turkey, dove, small game) and wildlife viewing.
South Republican SWA (Bonny parcel)	CPW	Restrooms, picnic area, campsites. Hunting (deer, rabbit, squirrel, turkey, pheasant, bobwhite quail, dove, waterfowl, snipe), pond fishing. The former Bonny Lake State Park currently is being managed as part of this SWA.
South Republican SWA (Kleweno parcel)	CPW	No facilities. Hunting (deer, rabbit, squirrel, turkey, pheasant, dove, waterfowl), wildlife viewing.
Simmons SWA	CPW	No facilities. Hunting (deer, turkey, rabbit, dove), wildlife viewing.
Stalker Lake SWA	CPW	Restrooms, boat ramp, picnic shelters, tables, playground. Hunting (waterfowl, pheasant, bobwhite quail, dove), fishing, wildlife viewing, picnicking, hiking.
Sandsage SWA	CPW	No facilities. Hunting (rabbit, squirrel, pheasant, bobwhite quail, waterfowl, dove), wildlife viewing, fishing, hiking.
Sandy Bluffs State Trust Land	CPW	No facilities. Hunting (small and big game).
Wray Country Club	City of Wray	Nine-hole golf course, par 35, 2,987 yards.
City of Burlington	City of Burlington	Baseball fields, swimming pool, sport fields (soccer, baseball), sport courts, gymnastics.
City of Wray	City of Wray	Recreation center, sport courts, aquatic center, multi-use path.

Table 5-11: Recreation Areas Crossed by Project Alternative

Route Alternative	Recreation Areas Within Alternative Alignment
C	Willow Creek SWA
C and D	South Republican SWA (Bonny parcel)
West of C and D	South Republican SWA (Kleweno parcel)
C	Simmons SWA
A East and B East and A West and B West	Stalker Lake SWA
Alternative B East and West	Sandy Bluffs State Trust Land

5.11 VISUAL RESOURCES

The Project Study Area is located in eastern Colorado in an area characterized by flat to gently rolling terrain accented by moderately incised and eroded drainages. The predominant line in the landscape is horizontal with some gently concave lines depicting rolling terrain. The road network is predominantly in a grid pattern. Small isolated groups of blocks depict rural settlements in the landscape.

Much of the native grasslands have been replaced by agricultural areas of pasture, irrigated crops circles, and animal husbandry. Vegetation patterns are broad monocultures of agricultural crops (winter wheat, corn, etc.). Small areas of trees are located in isolated drainages, in linear windbreaks, or in SWAs. There is very little water in the landscape, but there is evidence of standing water in drainages and erosion along the edge of incised drainages.

Colors in the landscape vary through the Project Study Area, but many reflect the agrarian nature of the landscape. The palette consists of light to medium greens, tan and golden yellow, and accented by deep green. Rural settlements are characterized by white, tans, green, grays, and accented by red and blue.

Views within the Project Study Area are broad and expansive and are only limited by stands of trees, groups of buildings, or other structures in the foreground. In areas of gently rolling terrain, the views are limited by adjacent scenery between 3 and 5 miles. The population density of the Project Study Area is low, few structures are visible and they are commonly seen in the middleground (0.5 mile to 3 miles) and background (3 miles to the edge of visibility). A common sight within the Project Study Area is the existing 115-kV transmission line from Burlington-Wray, located east of U.S. 385. The proposed transmission line would be constructed with the same type of wood H-frame structures used in this existing line. The wind turbines associated with the existing Kit Carson Windpower Project (located outside the Project Study Area) are easily seen in the middleground to background for many miles by travelers along U.S. 385 in Kit Carson County.

Sensitive visual receptors in the Project Study Area include residences, the three state highways (U.S. 36, U.S. 34, and U.S. 385, discussed further in Section 5.11), and SWAs. No federal visual resource management areas or state scenic areas are located within the Project Study Area, but several SWAs in the Project Study Area are available for public access: Stalker Lake, South Republican, Simmons, Willow Creek, and Sandsage. Table 5-10 summarizes the recreation opportunities available in these SWAs. The Project Study Area also includes the Andrews State Habitat Area, which is not available for public use, as are the Sandy Bluffs State Trust Lands.

Rural residences are scattered throughout the Project Study Area. Most rural residences are set back from the property line and typically have vegetated windbreaks in the immediate vicinity of the residence. In some portions of the Project Study Area, the rolling terrain would obscure views longer than 1,000 feet. Table 5-12 summarizes the number of highway crossings and residences within 0.25 mile of each Route Alternative.

Table 5-12: Visual Receptors in the Project Study Area

Receptor	Route Alternatives					
	A West	A East	B West	B East	C	D
Residences within 150–300 feet of centerline*	1	2	1	2	1	1
Residences within 300-1,320 feet of centerline	7	10	8	11	11	7
Length (miles) crossing SWAs	0.8	0.8	1.5	1.5	4.5	1.8
Number of state highway crossings	3	3	3	3	3	3
Number of county road crossings	38	38	41	41	36	31

* There are no residences within 0–150 feet of any of the Route Alternatives.

5.12 ECONOMICS AND SOCIAL VALUES

For the purpose of the economics and social values analysis, the study area was defined as Kit Carson and Yuma counties, which encompass all of the Route Alternatives. This section includes the social and economic characteristics of the study area. The proposed Project is located in northeastern Colorado in a primarily rural/agricultural region. The largest towns in the Project Study Area are Burlington, Wray, and Yuma. The following subsections summarize local socio-economic indicators including population, employment, income, temporary housing, community services, and infrastructure.

5.12.1 Population

Population trends for the study area are summarized in Table 5-13.

Table 5-13: Project Study Area Population

Area*	1990	2000	2010	2011 (estimate)	Average Growth 2000-2010
Yuma County	8,954	9,841	10,043	10,100	2%
Yuma	2,719	3,285	3,524	3,544	7%
Wray	1,998	2,187	2,342	2,354	7%
Vernon Census Designated Place (CDP)	**	**	29	**	**
Idalia CDP	**	**	88	**	**
Kit Carson County	7,140	8,011	8,270	8,142	3%
Burlington	2,941	3,678	4,254	4,074	16%
Stratton	**	**	658	**	**
State of Colorado	3,294,394	4,301,261	5,029,196	5,116,796	17%

* Sources: U.S. Census Bureau (2010a, 2010b, 2013a, 2013b); Colorado Department of Local Affairs (2012)

** Data not available.

5.12.2 Employment and Income

Table 5-14 summarizes the most recent employment and wage information available by county from the Colorado Department of Labor and Employment (CDLE (2013a, 2013b).

Table 5-14: Project Study Area Employment and Income

County/City	Civilian Labor Force	Total Employment	Number Unemployed	Unemployment Rate	Average Annual Wage*
Kit Carson County	4,390	4,193	197	4.5%	$34,112
Yuma County	6,197	5,959	238	3.8%	$35,724
Colorado	2,743,461	2,542,728	200,733	7.3%	$53,664

* Assumes a 40-hour week worked the year round.

5.12.3 Temporary Housing

Temporary housing in the study area primarily exists in the larger communities of Burlington, Stratton, Wray, and Yuma. Such accommodations consist of available rental housing, hotels, motels, recreational vehicle sites, and campgrounds. These facilities could accommodate temporary workers who might require housing while working on the Project.

5.12.4 Community Services and Infrastructure

Yuma County is served by volunteer fire departments located in Eckley, Hale, Idalia, Joes, Kirk, Vernon, Wages, Wauneta, Wray, and Yuma. Kit Carson County is served by five volunteer fire departments located in Burlington, Stratton, Vona, Seibert, and Flagler.

Police protection is provided by the Yuma County Sheriff's Department in Wray and the Kit Carson County Sheriff's Department in Burlington.

Nearby hospitals include the Yuma District Hospital in Yuma, the Wray Community District Hospital in Wray, and the Kit Carson County Memorial Hospital in Burlington, all of which provide 24-hour emergency care.

5.13 ENVIRONMENTAL JUSTICE

EO 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations, requires federal agencies to identify and address disproportionately high or adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations.

For the purpose of the environmental justice analysis, the study area was defined as Kit Carson and Yuma counties and incorporated all Project Route Alternatives. The predominant race in the study area is Caucasian. Both counties have lower minority populations than the state as whole. Tables 5-15 and 5-16 present race/ethnicity and income information, respectively.

Table 5-15: Total Percentage of Population By Race/Ethnicity

Geographic Area	Caucasian	Black or African American	American Indian or Alaska Native	Asian, native Hawaiian, or Pacific Islander	Hispanic or Latino*
Kit Carson County	94.9%	2.3%	0.8%	0.8%	19.0%
Yuma County	97.4%	0.4%	0.8%	0.6%	22.0%
Colorado	88.3%	4.3%	1.6%	3.1%	20.9%
United States	78.1%	13.1%	1.2%	5.2%	16.7%

* Census data explains "Hispanics may be of any race, so also are included in applicable race categories."
Source: U.S. Census Bureau 2013a, 2013b, 2013c.

The most recent 5-year estimates (2007-2011) from the U.S. Census Bureau's American Community Survey reports median household incomes of $43,194 and $44,991, for Kit Carson and Yuma counties, respectively. The proportion of residents living below the poverty level in both counties is below state and national levels.

Table 5-16: Environmental Justice Characteristics

Geographic Area	Total Population (2010)	Median Household Income (2007-2011)	Percentage of Individuals Living Below the Poverty Level (2007-2011)
Kit Carson County	8,270	$43,194	11.3%
Yuma County	10,043	$44,991	8.0%
Colorado	5,029,196	$57,685	12.5%
United States	308,745,538	$52,762	14.3%

Source: U.S. Census Bureau 2013a, 2013 b, 2013c.

5.14 HAZARDOUS MATERIALS AND SOLID WASTE

No active contamination sites, transfer stations, or landfills are identified in the Project Study Area (CDPHE 2012b).

5.15 PUBLIC HEALTH AND SAFETY

Tri-State will comply with applicable regulatory compliance standards for public health and safety.

Tri-State prohibits storage of flammables, construction of flammable structures, and other activities that have the potential to cause or provide fuel for fires on its easements and ROWs. Fuel for construction equipment will be the primary flammable substance present in the Project Area during construction. Fuels will be stored properly and no fueling will occur within 100 feet or more of surface waters and wetlands.

Construction may require the use of implosion sleeves for splicing conductors. All Tri-State electric facilities are designed, constructed, operated, and maintained to meet or exceed all applicable standards of design and performance set forth in the National Electrical Safety Code (NESC).

Although the potential does exist, given the stringent safety measures during construction and operation, hazards of fire, explosion, and other dangers to employees and the public are not anticipated.

5.16 CULTURAL RESOURCES

To further understand the significance of a resource, it is necessary to place the resource in the framework of the larger cultural history of the region, and to identify its role in the trends and patterns of history. The prehistoric culture of Colorado is divided into the four major watersheds of the state: the Colorado River Basin, the Arkansas River Basin, the Platte River Basin, and the Rio Grande River Basin. The Project Study Area falls within the Platte River Basin.

A summary of the prehistoric and historic culture of the Project Study Area is presented below. A more detailed description of the culture history of the region is found in the Cultural Resources Report prepared for this Project (TRC 2013b).

5.16.1 Cultural History Summary

The Paleoindian Period (circa 10,000–5500 B.C.). The Paleoindian period—consisting of the Clovis (10,000–9000 B.C.), Folsom (9000–8000 B.C.), and Plano (8000–5500 B.C.) complexes—is the earliest well-documented and accepted human presence in Colorado. The basic adaptive strategy recognized for the Paleoindian period was a subsistence economy that focused on the procurement of a limited number of key resources, especially megafauna (e.g., mammoth, bison). Because the locations of residential camps probably depended on the location and size of game herds, Paleoindian groups were undoubtedly highly mobile. Formerly, all Paleoindians were considered big-game hunters. Clovis was associated with the hunting of mammoths and other late Pleistocene fauna. Folsom and Plano complexes were associated with the hunting of now-extinct forms of bison. Although most excavated Clovis sites are kill sites in which Clovis points are associated with mammoth bones, the bones of much smaller animals—bison, horse, camel, cervids, canids, pronghorn, jackrabbit, birds—have also been recovered from Clovis processing localities (Cordell 1979:19–20). Currently, many researchers now view Clovis peoples as more generalized hunter-gatherers who also exploited a variety of floral and smaller faunal resources (Cordell 1997:96, 99; Ferring 1995; Haynes and Haury 1982; Johnson 1987; Moore 1996:40). Folsom and Plano groups likely "placed more emphasis on large-game hunting and less on collecting plant foods that required extensive processing" (Moore 1996:40). The earliest evidence for communal hunting occurs with Folsom components. Communal hunts required greater social organization and control than that evidenced in Clovis sites (Frison 1978:243–250, 1991:276–288). The earliest Plano complexes were frequently associated with now-extinct forms of bison. Although many recorded Plano sites in the western United States represent mass bison kills, campsites have also been reported. A number of Paleoindian sites are known to exist in extreme northeastern Colorado (Chenault 1999).

Archaic Period (5500 B.C.–A.D. 150). The Archaic period is generally divided into Early (5500–3000 B.C.), Middle (3000–1000 B.C.), and Late (1000 B.C.–A.D. 150). This period is associated with a major environmental change from wetter and cooler conditions to drier and warmer conditions that were similar to the present (Tate and Gilmore 1999). The Archaic period represents a lifeway with a more diverse resource base and different settlement pattern from the previous Paleoindian period. This change resulted as a response to changes in the environment from the cool and wet Anathermal to the warmer and dryer environment of the Altithermal, which was characterized by low rainfall and corresponding desiccation on the Plains (Antevs 1955). Several researchers (Benedict 1979; Reeves 1973; Wedel 1964) have postulated an abandonment of the Great Plains during this period (except perhaps river valleys) and movement of peoples into the foothills and mountains where climatic conditions were moister. This climate change affected the faunal and floral resources available for subsistence by the peoples of the

region. In general, the Archaic period was characterized by a broad spectrum hunting and gathering subsistence system that is expressed in the archaeological record by an increase in the use of ground stone implements, which implies the processing of vegetal resources by the manufacture of a variety of projectile point styles in conjunction with the atlatl and by an increase in the diversity of faunal and floral resources (Gilmore and Larmore 2003; Tate 1999).

Although this period saw a continuation of the mobile hunting and gathering pattern of the Paleoindian period, there was a shift towards resource diversification. In other words, the Archaic adaptation was a "diffuse" economy (Judge 1982:49). With the extinction of the larger bison forms at the end of the Plano complex, the smaller modern form of bison, *Bison bison*, emerged. The resource base included a variety of plants and the modern suite of Plains fauna. Archaic populations probably had a primary dependence on plant foods, a seasonally mobile settlement pattern, and a flexible social structure in which group size and composition varied in response to changing economic opportunities. Areas where the density and distribution of key plant resources were predictable on a seasonal basis were reoccupied (Hofman 1989:45; Judge 1982:49).

In general, the Archaic period is not well known or well represented in the eastern third of the Platte River Basin. The Hutton-Pinkham site (5YM112) is an Early Archaic/Middle Archaic open camp on the banks of a creek at its confluence with the South Fork of the Republican River in extreme southeastern Yuma County. Excavation of Archaic deposits recovered a variety of artifacts—projectile points, bifaces, end scrapers, gravers, a drill, flake tools, cores, hammerstones, manos, slab metates, awls, and tubular bone beads. The extreme use exhibited by most of the flake tools suggested a scarcity of tool stone sources in the area. The faunal assemblage included an abundance of bison bones, but deer and/or pronghorn, rabbit, ground squirrels and other rodents, birds, and freshwater mussels were also present. A charcoal sample produced a 2-sigma range of 3506–3405 cal. B.C. (Larson et al. 1992; Tate 1999:103, 105–106). No other excavated Archaic components occur in the immediate Project vicinity.

Late Prehistoric Period (A.D. 150–1540). The Late Prehistoric period is generally divided into the Early Ceramic Period (A.D. 150–1150), Middle Ceramic Period (A.D. 1150–1540), and Protohistoric Period (A.D. 1540–1860). The presence of ceramics is the distinguishing characteristic between Late Archaic and Early Ceramic components. In addition, the bow and arrow appeared in the area at about the same time as ceramics. Few Early Ceramic and Middle Ceramic period sites have been investigated in northeastern Colorado; Early Ceramic period sites are present in Morgan, Logan, and Weld counties, and Middle Ceramic period sites have been investigated in Logan County.

During the Protohistoric period, indigenous cultures continued to follow traditional lifeways and new resources (e.g., metal, guns, and horses) introduced either directly or indirectly by Europeans were adapted to those lifeways. The Protohistoric period began with the first European contact in the region. Although Coronado did not make it as far north as the Platte River Basin, his *entrada* introduced cultural material and animals that were quickly incorporated into the tool kit and subsistence system of the local inhabitants. This period also witnessed an environmental change with a return of climatic conditions similar to the present. The Platte River Basin experienced cultural dynamism during this time (Clark 1999:309). A combination of historic, linguistic, ethnohistoric, and archaeological data provides the framework for this period. The High Plains witnessed "an ever-shifting population during the Protohistoric period" (Clark 1999:310). Archaeologically, it is difficult to find and identify sites associated with the protohistoric Apache, Comanche, Arapaho, Cheyenne, and other Plains groups (Clark

1999:314) present in the region. The sites that have been identified include a variety of types that include open architectural sites, such as *wickiups*, tipi rings, stone rings, open camps, game drives, kill sites, ceremonial sites, and modified or scarred trees (Clark 1999:325–332). A typical protohistoric site near the present Project Study Area is the Starlite Ridge site (5CH44), a short-term game processing and core reduction camp in north-central Cheyenne County, south of the present Project Study Area.

Historic Period (post-A.D. 1860). The first Euro-Americans to claim the area that today is Yuma and Kit Carson counties were the Spanish. A Spanish expedition from New Mexico reportedly reached the South Platte River in 1659. For the remainder of the 17th and early 18th century, Spain claimed the territory. The French laid claim to the area because of their 1682 claim to the Mississippi River Valley and all lands drained by it. In 1739 and 1740, brothers Pierre and Paul Mallet led a trading expedition up the Platte River from the Missouri River and entered northeastern Colorado on the South Platte River. The French eventually acquired the area and sold it to the U.S. as part of the Louisiana Purchase in 1803 (Mehls 1984:19–20). The Cheyenne, Pawnee, and Kiowa were the dominant Native Americans in the area by the 1840s.

The Battle of Beecher Island (5YM40), an engagement between a band of Cheyenne and U.S. frontiersman under the command of Major George A. Forsyth, is noteworthy. Beecher Island is 16.5 miles southeast of the City of Wray, and only a few miles west of the proposed transmission line crossing of the Arikaree River by Route Alternative C, in Yuma County. Beecher Island Battleground was listed on the NRHP on October 26, 1976.

After the Civil War, the cattle industry greatly expanded on the Plains. Much of the land between the Platte River in the north and the Arkansas River in the south remained unsettled. In the early 1870s, cattle trails were established through northeastern Colorado to gain access to the Union Pacific Railroad in Ogallala, Nebraska and for markets further north in the Wyoming, Montana, and Dakota territories (Yuma County History 2012:2). By 1885, grazing was so intense that much of the native grama and buffalo grasses disappeared and were replaced by sagebrush and weeds. By 1880, with the extirpation of the bison herds, the removal of the Native Americans, and restraining the rangeland from the cattle ranchers, the land was opened for homesteading. During the 1880s, large numbers of German Russians settled in northeastern Colorado. To help meet the food demands resulting from World War I, dryland farming expanded in northeastern Colorado.

The northeastern Colorado landscape experienced other major changes during the 1920s and 1930s. Local and regional roads and transportation networks were expanded and greatly improved to accommodate the popularity in the automobile and use of mechanized farm equipment. The widespread installment of electricity by the Rural Electrification Administration during the 1930s resulted in major changes in farming and ranching, in addition to the advent of rapid communication (Mehls 1984:163). Other federal programs greatly expanded during the 1930s, including the Reconstruction Finance Corporation and the Federal Emergency Relief Administration. The federal program that had the greatest impact on most of the residents in northeastern Colorado was the Agricultural Adjustment Administration (AAA). The AAA offered farmers relief payments to maintain their farms, while attempting to increase commodity prices through production controls. The AAA paid farmers not to produce certain crops and livestock above certain quotas, which was to help reduce food surpluses and raise prices. Some of the controls were very controversial because of the large-scale slaughter of some livestock, particularly cattle and swine (Mehls 1984:164).

World War II stimulated the economy of northeastern Colorado because of the demand for food and other commodities, in addition to military-related projects. Following World War II, between 1945 and 1970, the livestock industry underwent major changes because of a change in the type of beef American consumers wanted. By the 1950s, consumers no longer wanted tough and unmarbled beef. This forced the ranchers to either sell yearlings to feedlots for final finishing, or develop their own grain feeding operations to complete the beef finishing themselves prior to shipping to slaughterhouses. Consequently, northeastern Colorado became the nation's leading producer of feeder cattle (Mehls 1984:175).

5.16.2 Cultural Resource Investigations

In order to determine if a site is eligible for listing under the National Register of Historic Places, certain criteria must be met. Cultural resources may include sites that are significant in American history, architecture, archeology, engineering, and culture. Eligible resources may be present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

A. That are associated with events that have made a significant contribution to the broad patterns of our history; or

B. That are associated with the lives of significant persons in or past; or

C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. That have yielded or may be likely to yield, information important in history or prehistory.

A Class I electronic archival and records search of the Colorado Cultural Resource database COMPASS was conducted on March 21, 2012, for the Burlington to Wray transmission line Project Study Area (approximately an 18-mile-wide corridor, depicted in Figure 1-2). The records search results include 115 sites in Yuma County and 12 sites in Kit Carson County. One previously recorded site, a segment of the BNSF Railway line (5YM259), is in the Area of Potential Effect (APE) of Route Alternative C (the Preferred Route). RUS defined the APE for the Project as a 150-foot-wide corridor (i.e., the transmission line ROW).

Tri-State contracted TRC Environmental Corporation (TRC) to conduct a Class III intensive 100 percent pedestrian survey of selected portions of Route Alternative C (the Preferred Route) and an alternate segment that was being considered for inclusion in the Preferred Route (this alternate segment was ultimately included as part of the Preferred Route). Cultural resources are more likely to retain their integrity in areas that have not been historically or are currently under cultivation. Uncultivated land in the APE primarily borders the major drainages in the Project Study Area, which are topographic areas thought to have the highest potential for cultural resources and are most likely to have maintained their integrity. Thus, Class III survey of 100 percent of these areas was deemed necessary an appropriate.

The Class III inventory included all uncultivated lands and a representative 10 percent sample of cultivated land. Cultivated lands are less likely to retain the integrity of cultural resources because of

intensive agricultural practices including land leveling, terracing, and plowing associated with pivot irrigation systems. Accordingly, Class III survey on 10 percent of cultivated land was deemed appropriate.

Cultivated land targeted for Class III survey was along drainages and playas, topographic areas thought to have the highest potential for cultural resources. In addition, where feasible, the transmission line APE in cultivated areas was visually inspected from adjoining county roads and two-track roads to look for historic remains, particularly abandoned homesteads. One locus for a potential historic site, in Township 7 South, Range 42 West, NW¼ of Section 32, was surveyed during this reconnaissance but no cultural materials were noted. In addition, all General Land Office (GLO) original survey plat maps, dating to the late 19th and early 20th century, were examined for evidence of potential prehistoric and historic cultural resources that may have been noted during the GLO surveys. The GLO maps, however, did not exhibit any areas that had potential for cultural resources.

Tri-State contacted landowners and acquired access permission forms from all landowners along Route Alternative C. The route and alternate segment included in the APE total 80.12 miles, of which 52.14 miles (65.08 percent) was surveyed. Of the 52.14 miles surveyed, 4.5 miles is private land that is administered by the CPW. Administered lands include the Willow Creek, Simmons, and South Republican, and Stalker Lake SWAs. No access roads outside the ROW were surveyed because access locations will not be finalized until Tri-State completes the engineering design and structure locations for the transmission line. Once structure locations have been identified and access roads defined, an intensive Class III survey will be completed for new roads outside of the existing APE, in non-cultivated lands. In cultivated areas, surveys would be limited to those areas outside of the APE with the potential to yield cultural resources as identified during Class I and III surveys. Most of the access is expected to be down line within the ROW or off existing county roads. After the cultural resources survey, approximately 4.8 miles of the northwestern portion of the route alignment was altered. These areas were incorporated into the pedestrian survey. Table 5-17 summarizes the surveyed and un-surveyed lands for Route Alternative C and the alternate segment. The totals in Table 5-17 represent the current alignment of Route Alternative C (the Preferred Route).

Table 5-17: Project Land Ownership

Landowner	Route Length	Total Surveyed Miles	Project Acres	Surveyed Acres	Percent Surveyed
Route Alternative C: private, uncultivated	43.61	43.61	792.91	792.91	100
Route Alternative C: private, cultivated	26.54	3.06	482.54	55.64	11.5
Preferred: Stalker Lake SWA, Uncultivated	0.28	0.28	5.09	5.09	100.0
Alternate Segment:* private, uncultivated	4.69	4.69	85.27	85.27	100
Alternate Segment:* private, cultivated	5.00	0.50	90.91	9.09	10.0
Totals	**80.12**	**52.14**	**1,456.72**	**948.00**	**65.08**

* At the time of the cultural survey, final modifications were still being considered to Route Alternative C, and this alternate segment was surveyed for its possible incorporation into the Preferred Route. Ultimately, this alternate segment was incorporated into the final alignment of the Preferred Route.

Table 9-18 presents the findings of a Class I archival and records search and Class III intensive 100 percent sample pedestrian survey of selected segments of the proposed Tri-State 70.43-mile Burlington to Wray 230-kV transmission line in Kit Carson and Yuma counties, northeastern Colorado. The survey documented nine historic, one prehistoric site (5YM331), and 13 isolated occurrences (IOs) by definition are not eligible to the NRHP.

The previously recorded site is a segment of the current BNSF rail line. The prehistoric site is a chalcedony outcrop. TRC recommended six of the 10 sites (the two homesteads, the laterals to the Hale Ditch, Fuller Ditch, the old fence posts, and the prehistoric site) as ineligible for listing in the NRHP. The six sites and 13 IOs recommended as ineligible are not considered to have the potential to provide additional data (Criterion D for eligibility for listing in the NRHP); TRC considers all available data contained on the sites to have been sufficiently documented.

Four of the sites (Hale Ditch, Laird Ditch, the manual cableway, and the BNSF rail line) are recommended as eligible to the NRHP under Criteria A and D. The irrigation ditches are recommended eligible for their association with historic events that have made a significant contribution to, and their potential to yield information important about, early irrigation agriculture during the late 19th century in Kit Carson and Yuma. The manual cableway is recommended as eligible for listing on the NRHP under Criteria A and C for its association with historic events that have made a significant contribution to early irrigation agriculture during the early 20th century and its engineering and construction. The BNSF rail line segment is recommended eligible under Criteria A, C, and D.

Concurrence from the Colorado State Historic Preservation Office (SHPO) is pending.

Table 5-18: Archaeological Sites Management Summary

Archaeological Sites Management summary Site	Description	NRHP Recommendation
5KC278	Historic homestead, 1914 to 1960s	Not eligible
5KC280	Concrete fence posts	Not eligible
5YM314.1	Fuller Ditch, 1904	Not eligible
5YM315.1	Laird Ditch, 1888	Eligible, A, and possibly D
5YM316.1	Hale Ditch, 1908	Eligible, A, and possibly D
5YM316.2	Hale Ditch laterals	Not eligible, Non-contributing elements to Hale Ditch
5YM259.4	BNSF Rail Line, CB&Q Rail Line	Eligible, A, C, and D
5YM329	Historic homestead, 1930s to 1960s	Not eligible
5YM330	Manual cableway	Eligible, A, C
5YM331	Prehistoric chalcedony quarry	Not eligible

5.17 TRANSPORTATION AND ACCESS

Transportation corridors in the Project Study Area generally consist of a network of east -west and north-south county roads. The county roads primarily serve the residents of these rural communities. Some of the county roads are paved but have no curb and gutter. Swales and irrigation ditches parallel many of the access roads The county roads generally have low traffic volume that reflects the rural and agrarian nature of the adjacent land use.

One north-south state highway (U.S. 385) and two east-west state highways (U.S. 36 and U.S. 34) bisect the Project Study Area. All Route Alternatives would cross U.S. 36, U.S. 34, and U.S. 385 once each. Figure 3-1 depicts major roadways in the Project Study Area and the Route Alternatives.

The BNSF rail line is located in the northern portion of the Project Study Area, and passes east-west along U.S. 34 through Wray. All Route Alternatives would cross the rail line.

There are three airports in the Project Study Area registered with the FAA (FAA 2013). Table 5-19 provides information on each airport and the distance to the closest Route Alternative(s). Figure 5-8 depicts the location of these airports relative to the Route Alternatives.

Table 5-19: FAA-Registered Airports in the Project Study Area

Airport	Airport Type	Owner	Location	Closest Route(s)	Distance (miles) to Closest Route
Wray Community District Hospital Heliport	Private	Wray Community District Hospital	City of Wray	C and D	1.44
Whomble	Private	Leonard L. Whomble	Yuma County	C	1.22
Wray Municipal	Public	City of Wray	City of Wray	C and D	1.07

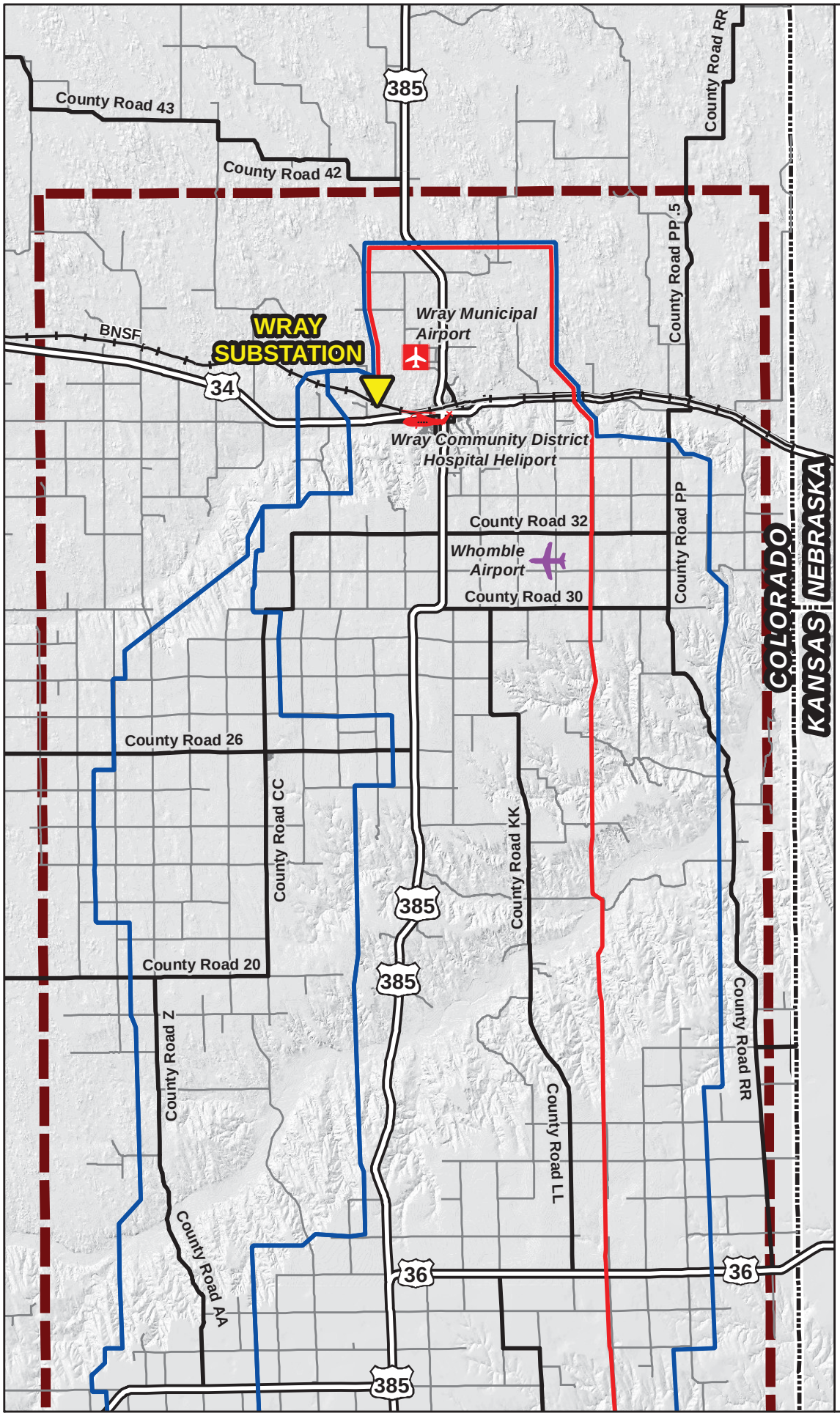

Figure 5-8

FAA-Registered Airports

Legend

- Study Area
- Wray Substation (End Point)
- Private Airstrip
- Public Airport
- Private Heliport
- Interstate Highway (70)
- U.S. Highway (34)
- Major Roads
- Local Roads
- Railroads
- State Line
- County Line

1 inch = 19,800 feet

0 1 2 3
Miles

1 inch = 3.75 miles

Sources:
FAA - Airports
CDOT - Highways, Major and Local Roads, Railroads, Municipal Limits
USGS - Elevation

Acronyms:
BNSF: Burlington Northern Santa Fe
CDOT: Colorado Department of Transportation
FAA: Federal Aviation Administration
USGS: United States Geological Survey

TRI-STATE Generation and Transmission Association, Inc.
A Touchstone Energy® Cooperative

Burlington-Wray 230-kV Transmission Project

5.18 ELECTRICAL CHARACTERISTICS AND PUBLIC SAFETY

5.18.1 Electrical and Magnetic Fields

Electric transmission lines produce electric and magnetic fields (EMF) when they are in operation. EMF is a term that refers to electric and magnetic fields. These fields are caused by different aspects of the operation of a transmission line and can be evaluated separately.

Electric fields are produced whenever a conductor is connected to a source of electrical voltage. An example of this is the plugging of a lamp into a wall outlet in a home. When the lamp is plugged in, a voltage is induced in the cord of the lamp, which causes an electric field to be created around the cord.

Electric fields decrease in strength with distance from the source and are shielded or weakened by materials such as building and trees. Electric fields are measured in units of volts/meter (V/m) or kilovolts per meter (kV/m). Electric and magnetic fields extend out from the conductors (transmission line spanning between transmission structures) and decrease rapidly with distance from the transmission line. Existing sources of 60-Hertz (Hz) electric and magnetic fields in the Project Study Area include existing transmission and distribution lines, substations, electrical wiring, and appliances used in homes and businesses.

Magnetic fields are produced whenever an electrical current flows in a conductor. In the lamp example, if the lamp is turned on allowing electricity to flow to the lamp, a magnetic field is created around the lamp cord in addition to the electric field. Magnetic fields are typically measures in units of milligauss (mG).

Unlike electric fields, which are easily shielded by common conductive objects, magnetic fields cannot easily be shielded. Most materials (such as those that make up buildings, trees, and the ground) do not effectively shield magnetic fields. Certain ferromagnetic materials (i.e., those containing iron, nickel, or cobalt) have a property that, when in proper orientation and location, can shield magnetic fields. Eddy currents are induced in highly conducive metals used in conductive shielding and cancel the imposed magnetic field.

This next section describes electrical characteristics of transmission lines and modeling results.

5.18.1.1 Modeling Methodology

The EMF for the Project was predicted using EMF Workstation: ENVIRO (Version 3.52), a Windows-based model developed by the Electric Power Research Institute. It is a program that accurately predicts the electric and magnetic fields produced by linear transmission lines.

To perform this modeling, detailed information on the design of the line, which included projected electrical power flows, operating voltage, tower configuration, conductor size and type, the height and horizontal location of each conductor, conductor sag, and conductor phasing. The modeling was conducted for the scenario of a new 230-kV single-circuit transmission line on a new 150-foot-wide ROW. The maximum thermal capacity for such a line was modeled. This scenario was modeled according to CPCN rule 3206(e)(I), which states “For a right-of-way containing a single circuit, the magnetic field level will be presented at the continuous mega volt amperes (MVA) rating of that circuit.”

These data were input into the ENVIRO program, which produced the lateral profiles of the magnetic fields out to 75 feet from the left and right ROW edges. These profiles were then plotted to produce the graphs presented as Figures 5-9 and 5-10. The profiles were calculated with the lowest phase conductor at 28 feet above the ground for the 230-kV line, which meets or exceeds the minimum ground clearance per the NESC and the RUS Design Manual for High Voltage Transmission Lines, Bulletin 1724E-210, which

coincides with the lowest point of conductor sag, providing the most conservative results. The calculations are computed at a height of 1 meter (3.3 feet) above the ground. The accuracy of the modeling is dependent on the accuracy of the input data. The resulting field plots are within a few percent of the true value for the conditions modeled.

5.18.1.2 Modeling Results

The new 230-kV single-circuit line was modeled as an H-frame structure, specifically the RUS TM-230. The electric field modeling results are presented in Figure 5-9. The results of the electric field modeling results show that on the left ROW edge the electric field is approximately 0.52-kV/m and approximately 0.52-kV/m on the right ROW edge. The maximum electric field within the ROW is approximately 2.96-kV/m. The complete results of the magnetic field modeling are presented in Appendix C.

The magnetic field results are presented in Figure 5-10. The outer edges of the ROW are shown as vertical dashed lines in the figure.

The results of the magnetic field modeling plotted in Figure 5-10 show that on the left ROW edge the magnetic field is approximately 56-mG and approximately 57-mG on the right ROW edge. The maximum magnetic field within the ROW is approximately 336-mG.

5.18.2 Corona Characteristics

Corona is the electrical ionization of the air that occurs near the surface of the energized conductor and suspension hardware as a result of very high electric field strength. Corona may result in audible noise being produced by the transmission lines.

The amount of corona produced by a transmission line is a function of the voltage of the line, the diameter of the conductors, the locations of the conductors in relation to each other, the elevation of the line above sea level, the condition of the conductors and hardware, and the local weather conditions. Power flow does not affect the amount of corona produced by a transmission line. Corona typically becomes a design concern for transmission lines at 345-kV and above and is less noticeable from lower voltage lines such as the 230-kV line proposed for the Project.

The electric field gradient is greatest at the surface of the conductor. Large-diameter conductors have lower electric field gradients at the conductor surface and, hence, lower corona than smaller conductors, everything else being equal.

Irregularities (such as nicks and scrapes on the conductor surface or sharp edges on suspension hardware) concentrate the electric field at these locations and thus increase the electric field gradient and the resulting corona at these spots. Similarly, foreign objects on the conductor surface, such as dust or insects, can cause irregularities on the surface that are a source for corona.

Corona also increases at higher elevations where the density of the atmosphere is less than at sea level. Audible noise will vary with elevation with the relationship of A/300 where A is the elevation of the line above sea level measured in meters (EPRI 2005). Audible noise at 600 meters elevation will be twice the audible noise at 300 meters, all other things being equal. The Project was modeled with an elevation of 4,000 feet.

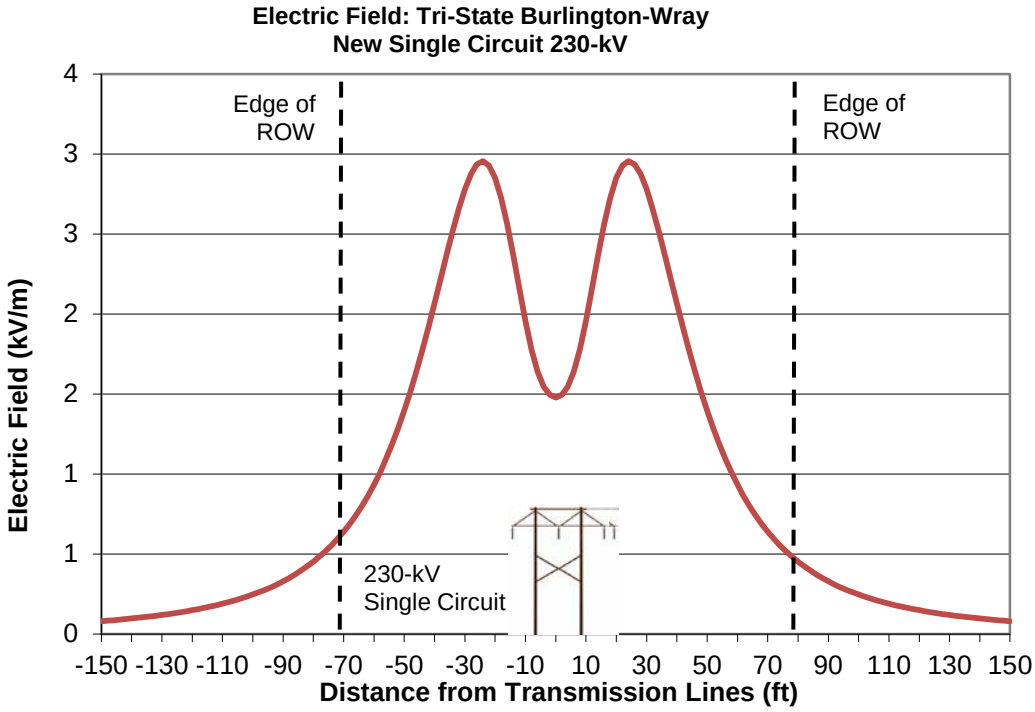

Figure 5-9: Electric Field Modeling Results

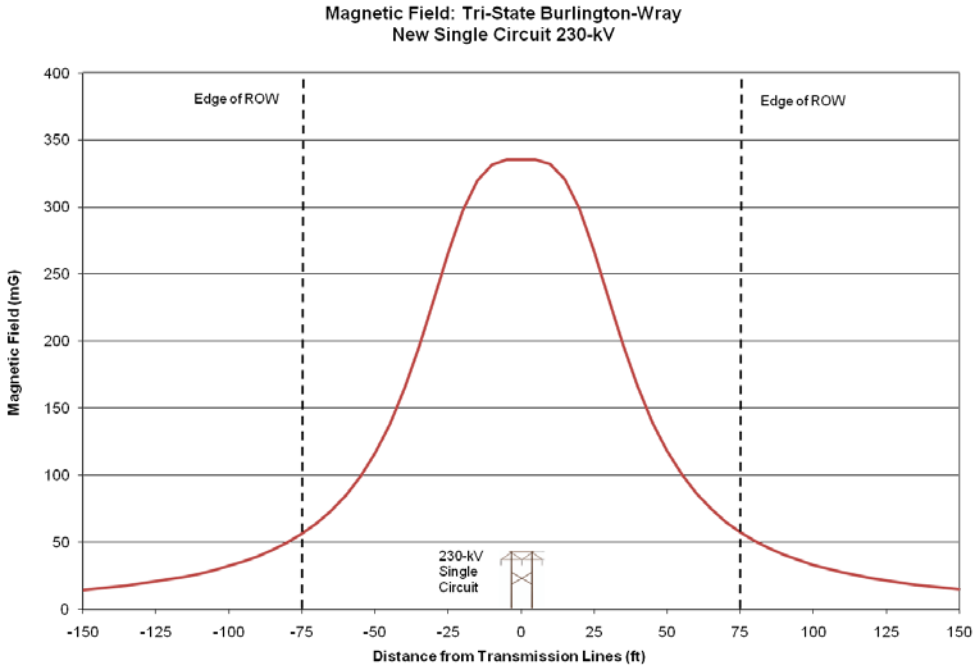

Figure 5-10: Magnetic Field Modeling Results

Raindrops, snow, fog, hoarfrost, and condensation accumulated on the conductor surface are also sources of surface irregularities that can increase corona. During fair weather, the number of these condensed water droplets or ice crystals is usually small and the corona effect is also small. However, during wet weather, the number of these sources increases (e.g., to the number of rain drops standing on the conductor) and corona effects are therefore greater. During wet or foul weather conditions, the conductor will produce the greatest amount of corona noise. However, during heavy rain, the noise generated by the falling rain drops hitting the ground will typically be greater than the noise generated by corona and thus will mask the audible noise from the transmission line.

Corona produced on a transmission line can be reduced by the design of the transmission line and the selection of hardware and conductors used for the construction of the line. For example, the use of conductor clamps that hold the conductor in place should have rounded rather than sharp edges and no protruding bolts with sharp edges to reduce corona. The conductors should have smooth surfaces without nicks or burrs or scrapes in the conductor strands and should be handled carefully during construction.

5.18.2.1 Modeling Methodology

The audible noise for the Project was predicted using EMF Workstation: ENVIRO (Version 3.52), the same program used to predict magnetic fields from the Project.

The data presented in this EA were input into the ENVIRO program to calculate the corona audible noise, with the addition of elevation of the line above sea level. The Project was modeled with an elevation of 4,000 feet. Because the equations that predict audible noise were created from empirical measurements, the accuracy of the model is as good as these measurements that produced the original equations. In addition, the model is as good as the accuracy of the parameters input to the model (e.g., the actual elevation of the transmission line at a particular location rather than the average elevation of the entire Project). Therefore, given these potential uncertainties, the resulting field plots are within a few percentage points of the true value for the conditions modeled. The complete results of the audible noise modeling are presented in Appendix C.

5.18.2.2 Modeling Results

The corona audible noise results for a new 230-kV line located on a 150-foot-wide ROW scenario are presented in Figure 5-11. The outer edges of the ROW are shown as vertical dashed lines in the figure.

The figure depicts two weather conditions for the corona audible noise results, fair and rain. This is to show the range in corona effects due to changing weather. CPCN rule 3206(f)(I) specifies that the audible noise modeling must assume "that the proposed facility is operating at its highest continuous design voltage under L_{50}[4] rain conditions." The figures present the audible noise results for L_{50} rain conditions.

The results of the corona audible noise modeling plotted in Figure 5-11 show that on both the left and right edges of the ROW, the audible noise is approximately 17 dBA in fair weather and 42 dBA in wet weather. The figure also shows that 25 feet from both the left and right edges of the ROW, the audible noise is approximately 15 dBA in fair weather and 40 dBA in wet weather. The maximum noise that occurs within the ROW is 22 dBA in fair weather and 47 dBA in wet weather.

[4] L_{50} refers to the sound level (in decibels on the A-weighted scale) that is exceeded 50 percent of the time during a one hour survey.

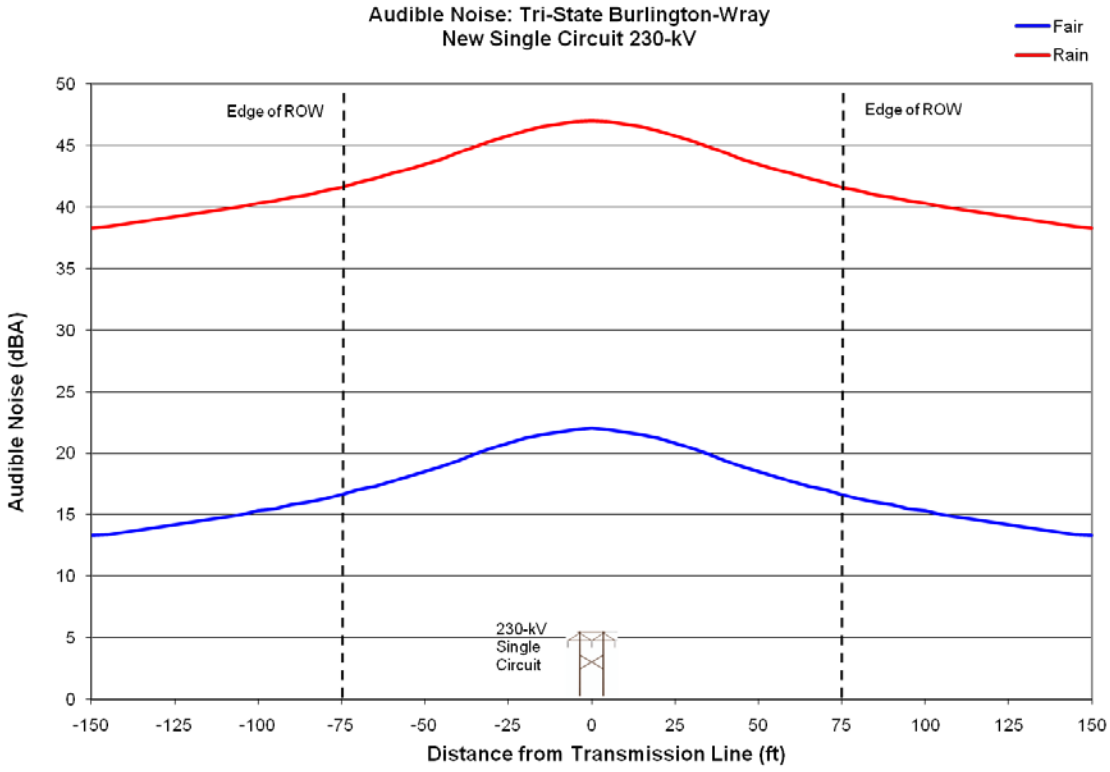

Figure 5-11: Audible Noise Modeling Results

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6.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATION

The following sections describe the anticipated effects from construction, operation, and maintenance of the Proposed Action and the No Action Alternative to existing human and natural environments.

The Proposed Action is to construct a new 230-kV single-circuit transmission line from Burlington to Wray. Tri-State has identified six Route Alternatives, including a Preferred Route, as depicted on Figure 3-1.

Tri-State implements standard best management practices, otherwise known as Environmental Protection Measures (EPMs) (described in Table 3-7 in Section 3.4.1.7), for every construction project as standard operating procedure. EPMs are measures taken during the construction and/or future maintenance phase of a project to avoid and minimize a foreseeable effect to the human or natural environment. Tri-State would comply with any other federal, state, or local mitigation requirements.

Potential impacts associated with construction, operation, and long-term maintenance of the proposed transmission line are described in terms of type, duration, and extent. General definitions of these terms are below.

- **Type**: There are categories for analyzing impacts for this environmental review:
  - Beneficial: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.
  - Adverse: A change that moves the resource away from a desired condition or detracts from its appearance or condition.
  - Direct: An effect on a resource by an action at the same place and time.
  - Indirect: An effect from an action that occurs later or perhaps at a different place and often to a different resource, but is still reasonably foreseeable. For example, ground disturbance can result in future invasion of noxious weeds.
  - Cumulative: Impacts to resources that are added to existing impacts from other actions.
- **Extent**: The environmental analysis also discusses the extent of where the potential impacts associated with the proposed project are likely to occur. For example impacts could be localized to the project area or if more severe could impact resources on a regional level.
- **Duration**: Duration is the length of time an effect will occur, short-term or long-term.
  - Short-term impacts are generally limited to the construction period of a project or for a period of time post-construction until site reclamation/restoration is complete.
  - Long-term impacts last beyond the construction period, and the resources may not regain their pre-construction conditions for a longer period of time.

6.1 NO ACTION ALTERNATIVE

Selection of the No Action alternative would result in no new transmission line construction. There would not be any new direct, indirect, or cumulative impacts to the existing human or natural environment. Tri-State's purpose and need would not be met and ongoing transmission capacity issues and operating restrictions on Tri-State network resources would continue. Tri-State would be restricted in dispatching existing generation resources to serve its native load. In addition, the Kit Carson Wind Facility would continue to operate under restrictions and interconnection of future renewable energy projects would not be possible.

6.2 LAND USE

6.2.1 Impacts Associated with All Route Alternatives

During construction, there would be temporary direct impacts to agricultural and grazing lands within the 150-foot-wide transmission line ROW, within the construction staging areas, and pulling sites which may occur outside of the ROW. Long-term impacts would be limited to the poles locations. The area encompassed by the footprint of each transmission structure is 300 square feet for two-pole tangent H-frame structures and this area would be converted from its current land use. After construction, the land around the structure would be returned to its previous use (agriculture or grazing) as long at those activities do not interfere with the safe operation and maintenance of the transmission line.

Landowners may be required to temporarily avoid the ROW for the duration of construction in the area and potentially during certain maintenance activities. Landowners would be notified prior to the start of construction and would be notified of the anticipated timing of construction and activities. The majority of the length of each Route Alternative would cross privately owned land. No federal land would be crossed by any of the Route Alternatives.

Temporary impacts to land use during construction and long-term maintenance activities may include direct effects to fencing and gates in the work areas. Impacts to grazing infrastructure would be minimized through implementation of EPM LU-2. Construction vehicles will be required to travel at minimum speeds to avoid collision with livestock that may occur in the construction area. Indirect impact to livestock such as stepping into holes for transmission structures would be minimized through implementation of EPM LU-4. These impacts would be minimized through the implementation of EPMs LU-1 through LU-4 as outlined in Table 3-7.

The primary indirect effect to land use from construction and future maintenance activities associated with the power line is the potential for the spread of noxious weed populations and their impact to forage and cropland in the project area. EPM NW-1, 2, and 3 would minimize and mitigate these impacts.

Potential impacts to the land use of SWAs are discussed in detail below under each Project Alternative.

Construction of any of the Route Alternatives would have a localized, long-term effect on land use within the transmission line ROW. Indirect impacts to land use could occur if noxious weed infestations increase post-construction. Tri-State would implement EPMs NW-1, 2, and 3 (Table 3-7) to minimize impacts to land use from the spread of noxious weeds. Construction, operation, and maintenance of any of the Route Alternatives are not anticipated to have an adverse long-term direct or indirect impact on agricultural or grazing land uses within the study area or on a state or regional level. Table 6-1 summarizes the amount of prime farmland and cultivated cropland impacted by the total estimated footprint area of transmission structures along each route alternative.

Tri-State has obtained applicable county permits and will comply with federal, state, and local regulations during the construction, operation, and maintenance of the Project.

Design standards and mitigation measures outlined in Table 3-7 would mitigate and minimize any potential impacts to land use; therefore, long-term adverse impacts to land use at a local, state, or regional level are not anticipated.

Table 6-1: Amount of Agricultural Land Impacted By Transmission Structures

Route Alternative	Total Prime Farmland Disturbed by Structure Footprint	Total Cultivated Cropland Removed from Production by Structure Footprint*
A West	1.6 acre	1.1 acres
A East	1.6 acre	1.1 acres
B West	2.0 acres	1.7 acres
B East	2.0 acres	1.7 acres
C (Preferred)	1.7 acres	1.1 acres
D	1.2 acres	0.8 acre

* Tri-State estimates that there will be six to nine structures per mile depending on terrain and other variables. To calculate area, a conservative estimate of nine structures per mile was used, with each structure requiring 300 square feet of ground surface.

6.2.2 Impacts Associated with Route Alternative A West

Generally, the impacts to land use would be the same as described in Section 6.2.1. Route Alternative A West is approximately 66.3 miles long and is the shortest of the Route Alternatives identified. Approximately 93 percent of A West would cross privately owned land. Approximately 4.1 acres of land (300 square feet for each transmission structure) along this route would be converted from its current land use.

Table 5-2 and 5-3 summarize the length of prime farmland and cultivated cropland, respectively, crossed by each Route Alternative. Table 6-1 summarizes the area of each type of land use that would be impacted by the structure footprint. Route Alternative A West would cross 25.7 miles of prime farmland, which comprises 39 percent of the route, and structure footprints would disturb 1.6 acres of prime farmland. The route would cross 1.3 miles of pivot irrigation and 17.6 miles of cultivated cropland, or 7 percent of the route. Approximately 1.1 acres of cultivated cropland would be removed from production by structure footprints. After construction, with the exception of the area disturbed for new transmission structures, there would be no long-term adverse impacts to prime farmland or the use of the farmland within the ROW.

Table 5-1 summarizes the length of privately owned and state owned or managed lands crossed by each Route Alternative. Route Alternative A West would cross approximately 0.8 mile of SWA and 3.8 miles of State Trust lands. Construction of the transmission line likely would cause temporary restrictions of the use of SWAs and other lands for recreation, but this impact would be short-term and temporary and limited to construction areas. Public access to approximately 14.5 acres of SWA could be temporarily restricted during construction of Route Alternative A West. Maintenance of the transmission line potentially could temporarily restrict access to the ROW located in SWAs or State Trust lands, although this also would be a short-term, temporary impact.

The primary adverse indirect effect to land use from construction and future maintenance activities associated with this alternative is the potential for the spread of noxious weed populations and their impact to forage and cropland in the project area. Implementation of EPMs NW-1, 2, and 3 would minimize and mitigate these impacts.

The Project is not expected to result in long-term adverse impacts to the land-use aspect of SWAs or other state lands. Recreation and wildlife impacts to SWAs are provided in their respective sections below.

6.2.3 Impacts Associated with Route Alternative A East

Generally, the impacts to land use would be the same as described in Section 6.2.1. Route Alternative A East is approximately 67.1 miles long, making it the second shortest of the Route Alternatives. Approximately 94 percent of A East would cross privately owned land. The alignment of Route Alternative A East is identical to that of A West, except that in the northern portion of the route, Route Alternative A East would cross Chief Creek further to the east. Approximately 4.3 acres along this route would be impacted by structure footprints.

Route Alternative A East would cross approximately 25.8 acres of prime farmland, or 38 percent of the route, and structure footprints would disturb approximately 1.6 acres of prime farmland. The route would cross 1.3 miles of pivot irrigation, and 17.6 miles of cultivated cropland, or 26 percent of the route. Approximately 1.1 acres of cultivated cropland would be removed from production by structure footprints. After construction, with the exception of the area disturbed for new transmission structures, there would be no long-term adverse impacts to prime farmland or the use of the farmland within the ROW.

Route Alternative A East would cross the same SWAs as Route Alternative A West. Alternative A East would cross approximately 3.4 miles of other state owned or managed (State Trust) lands. Impacts to land use would be the same as those described above for Route Alternative A West.

The primary indirect effect to land use from construction and future maintenance activities associated with this alternative is the potential for the spread of noxious weed populations and their impact to forage and cropland in the project area. EPM NW-1, 2, and 3 would minimize and mitigate these impacts.

The Project is not expected to result in any long-term adverse impacts to the land-use aspects of SWAs or other state lands are not anticipated. Recreation, visual, and wildlife impacts to SWAs are provided in their respective sections below.

6.2.4 Impacts Associated with Route Alternative B West

Generally, the impacts to land use would be the same as described in Section 6.2.1. Route Alternative B West is approximately 69.1 miles long, and approximately 95 percent of the route would cross privately owned land. Approximately 4.3 acres along this route would be impacted by structure footprints.

Route Alternative B West would cross approximately 32.5 miles of prime farmland, or 47 percent of the route; only Route Alternative B East would cross more prime farmland. Approximately 2.0 acres of prime farmland would be disturbed by structure footprints. The route would cross 1.7 miles of pivot irrigation and 27.3 miles of cultivated cropland, or 40 percent of the route. Approximately 1.7 acres of cultivated cropland would be removed from production by structure footprints. After construction, with the exception of the area disturbed for new transmission structures, there would be no long-term adverse impacts to prime farmland or the use of the farmland within the ROW.

Route Alternative B West would cross approximately 1.5 miles of SWA and 2.1 miles of other state owned or managed (State Trust) lands. Construction of the transmission line would likely cause

temporary restrictions of the use of SWAs and other lands for recreation, but this impact would be short-term and temporary and limited to the construction areas. Public access to approximately 27.3 acres of SWA could be temporarily restricted during construction of Route Alternative B West. Maintenance of the transmission line potentially could temporarily restrict access to the ROW located in SWAs or State Trust lands; however, this also would be a short-term impact.

The primary indirect effect to land use from construction and future maintenance activities associated with this alternative is the potential for the spread of noxious weed populations and their impact to forage and cropland in the project area. EPM NW-1, 2, and 3 would minimize and mitigate these impacts.

The Project is not expected to result in long-term adverse impacts to the land-use aspects of SWAs or other state lands are not anticipated. Recreation, visual, and wildlife impacts to SWAs are provided in their respective sections below.

6.2.5 Impacts Associated with Route Alternative B East

Generally, the impacts to land use would be the same as described in Section 6.2.1. Route Alternative B East is approximately 69.9 miles long, and approximately 95 percent of the route crosses privately owned land. Approximately 4.3 acres along this route would be impacted by structure footprints. The alignment of Route Alternative B East is identical to that of Route Alternative B West, except that in the northern portion of the route, Route Alternative B East would cross Chief Creek further to the east.

Route Alternative B East would cross approximately 32.6 miles of prime farmland, which is the most of all the Route Alternatives, or 47 percent of the route. Approximately 2.0 acres of prime farmland would be disturbed by structure footprints. Route Alternative B East would cross approximately 1.7 miles of pivot irrigation and 27.4 miles of cultivated cropland, or 39 percent of the route. Approximately 1.7 acres of cultivated cropland would be removed from production by structure footprints. After construction, with the exception of the area disturbed for new transmission structures, there would be no long-term adverse impacts to prime farmland or the use of the farmland within the ROW.

Route Alternative B East crosses the same SWAs as Route Alternative B West. Route Alternative B East would cross approximately 1.6 miles of other state owned or managed (State Trust) lands. Impacts to land use would be the same as those described above for B West.

The primary indirect effect to land use from construction and future maintenance activities associated with the power line is the potential for the spread of noxious weed populations and their impact to forage and cropland in the project area. EPM NW-1, 2, and 3 would minimize and mitigate these impacts.

The Project is not expected to result in long-term adverse impacts to the land-use aspects of SWAs or other state lands are not anticipated. Recreation, visual, and wildlife impacts to SWAs are provided in their respective sections below.

6.2.6 Impacts Associated with Route Alternative C (Preferred Route)

Generally, the impacts to land use would be the same as described in Section 6.2.1. Route Alternative C is the second longest of the Route Alternatives, at approximately 72.0 miles. Approximately 91 percent of the route would cross privately owned land. Approximately 4.5 acres along this route would be impacted by structure footprints.

Approximately 27.6 miles of the route would cross prime farmland, or 38 percent of the route. Approximately 1.7 acres of prime farmland would be disturbed by structure footprints. Route Alternative C would cross 0.5 miles of pivot irrigation and 18.4 miles of cultivated cropland, or 25 percent of the route. Approximately 1.1 acres of cultivated cropland would be removed from production by structure footprints. After construction, with the exception of the area disturbed for new transmission structures, there would be no long-term adverse impacts to prime farmland or the use of the farmland within the ROW.

Route Alternative C would cross approximately 4.5 miles of SWA, making it the route that crosses the greatest length of SWA, and 1.7 miles of other state owned or managed (State Trust) lands. Construction of the transmission line would likely cause temporary restrictions of the use of SWAs and other lands for recreation, but this impact would be short-term and temporary and limited to the construction area. Public access to approximately 81.8 acres of SWA could be temporarily restricted during construction of Route Alternative C. Maintenance of the transmission line potentially could also restrict access to the ROW in SWAs or State Trust lands; however, this also would be a short-term, temporary impact.

The primary indirect effect to land use from construction and future maintenance activities associated with the power line is the potential for the spread of noxious weed populations and their impact to forage and cropland in the project area. EPM NW-1, 2, and 3 would minimize and mitigate these impacts.

The Project is not expected to result in long-term adverse impacts to the land-use aspects of SWAs or other state lands. Recreation, visual, and wildlife impacts to SWAs are provided in their respective sections below.

6.2.7 Impacts Associated with Route Alternative D

Generally, the impacts to land use would be the same as described in Section 6.2.1. Route Alternative D is the longest of the Route Alternatives, at approximately 74.8 miles. Approximately 91 percent of the route would cross privately owned land. Approximately 4.6 acres along this route would be impacted by structure footprints.

Approximately 19.2 miles of the route would cross prime farmland, making it the route that crosses the least amount of prime farmland. Approximately 1.2 acres of prime farmland would be disturbed by structure footprints. Route Alternative D would cross 0.1 mile of pivot irrigation and 12.5 miles of cultivated cropland, or 17 percent of the route. Approximately 0.8 acre of cultivated cropland would be removed from production by structure footprints. After construction, with the exception of the area disturbed for new transmission structures, there would be no long-term adverse impacts to prime farmland or the use of the farmland within the ROW.

Route Alternative D would cross approximately 1.8 miles of SWAs, making it the route the crosses the second greatest length of SWA, and 4.8 miles of other state owned or managed (State Trust) lands. Construction of the transmission line would likely cause temporary restrictions of the use of SWAs and other lands for recreation, but this impact would be short-term and temporary and limited to the construction area. Public access to approximately 32.7 acres of SWA could be temporarily restricted during construction of Route Alternative D. Maintenance of the transmission line potentially could temporarily restrict access to the ROW in SWAs or State Trust lands. The primary indirect effect to land use from construction and future maintenance activities associated with the power line is the potential for

the spread of noxious weed populations and their impact to forage and cropland in the project area. EPM NW-1, 2, and 3 would minimize and mitigate these impacts.

The Project is not expected to result in long-term adverse impacts to the land-use aspects of SWAs or other state lands. Recreation and wildlife impacts to SWAs are provided in their respective sections below.

6.3 GEOLOGY, MINERALS, AND SOILS

6.3.1 Impacts Associated with All Route Alternatives

Impacts to geology, minerals, and soils, are generally anticipated to be similar across all Route Alternatives.

Route Alternative A West is the shortest in length of all the Route Alternatives, and therefore is expected to require less ground disturbance relative to the other project alternatives and, therefore, the least amount of impacts to soil resources. Route Alternative D is the longest route, and therefore is expected to require greater ground disturbance and therefore greater impacts to soils resources. Given the network of existing private and county roads that cross the entire Project Study Area, it is not anticipated that a particular Route Alternative would require significantly more access development than another. However, soil compaction along overland routes is expected to be higher on route alternatives that are longer in length. These impacts would be temporary in nature and EPMs VEG-1, 2, and 3.

Areas where project alternatives would be in proximity to surface waters have been mapped as having moderate water erosion potential. The potential for wind erosion can be found primarily on the western and north end of the project study area. EPM's S-1 through S-4 would minimize soil erosion during project construction.

Impacts to soil would occur from structure construction, use of staging areas and pulling sites, as well as overland and new access routes. Impacts to soil resources would be limited to the transmission ROW, staging areas, and associated access roads and would not affect resources on a state or regional level. These types of activities may results in disturbance to soils including direct impacts such as soil compaction, loss of soil through erosion and runoff. Indirect impacts to soil resources include the potential for erosion which can lead to sedimentation of nearby waterbodies. Soil also could be directly contaminated by spills from vehicles and heavy equipment or by mishandling of hazardous substances at construction sites. The EPMs summarized in Table 3-7, including S-1 through S-4 and HM 1-3, S1-S4, and SW 1-4, would minimize and mitigate impacts to soil resources. A SWMP would be prepared and a permit obtained from the CDPHE prior to construction if impacts exceed the 1-acre threshold. If impacts are under the 1-acres threshold, best management practices would still be installed in areas where erosion may occur.

During construction, the majority of vehicle and equipment travel would be limited to overland travel, and county and private roads. Any new access roads would be properly designed and constructed to drain properly and protect the surrounding environment from potential erosion.

To prevent or reverse the effects of soil compaction, disturbed areas would be adequately scarified after construction to loosen the soil structure and to aerate the soil in preparation for revegetation. Dust control will be used as necessary to mitigate erosion and dust impacts in the construction zones.

Access roads for the construction and maintenance of the transmission line may be required in certain locations. Final access road alignment would be determined once final engineering is complete. Section 3.4.1.6 discusses the different possible levels of access road construction that might be required. Tri-State selected the Route Alternatives to minimize the need for new access roads. EPMs previously discussed above would minimize impacts to geology and soils from new access roads.

Mineral resources (oil and gas) are found throughout the Project Study Area. Alternative C would avoid all existing oil and gas infrastructure. No direct impacts to oil and gas operations are expected. Potential indirect impacts to mineral resources from construction of the proposed project would be future inaccessibility to oil and gas resources caused by placement of transmission structures. The project would only exclude some mineral extraction around the transmission structures. To minimize any impacts to oil and gas operations, Tri-State would:

- Underground pipelines and other utilities will be located prior to construction to ensure no damage to existing infrastructure occurs during project construction.
- Tri-State would coordinate with oil and gas operators in the future if new development is proposed within proximity to the transmission ROW. If a new facility in constructed prior to construction of the transmission line, Tri-State will coordinate with the operator to ensure appropriate design standards are met.

None of the Route Alternatives are expected to impact existing oil and gas well or other existing mineral development area.

With the implementation of EPMs listed above, as well as the creation of a SWMP, the Project is not expected to have long-term adverse impacts on soil resources in the Project area.

6.4 AIR QUALITY

6.4.1 Impacts Associated with All Route Alternatives

The primary emissions generated from construction and operation of transmission lines are those associated with transmission line construction and would include exhaust emissions from construction equipment, helicopters (if necessary), and vehicles, as well as fugitive dust emissions from site disturbance by construction vehicle overland access and use of existing non-paved roads in the study area. Operation of the transmission line would not result in any air emissions. Construction and routine operation and maintenance activities associated with any of the proposed Route Alternatives would generate less than significant amounts of particulate matter from soil disturbances and diesel-fueled equipment, and less than significant amounts of carbon monoxide and the precursor pollutants to ozone formation from tailpipe emissions as defined by the CDHPE. CDPHE air quality control commission regulations provide an exemption from air permitting for these types of construction activities under 5 CCR 1001-3, Section II.A.6.c As used in this Regulation No. 1, “fugitive particulate emissions” mean fugitive emissions of particulate matter that are the direct or proximate result of man's activities, (e.g., materials left by man exposed to the wind or later acted upon by another force as the wind or automobile traffic, or particulate matter being thrown into the atmosphere by the operation of a bulldozer.)

Any air pollutants generated would be widely dispersed across the Project Study Area and short-term in duration. Air pollutants would be minimized through implementation of the EPMs described in Table 3-7 for dust suppression and proper vehicle maintenance (AQ-1 through AQ-4). Construction of either of the

Route Alternatives, therefore, is not expected to negatively contribute to the air quality status of the area. There would be no long-term adverse air quality direct or indirect effects associated with routine operation and maintenance of the proposed transmission line. Construction and operation of the line would not exceed any state or federal standards for air quality, nor is a permit required for this type of activity.

No indirect impacts to air quality have been identified for any of the project alternatives. As previously discussed in the project description, existing generation would be used to supply the target loads via the proposed transmission line once the bottleneck is relieved. Tri-State does not anticipate any substantive changes in the way it operates its generation fleet as a result of the Project, other than more efficient dispatch of generation resources that can be accommodated by the higher-rated 230-kV transmission line. The project would not increase the need for generation and therefore, would not result in any direct or indirect effects to air quality, other than those discussed above related to project construction. The project would allow for the future interconnection of renewable wind projects which over the long-term could have a beneficial impact on air quality. The project is not expected to have an adverse effect on air quality within the project area, state, or regional area.

6.5 NOISE

6.5.1 Impacts Associated with All Route Alternatives

Any of the Route Alternatives would be constructed using the same types and numbers of equipment and using the same construction techniques and procedures, so the impacts analysis for noise applies to all Route Alternatives. Noise impacts would primarily be localized within the project area. The primary source of noise from construction of either of the Route Alternatives includes:

- Assembly, erection, and drilling of transmission structures, stringing of the conductor and overhead shield wires, and installation of the optical ground wire
- Helicopter-assisted construction to pull the conductor (wires), or if necessary, in areas of inaccessible terrain
- Construction vehicles traveling up and down the ROW
- Maintenance vehicles traveling up and down the ROW

Typical equipment associated with transmission line construction and their associated noise levels at full power are provided in Table 6-2. The shaded areas indicate reference noise levels.

Table 6-2: Construction Equipment Noise Levels

Equipment	Typical Noise Levels 50 feet from Source (dBA)
Rural area during daytime	40
Small town residential area during daytime	50
Normal conversation at 6 feet	55–65
Trucks	75
Air Compressor	81
Mobile crane	83
City traffic	80
Backhoe	80

Table 6-2: Construction Equipment Noise Levels

Equipment	Typical Noise Levels 50 feet from Source (dBA)
Concrete mixer	85
Bulldozer	85
Grader	85
Rotary drilling rig	87
Jack hammer	88
Peak combined equipment	89
Lawn mower	90
Rock drill	98

Source: CDOT (2006)

Table 5-12 summarizes the distance of each Route Alternative to the closest residences. Construction noise effects along either of the Route Alternatives are expected to localized to the project area and short term, and would not impact a large number of residences. There are only two residences within 150–300 feet of Alternatives A West and B West, C (Preferred) and D. Two residences are located within 300–1,320 feet of the ROW for alternatives A East and B East. Construction is expected to take 1–2 days (non-continuous) for structure erection and 2 days for optical ground wire installation. Construction is expected to occur 6 days a week during daylight hours.

Post-construction, the noise effects from routine inspection and maintenance activities would be localized to the ROW because of their short duration and infrequency.

6.5.2 Potential Impacts from Corona Noise Associated with All Route Alternatives

Corona from transmission lines can create audible noise (buzzing, humming, or crackling) or radio and television interference. Each condition is described below.

Corona noise can be a result of defects or damage to the surface of conductors. Practicable measures for eliminating or reducing wet weather noise are generally limited to carefully handling the conductor during construction to avoid damaging the surface. The construction contractor would be expected to treat the conductor with care to avoid creating irregularities (such as nicks, scrapes, and burrs) on the conductor surface. The contractor would normally take such precautions because if the conductor is damaged, its physical strength and ability to transmit power could also be compromised.

The parameters of importance in measuring corona are the transmission line voltage, transmission line configuration, number and diameter of the conductors, altitude above sea level, and weather conditions. Modeling for the proposed Project demonstrated that noise levels from the corona effect would be approximately 42 dBA at the edge of the 230-kV transmission line (75 feet from the centerline) during wet weather and 17 dBA in fair weather (Table 6-3). Modeling at 230-kV represents the maximum expected corona for the proposed Project. During wet weather, noise is likely to be masked by falling rain so that the noise generated by corona would be barely discernible. The noise at the edge of the ROW in fair weather conditions is comparable to a soft whisper. The corona noise shown in Table 6-3 is compared to typical noise levels encountered in daily life in Table 6-4.

Table 6-3: Projected Audible Noise Levels

Location	Fair Weather Corona (dBA)	Wet Weather Corona (dBA)
Center of ROW	22	47
Edge of ROW	17	42

Table 6-4: Audible Noise Decibel Ratings of Common Noises

Common Noises	Typical Decibel Level (dB)	Notes
[threshold]	0	Lowest level audible to human ear
Soft Whisper	30	Audible noise from electric transmission lines generally fall in this range
Rainfall	50	
Freeway Traffic	70	Critical level begins
Power Saw	110	Danger level
Fireworks	150	Hearing loss
Shotgun	170	

Source: American Academy of Otolaryngology (2013)

Because wet weather corona noise would be barely distinguishable from background noise levels at distances of more than 250 feet from a transmission line, its impacts are not expected to result in adverse long-term effects to humans, wildlife, or domestic animals/livestock. Likewise, the noise increase over background conditions is not expected to result in long-term adverse effects and, because of its association with wet weather, would not be continuous.

In addition to generating audible noise, corona from transmission lines can emit noise at frequencies used to transmit radio and television signals. This noise can cause an indirect effect in the form of radio and television interference that is recognized as static for radio reception and as “snow” for television reception.

The most common radio interference is to the AM broadcast band (535 to 1,605 kilohertz [kHz]). Only AM radio receivers very near transmission lines have the potential to be affected because “amplitude modulated” transmission of radio frequencies in the 535- to 1,605-kHz broadcast band can be altered by physical features. FM transmission of radio transmission is rarely affected.

Television interference from corona generally only occurs at the edge of the ROW during wet weather for transmission lines with voltages of 345-kV or higher. Television interference would only affect broadcast signals received through an antenna and would not affect cable television or digital satellite television reception.

Corona can also be dimly visible as bluish glow or as bluish plumes. Corona on conductors is observable only under the darkest and/or rainiest conditions when the corona is most intense. It is likely only visible with the aid of binoculars. Without intentionally looking for corona, it generally is not perceivable.

Tri-State has adopted, as corporate policy, programs that ensure its electric facilities are designed, constructed, and operated in strict accordance with the NESC and all applicable federal, state, and local regulations.

The Project is not expected to result in long-term adverse effects from noise.

6.6 WATER RESOURCES

6.6.1 Impacts Associated with All Route Alternatives

Table 5-5 summarizes the number of drainages within each of the proposed Route Alternatives. Each of the Route Alternatives was aligned to maximize the ability to avoid and span major surface waters and wetlands within the proposed alternatives' ROWs to the greatest extent feasible. Sediment control measures will be implemented when working near drainages and irrigation ditches to mitigate any indirect impacts from runoff and sedimentation.

Around the major surface waters in the Project Study Area (Arikaree River, North Fork of the Republican River, South Fork of the Republican River, Chief Creek), there will be no down-line vehicle access, regardless of alternative selected. Access to the transmission line and structures in these areas would be via existing county roads and access routes.

Structures would not be placed in any surface water or wetland area. The primary potential direct impact to surface waters would occur from access road improvement/creation. Once final engineering of the transmission line is complete, access roads would be identified. Access roads will be routed to avoid impacts to surface waters and wetlands to the greatest extent feasible. It is possible that ephemeral drainages and swales that may or may not be connected to a WOUS may be crossed during Project construction during dry periods. In some cases, Tri-State might be required to use timber mats or temporarily pull back the banks of some of the drainages to facilitate construction access. Any temporary disturbance to drainages would be restored post-construction.

While it is unlikely, should Tri-State's final design of the selected route and associated access roads result in long-term impacts to surface water, wetlands, or other potential "waters of the United States," conditions of the Nationwide 12 would be strictly adhered to. Project impacts totaling 0.1 acre or more would require mitigation and a pre-construction notification to the USACE.

In summary, transmission lines can be routed and designed to span surface waters and wetlands, therefore direct and indirect impacts to surface waters during Project construction are expected to be localized to areas needed during project construction and would be minimized with the implementation of EPMs WET 1-3, SW 1-4, and WQ 1-5.

No long-term adverse impacts to water resources are anticipated.

6.6.2 Impacts Associated with Route Alternative A West

Generally, the impacts to water resources would be the same as described in Section 6.6.1. According to the USGS's EDNA database (USGS 2012a), Route Alternative A West would cross/span 50 drainages, of the most of any of the Route Alternatives. The majority (46) of these drainages are low flow, ephemeral streams, with flows of 0 to 17 cfs. Based on the discussion in Section 6.6.1 and the use of EPMs, no adverse long-term impacts to water resources are anticipated.

6.6.3 Impacts Associated with Route Alternative A East

Generally, the impacts to water resources would be the same as described in Section 6.6.1. According to the USGS's EDNA database (USGS 2012a), Route Alternative A East would span 49 drainages, the second greatest number of drainage crossings of all the Route Alternatives. The majority (45) of these drainages have flows of 0 to 17 cfs. Based on the discussion in Section 6.6.1 and the use of EPMs, long-term adverse impacts to water resources are not anticipated.

6.6.4 Impacts Associated with Route Alternative B West

Generally, the impacts to water resources would be the same as described in Section 6.6.1. According to the USGS's EDNA database (USGS 2012a), Route Alternative B West would span 34 drainages. The majority (31) of these drainages are low-flow ephemeral streams, with flows of 0 to 17 cfs. Based on the discussion in Section 6.6.1 and the use of EPMs, long-term adverse impacts to water resources are not anticipated.

6.6.5 Impacts Associated with Route Alternative B East

Generally, the impacts to water resources would be the same as described in Section 6.6.1. According to the USGS's EDNA database (USGS 2012a), Route Alternative B East would span 33 drainages. The majority (30) of these drainages are low-flow ephemeral streams, with flows of 0 to 17 cfs. Based on the discussion in Section 6.6.1 and the use of EPMs, no long-term adverse impacts to water resources are anticipated.

6.6.6 Impacts Associated with Route Alternative C (Preferred)

Generally, the impacts to water resources would be the same as described in Section 6.6.1. According to the USGS's EDNA database (USGS 2012a), Route Alternative C would span 22 drainages, which is the least number of drainages spanned of any of the Route Alternatives. The majority (19) of these drainages are low-flow ephemeral streams, with flows of 0 to 17 cfs. Based on the discussion in Section 6.6.1 and the use of EPMs, no long-term adverse impacts to water resources are anticipated.

6.6.7 Impacts Associated with Route Alternative D

Generally, the impacts to water resources would be the same as described in Section 6.6.1. According to the USGS's EDNA database (USGS 2012a), Route Alternative D would span 32 drainages. The majority (29) of these drainages are low-flow ephemeral streams, with flows of 0 to 17 cfs. Based on the discussion in Section 6.6.1 and the use of EPMs, no long-term adverse impacts to water resources are anticipated.

6.7 WETLANDS AND FLOODPLAINS

6.7.1 Impacts Associated with All Route Alternatives

Table 5-7 summarizes the number of wetlands spanned by each Route Alternative. Since the distances between poles would be 650 to 1,100 feet, it is expected that wetland and riparian areas would be spanned regardless of Route Alternative selected. In some of the riparian areas near the major surface waters in the Project Study Area (such as the Arikaree River, South Fork of the Republican River, North Fork of the Republican River, and Chief Creek), some trees may be removed for the safe and reliable construction and operation of the transmission line, resulting in a Long-term direct impact. The final route selected

would be carefully aligned to span waterways, place poles outside of wetland areas to the greatest extent feasible, and to require the removal of as few trees as possible. The same approach would be used for access roads. Roads would be placed outside of wetlands, floodplains, and surface waters to the greatest extent feasible.

Tri-State and Tri-State's contractor would not stage materials in wetland and riparian communities. Impacts would be limited to tree removal for the construction and safe operation of the transmission line.

The proposed Project is expected to have short-term impacts to wetlands and riparian communities. Should Tri-State's final design of the selected route result in impacts to jurisdictional wetlands, the appropriate permit would be obtained through the USACE if the Project's impact exceeded the thresholds outlined under the NWP Program. Implementation of EPMs in Table 3-7 including S1-S4, SW-1, SW-4, and VEG 1-3, would minimize impacts to wetlands/riparian communities, and water quality.

Floodplain data are unavailable for the majority of the Project Study Area. The majority of the drainages in the Project Study Area are ephemeral. While some of these drainages could be prone to flash flooding, the lack of significant floodplains suggests infrequent major flooding events in the Project Study Area. The peak flows in 2011 for the largest waterways in the Project Study Area do not suggest a significant concern for flooding (Table 5-4). Any of the proposed Route Alternatives would span wetlands, surface waters, and floodplains to the greatest extent feasible. Structures would be placed outside of floodplains to the greatest extent feasible.

The primary indirect impact associated with project construction is the potential for erosion into wetlands and other surface waters. A stormwater management plan would be implemented to prevent fill of wetlands and minimize erosion impacts. Implementation of a stormwater management plan as well as EPMs SW-1 through SW-4 would minimize short- and long-term impacts to wetlands and floodplains. Impacts are expected to be localized to the project area. The Project is not expected to affect the structure and function of floodplains in the Project Study Area.

6.7.2 Impacts Associated with Route Alternative A West

Generally, the impacts to wetlands and floodplains would be the same as described in Section 6.7.1. According to NWI data (USFWS 2012), Route Alternative A West would span 22 palustrine wetland areas and 12 riparian (riverine) areas. Only Route Alternative A East would span more palustrine wetlands. Based on the discussion in Section 6.7.1 and the use of EPMs, adverse long-term impacts to wetlands and floodplains are not anticipated.

6.7.3 Impacts Associated with Route Alternative A East

Generally, the impacts to wetlands and floodplains would be the same as described in Section 6.7.1. According to NWI data (USFWS 2012), Route Alternative A East would span 23 palustrine wetland areas, which is the most of any of the Route Alternatives. Route Alternative A East would span 12 riparian (riverine) areas. Based on the discussion in Section 6.7.1 and the use of EPMs, long-term impacts adverse to wetlands and floodplains are not anticipated.

6.7.4 Impacts Associated with Route Alternative B West

Generally, the impacts to wetlands and floodplains would be the same as described in Section 6.7.1. According to NWI data (USFWS 2012), Route Alternative B West would span 11 palustrine wetland areas, which is the second least of any of the Route Alternatives, and 13 riparian (riverine) areas. Based on the discussion in Section 6.7.1 and the use of EPMs, long-term adverse impacts to wetlands and floodplains are not anticipated.

6.7.5 Impacts Associated with Route Alternative B East

Generally, the impacts to wetlands and floodplains would be the same as described in Section 6.7.1. According to NWI data (USFWS 2012), Route Alternative B East would span 12 palustrine wetland areas, and 13 riparian (riverine) areas. Based on the discussion in Section 6.7.1 and the use of EPMs, long-term adverse impacts to wetlands and floodplains are not anticipated.

6.7.6 Impacts Associated with Route Alternative C (Preferred)

Generally, the impacts to wetlands and floodplains would be the same as described in Section 6.7.1. According to NWI data (USFWS 2012), Route Alternative C would span 8 palustrine wetland areas; which is the least of all the Route Alternatives. The route would span 11 riparian (riverine) areas, which is the least of all the Route Alternatives. Based on the discussion in Section 6.7.1 and the use of EPMs, long-term adverse impacts to wetlands and floodplains are not anticipated.

6.7.7 Impacts Associated with Route Alternative D

Generally, the impacts to wetlands and floodplains would be the same as described in Section 6.7.1. According to NWI data (USFWS 2012), Route Alternative D would span 16 palustrine wetland areas, which is the third greatest of all the Route Alternatives. The route would span 15 riparian (riverine) areas, which is the most of any of the Route Alternatives. Riparian vegetation to be removed for construction and safe operation of the transmission line is expected to be higher for this alternative. Based on the discussion in Section 6.7.1 and the use of EPMs, long-term adverse impacts to wetlands and floodplains are not anticipated.

6.8 VEGETATION RESOURCES

6.8.1 Impacts Associated with All Route Alternatives

The Project Study Area has been heavily influenced and disturbed by agricultural activities (grazing and cultivation). Construction activities could result in vegetation removal, trampling of vegetation, fugitive dust impacts, erosion, soil compaction, and sedimentation within the project area. No long-term impacts to vegetation on a local, state, or regional scale are expected.

One of the primary short- and long-term indirect effects to vegetation from project construction is the propagation of noxious weeds. Ground disturbance also could result in propagation of noxious weeds, particularly in areas that have existing weed infestations. Noxious weeds can be spread from unwashed construction equipment or vehicles transporting noxious weed-inoculated soil or plant materials into previously un-infested areas or from transfer of topsoil inoculated with noxious weeds. Propagation of noxious weeds can result in the loss of native plant communities and alteration of natural drainage patterns. Implementation of EPMs and a noxious weed management plan as discussed in Table 3-7 would mitigate any long-term impacts to vegetation found in the ROW.

Long-term impacts would be limited to the transmission structures (each structure has a 300-square-foot footprint) that would be installed as part of the proposed Project and any long-term access roads that are created. Most permanent access roads would be re-seeded to maintain the stability of the road bed and prevent future soil erosion. Any areas surrounding the transmission structures that are temporarily impacted would be restored with native grass species or using a seed mix approved by the local landowner once the structures are in place.

During Project construction, existing access roads would be used to the greatest extent possible. In areas where no access roads are present, the transmission line would be accessed overland and in some instances new access roads may be necessary. Overland access could result in vegetation removal, trampling, soil compaction, erosion, and spread of noxious weeds within the Project Study Area and adjacent lands. Implementation of EPMs (VEG-1 through VEG-3) would mitigate any long-term impacts to vegetation found in the overland access areas.

Where new roads are required for access to the alignment, ground clearing and blading would occur. New road widths are estimated to be at a maximum 16 feet wide. While the creation of new roads and installation of transmission structures would result in long-term loss of vegetation, the relative area of impact is minimal and the impacts are expected to be further minimized with the implementation of EPMs. Vegetation would be cleared from those areas necessary to obtain adequate working width and turning radius space for maintenance equipment and allow for the safe operation of the transmission line.

Fugitive dust may affect vegetation during construction and during ground disturbing maintenance activities. Fugitive dust from construction and maintenance activities has the potential to affect plant growth and flowering. Dust effects on plants include reduced photosynthetic rates from clogged leaf surfaces (stomata), decreased air exchange, and decreased respiration and transpiration (Everett 1980, Farmer 1993). Impacts are expected to be localized to the project area and short-term in nature.

In some of the riparian areas near the major surface waters in the Project Study Area (such as the Arikaree River, South Fork of the Republican River, North Fork of the Republican River, and Chief Creek), some trees may be removed, resulting in a permanent direct impact. The final route selected would be carefully aligned to span these waterways, place poles outside of wetland areas to the greatest extent feasible, and to require the removal of as few trees as possible.

Route Alternative A West is the shortest in length of all the Route Alternatives, and therefore would have less impact to vegetation than the other Route Alternatives. Route Alternative D is the longest route, and therefore would have the greatest impact to vegetation. Given the network of existing private and county roads that cross the entire Project Study Area, it is not anticipated that a particular Route Alternative would require significantly more new access roads than another, although down-line overland access for alternatives with longer lengths, such as Route Alternative D, could result in greater temporary disturbance than shorter routes.

The majority of impacts to vegetation from any of the proposed Route Alternatives are expected to be localized and temporary in nature. The EPMs in Table 3-7 would minimize and mitigate impacts to vegetation within the ROW and the surrounding area, and reduce the spread of noxious weeds; therefore, long-term adverse impacts to vegetation are not anticipated.

Table 6-5 summarizes the length of each cover type by alternative.

Table 6-5: Vegetation Cover Types by Project Alternative

Cover Type (miles)	A West	A East	B West	B East	C	D
Length crossing deciduous forest	0	0	0	0	0.07	0
Length crossing native grasslands	0	0	0	0	0	0
Length crossing evergreen forests	0	0	0	0	0	0
Length crossing pasture/hay	0	0	0	0	0.66	0.43
Length crossing cultivated crops	17.57	17.60	27.32	27.35	18.41	12.52
Length crossing woody wetlands	0.10	0.12	0.06	0.07	0.02	0.02
Length crossing developed land	0.04	0.04	0.04	0.04	0.04	0.04
Length crossing shrub/scrub	0	0	0	0	0	0
Length crossing grassland/herbaceous	45.54	46.26	38.06	38.78	46.05	57.30
Length crossing emergent herbaceous wetlands	0.14	0.16	0.12	0.15	0	0

6.8.2 Impacts Associated with Route Alternative A West

Generally, the impacts to vegetation would be the same as those described in Section 6.8.1. Approximately 69 percent of Route Alternative A West would cross grassland (45.54 miles). The other dominant cover type in the ROW is cultivated cropland (17.57 miles). Based on the discussion in Section 6.8.1 and the use of EPMs long-term adverse impacts are not anticipated.

6.8.3 Impacts Associated with Route Alternative A East

Generally, the impacts to vegetation would be the same as those described in Section 6.8.1. Approximately 69 percent of Route Alternative A East would cross grassland/herbaceous cover types (46.2 miles). This route would cross the second greatest amount (in total miles and percent) of grassland of all the Route Alternatives. The second dominant cover type within this alternative is cultivated cropland (17.60). Based on the discussion in Section 6.8.1 and the use of EPMs, long-term adverse impacts are not anticipated.

6.8.4 Impacts Associated with Route Alternative B West

Generally, the impacts to vegetation would be the same as those described in Section 6.8.1. Approximately 55 percent of Route Alternative B West would cross 38.06 miles of the grassland/herbaceous cover type (38.1 miles). This route would cross the least amount of grassland (in total miles and percent) of all of the Route Alternatives. The second most dominant cover type within this alternative is cultivated cropland (27.32 miles). Both Route Alternatives B West and B East would result in greater impacts to cultivated croplands relative to other Project alternatives. Based on the discussion in Section 6.8.1 and the use of EPMs, long-term adverse impacts are not anticipated.

6.8.5 Impacts Associated with Route Alternative B East

Generally, the impacts to vegetation would be the same as those described in Section 6.8.1. Approximately 56 percent of Route Alternative B East would cross grassland/herbaceous cover types (38.78 miles). This route would cross the second least amount of grassland (in total miles and percent) of all of the Route Alternatives. The other dominant cover type in this alternative is cultivated cropland

(27.35 miles). Based on the discussion in Section 6.8.1 and the use of EPMs, long-term adverse impacts are not anticipated.

6.8.6 Impacts Associated with Route Alternative C (Preferred)

Generally, the impacts to vegetation would be the same as those described in Section 6.8.1. Approximately 64 percent of Route Alternative C would cross the grassland/herbaceous area cover type (46.05 miles). This route would cross the third least amount of grassland (in total miles and percent) of all of the Route Alternatives. The second most dominant cover type within this alternative is cultivated cropland (18.41 miles). Based on the discussion in Section 6.8.1 and the use of EPMs, long-term adverse impacts are not anticipated.

6.8.7 Impacts Associated with Route Alternative D

Generally, the impacts to vegetation would be the same as those described in Section 6.8.1. Approximately 77 percent of Route Alternative D would cross the grassland/herbaceous cover type (57.30 miles). This route would cross the greatest amount of grassland (in total miles and percent) of all of the Route Alternatives. The second most dominant cover type in this alternative is cultivated cropland (12.52 miles). Based on the discussion in Section 6.8.1 and the use of EPMs, long-term adverse impacts are not anticipated.

6.9 WILDLIFE AND WILDLIFE HABITAT

6.9.1 Impacts Associated with All Route Alternatives

Construction impacts to wildlife during construction of a transmission line include temporary disturbance from construction noise and equipment, temporary avoidance of construction zones, habitat loss, direct mortality to less mobile fossorial species, and increase in collision risk for avian species. Indirect impacts include affects to habitat from the spread of noxious weeds as well as the fragmentation of habitats from the development of a transmission ROW and associated access roads. The majority of these impacts are expected to be short-term and localized in nature.

During public scoping for the Project, the CPW identified Stalker Lake and Bonny Lakes as areas with high concentration of waterfowl during the fall and winter migrations. Bonny Reservoir is also used by sandhill cranes during spring and fall migration. A historic whooping crane occurrence was also documented at Bonny Reservoir. The largest risk to wildlife species with operation of a transmission line is the potential for less maneuverable species, such as waterfowl and cranes, to collide with the line. Higher risk areas are those that bisect foraging habitats and in proximity to wetlands and surface waters. Tri-State will conduct a collision risk assessment once the final alignment has been designed to assess areas where marking the line with some form of avian flight diverter might be warranted to mitigate this potential effect. The risk assessment would review all surface waters and wetland areas including the North Fork and South Forks of the Republican River, Bonny Reservoir, and Stalker Lake.

As discussed in the affected environment, Bonny Reservoir also provides winter habitat for bald eagles. Osprey and golden eagle also occur in the area. Measures discussed above to mitigate potential avian collisions would also benefit eagles, osprey, and other raptors that may occur in the Project Study Area. The transmission line design would take into consideration the Avian Power Line Interaction Committee’s recommended practices for minimizing electrocution risk on power lines.

Suitable nesting habitat for tree and shrub-nesting species is limited throughout the Project Study Area; trees and large shrubs are primarily found only within riparian areas. Tri-State would route the final alignment to the greatest extent feasible to reduce the need to cut trees (particularly in riparian communities). Some avian nesting habitat could be removed to ensure the safe and reliable operation of the transmission line. All of the Route Alternatives cross riparian areas, and Tri-State would construct the transmission line in these riparian areas outside the avian nesting season (after August 15) to the greatest extent feasible. Should this not be feasible, Tri-State would remove the nesting material outside the breeding season to avoid taking an active bird nest. If landowner permission to cut trees ahead of construction is not permitted, Tri-State would conduct nesting surveys prior to construction. If an active nest is found, it would be flagged and avoided. If the nest could not be avoided, Tri-State would contact USFWS to determine the appropriate course of action.

Tri-State would adhere to the guidelines outlined in the "Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors" (CDOW 2002) to determine the necessary timing and buffer guidelines for specific raptor species that may be actively nesting in the Project Study Area during construction.

Big and small game animals might be temporarily impacted during Project construction due to noise, human presence, and impacts to forage (vegetation) within the areas where transmission structures will be placed. After construction, revegetation of areas impacted by construction and noxious weed management would mitigate impacts to wildlife foraging habitat. Permanent impacts to vegetation would be limited to the structure locations only and areas where new roads would be constructed, so impacts to habitat are expected to be minor. Table 5-8 summarizes the length of each Route Alternative through game species habitat, and Figure 5-6 depicts areas of game habitat within the Project Study Area. As depicted in Figure 5-6, game species' winter ranges and winter concentration areas are primarily along the major river corridors in the Project Study Area: the South Fork of the Republican River, the Arikaree River, and the North Fork of the Republican River. Wildlife movements would not be prohibited by operation of the transmission line. Big game might temporarily avoid the ROW in the future during routine maintenance repairs.

Where new roads are required for access to the alignment, ground clearing and blading would occur. While the creation of new roads and installation of transmission structures would result in permanent habitat loss for small mammals and ground-nesting birds, the impact would be limited to the transmission and access road ROWs and is expected to have a minimal impact regardless of the routing alternative selected. The Project is not expected to result in long-term adverse impacts to local or regional wildlife populations.

Indirect impacts to habitats from the propagation of noxious weeds as well as habitat fragmentation can be minimized by revegetation of temporary use areas as well as noxious weed management post construction as outlined in the EPM Table 3-7, measures NW 1-NW 3 and VEG 1-VEG 3.

Potential impacts to special status avian species are discussed in more detail below in Section 6.10.

6.9.2 Impacts Associated with Route Alternative A West

Generally, the impacts associated with Route Alternative A West to wildlife and wildlife habitat would be the same as discussed above in Section 6.9.1. White-tailed deer winter range and concentration areas and

mule deer winter range and concentration areas would be impacted by this alternative as shown previously in Table 5-8. Permanent habitat impacts would be limited to the areas structures would be erected. The transmission line should not result in long-term adverse impacts to big game or their habitats associated with this alternative.

Approximately 0.6 mile of a bald eagle winter concentration, winter forage, and winter range (overlapping habitat types) occurs under this alternative where the alternative would span the South Fork of the Republican River. The CPW has also indicated that there are high concentrations of bald eagles during the winter around Bonny Reservoir. There are no bald eagle nest or roost sites within 0.5 mile of the alternative.

Greater prairie chicken production areas would not be crossed by this or any project alternative. Construction would occur to the greatest extent feasible outside of the lekking season. If construction occurs within these areas during the lekking season, a lek survey would be completed prior to construction and if identified, appropriate time restrictions would be implemented as identified in coordination with the CPW.

Bonny Lake is located approximately 6 miles east of this Alternative and Stalker Lake SWA is located to the east of the existing Wray Substation. Both Route Alternatives A West and A East and B West and B East would parallel Stalker Lake SWA (Figure 5-1). Waterfowl and other avian species in the area are likely travel to and from both of these large surface waters to feed and nest. The surface waters spanned by this alternative also provide habitat for waterfowl and other migratory birds. An avian collision risk assessment would be conducted when a final route is selected and areas with potential collision risk would be marked using flight diverters to mitigate potential impacts to bald eagles and other migratory birds. Long-term adverse impacts to local or regional wildlife populations or wildlife habitat are not anticipated.

6.9.3 Impacts Associated with Route Alternative A East

Generally, the impacts associated with Route Alternative A East to wildlife and wildlife habitat would be the same as discussed above in Section 6.9.1 and those discussed above under Route Alternative A West. Long-term adverse impacts to local or regional wildlife populations or wildlife habitat are not anticipated.

6.9.4 Impacts Associated with Route Alternative B West

Generally, the impacts associated with Route Alternative B West to wildlife and wildlife habitat would be the same as discussed above in Section 6.9.1 and Route Alternative A West. Long-term adverse impacts to local or regional wildlife populations or wildlife habitat are not anticipated.

6.9.5 Impacts Associated with Route Alternative B East

Generally, the impacts associated with Route Alternative B East to wildlife and wildlife habitat would be the same as discussed above in Section 6.9.1 and Route Alternative A West. Long-term adverse impacts to local or regional wildlife populations or wildlife habitat are not anticipated.

6.9.6 Impacts Associated with Route Alternative C (Preferred)

Generally, the impacts associated with Route Alternative C to wildlife and wildlife habitat would be the same as discussed above in Section 6.9.1. This route alternative would cross greater amounts of greater

prairie chicken production areas located in the northern portion of the Project Study Area and depicted on Figure 5-7. Route Alternative C would cross approximately 11.5 miles of greater prairie chicken production area habitat. In addition, the CPW has noted a lek located near the Willow Creek SWA. Tri-State would limit construction during March–April (during lekking) in the greater prairie chicken production areas in the northern portion of the Project Study Area and near Willow Creek SWA to the greatest extent feasible. Should construction occur in these areas in March–April, the areas would be surveyed for leks. If leks were discovered in proximity to the ROW, construction timing constraints would be enforced in early morning hours through the breeding season. Long-term adverse impacts to local or regional wildlife populations or wildlife habitat are not anticipated from construction, operation, and maintenance of the transmission line. Long-term indirect impacts to habitats including fragmentation and impacts to native vegetation via noxious weed propagation may occur with the construction and operation of this alternative. EPMs NW-1 through NW-3 and VEG-1 through VEG-3 would be implemented to minimize these long-term direct and indirect impacts.

Route Alternative C would span a portion of Stalker Lake SWA at the northern end of the SWA. There are existing transmission lines that also span the northern end of this SWA (Figure 5-1). An avian collision risk assessment would be conducted when a final route is selected and areas with potential collision risk would be marked using flight diverters to mitigate potential impacts to migratory birds.

6.9.7 Impacts Associated with Route Alternative D

Generally, the impacts associated with Route Alternative D to wildlife and wildlife habitat would be the same as discussed above in Section 6.9.1. This route alternative would cross the greatest amount of greater prairie chicken production areas located in the northern portion of the Project Study and depicted on Figure 5-7. Route Alternative D would cross approximately 13.4 miles of greater prairie chicken production area habitat (Figure 5-7). Tri-State would limit construction during March-April (during lekking) in the greater prairie chicken production areas in the northern portion of the Project Study Area to the greatest extent feasible. Should construction occur in these areas in March–April, the areas would be surveyed for leks. Long-term direct adverse impacts to local or regional wildlife populations or wildlife habitat are not anticipated. Long-term indirect impacts such as habitat fragmentation and impacts to native vegetation via noxious weed propagation may occur with the construction and operation of this alternative.

Waterfowl and other avian species in the area are likely to travel to and from both of these large surface waters to feed and nest. The surface waters spanned by this Route Alternative C also provide habitat for waterfowl and other migratory birds. An avian collision risk assessment would be conducted when a final route is selected and areas with potential collision risk would be marked using flight diverters to mitigate potential impacts to bald eagles and other migratory birds.

6.10 IMPACTS TO SPECIAL STATUS SPECIES AND MIGRATORY BIRDS ASSOCIATED WITH ALL ROUTE ALTERNATIVES

6.10.1 Impacts to Federally Listed Threatened or Endangered Species

According to the USFWS' IPaC system, no federally threatened or endangered species are listed as occurring in Yuma or Kit Carson counties. Tri-State submitted a letter to the UFWS on February 12, 2012, requesting concurrence from the USFWS that the project would not result in impacts to federally listed species. The USFWS concurred in a letter dated April 1, 2013, with this determination but

requested some additional environmental protection measures be implemented to minimize impacts to migratory birds, which were detailed in Chapter 5.

6.10.2 Impacts to State Threatened or Endangered Fish Species

Construction of any of the Route Alternatives is not expected to have any short-term or long-term impacts to the state endangered plains minnow or to the state threatened brassy minnow. All surface water bodies and aquatic habitats would be spanned by the transmission line. No water use and depletion issues are expected to occur during construction because contractors would be responsible for obtaining water used for construction from a source that would not result in depletions to local surface water bodies that may provide habitat for these fish species. Standard EPMs described in Section 3.4.1.7, Table 3-7, would ensure the Project does not indirectly adversely impact surface waters.

6.10.3 Impacts to State Threatened or Endangered Avian Species

State threatened and endangered species that may occur in the Project Study area were discussed above in Section 5.9. Each of the Route Alternatives provides suitable habitat for the state threatened western burrowing owl. A survey for the presence of western burrowing owls within the ROW would be conducted if construction occurs during the burrowing owl breeding season (March 15 through October 31). If prairie dog colonies are found, surveys for burrowing owls would be conducted following CPW protocol to ensure the proposed Project does not affect this state listed species.

None of the Route Alternatives provides suitable nesting habitat for the state threatened piping plover, and in Colorado, this species is only known to nest in the Arkansas River Valley (Kingery 1998). This species is a federal threatened species, and does not appear on USFWS' IPaC system as occurring in Yuma or Kit Carson County. It is possible the species could occur in the Project Study Area as a transient; however, short and long-term adverse impacts to state populations of this species are not anticipated.

None of the Route Alternatives provides suitable nesting habitat for the state endangered least tern, and in Colorado, this species is only known to nest in the Arkansas River Valley (Kingery 1998). This species is a federal endangered species, and does not appear on USFWS' IPaC system as occurring in Yuma or Kit Carson County. It is possible the species could occur in the Project Study Area as a transient; however, short and long-term impacts to state populations of this species are not anticipated.

While NDIS lists the plains sharp-tailed grouse as known to occur in Yuma County, more recent literature (Kingery 1998) indicates the only population of this species is located in Douglas County. It is possible the species could occur in the Project Study Area, but it is unlikely. No impacts to this species are anticipated.

As summarized in the affected environment, the state endangered whooping crane has not been recorded in Colorado since 2002 and the USFWS concurred that it is unlikely this species would occur in the Project Study Area. The whooping cranes' preferred migration corridor is generally east of the Project Study Area. It is possible that a transient could occur in the Project Study Area. Potential collision risk to avian species including the whooping crane would be addressed through an avian collision risk assessment once a final alignment has been identified. Flight diverters would be installed in areas with high and moderate potential for collision.

6.10.4 Impacts to State Threatened or Endangered Mammals

No state threatened or endangered mammals are listed as occurring in the Project Study Area.

6.10.5 Impacts to State Threatened or Endangered Reptiles or Amphibians

No state threatened or endangered reptiles or amphibians are listed as occurring in the Project Study Area.

6.10.6 Impacts to Raptors and Migratory Birds

Tri-State would adhere to the guidelines outlined in the "Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors" (Craig 2008) to determine the necessary timing and buffer guidelines for specific raptor species that occur in the Project Study Area. Most raptor species in Colorado require a 0.25-mile buffer from construction disturbance during their respective nesting periods. New construction is not permitted within 0.25 mile of an active bald or golden eagle nest site, and no site disturbance is allowed during the nesting season within 0.5 mile of an active nest or communal roost site. There are no documented nesting or roosting sites within 0.5 mile of any of the Project alternatives.

Because construction may occur during the avian nesting season, measures would be taken to minimize any potential impacts to raptors and migratory birds. Tri-State would clear vegetation in the ROW during the non-nesting season to the greatest extent feasible and would conduct nesting surveys prior to construction to ensure the Project does not result in the "take" of any active nest or migratory bird. If active raptor nests are found within 0.25 mile of the ROW, and buffers cannot be maintained because of other land use constraints or construction issues, Tri-State would consult with the USFWS Migratory Bird Office and the CPW to identify appropriate measures to mitigate construction disturbance and to prevent nest abandonment.

As discussed in Section 6.9.1, Tri-State would conduct an avian collision risk assessment once the final alignment has been designed to assess areas where marking the line with some form of avian flight diverter might be warranted to mitigate collision risk. The transmission line will be designed with consideration of APLIC's suggested practices for minimizing electrocution and collision risk on power lines.

Through the implementation of these EPMs, no adverse impacts to nesting avian species are expected from construction or routine maintenance activities associated with either of the Route Alternatives.

6.11 RECREATION

6.11.1 Impacts Associated with All Route Alternatives

The primary location for recreation activities in the Project Study Area are the SWAs. All Route Alternatives would cross state-managed lands, including SWAs, where recreation opportunities include hunting, wildlife viewing, and fishing. Table 6-6 presents the length of SWA land crossed by each Route Alternative.

The potentially impacted activities would include hunting, hiking, and wildlife viewing within the construction areas. Wildlife may avoid construction areas, which could indirectly and temporarily affect wildlife viewing opportunities in these areas.

Construction and operation of a transmission line near SWAs would have direct effects to the visual aesthetics of the area. Visual impacts are discussed in greater detail under Section 6.12.

Other organized recreation activities in the Project Study Area are located in the incorporated cities of Burlington and Wray; all Route Alternatives avoid these incorporated areas. Impacts to recreation activities would be short-term and limited to the construction period.

Table 6-6: Length of SWAs Crossed By Alternative

Alternative Alignment	Length Crossing SWAs
Alternative A East	0.8
Alternative A West	0.8
Alternative B East	1.5
Alternative B West	1.5
Alternative C	4.6
Alternative D	1.8

6.11.2 Impacts Associated with Route Alternative A West

Route Alternative A West would pass through a total of 0.8 mile of the northern portion and along the easternmost boundary of the Stalker Lake SWA located west of Wray and line would pass outside the western boundary of a portion of the South Republican SWA. During construction, access to the portions of the SWAs occurring in the construction ROW (approximately 14.5 acres) may be temporarily restricted to protect public health and safety. Alternatives A East and A West would have the lowest mileage of SWAs crossed relative to other project alternatives. The potentially impacted activities would include hunting, hiking, and wildlife viewing within the construction areas. Fishing and picnicking at the lake would not be affected. Temporary restrictions on access and impacts to recreation within the Stalker Lake and South Republican SWA during construction are expected to be a short-term and localized impact.

The primary long-term impact to the SWAs in the area would be associated with the visual impact associated with the power line. Visual impacts are discussed further in Section 6.12.

Route Alternative A West is not expected to result in long-term adverse impacts to recreation activities in the area.

6.11.3 Impacts Associated with Route Alternative A East

Route Alternative A East would pass through a total of 0.8 mile of SWA. The SWAs crossed by Route Alternative A West are those that are also spanned by Route Alternative A East. Impacts associated with Route Alternative A East are anticipated to be the same as described for Route Alternative A West in Section 6.11.2. Alternatives A East and A West would have the lowest mileage of SWAs crossed relative to other project alternatives. The primary long-term impact to the SWAs in the area would be associated with the visual impact associated with the power line. Visual impacts are discussed further in Section 6.12.

This alternative is not expected to result in long-term adverse impacts to recreation activities in the area.

6.11.4 Impacts Associated with Route Alternative B West

Alternatives B West and B East have the second lowest percentage of SWAs crossed relative to other project alternatives (1.5 miles). Like the Route Alternatives A West and A East, Route Alternative B West would pass through the same 0.8 acre of the Stalker Lake SWA and impacts would be identical to those described in Section 6.11.2. Route Alternative B West also would pass through approximately 0.75 mile of the Sandy Bluffs State Trust Land, which offers recreational hunting of big and small game. During construction, access to the approximately 13.6 acres along the ROW area in Sandy Bluffs may be temporarily restricted to protect public health and safety. The potentially impacted activities would include hunting, hiking, and wildlife viewing in the ROW. The Sandy Bluffs State Trust Land includes approximately 6,385 acres, and the Project Study Area includes more than 25,000 acres of SWA; temporary restrictions on access and impacts to recreation in 13.6 acres of the Sandy Bluffs State Trust Land during construction would be a short-term impact. The primary long-term impact to the SWAs in the area would be associated with the visual impact associated with the power line. Visual impacts are discussed further in Section 6.12.

The alternative is not expected to result in long-term adverse impacts to recreation activities in the area.

6.11.5 Impacts Associated with Route Alternative B East

Alternatives B West and B East have the second lowest percentage of SWAs crossed relative to other project alternatives (1.5 miles). Route Alternative B East would pass through a total of 1.5 miles of SWA. Impacts associated with Route Alternative B East are anticipated to be the same as described for Route Alternative B West in Section 6.11.4. The primary long-term impact to the SWAs in the area would be associated with the visual impact associated with the power line. Visual impacts are discussed further in Section 6.12.

This alternative is not expected to result in long-term adverse impacts to recreation activities in the area.

6.11.6 Impacts Associated with Route Alternative C (Preferred)

Route Alternative C would cross a total of approximately 4.6 miles (or 81.8 acres) of SWA. Impacted SWAs include Stalker Lake SWA (0.3 mile, or 5.5 acres), South Republican SWA (1.5 miles, or 27.3 acres), Simmons SWA (2.0 miles, or 36.4 acres), and Willow Creek SWA (0.7 mile, or 12.7 acres).

During construction, access to the approximately 5.5 acres along the ROW area in Stalker Lake SWA may be temporarily restricted to protect public health and safety. The impacted area would be along the easternmost boundary of the SWA, well away from the lake and picnic facilities area. The potentially impacted activities during construction would include hunting, hiking, and wildlife viewing in the ROW. The Stalker Lake SWA includes approximately 420 acres, and the Project Study Area includes more than 25,000 acres of SWA; temporary restrictions on access and impacts to recreation in 5.5 acres of the Stalker Lake SWA would be limited to the construction time period in that immediate area. The primary long-term effect to recreation activities would be the visual impacts from the power line within the SWAs. Visual impacts are discussed in Section 6.12.

During construction, access to the approximately 27.3 acres along the ROW area in the South Republican SWA may be temporarily restricted to protect public health and safety. The impacted area would be through the eastern portion the SWA, more than 3 miles east of the Bonny Dam and more than 4 miles

from the campground and picnic facilities area. The potentially impacted activities during construction would include hunting, hiking, and wildlife viewing in the ROW. The South Republican SWA includes more than 21,000 acres, and the Project Study Area includes more than 25,000 acres of SWA; temporary restrictions on access and impacts to recreation in 27.3 acres of the South Republican SWA would be limited to the construction time period in that immediate area, which is anticipated to be a few days to a couple of weeks in duration, and would be a short-term impact. The primary long-term effect to recreation activities would be the visual impacts from the power line within the SWAs. Visual impacts are discussed in Section 6.12.

During construction, access to the approximately 36.4 acres along the ROW area in the Simmons SWA may be temporarily restricted to protect public health and safety. The impacted area would be through the central portion the SWA. Simmons SWA does not provide any picnic or camping facilities. The potentially impacted activities during construction would include hunting, hiking, and wildlife viewing in the ROW. The Simmons SWA includes approximately 2,317 acres, and the Project Study Area includes more than 25,000 acres of SWA; temporary restrictions on access and impacts to recreation in 36.4 acres of the Simmons SWA would be limited to the construction time period in that immediate area, which is anticipated to be a few days to a couple of weeks in duration, and would be a short-term impact. The primary long-term impact to the recreation in this SWA is the visual impact of the transmission line. Visual impacts are discussed in Section 6.12.

During construction, access to the approximately 12.7 acres along the ROW area in the Willow Creek SWA may be temporarily restricted to protect public health and safety. The impacted area would be through the westernmost portion the SWA. Willow Creek SWA does not provide any picnic or camping facilities. The potentially impacted activities during construction would include hunting, hiking, and wildlife viewing in the ROW. The Willow Creek SWA includes approximately 890 acres, and the Project Study Area includes more than 25,000 acres of SWA; temporary restrictions on access and impacts to recreation in 12.7 acres of the Willow Creek SWA would be limited to the construction time period in that immediate area, which is anticipated to be a few days to a couple of weeks in duration, and would not be a significant impact. The primary long-term impact to the recreation in this SWA is the visual impact of the transmission line. Visual impacts are discussed in Section 6.12.

This alternative is not expected to result in long-term adverse impacts to recreation activities in the area.

6.11.7 Impacts Associated with Route Alternative D

Route Alternative D would cross 1.8 miles (or 32.7 acres) of SWA. Impacted SWAs include Stalker Lake SWA (0.3 mile, or 5.5 acres) and South Republican SWA (1.5 miles, or 27.3 acres). The impacts to recreation in these SWAs would be the same as described in Section 6.11.6. The primary long-term impact to the recreation in this SWA is the visual impact of the transmission line. This alternative is not expected to result in long-term adverse impacts to recreation activities in the area.

6.12 VISUAL RESOURCES

6.12.1 Impacts Associated with All Route Alternatives

Construction of the Project would create direct long-term impacts to visual resources. No indirect impacts to visual resources have been identified for any of the project alternatives. Either of the Route Alternatives would cross rural and agrarian areas with a low population density. While the Project would

parallel existing roads in the immediate foreground, many of the county roads are lightly traveled and primarily used to access agricultural fields during the growing season or isolated rural residences. The Project would appear in the middleground (0.5 mile to 3 miles) or background (3 miles to the edge of visibility) as seen from U.S. 385 or residences near the towns of Burlington and Wray. The dark color and small width (or fineness) of the pole structure would minimize the contrast with the existing terrain and landscape under certain lighting conditions. In addition, Tri-State identified Route Alternatives that minimize overall visual impacts to visual by avoiding residences and taking advantage of topography to buffer views of the transmission line from residences, highways, and within SWAs to the greatest extent feasible.

Table 5-12 summarizes the distance of each Route Alternative from the closest residences. There are few residences within 0.25 mile of any of the Route Alternatives. Although construction of any of the Route Alternatives would result in long-term visual impacts, because of the rural and agrarian character of the Project Study Area and the low number of residences that would be near either of the Route Alternatives, significant visual impacts are not anticipated.

Each of the proposed Route Alternatives would cross the SWAs and state highways, creating a direct long-term visual impact in the foreground and middleground.

6.12.2 Impacts Associated with Route Alternative A West

6.12.2.1 Visual Impacts to Residences

Route Alternative A West would be in the foreground and within 1,320 feet of eight residences and would create a direct long-term impact to visual resources. Rolling terrain would block partial views of the transmission line from some of these residences; some of the residences would have direct views of the transmission line. One of the residences is within 300 feet of Route Alternative A West; a short windbreak buffers about 100 feet of the southern view of the proposed transmission line alignment. The presence of the line in proximity to these residences creates a direct long-term adverse visual impact. Impacts to the residences could be mitigated in some situations through pole placement area whenever engineering permits.

6.12.2.2 Visual Impacts Along State Highways and County Roads

Route Alternative A West would cross U.S. 385, U.S. 36, and U.S. 34 once. Route Alternative A West would cross U.S. 385 south of County Road (CR) HH and would create a direct long-term visual impact in the immediate foreground and middleground. The route would cross the road perpendicularly on flat terrain and would be visible up to 3 miles away along the roadway.

The southern 12 miles (approximately) of Route Alternative A West roughly parallels U.S. 385, with some segments perpendicular (and visible) to U.S. 385. In this area, Route Alternative A West would create a direct long-term visual impact in the middleground and background as seen from U.S. 385. However, the terrain and distance, up to 5 miles, from U.S. 385 would partially obscure views and reduce the visual impacts to motorists.

Route Alternative A West would cross U.S. 34 at a perpendicular angle in an area of flat terrain and would create direct long-term impacts to visual resources in the foreground to middleground in the area of the highway crossing.

West of where the route would cross U.S. 36, the line would be visible to motorists traveling east along the highway from approximately 5.5 miles away. Views further west, views would be obscured by the hilly terrain. As motorists travel east on U.S. 36, the transmission line would appear in the middleground and foreground for approximately 5.5 miles. The route would cross U.S. 36 at an angle. East of where the route would cross the highway, the terrain is flat and motorists along the highway would have direct foreground to middleground views of the transmission line as they approach it traveling west on the highway from Idalia. The route would create long-term direct impacts to visual resources in the middleground and foreground.

Route Alternative A West would cross 38 county roads and would create a direct long-term impact in the foreground and middleground at the road crossings.

6.12.2.3 Visual Impacts to SWAs

Route Alternative A West would cross through a total of 0.8 miles of SWA. The route would cross Stalker Lake SWA and create a direct long-term impact to visual resources in the foreground and middleground. From the picnic facilities area and from the lake the transmission line would be visible as it passes east-west through the northernmost portion of the Stalker Lake SWA. There is some vegetation near the existing recreation resources that would provide a minimal visual buffer. However, the flat terrain and otherwise unobstructed views would provide direct views to the transmission line.

Route Alternative A West would parallel a small parcel of the South Republican SWA for approximately 0.8 mile. The route in this area does not enter the SWA, but borders its western boundary. Along the western boundary of this SWA parcel, the transmission line would be in the immediate foreground and would create a direct long-term impact to visual resources in the immediate foreground and middleground.

6.12.3 Impacts Associated with Route Alternative A East

6.12.3.1 Visual Impacts to Residences

Route Alternative A East would be in the foreground and within 1,320 feet of 12 residences and would create a direct long-term impact to visual resources. Hilly and rolling terrain would block partial views of the route from some of the residences; some of the residences would have direct views of the transmission line. Two of the residences are within 300 feet of Route Alternative A East and would have relatively unobstructed views of the transmission line. The location of the line in these locations would create a long-term adverse visual impact to these residences. Impacts to the residences within 300 feet could be mitigated in some situations through pole placement area whenever engineering permits.

6.12.3.2 Visual Impacts Along State Highways and County Roads

Route Alternative A East would cross U.S. 385 and U.S. 36 in the same areas as Route Alternative A West. Route Alternative A East would cross U.S. 34 to the east of where Route Alternative A West would cross U.S. 34; however, visual impacts would be the same as described above in Section 6.12.2.2.

Route Alternative A East would cross 38 county roads and would create a direct long-term adverse impact in the foreground and middleground at the road crossings.

6.12.3.3 Visual Impacts to SWAs

The impacts would be the same as described in Section 6.12.2.3.

6.12.4 Impacts Associated with Route Alternative B West

6.12.4.1 Visual Impacts to Residences

Route Alternative B West would be in the foreground and within 1,320 feet of nine residences and would create a direct long-term impact to visual resources. Hilly and rolling terrain would block partial views of the route from some of the residences; some of the residences would have direct views of the transmission line. One of the residences is within 300 feet of Route Alternative B West; a short windbreak buffers about 100 feet of the southern view of the proposed transmission line alignment. Impacts to this residence could be mitigated in some situations through pole placement area whenever engineering permits.

6.12.4.2 Visual Impacts Along State Highways and County Roads

Route Alternative B West would cross U.S. 385 south of CR HH and would create a direct long-term visual impact in the immediate foreground and middleground. The route would cross the road perpendicularly on flat terrain and would be visible up to 3 miles away along the roadway.

The southern 12 miles (approximately) of Route Alternative B West roughly parallels U.S. 385, with some segments perpendicular (and visible) to U.S. 385. In this area, Route Alternative B West would create a direct long-term visual impact in the middleground and background as seen from U.S. 385. However, the terrain and distance, up to five miles, from U.S. 385 would partially obscure views and reduce the adverse visual impacts to motorists.

North of CR 7, Route Alternative B West would be visible to the west along U.S. 385. The transmission line would be approximately 3.5 miles from the highway, and would appear in the middleground. North of where U.S. 36 turns eastward from U.S. 385, the transmission line would appear in the foreground from U.S. 385 for approximately 3 miles. Further north, terrain to the west of U.S. 385 would obscure views of the transmission line from the highway. As U.S. 385 approaches Wray, the route would again appear in the foreground of the highway, as a short portion of the route is 0.5 mile from the highway. Approaching Wray, the transmission line would appear further in the middleground to background.

Route Alternative B West would cross U.S. 36 at a perpendicular angle in an area of flat terrain. The transmission line would create direct long-term impacts to the foreground and middleground visual resources in this area. East of Idalia, views of the transmission line from U.S. 36 would be partially obscured by structures in Idalia. West of where the route crosses U.S. 36, the transmission line would be visible from the highway from approximately 5 to 7 miles away.

Route Alternative B West would cross U.S. 34 at a perpendicular angle in an area of flat terrain and would create direct long-term adverse impacts to visual resources in the foreground to middleground in the area of the highway crossing.

Route Alternative B West would cross 41 county roads and would create a direct long-term adverse impact in the foreground and middleground at the road crossings.

6.12.4.3 Visual Impacts to SWAs

Route Alternative B would cross a total of approximately 1.5 miles of SWA lands. Like Route Alternatives A West and B East, Route Alternative B West would cross 0.8 mile of the Stalker Lake SWA and create a direct long-term impact to visual resources in the foreground and middleground. From the picnic facilities area and from the lake the transmission line would be visible as it passes east-west through the northernmost portion of the Stalker Lake SWA. There is some vegetation near the existing recreation resources that would provide a minimal visual buffer. However, the flat terrain and otherwise unobstructed views would provide direct views to the transmission line.

Route Alternative B West would cross approximately 0.75 mile of the Sandy Bluffs State Trust Land, which is open for public use. In the valley where the route would cross Black Wolf Creek, middleground views of the transmission line would be obscured by terrain, although from the creek bed, there would be direct foreground and middleground views of the transmission line. As the transmission line travels north of Black Wolf Creek, the terrain becomes more rugged, and views of the transmission line would mostly be limited to the foreground. Route Alternative B West would create direct long-term impacts to visual resources in foreground and middleground.

Like the Route Alternatives A West and B East and B West and B East, Route Alternative B West would parallel a small parcel of the South Republican SWA for approximately 0.8 mile. The route in this area does not enter the SWA, but borders its western boundary. Along the western boundary of this SWA parcel, the transmission line would be in the immediate foreground and would create a direct long-term adverse impact to visual resources in the immediate foreground and middle-ground.

6.12.5 Impacts Associated with Route Alternative B East

6.12.5.1 Visual Impacts to Residences

Route Alternative B East would be in the foreground and within 1,320 feet of 13 residences and would create a direct long-term impact to visual resources. Two of the residences are within 300 feet of Route Alternative B East. The presence of the line in proximity to these residences creates a direct long-term adverse visual impact. Impacts to these residences could be mitigated in some situations through pole placement area whenever engineering permits.

6.12.5.2 Visual Impacts Along State Highways and County Roads

Route Alternative B East would cross U.S. 385 and U.S. 36 in the same areas as Route Alternative B West. Route Alternative B East would cross U.S. 34 to the east of where Route Alternative B West would cross U.S. 34; however, visual impacts would be the same as described above in Section 6.12.4.2.

Route Alternative B East would cross 41 county roads and would create a direct long-term adverse impact in the foreground and middleground at the road crossings.

6.12.5.3 Visual Impacts to SWAs

Impacts would be the same as described in Section 6.12.4.3.

6.12.6 Impacts Associated with Route Alternative C (Preferred)

6.12.6.1 Visual Impacts to Residences

Route Alternative C would be in the foreground and within 1,320 feet of 12 residences and would create a direct long-term impact to visual resources in the foreground and middleground. Some of the residences would not have direct views of Route Alternative C due to vegetation, terrain, or structure orientation. At least three of the residences would have direct, unobstructed views of the transmission line in the foreground and middleground. One residence is within 300 feet of Alternative C. The presence of the line in proximity to these residences creates a direct long-term adverse visual impact. Impacts to this residence could be mitigated in some situations through pole placement area whenever engineering permits.

6.12.6.2 Visual Impacts Along State Highways and County Roads

In the southernmost portion of the route, the centerline of Route Alternative C is roughly parallel to U.S. 385 with some short segments perpendicular to US 385. Route Alternative C would create a direct long-term impact to visual resources in the middleground and background as seen from U.S. 385. However, the terrain and distance from U.S. 385, up to 7 miles, would reduce the adverse visual impacts to motorists because there would be partial views of the Project.

North of CR 9, Route Alternative C would be visible in the background from U.S. 385 to the east. In this area, the transmission line is more than 5 miles east of the highway. Further north along U.S. 385, hilly terrain to the east would obscure views of the transmission line.

Route Alternative C would cross U.S. 34 at a perpendicular angle east of Wray. The Project would create a direct long-term impact to visual resources at the U.S. 34 road crossing. The terrain is slightly rolling and would provide a minimal visual buffer to the transmission structures north of the road. South of U.S. 34, the Project is aligned through a broad drainage and the terrain would provide a visual buffer to the transmission structures.

Route Alternative C would cross U.S. 36 at a perpendicular angle in an area of flat terrain. The route would create a direct long-term adverse impact to visual resources at the highway crossing, and would be visible along the highway in the foreground, middleground, and background for several miles.

Route Alternative C would cross 36 county roads and would create a direct long-term adverse impact in the foreground and middleground at the road crossings.

6.12.6.3 Visual Impacts to SWAs

Route Alternative C would cross a total of approximately 4.6 miles of SWA. Impacted SWAs include Stalker Lake SWA (0.3 mile), South Republican SWA (1.5 miles), Simmons SWA (2.0 miles) and Willow Creek SWA (0.7 mile).

Route Alternative C would cross the westernmost portion of the Stalker Lake SWA in a north-south line. In this area, views in the foreground and middleground include the Wray Substation and other existing transmission lines that exit the Wray Substation. Route Alternative C would not be visible from the lake or the SWA’s picnic and campground facilities.

Route Alternative C would cross the South Republican SWA in the immediate foreground and would create a direct long term impact to visual resources. The hilly and rolling terrain in the vicinity of the SWA confines the foreground impact to the river crossing and public open space because the SWA is lower in elevation than the surrounding terrain.

Route Alternative C would cross the Simmons SWA in the immediate foreground and middleground and would create a direct long term impact to visual resources. In the southern portion of the SWA, south of the Arikaree River, middleground views of the transmission line would be obscured by the relatively rugged terrain. Once the transmission line enters the river valley, there would be direct foreground and middleground visual impacts. On the southern side of the river, northern views of the transmission would be obscured by trees along the river; similarly, on the northern side of the river, southern views would be obscured by trees. Approximately 0.8 mile north of the Arikaree River, middleground views of the transmission line would be obscured by terrain.

Route Alternative C would cross the Willow Creek SWA in the immediate foreground and would create a direct long term adverse impact to visual resources. Terrain in this area would mostly obscure middleground views of the transmission line.

6.12.7 Impacts Associated with Route Alternative D

6.12.7.1 Visual Impacts to Residences

Route Alternative D would be in the foreground and within 1,320 feet of eight rural residences and would create a direct long-term impact to visual resources. One of these residences is within 300 feet of the proposed transmission line. Impacts to this specific residence could be mitigated in some situations through pole placement area whenever engineering permits.

Some of the rural residences do not have direct views of Route Alternative D because of vegetation, terrain, or structure orientation. Tri-State's land and engineering department would work with the individual landowners within 300 feet of the line to reduce visual impacts to the extent feasible.

6.12.7.2 Visual Impacts Along State Highways and County Roads

The southernmost 6 miles (approximately) of Route Alternative D would be in the foreground and middleground views from U.S. 385 and would create a direct long-term impact to visual resources. In the southern portion of the Project Study area, the majority of the route would be at least 5.5 miles from U.S. 385 and would appear faintly in the background. Structures would appear in the background from 3 to 7 miles from the road. North of CR GG, most of the transmission line would not be visible from U.S. 385 because the rolling hilly terrain would block views.

Route Alternative D would cross U.S. 34 at a perpendicular angle east of Wray. The transmission line would create a direct long-term impact to visual resources at the U.S. 34 road crossing. The terrain is slightly rolling and provides a minimal visual buffer to the structures north of the road. South of U.S. 34, the route is aligned through a broad drainage and the terrain would provide a visual buffer to the structures.

Route Alternative D would cross U.S. 36 at a perpendicular angle in an area of flat terrain. West of the intersection with the route, the transmission line would be visible in the foreground, middleground, and

background from the highway for 5 to 7 miles. East of the intersection with the route, hilly terrain would partially obscure views of the transmission line. The route would create a direct long-term adverse impact to visual resources.

Route Alternative D would cross 31 county roads and would create a direct long-term adverse impact in the foreground and middleground at the road crossings.

6.12.7.3 Visual Impacts to SWAs

Route Alternative D would cross a total of approximately 1.8 miles of SWA. Impacted SWAs include Stalker Lake SWA (0.3 mile) and South Republican SWA (1.5 miles). The impacts to these two SWAs would be the same as described in Section 6.12.6.3.

6.13 ECONOMICS AND SOCIAL VALUES

6.13.1 Impacts Associated with All Route Alternatives

Impacts associated with socio-economics would be similar regardless of the alternative selected and therefore the following section applies to all Project alternatives.

Construction is expected to occur over 12 months, although the construction schedule and length may vary to comply with seasonal constraints, such as raptor nesting and agricultural production. At the peak of construction, the Project is anticipated to include approximately 30–35 employees.

Temporary benefits during construction would include increased local revenue from construction workers for food and services, and some local revenue from purchase of construction materials and services. While the Project is expected to benefit the local area, these effects to the local economy are anticipated to be temporary and localized.

Once constructed, the Project is anticipated to generate approximately $399,740 in annual tax revenues for the state of Colorado.

It is anticipated that sufficient temporary housing is available locally for construction workers, as the Project area has several hotels/motels, and a large camping area at the former Bonny Reservoir. Burlington is the most likely location that workers would seek lodging because of the availability of dining, lodging, fuel, groceries, and other amenities.

The hospitals in Wray and Burlington would be adequate during construction if an emergency incident occurred. The need for long-term public services (such as schools) is not anticipated. Local police and fire officials would be notified of construction prior to the start of construction activities.

The project would not have adverse direct or indirect effects on the socio-economic environment. The Project is expected to have beneficial socio-economic impact on local communities and the state via temporary and annual tax revenues.

6.14 ENVIRONMENTAL JUSTICE

6.14.1 Impacts Associated with All Route Alternatives

Impacts associated with environmental justice would be similar regardless of the alternative selected and therefore the following section applies to all Project alternatives.

Guidance from the Council on Environmental Quality directs that minority populations should be identified where (1) the minority population of the affected area exceeds 50 percent, or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

Minority populations in the Project Study Area do not approach 50 percent of the overall population (Table 5-15). Compared with the overall minority population for the state of Colorado, the Project Study Area does not include a meaningfully greater minority population. The proposed Project would not have a disproportionately negative effect on minority populations.

Incomes in the Project Study Area are generally lower than the state average (Table 5-14). This lower amount correlates to and is expected in agricultural areas, which typically have lower incomes than urban areas. Fewer individuals are living below the poverty level in the Project Study Area as compared to the state. The proposed Project would not have a disproportionately adverse short-term or long-term effect on minority populations.

6.15 PUBLIC HEALTH AND SAFETY

6.15.1 Impacts Associated with All Route Alternatives

The greatest danger from a transmission line is direct contact with electrical conductors. Accordingly, extreme caution must be exercised when operating vehicles and equipment for any purpose in close proximity to the Project.

Post-construction, the Project would be unmanned and controlled remotely by Tri-State's operation center. Transmission line structures and the conductor may occasionally be hit by lightning during a thunderstorm; therefore, the area near towers and other tall objects, such as trees, should be avoided during thunderstorms. The proposed Project is designed with overhead ground wires and grounded towers to protect the system from damage from lightning.

Potential impacts associated with electric and magnetic fields are discussed further below under Section 6.18.

Design standards and EPMs outlined in Table 3-7 would minimize and mitigate any potential public health and safety issues that may result from construction, operation, and maintenance of the Project; therefore, the Project is not anticipated to result in adverse direct or indirect effects to public health and safety.

6.16 CULTURAL RESOURCES

A summary of cultural and historic sites and their proposed impact determination are provided below in Table 6-7 for the preferred alternative route. Should another alternative be selected, an intensive Class III

inventory of selected alignment would be completed prior to construction along with the Section 106 consultation process.

Table 6-7: Recommended Determination of Effect for Cultural and Historic Resources

Archaeological Sites Management Summary Site	Description	NRHP Recommendation	Project Impact (Pending Concurrence)
5KC278	Historic homestead, 1914 to 1960s	Not eligible	No historic properties affected
5KC280	Concrete fence posts	Not eligible	No historic properties affected
5YM314.1	Fuller Ditch, 1904	Not eligible	No historic properties affected
5YM315.1	Laird Ditch, 1888	Eligible, A, and possibly D	No adverse effect on significant cultural resources
5YM316.1	Hale Ditch, 1908	Eligible, A, and possibly D	No adverse effect on significant cultural resources
5YM316.2	Hale Ditch laterals	Not eligible, Non-contributing elements to Hale Ditch	No historic properties affected
5YM259.4	BNSF Rail Line, CB&Q Rail Line	Eligible, A, C, and D	No adverse effect on significant cultural resources
5YM329	Historic homestead, 1930s to 1960s	Not eligible	No historic properties affected
5YM330	Manual cableway	Eligible, A, C	No adverse effect on significant cultural resources
5YM331	Prehistoric chalcedony quarry	Not eligible	No historic properties affected

6.16.1 Impacts Associated with Route Alternative C

Ground-disturbing activities have the potential to disturb intact subsurface artifacts, features, or materials, resulting in a potential loss of significant data on the resources. Loss of additional data from a site is considered an adverse effect.

The cultural resource survey of Route Alternative C resulted in the recording of 10 sites: two historic homesteads, three irrigation ditches and laterals, a manual cableway, a previously recorded segment of the current BNSF rail line, concrete fence posts, and a prehistoric chalcedony outcrop. TRC recommended six of the ten sites (the two homesteads, Fuller Ditch, the laterals to the Hale Ditch, the old fence posts, and the prehistoric site) as ineligible for listing in the NRHP. In addition, 13 IOs were documented. TRC recommended none of the IOs as eligible for listing in the NRHP. The six sites and 13 IOs recommended as ineligible are not considered to have the potential to provide additional data (Criterion D for eligibility for listing in the NRHP); TRC considers all available data contained on the sites to have been sufficiently documented.

Of the four eligible sites, three of the sites (two of the irrigation ditches and the rail line) are recommended as eligible to the NRHP under Criteria A and D for their association with historic events

that have made a significant contribution to, and their potential to yield information important about, early irrigation agriculture during the late nineteenth century in Kit Carson and Yuma counties, Colorado. Each of the three sites is currently in operation and is part of a larger linear resource. For the purposes of the cultural resources survey, only the segments of the sites that occur within the ROW of the Preferred Alternative, or 150 feet, were examined. It is the policy of the Colorado SHPO that linear cultural resources be considered eligible for listing to the NRHP unless field surveys can document otherwise.

One of the sites (the manual cableway) is recommended as eligible for listing on the NRHP under Criteria A and C for its association with historic events that have made a significant contribution to early irrigation agriculture during the early 20th century and its engineering and construction. The cableway crosses the South Fork of the Republican River and appears to date to the 1920s to the 1950s and was likely used in association with the irrigation system in the South Republican River Valley. Land use in the immediate vicinity of the cableway consists of grazing. The transmission line would span this cableway and not disturb any of its components.

The Class III inventory report has been submitted to the Colorado SHPO for review. Concurrence from the Colorado SHPO on eligibility recommendations is pending.

Construction of the Route Alternative C would not create direct impacts to the sites recommended as eligible or ineligible, as each of the 10 sites identified would be spanned by the transmission line and structures would be placed outside of the site boundaries. Construction of the Route Alternative C would create indirect visual impacts to the immediate foreground and middleground of the sites; however, each of the irrigation ditch sites is currently spanned by existing electric distribution lines, and portions of the rail line are spanned and paralleled by existing electric transmission and distribution lines. Construction of Alternative C would not create a new or unique type of visual effect along these sites. In addition, the nature of the sites (industrial transportation and agricultural irrigation) is not associated with creating or contributing to a visual resource. The construction of Alternative C would create a new indirect visual impact in the area of the manual cableway. The nature of this site—a cable car for crossing or transporting materials across the river—is not associated with creating or contributing to a visual resource.

Should any previously unknown historic/prehistoric sites or artifacts be encountered during construction, all land-altering activities at that location shall be immediately suspended and the discovery left intact until such time that Tri-State is notified and appropriate measures taken to ensure compliance with NHPA and enabling legislation. A similar process shall apply if paleontological resources are discovered during excavations.

Construction, operation, and maintenance of the proposed Project are not anticipated to result in adverse impacts to cultural resources.

6.17 TRANSPORTATION AND ACCESS

6.17.1 Impacts Associated with All Route Alternatives

Construction activities would use existing private and public access as well as overland travel in the ROW. Temporary increases in traffic would be generated for one-way and roundtrip construction activities including surveying, construction materials hauling and staging, pole-hole excavation, structure

assembly and erection, groundwire and conductor stringing, sagging and clipping, and ROW cleanup and restoration.

There are few residences within 0.25 mile of any of the Route Alternatives (Table 5-12). Short-term impacts to transportation and access for construction activities would include minor increases in traffic volumes on U.S. 385 and county roads that provide access to construction sites. Potential short-term direct impacts from construction also could include traffic delays or temporary lane closures while conductors are strung between transmission structures across affected roadways. Traffic safety measures and personnel would be provided by the construction contractor. Stringing operations would be discussed with the counties and with the appropriate transportation organization(s), and if required, state highway troopers would be enlisted to assist with public safety and to ensure minimal disruption to traffic flow or operations. Should such measures be required, it is likely they would only be required where the transmission route crosses U.S. 385, U.S. 36, and U.S. 34 (each of the Route Alternatives would cross U.S. 36, U.S. 34, and U.S. 385 once). Roads would only be closed if the counties or Colorado Department of Transportation (CDOT) required a closure.

All of the Route Alternatives would cross the BNSF rail line that runs east-west in the northern portion of the Project Study Area along U.S. Highway 34 through Wray as depicted on Figure 3-1. Short-term direct effects could occur where the transmission line crosses the existing BNSF rail line. Stringing conductors over railroad tracks could delay rail operations. Any such activities would be coordinated with the affected rail line to minimize scheduling disruptions.

Other potential transportation effects associated with transmission lines are the potential conflicts between transmission structures and aviation operations. The locations of private and public airports in the Project Study Area are depicted on Figure 5-8. Distances from the airports to the nearest Route Alternative are provided in Table 5-19.

CFR Title 14 Part 77.9 states that any person/organization who intends to sponsor any of the following construction or alterations must notify the Administrator of the FAA (FAA 2012):

- *any construction or alteration exceeding 200 feet above ground level*
- *any construction or alteration:*
  - *within 20,000 feet of a public use or military airport which exceeds a 100:1 surface from any point on the runway of each airport with its longest runway more than 3,200 feet*
  - *within 10,000 feet of a public use or military airport which exceeds a 50:1 surface from any point on the runway of each airport with its longest runway no more than 3,200 feet*
  - *within 5,000 feet of a public use heliport which exceeds a 25:1 surface*
  - *any highway, railroad or other traverse way whose prescribed adjusted height would exceed the above noted standards*
  - *when requested by the FAA*
  - *any construction or alteration located on a public use airport or heliport regardless of height or location.*

All transmission structures are anticipated to be less than 200 feet above ground level. The runway at Wray Municipal Airport is 5,400 feet long, and two of the Route Alternatives (C and D) are within 20,000

feet (approximately 3.7 miles) of the airport. The runway at Whomble Airport is 3,200 feet long, and all Route Alternatives are greater than 5,000 feet from the hospital heliport in Wray. Therefore, the only airport where aviation may potentially be impacted by the proposed Project (by Route Alternatives C or D) is the Wray Municipal Airport. Once Tri-State has completed detailed engineering (location of structures), it would evaluate whether it needs to submit a Notice of Proposed Construction or Alteration (Form 7460-1) to the FAA.

Long-term impacts to transportation during maintenance activities would be localized and short-term in nature. Personnel would use light-duty pickup trucks on public roads and overland travel in the ROW to conduct inspections and to provide maintenance at individual transmission structures. There are no indirect impacts associated with transportation resources.

Every effort would be made to avoid access disruptions to individual residential properties when stringing conductors or during structure assemble and erection.

Impacts to transportation from either Route Alternative C or D would be short-term in nature. Long-term adverse impacts are not anticipated.

6.18 ELECTRICAL CHARACTERISTICS AND PUBLIC SAFETY

6.18.1 Impacts Associated with All Route Alternatives

Concerns regarding long-term exposure to electric and magnetic fields have been tempered over the past decade because specific adverse impacts to human health have not been conclusively identified. Research into possible health impacts has been conducted using human and animal tissues, and cells. The research results have been reviewed by numerous authors and scientific panels. The existence of adverse impacts, however, has not been established.

There were two noteworthy literature reviews commissioned by Congress and conducted by federal agencies. The first was conducted by the National Institutes of Environmental Health Sciences (NIEHS) in the National Institutes of Health. Following passage of the 1992 Energy Policy Act, NIEHS was instructed by Congress to perform a literature search on health effects related to EMF and to prepare a report on its findings. A conclusion of this report, “NIEHS Report on Health Effects from Exposure to Power Line Frequency Electric and Magnetic Fields,” is that the “scientific evidence suggesting that (electric and magnetic field exposures) pose any health risk is weak” (NIEHS 1991:9).

Congress also instructed the National Research Council to conduct a similar study following the 1992 Energy Policy. The National Academy of Science (NAS) concluded that “the results of…the program do not support the contention that the use of electricity poses a major unrecognized public health danger” (NAS 1997). The NAS further recommended that the federal government cease funding additional research on electric and magnetic fields. The federally funded research program was subsequently shut down.

Regarding potential impacts to animals, numerous studies have investigated the impacts to livestock from the electrical environment of high-voltage transmission lines. There is no evidence that exposure to electric fields beneath transmission lines affects livestock behavior or productivity.

While some studies do suggest a link, the bulk of the scientific literature on the subject of electric and magnetic fields fails to conclude that exposure is a health threat. Both the NIEHS and NAS reports referenced above support the conclusion of no conclusive link. The proposed Project, therefore, is not expected to cause adverse health effects related to EMF or corona.

6.18.2 Potential Impacts of Electric Fields Associated with All Route Alternatives

The electric field modeling results were presented previously in Figure 5-9. The electric field associated with transmission lines varies by transmission line voltage. The results of the electric field modeling plotted show that on the left edge of the ROW the electric field is approximately 0.52-kV/m and approximately 0.52-kV/m on the right edge of the ROW. Electric fields would diminish to ambient background at approximately 150 feet from the transmission line centerline.

The maximum electric field within the ROW is approximately 2.96-kV/m. In comparison, the electric field next to an electric blanket is approximately 1 to 10-kV/m. The electric field of a typical refrigerator is approximately 0.06-kV/m. The electric fields of other common house appliances are provided in Table 6-8 for a relative comparison of electric fields from a 230-kV transmission line.

Table 6-8: Electric Field Values for Common Objects

Appliance	Electric Field Strength (kV/m)
Refrigerator	0.06
Electric blanket	1–10*
Broiler	0.13
Stereo	0.09
Iron	0.06
Coffee pot	0.03

* 1 to 10-kV/m next to blanket wires (Enertech 1985)

Electric fields are a common phenomenon. When the electric field under a transmission line is sufficiently great, it can be perceived as raising the hair on a hand or arm, like the sensation of a slight breeze. It is unlikely, however, that the electric field under a transmission line would be perceivable when standing on the ground. Instead, an individual may perceive skin stimulation when working on top of equipment under a transmission line. In an electric field, a conducting object will assume some voltage if the object is not grounded. These induced voltages in a transmission line ROW could cause nuisance shocks. For example, a spark discharge shock could occur when contact is made with an object, such as a vehicle, where there is an inadequate ground. This would be similar to a "carpet" shock that can occur when touching a doorknob after walking across a carpet on a dry day. This type of shock typically would occur directly under the transmission line near mid-span where the conductors are nearest to the ground.

Because carrying or handling conducting objects under a transmission line also could result in nuisance shocks, irrigation pipe should be carried as low to the ground as possible and preferably unloaded at a distance from the transmission line to eliminate nuisance shocks. The primary hazard with irrigation pipe is direct contact with the conductors. Direct contact could occur when the pipe is tipped up to remove an object, such as a dead animal.

Normal grounding policies effectively mitigate the possibility of nuisance shocks from induced currents on stationary objects, such as fences and buildings. Since electric fields extend beyond the ROW,

grounding practices would extend beyond the ROW for very large objects or long fences. Properly applying grounding practices during and after construction will effectively mitigate the potential for shocks from stationary objects near the transmission lines. Adequate grounding techniques also would apply to metal water and feed troughs for livestock. Like all conducting objects, their potential to induce nuisance shocks can be eliminated with grounding.

In addition to nuisance shocks, one historical concern regarding electric fields has been the possibility of interference with cardiac pacemakers. There are two common types of pacemakers, asynchronous and synchronous pacemakers. The asynchronous pacemaker pulses at a predetermined rate and is practically immune to interference because it has no sensing circuitry and is not complex. The synchronous pacemaker, however, pulses only when its sensing circuitry determines that pacing is necessary. Interference from a transmission line electric field could cause a spurious, or false, signal on the pacemaker's sensing circuitry. When these pacemakers detect a spurious signal, such as a 60-Hz signal, they are programmed to revert to an asynchronous or fixed pacing mode of operation and will return to synchronous operation within a specified time after the signal is no longer detected. Research and reviews indicate that the risk to pacemaker wearers from transmission lines is minimal. To date, no evidence has been found that a transmission line has caused a serious problem to the wearer of a pacemaker. In addition, pacemaker manufacturers have redesigned recent models to be less sensitive to this concern.

Lastly, it is possible for electric fields to cause minor damage to leaf tips from induced corona on the upper most parts of plants (McKee et al. 1978). The impacts are limited to corona damage at sharp terminal parts of plants at very high electric field levels. The impact generally is too limited to be noticeable under field conditions. In addition, the electric fields calculated for the proposed Project are below levels where the leaf tip corona phenomenon has been observed. No damage or harm to crops, therefore, is expected to occur from electric fields under the proposed transmission lines.

In general, the electric fields associated with the Project would be similar to household appliances at the edge of the ROW and would diminish rapidly to ambient background approximately 150 feet from the transmission line centerline. Nuisance shocks could be avoided through proper equipment handling in the transmission line ROW and through adequate grounding techniques. Potential indirect impacts to pacemakers and agricultural crops have been demonstrated in theory but have not presented adverse impacts in the field.

Tri-State has adopted, as corporate policy, programs that ensure that its electric facilities are designed, constructed, and operated in such a manner as to minimize, to the extent prudent and practicable, the level of EMF that is created (Appendix D). Normal grounding policies would effectively mitigate the possibility of nuisance shocks on stationary objects, such as fences and buildings. Because the electric fields continue (but diminish) beyond the ROW, grounding practices would extend beyond the ROW for very large objects or long fences.

6.18.3 Potential Impacts of Magnetic Fields Associated with All Route Alternatives

Magnetic fields from household appliances are comparable to, or greater than, those from transmission lines. The maximum (peak) calculated 60-Hz magnetic field for a 230-kV transmission line ROW easement would be approximately 336-mG and would diminish to approximately 56-mG on the left edge of the ROW and 57 mG on the right edge of the ROW. In comparison, the maximum magnetic field of a clothes dryer is approximately 3- to 80-mG. The maximum magnetic field of an electric range is

approximately 100 to 1,200-mG. In comparison to the magnetic fields of typical household appliances presented below in Table 6-9, the magnetic fields associated with the proposed Project at the edge of the ROW are not considered to be severe.

Table 6-9: Typical Magnetic Field Values for Common Appliances

Appliance	Magnetic Field (mG)	
	Distance of 1 foot	Maximum
Electric Range	3–30	100–1,200
Electric Oven	2–25	10–50
Garbage Disposal	10–20	850–1,250
Refrigerator	0.3–3	4–15
Clothes Washer	1–3	3–80
Coffee Maker	0.8–1	15–250
Toaster	0.6–8	70–150
Crock Pot	0.8–1	15–80
Iron	1–3	90–300
Vacuum Cleaner	20–200	2,000–8,000
Hair Dryer	1–70	60–20,000
Color TV	9–20	150–15,000
Fluorescent Desk Lamp	6–20	400–3,500

Source: Gauger (1985)

As described above, impacts from the magnetic fields associated with the proposed Project are not considered significant.

6.19 CUMULATIVE IMPACTS

Cumulative impacts result from the incremental impact of an action when added to other past, present, and future actions, regardless of who undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Issues and resource to be considered in the cumulative effects analysis were identified through scoping and request for information from Kit Carson and Yuma counties on projects that are under current review. The study area for cumulative effects includes the same study area used for resource analysis in Chapter 5.

6.19.1 Existing and Past Actions

Kit Carson and Yuma counties have zoned the majority of the study area for agriculture. The majority of the land along each of the Route Alternatives is grassland and privately owned. Existing land uses in the Project Study Area include scattered rural residences and farms, animal husbandry, pivot irrigation, and large undeveloped open spaces.

There are no federal lands in the study area, but there are multiple SWAs as discussed under Chapter 5 (Recreation, Land Use, and Visual Resource sections). These areas are used for hunting, wildlife viewing, fishing, and camping.

The study area also includes extensive oil and gas development. There are existing 115-kV and 230-kV transmission lines in the study area, including Tri-State's Burlington to Wray 115-kV line, which bisects the study area. Tri-State's Burlington Generation Station and Limon Generation Station are located in the study area along with the Burlington and Wray substations.

The Kit Carson Windpower Project began commercial operations in 2010. The wind farm supplies energy to Tri-State under the terms of a 20-year power purchase agreement with Duke Energy. The facility generates 51-MW of energy and includes 34 wind turbines on a total of 6,000 acres.

The Colorado Highland Wind Project is located 25 miles northeast of Sterling, Colorado in Logan County. The wind facility was constructed in 2012 and produces 67-MW. The wind facility is currently being expanded from 5,200 acres to 6,640 acres, adding 14, 1.7-MW. These additions will increase the generation capacity to 91-MW. Tri-State has a 20-year power purchase agreement to take all of the generation from this site.

6.19.2 Reasonably Foreseeable Future Actions

Projects were identified as reasonably foreseeable based on the following criteria:

- Projects where local or state permit applications have been submitted
- Projects or actions where funding has been identified or is under contract
- Projects or actions that have begun or completed the NEPA process.

Based on agency scoping and outreach to Yuma and Kit Carson counties, only one project was identified as reasonably foreseeable based on the criteria defined above. This is for a wind facility that would interconnect with Western's transmission system; the Wray Wind Energy Project.

6.19.2.1 Wray Wind Energy Project

As part of the Wray Wind Energy Project, Invenergy Wind Development LLC and Wray Wind Energy LLC are proposing to construct 56 wind turbines across 21,000 acres northeast of the town of Wray, in Yuma County, Colorado. With the potential for 90 megawatts of output, Invenergy has requested an interconnection to Western's transmission system. This interconnection would include the construction of a new 9.5-mile 115-kV transmission line, a short double-circuit 115-kv transmission line, a new switchyard, and a new collector substation. As a result, Western prepared an EA to assess the impacts of the proposed project and a FONSI was issued in December of 2012. The construction of the project is expected to require 399 acres of temporary disturbance and 62 acres of permanent disturbance. Currently, Invenergy has submitted for a Yuma County land use permit and the application is under review.

Colorado Senate Bill 252 requires cooperatives to supply 20 percent of their electricity from renewable sources by 2020. This was increased from the 10 percent required by 2020 in 2007. Tri-State has a renewable energy queue to process renewable energy developers' interconnection requests. While there are interconnection request in the queue, and there are currently no formal projects or contracts signed at the time this EA was drafted. Given the new renewable energy requirement, it is likely that additional wind generation could be constructed in proximity to the study area, though these would not fit the definition of reasonably foreseeable. Without a defined project or permit application, it is not feasible to understand or analyze potential cumulative effects.

6.19.3 Cumulative Impacts to Land Use

Cumulative impacts analysis for land use includes agriculture, recreation, transportation, and access.

The Project Study Area has been affected by agricultural operations, oil and gas development, distribution and transmission line development, and renewable energy projects. The Burlington-Wray Project would result primarily in temporary impacts to land uses in the study area. Permanent impacts would be limited to areas where the transmission structures would be placed and where access roads to be used for both construction and future maintenance are constructed. Areas around transmission structures would be taken out of agricultural production but the remainder of the ROW could be used for agricultural purposes and mineral extraction (if can be conducted in a manner that would not affect the safe and reliable operation of the transmission line).

New wind projects as discussed above, the Colorado Highland Wind Farm expansion and the Wray Wind Energy Project would both result in direct impacts to land uses and resources within the project footprints. The Colorado Highland Wind Farm is expanding from 5,200 acres to 6,540 acres and the Wray Wind Energy Project will impact 399 acres of temporary impacts and 62 acres of permanent impact. These wind facilities would result in greater impacts to land use relative to transmission line and oil and gas well pads due to the relative size and extent of the facilities.

The visual aesthetics of the area would be affected by both the construction of a new transmission line and the new wind facility expansion in Logan County and Wray Wind Energy Project in Yuma County. There are existing transmission lines and energy facilities in the Study Area, and these new facilities would contribute to adverse effects to the visual aesthetics of the area.

Construction activities associated with Alternative C may pose short-term impacts to recreation resources such as hunting, hiking, and fishing. The primary impact to recreational activities from a new transmission line, expansion of existing wind facilities as well as construction of the new Wray Wind Energy Facility would be visual impacts to the natural setting. There are, however, existing transmission lines, oil and gas development, generation facilities, and substations in the study area.

Impacts to transportation associated with the construction of new transmission projects would be temporary and no long-term adverse impact is anticipated. Permanent impacts to agricultural activities for construction/expansion of new wind facilities is expected to have a greater relative impact on the condition of existing roads and new impacts in areas where new roads are constructed.

Energy development is an existing land use in the study area as well as Kit Carson and Yuma counties. Alternative C would utilize existing linear corridors, section lines, and access roads to the greatest extent feasible to reduce visual, land use, and transportation impacts. Agricultural operations could continue post-construction in proximity to the transmission ROW and between spans. The project is not expected to result in cumulative adverse effects to land uses in the study area.

6.19.4 Cumulative Impacts to Biological and Natural Resources

The cumulative impacts analysis for biological and natural resources includes geology, minerals, soils, air quality, water resources, wetlands, floodplains, vegetation, wildlife, wildlife habitat, special species and migratory birds, and cultural resources.

Construction of the power line would result in direct impacts to geology, soils, and vegetation resources. Long-term impacts would be limited to areas where the transmission line structures would be constructed. Short-term and long-term impacts would occur from the use of overland travel routes and new access routes required for the construction and long-term maintenance of the transmission line. EPMs would be implemented to reduce these temporary impacts. The expansion of the Colorado Highland Wind Project as well as the construction of the Wray Wind Energy Project would impact a larger percentage of vegetation, soils, and geology because of the area required to construct and operate a wind facility. With implementation of similar best management practices, these impacts can be minimized.

The primary cumulative impact to wildlife associated with construction of Alternative C as well as the expansion and construction of wind facilities and the presence of existing transmission and distribution lines is the increased cumulative collision risk for migratory and resident avian species in the Study Area. There are a number of SWAs and surface waters throughout the study area that provide migrations stop-over and nesting habitats for a variety of avian species. Once final engineering is complete, Tri-State will complete and avian collision risk assessment to identify areas along the alignment that could pose a collision risk based on habitats and relative position of the line to certain habitats (wetlands, surface waters, riparian areas, etc.). Those areas of moderate to high risk will be marked with an appropriate flight diverter device to mitigate collision risks associated with the operation of the transmission line. Completion of a collision risk assessment followed by the marking of spans that pose a moderate to high collision risk would mitigate collision-related cumulative impacts to migratory birds. Wind farm operators conduct surveys to identify areas of avian collision concern prior to construction and environmental protection or mitigation measures implemented to minimize impacts to migratory birds would reduce the intensity of collision risk in the study area.

There are no documented federal or state listed species known to occur in the study area and there is no critical habitat present. Alternative C would not result in cumulative impacts to protected species. Tri-State will survey for burrowing owls prior to construction to ensure this state listed species is not impacted during project construction.

Existing land uses such as conversion of native grasslands for agricultural purposes and oil and gas operations can have a long-term adverse to wildlife populations and habitat. Habitat loss and fragmentation from construction of proposed and existing wind facilities as well as the proposed transmission line project would result in cumulative impacts to wildlife and wildlife habitat in both the short-term and long-term. Long-term direct impacts to wildlife habitat from the expansion/construction of wind facilities are expected and would be larger than that required for a linear ROW. Tri-State will reclaim all areas temporarily disturbed during construction to pre-construction conditions to minimize cumulative habitat loss from project construction.

Greater prairie-chickens are common in the sandhills of northern and central Yuma County. The CPW has mapped portions of Logan County as overall range for this species. Greater prairie chickens occur in the northern portion of the transmission line study area. Expansion of the Colorado Highland Wind Project may affect/remove overall range and production areas for this species. According to CPW, there may be one active lek site in proximity to the Preferred Alignment (Alternative C). The Wray Wind Energy Project documented 45 active leks within the study areas of this project. While the greater prairie chicken is a common species to this area, new wind energy developments, oil and gas and transmission line development will reduce overall contiguous habitat for the prairie chicken and other grassland species.

With the implementation of lek surveys, seasonal constraints and buffers, impacts to breeding populations can be reduced. The Project is not expected to result in long-term adverse cumulative effects to greater prairie chickens.

Air impacts associated with the project are limited to fugitive dust and exhaust emissions during project construction. Similar impacts are expected from the expansion of the Colorado Highland Wind Project as well as construction of the Wray Wind Energy Project. Operation of these facilities would not result in air impacts. Existing generation would be used to supply the target loads via the proposed transmission line once the bottleneck is relieved. Tri-State does not anticipate any substantive changes in the way it operates its generation fleet as a result of the Project, other than more efficient dispatch of generation resources that can be accommodated by the higher-rated 230-kV transmission line. There would be no change in the way Tri-State operates its generation fleet and therefore there would be no indirect effects to air quality. Alternative C is not expected to result in long-term adverse cumulative effects to air quality.

Transmission lines in eastern Colorado can generally be aligned to avoid surface waters, wetlands, and in most cases, floodplains. Some overland access might be required across ephemeral washes, but these impacts are expected to be limited to the construction period. Final access road design will avoid surface waters to the greatest extent feasible and will be designed to drain properly. Ground disturbance from existing agricultural operations, oil and gas operations, and wind farm development can result in soil erosion that can indirectly affect water quality. In order to minimize these impacts, a stormwater management plan would be implemented that would include the installation of BMPs near irrigation ditches, surface waters, and wetlands to minimize these impacts. It is assumed that the expansion and construction of the wind farms previously mentioned would implement the same avoidance and EPMs to minimize impacts to surface waters and wetlands. Floodplain data is limited in the study area, but it is assumed that if structures can be placed outside of surface waters and buffered whenever engineering permits. The project would not affect the structure or function of the floodplains in the area. Alternative C is not expected to result in long-term adverse cumulative effects to floodplains, surface water, or wetlands.

Alternative C is not expected to adversely affect any cultural resources and therefore, there would be no cumulative impacts to cultural resources relative to other existing and foreseeable developments.

6.19.5 Cumulative Impacts to the Human Environment

For the purposes of cumulative impacts analysis, the human environment includes economics and social values, environmental justice, hazardous materials and public safety, electrical characteristic, noise, public safety, and recreation.

No adverse impacts to the human environment were identified as a part of this environmental review.

Economic impacts from the proposed and foreseeable projects are generally expected to be beneficial for local communities during Project construction because workers would be utilizing local hotels, restaurants, and other local businesses.

EPMs pertaining to hazardous waste would minimize and mitigate any potential impacts related to the incidental release of toxic materials during project construction.

Existing substations, transmission lines, and distributions lines in the study area are existing sources of electric and magnetic fields in the study area. Modeling conducted as part of this environmental review showed that electric and magnetic fields reduce drastically within distance beyond the ROW for transmission lines. The new transmission lines, as well as the existing transmission lines in the study area, are not expected to exceed established guidelines for magnetic or electric fields.

Existing noise receptors in the project area includes agricultural equipment/activities, oil and gas operations, and rural traffic. Noise impacts for the Project and existing and future wind energy projects will primarily be limited to the construction period. Corona is a potential impact associated with existing transmission lines in the study area as well as operation of Alternative C. Because wet weather corona noise would be barely distinguishable from background noise levels at distances of more than 250 feet from a transmission line, and because the noise would not be continuous. its impacts are not expected to result in long-term, adverse effects to humans, wildlife, or domestic animals/livestock. Corona produced on a transmission line can be reduced if necessary by the design of the transmission line and the selection of hardware and conductors used for the construction of the line. The project is not expected to result in long-term adverse noise impacts.

The primary long-term cumulative impact associated with recreational opportunities in the study area is the visual impact of new transmission lines and wind farms in proximity to SWAs and other wildlife viewing areas. Past and reasonably foreseeable activities would not directly affect recreational activities after construction is complete. There are two existing wind farms, substations, generation facilities, oil and gas operations, and transmission lines in the study area. The viewshed has therefore been altered/affected by past development. The transmission line will be aligned to minimize impacts to SWAs to the extent feasible. Construction and operation of Alternative C is not expected to have a long-term cumulative effect on recreational opportunities in the study area.

The proposed project is not expected to adversely affect environmental justice or public safety, and therefore there would no cumulative impacts relative to other existing and foreseeable developments.

7.0 LIST OF PREPARERS

The key team members who conducted the environmental impact analysis and prepared this EA are listed in Table 7-1.

Table 7-1: List of Preparers

Name	Title	Responsibility/Specialty
Tri-State		
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Appendix A:

Colorado Parks and Wildlife Comments on Burlington-Wray 230-Kilovolt Transmission

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COLORADO PARKS & WILDLIFE

6060 Broadway • Denver, Colorado 80216
Phone (303) 297-1192 • FAX (303) 291-7109
wildlife.state.co.us • parks.state.co.us

April 30, 2012

Laurie Spears
Environmental Planner
Tri-State Generation and Transmission Association, Inc.
P.O. Box 33695
Denver, CO 80233

RE: Request for comments on the Burlington – Wray 230-kV Transmission Project

Dear Ms. Spears,

Thank you for the opportunity to comment on the proposed transmission line project in Kit Carson and Yuma Counties. Our goal at Colorado Parks and Wildlife (CPW) is to provide complete, consistent and timely information to all entities who request comments on matters within our statutory authority and our mission.

Colorado Parks and Wildlife would like to promote development with wildlife in mind. Therefore, we would like to encourage developments to consider leaving, mitigating for, or improving the existing wildlife habitat that exists in the area.

District Wildlife Managers have met with project planners via conference call and have reviewed Tri-State's proposed transmission line corridors. The following recommendations were compiled to assist Tri-State in avoiding or minimizing wildlife impacts when choosing a transmission corridor.

Most of the proposed project area is comprised of native sandsage and shortgrass prairie with areas of developed agricultural lands interspersed. Within the native prairie habitats specific areas of concern will include any groups of deciduous trees, wetland areas, lakes, and large continuous tracts of unbroken prairie. Development in the agricultural areas will have less of an impact on wildlife species than within the native prairie. The CPW recommends that these areas be identified in the planning process to help select a corridor with a high percentage of already developed land. Also, by placing the new transmission line adjacent to existing lines or roads, the overall wildlife impacts can be minimized.

Ecologically, native prairie habitats are very rich in wildlife diversity. In Yuma and Kit Carson Counties, large unbroken tracts of prairie habitats are found on only a small portion of the landscape, yet they are critical habitat for a high proportion of the wildlife species. The primary wildlife species of concern within the proposed project area are raptors, waterfowl, greater prairie chickens, swift foxes, and song birds. These species are likely to be found throughout the proposed project area. Potential impacts to both raptors and waterfowl will likely be higher in the river riparian corridors and bodies of water including Bonny Reservoir and Stalker Lake.

Bald eagles winter in the vicinity of Bonny Reservoir in numbers as great as 50 birds. These birds frequent the areas along the S. Fork of the South Republican River and north and south for many miles. Golden eagles are also found in the project area. Ospreys are summer residents in the vicinity of both Bonny Reservoir and Stalker Lake. Many other raptors use the area including red-tailed hawks, northern rough-legged hawks, ferruginous hawks, Swainson's hawks, Cooper's hawks, sharp-shinned hawks, prairie

falcons, merlins and American kestrels. Several species of owls use the area seasonally or year around including great horned owls, barn owls, short-eared and long-eared owls. Burrowing owls use the area seasonally.

Both Bonny Reservoir and Stalker Lake concentrate large numbers of waterfowl during the fall and winter migrations. These waterfowl species include Canada, snow, blue, white-fronted and Ross' geese as well as a wide variety of ducks and shorebirds. Sandhill cranes also migrate through the area in the spring and fall and use Bonny Reservoir for resting. There has also been one whooping crane sighting in the past.

Greater prairie chickens are found throughout the proposed project area with higher concentrations likely in the northern half of the project area. If construction is going to occur during March and April the CPW recommends that the area be surveyed for leks (areas where the males come to display during the breeding season) and if any are located, appropriate time restrictions could be implemented.

Having looked at your proposed routes, each of them traverses some portion of a CPW managed property. These properties include both fee title and conservation easements that could pose restrictions in deciding the final transmission route. Access to fee title CPW property would need Colorado Wildlife Commission approval.

Current CPW policy directs our efforts towards proposals that will potentially have high impacts to wildlife and wildlife habitat. The emphasis of CPW's concerns is on large acreages, critical habitats, wildlife diversity, and impacts to species of special concern, or those that are state or federally endangered. By trying to find a proposed transmission corridor that consists of developing along existing roads, developed agriculture and transmission line corridors, the impacts of the development, as proposed, may be characterized as minimal.

This may not mean that the landscape has no value to wildlife or value to the community. It is important to remember that incremental and cumulative loss of natural areas and open spaces will, over time, significantly degrade the overall quality of wildlife habitat in the area.

We appreciate the opportunity to comment on this project, and if you have any further questions, please do not hesitate to contact District Wildlife Managers Josh Melby (970-848-0683) and Tom Seamans (719-346-8991) at your earliest convenience.

Sincerely,

Tom Kroening
Area Wildlife Manager

cc: S. Yamashita, D. Prenzlow, K. Green, D. Lovell, C. Chick, J. Melby, T. Seamans

Appendix B:

U.S. Fish and Wildlife Concurrence Letters on Burlington-Wray 230-Kilovolt Transmission

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TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC.
HEADQUARTERS: P.O. BOX 33695 DENVER, COLORADO 80233-0695 303-452-6111

February 15, 2012

Susan Linner
Colorado Field Supervisor
U.S. Fish and Wildlife Service Region 6
Ecological Services
Colorado Field Office
P.O. Box 25486, DFC 65412
Denver, CO 80225-0486

Re: Request for Concurrence of No Impact for Federally Listed and Candidate Species for Tri-State Generation and Transmission Association, Inc's Burlington-Wray 230kV Transmission Line Project

Dear Ms. Linner:

Tri-State Generation and Transmission Association, Inc. (Tri-State) is proposing to construct a new single-circuit 230-kilovolt (kV) transmission line in Kit Carson and Yuma Counties to complete a 230-kV path in the region. The existing Tri-State transmission system in northeastern Colorado consists of a 230-kV line from Story to Wray and a 230-kV line extending from Burlington to Big Sandy to Midway (located between Colorado Springs and Pueblo). These two 230-kV transmission lines are linked together with a 115-kV line between Burlington and Wray. The lower voltage 115-kV line has a lower transmission capacity than the 230-kV lines and therefore severely restricts Tri-State's ability to fully utilize its 230-kV transmission system to dispatch its generation resources and serve its native load. The proposed transmission line will be located between Tri-State's existing Burlington Substation in Kit Carson County and Tri-State's existing Wray Substation in Yuma County. The line construction could begin in 2014 and is expected to be in-service between late 2015 and mid-2016. The proposed transmission line would be approximately 72 miles in length and will be located mostly on private lands, with some portions crossing state-owned or managed lands. The proposed route will parallel existing roads and property and section lines to the greatest extent feasible. A map of the proposed transmission line route is provided as Exhibit A.

Summary of Communications to Date

On August 30, 2011, Tri-State sent an invitation to the U.S. Fish and Wildlife Service (USFWS) for an Informational Public Open House hosted by Tri-State to provide information to the general public and landowners about the proposed transmission line.

On December 21, 2011, Tri-State sent the USFWS a letter and the proposed Macro Corridors that were being considered for siting the transmission line route, and to request comments from USFWS regarding the proposed project and its potential impacts to threatened and endangered

species. The USFWS responded on February 1, 2012 with a letter providing the website address for the Information, Planning and Conservation (IPaC) system, which could be used to generate a species list for the project. According to the IPaC system, no federally listed species are found in Yuma or Kit Carson Counties.

On February 13, 2012, Tri-State sent a letter to Ms. Linner inviting her to attend the Public and Agency Scoping Meetings held for the project (scoping meetings were held March 6 and 7, 2012). All landowners in the Study Area were invited via postcard, as were county officials and representatives from The Colorado Parks and Wildlife (CPW).

On August 6, 2012, Tri-State sent a letter to Ms. Linner inviting USFWS to attend public Route Refinement Meetings (meetings were held August 22 and 23, 2012).

Route Selection

After analyzing comments received at the Scoping and Route Refinement Meetings, Tri-State selected the Preferred Route depicted on Exhibit A. The preferred route was selected because a portion of the route (32 percent) parallels existing access (county) roads and as well as existing electrical distribution lines. In addition, 26 percent of the route parallels property parcel boundaries. The Preferred Route would also result in minimal impacts to private landowners relative to other alternatives considered (there are only nine residences within 0.25-miles of the Preferred Route). Tri-State also favored routing along fence lines and parcel boundaries to avoid bisecting properties and interrupting agricultural practices. By paralleling existing linear rights-of-way and utilizing existing access to the greatest extent feasible; Tri-State will minimize impacts to wildlife, natural resources, as well as land uses in the study area.

Federally Protected Species

According to USFWS databases, IPaC, there are no species that are federally endangered, threatened, or candidates under the Endangered Species Act that are known or believed to occur in Yuma and Kit Carson Counties.

Whooping Crane (*Grus Americana*)

The IPaC database indicates that the whooping crane is not known to occur in Kit Carson or Yuma Counties. According to a project scoping response letter received from Tom Kroening with CPW (2012), there is one historic whooping crane occurrence in Kit Carson County. According to CPW's webpage species profile, whooping cranes have not been seen in Colorado since 2002. It is possible, but unlikely, that a whooping crane could occur in the project area during migration. The project is not anticipated to impact whooping cranes.

The preferred alignment was routed to avoid wetlands and surface waters to the greatest extent feasible. Tri-State will complete an avian risk assessment once the preferred alignment is selected to identify areas within or in proximity to the transmission alignment that might pose a collision risk to whooping cranes and migratory birds. Transmission spans identified as a collision risk will be marked using swan or other type of flight diverter.

Bald and Golden Eagles

Bald and golden eagles are known to occur in Yuma and Kit Carson Counties (CPW 2012). Once final engineering of the route has been completed and before construction begins, nest and roosting surveys will be conducted by a qualified wildlife biologist to identify any potential bald and golden eagle nests that could occur in the project area.

Other Raptors and Migratory Birds

Although formal survey has yet to be completed, Tri-State representatives have observed nests in proximity to the preferred alignment during cultural survey and general site reconnaissance. Prior to construction Tri-State will conduct surveys for raptor nests along the preferred alignment to locate any active nests and identify the species inhabiting the nest. Construction is expected to occur over a period of approximately 12 months, however, construction will proceed in phases, and it is possible that construction in areas with nests can be scheduled to occur outside the nesting season. Tri-State abides by CPW seasonal buffers and time constraints during construction projects to the greatest extent feasible to mitigate impacts to nesting migratory birds. If it is not feasible to construct entirely outside of the nesting season, Tri-State will consult with USFWS and CPW to identify appropriate mitigation measures. Tri-State has used nest monitors in the past to ensure construction activities do not impact nesting raptors.

While a formal survey has not been conducted, Tri-State has observed burrowing owls and black-tailed prairie dog colonies in proximity to the preferred alignment colonies. Once a final alignment has been engineered, Tri-State will conduct a survey to identify suitable habitats in the right-of-way for burrowing owls (black-tailed prairie dog colonies). If construction occurs during the burrowing owl breeding season (March 15 through October 31), burrowing owl surveys will be conducted within the ROW and associated access roads that contain suitable habitat. Tri-State will abide by CPW's seasonal restrictions and buffers to avoid impacts to this species.

Conclusion

Based on previous correspondence with the USFWS (Exhibit B) and a review of the USFWS and NDIS databases, Tri-State believes that no federally-listed species will be impacted by the proposed project. Furthermore, Tri-State will implement the following mitigation measures to minimize impacts to migratory birds, including whooping cranes.

- If construction were to occur within the avian breeding season, Tri-State will complete a raptor nest survey on-site prior to project construction to ensure active nests are not impacted by the proposed project. Tri-State will either restrict specific activities near the nests that may result in nest abandonment or provide a qualified monitor to observe the nest and ensure construction activities do not result in nest abandonment. during construction or restrict
- The transmission line will be designed with the incorporation of the Avian Power Line Interaction Committee's suggested practices for avian protection on power lines. Tri-State will not place any structures in streambeds, wetlands, or other water features. These features will be spanned by the proposed transmission line.
- Tri-State will conduct an avian collision risk assessment once the final route has been engineered. Areas that pose a collision risk to avian species will be marked using swan or other type of flight diverter device.
- If construction occurs during the burrowing owl breeding season (March 15 through October 31), survey of the transmission line right-of-way and in areas where new access roads are required will be conducted in accordance with CPW protocols.

Tri-State is formally requesting written concurrence from USFWS that the Burlington-Wray 230-kV Transmission Project will have no impact on federally listed or candidate species. Please contact me with any additional questions or concerns the USFWS may have regarding the project.

Sincerely,

Curtis Miller
Environmental Planner
Office: (303) 254-3280
Curtis.miller@tristategt.org

Exhibits:

Exhibit A: Preferred Route Map

Exhibit B: Previous Correspondence with the Colorado Parks and Wildlife and the U.S. Fish and Wildlife Service

Exhibit A:
Preferred Route Map

Exhibit B:
Previous Correspondence the U.S. Fish and Wildlife Service

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Colorado Field Office
P.O. Box 25486, DFC (65412)
Denver, Colorado 80225-0486

IN REPLY REFER TO:
ES/CO: Electrical / USDA RUS / Tri-State / Burlington-Wray 230-kV Transmission Line
TAILS: 06E24000-2013-I-0326
PREVIOUS: 06E24000-2012-SL-0156, CPA-0026

APR 0 1 2013

Curtis Miller
Environmental Planner
Tri-State Generation & Transmission Association, Inc.
P.O. Box 33695
Denver, Colorado 80233-0695

Dear Mr. Miller:

Thank you for your letter to the U.S. Fish and Wildlife Service (Service) dated February 15, 2012, regarding Tri-State Generation and Transmission Association Incorporated's (Tri-State's) proposed **Burlington-Wray 230 kV Transmission Line Project** in Kit Carson and Yuma Counties, Colorado. We received your letter on February 19 and you provided additional information about this project by email and telephone on March 20 and 28, 2013. You used our online ECOS-IPaC application to download a species list for this project on February 1, 2012 (TAILS: 06E24000-2012-SL-0156, CPA-0026). Tri-State also invited the Service to attend several public scoping meetings about this project.

With funding provided by the U.S. Department of Agriculture's Rural Utilities Service (RUS), Tri-State proposes to construct approximately 72 miles of new, overhead transmission line on private and State lands in Kit Carson and Yuma Counties. The project will connect the existing Burlington and Wray substations to complete a 230-kV path in the region. Approximately 32 percent of the preferred route parallels existing county roads and distribution lines, while approximately 26 percent of the proposed route parallels property parcel boundaries. Additionally, the preferred alignment will avoid wetlands and surface waters to the greatest extent feasible.

You request the Service's concurrence with your determination that the proposed project is not likely to adversely affect the federally endangered whooping crane (*Grus americana*). In response to your request, we provide comments regarding (1) the whooping crane and (2) other migratory birds and eagles. We prepare these comments under the authority of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 *et seq.*). Protective measures for migratory birds are provided under the authority of the Migratory Bird Treaty Act of 1918 (MBTA), as amended (16 U.S.C. 703 *et seq.*), and the Bald and Golden Eagle Protection Act of 1940 (BGEPA), as amended (16 U.S.C. 668 *et seq.*).

1. Determination for Whooping Crane:

According to Colorado Parks and Wildlife (CPW), whooping cranes have not been observed in Colorado since 2002 (CPW 2012, p. 1). During your scoping process, CPW reported a past whooping crane sighting in Kit Carson, Colorado. Therefore, you determined that it is possible, but unlikely, that a whooping crane could occur within the proposed project area during migration.

In order to avoid and minimize potential impacts to the whooping crane, Tri-State will select a route alignment that avoids wetlands and surface waters to the greatest extent feasible. Tri-State will not place any structures in streambeds, wetlands, or other water features. Additionally, once the route is finalized, Tri-State will complete an avian risk assessment to identify areas within or near the proposed transmission line that may pose a collision risk to the whopping crane and other migratory birds. Tri-State will mark all transmission spans that pose a collision risk with swan or other types of bird flight diverters.

Therefore, based on the information that you provided, the Service concurs with your determination that the proposed project is not likely to adversely affect the whooping crane. The limited documentation of whopping cranes in Yuma and Kit Carson Counties, Colorado, suggests that any potential effects are extremely unlikely, and therefore discountable. Should your project plans change, or if the distribution of federally listed species changes, the Service may reconsider this determination.

2. Migratory Birds and Bald and Golden Eagles:

The construction and operation of transmission lines or other facilities may remove or disturb vegetation or other structures used by migratory birds and eagles for nesting, roosting, perching, or foraging. Once constructed, transmission lines may interrupt migratory bird migrations or kill birds during collisions. Therefore, we highlight the relevance of the MBTA and BGEPA to your project and provide recommendations intended to limit your project's impacts on migratory birds and eagles.

Migratory Bird Treaty Act (MBTA):

The MBTA protects migratory birds, nests, and eggs from possession, sale, purchase, barter, transport, import, export, and take. Under the MBTA, it is unlawful unless permitted by regulations to pursue, hunt, take, capture, kill, or attempt to pursue, hunt, take, capture, or kill any migratory birds by any means or in any manner. The MBTA applies to 1,007 species of migratory birds identified in 50 CFR § 10.13 and "take" is defined in 50 CFR § 10.12. The MBTA does not require intent to be proven, there is no incidental take statement, and the ESA does not absolve individuals or companies from liability under the MBTA. Unless permitted by the Service, the MBTA prohibits any intentional or unintentional activity that results in the take of migratory birds. Although the MBTA does not protect the habitats of migratory birds, activities that affect habitats and result in take of migratory birds do violate the MBTA.

Bald and Golden Eagle Protection Act (BGEPA):

The BGEPA prohibits individuals and companies from knowingly, or with wanton disregard for the consequences of the Act, taking any bald or golden eagles or their body parts, nests, chicks, or eggs, which includes collection, molestation, disturbance, or killing. The BGEPA affords eagles additional protections beyond those provided by the MBTA by making it unlawful to "disturb" eagles. "Disturb" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, injury to an eagle or decreases its productivity or results in nest abandonment due to interference with breeding, feeding, or sheltering behaviors. A permitting process provides limited exceptions to the BGEPA's prohibitions and the Service has issued regulations concerning the permit procedures in 50 CFR part 22.

Removing nests, destroying nests, or causing nest abandonment may constitute a violation of the MBTA and BGEPA. Removal of any active migratory bird nest or nest tree is prohibited. For golden eagles, permits for inactive nests are restricted to activities involving resource extraction for human health and safety. No permits will be issued for any active nest of any migratory bird species, unless removal of the active nest is necessary for reasons of human health and safety. Therefore, if nesting migratory birds are present within or near the project area, timing of activities is a significant consideration and should be addressed in the early phases of project planning. Nest manipulation is not allowed without a permit. If a permit cannot be issued, your project may need to be modified to ensure that take of any migratory bird, eagle, young, eggs, or nests will not occur.

Recommendations for migratory birds and eagles:

To minimize impacts to migratory birds, the Service recommends that construction occur outside the typical breeding season. Although the provisions of the MBTA apply year-round, most nesting activity occurs between April 1 and July 15. However, some migratory birds nest outside of this loosely defined period. If proposed activities must occur during the nesting season, or at any other time that may result in the take of migratory birds or eagles, we recommend that qualified biologists conduct pre-work field surveys of the affected habitats or structures, during the nesting season, to verify the presence or absence of migratory birds and eagles. Please contact the Service's Colorado Field Office for guidance if surveys identify birds or nests that may be affected by project activities.

In Colorado, electrocutions at power lines are a serious threat to the ferruginous hawk (*Buteo regalis*), the golden eagle (*Aquila chrysaetos*), and other large raptors. In open landscapes, electrical poles often provide suitable perches or nest sites for birds of prey. As birds perch or build nests on power poles, their long wingspans easily touch electrical lines and complete circuits, effectively disrupting electrical service and often fatally electrocuting the bird. To reduce avian electrocutions and power outages caused by birds at the Tri-State's power lines, we recommend undergrounding electrical lines whenever possible, or building 3-phase line with at least 10-foot crossarms (at least 5 feet of spacing between phases) to better accommodate long wingspans. The Avian Power Line Interaction Committee (APLIC) provides additional recommendations to discourage nesting and perching in order to prevent electrocutions and power outages.

According to your letter, Tri-State will avoid and minimize potential impacts to migratory birds by:

- Incorporating APLIC's recommended avian protection practices on its power lines;
- Avoiding all streambeds, wetlands, and waterbodies to the maximum extent possible;
- Conducting an avian collision risk assessment and marking all areas that pose a collision risk with swan or other types of bird flight diverters;
- Completing raptor nest surveys and restricting activities near active nests; and
- Surveying the route for the burrowing owl.

Although absolution from liability under the MBTA is not possible, the Service's Office of Law Enforcement uses its enforcement and prosecutorial discretion when companies or individuals have made efforts to avoid the unauthorized take of migratory birds. The Office of Law Enforcement focuses its resources on investigating and prosecuting individuals and companies that take migratory birds without regard for their actions. However, it is the project proponent's responsibility to minimize the effects of this project on migratory birds and other resources.

We are available at any time to provide recommendations intended to prevent and reduce avian mortalities at Tri-State's electrical facilities. We hope to work with Tri-State to reduce moralities and prevent service interruptions to your customers caused by birds. In the event that any migratory bird is killed, injured, or found dead at a power line or other facility within Tri-State's service area, please contact the Service immediately so that we can track incidents and help you identify corrective solutions. Please report incidents to the Colorado Field Office at (303) 236–4773. Alternatively, the electrical industry may report incidents involving migratory birds online at the following web address:

http://birdreport.fws.gov

The Service appreciates the opportunity to work with the Tri-State and the RUS on the Burlington-Wray Transmission Line project. If we can be of any additional assistance, please contact Craig Hansen of the Colorado Field Office by telephone at (303) 236-4749 or by email to craig_hansen@fws.gov. Thank you for your concern for natural resources.

Sincerely,

Susan C. Linner
Colorado Field Supervisor

cc: USFWS, Colorado Field Office, Craig Hansen

References Cited:

CPW (2012). Colorado Parks and Wildlife Whooping Crane species profile page. Dated November 6, 2012. Accessed April 1, 2013. http://wildlife.state.co.us/WildlifeSpecies/Profiles/Birds/Pages/WhoopingCrane.aspx

Appendix C:

Magnetic Fields and Audible Noise Report

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Burlington-Wray Transmission Line Project

Electric and Magnetic Fields and Audible Noise

Prepared for

Tri-State Generation and Transmission Association, Inc.
1100 W. 116th Ave.
Westminster, CO 80234

CH2M HILL
9193 South Jamaica Street
Englewood, CO 80112-5946

July, 2013

Burlington-Wray Transmission Line Project

Introduction

The Tri-State Generation and Transmission Association, Inc. (Tri-State) is adding a 230 kilovolt (kV) single circuit electric transmission line from Burlington to Wray in eastern Colorado. The project is called the Burlington-Wray 230 kV Transmission Line Project (the "Project").

This report describes the modeling of electric and magnetic fields and the audible noise produced from corona for the Project.

Magnetic Fields from Burlington-Wray Transmission Line Project

Electric transmission lines produce EMF when they are in operation. EMF is a term that refers to electric and magnetic fields. These fields are caused by different aspects of the operation of a transmission line and can be evaluated separately.

Electric fields are produced whenever a conductor is connected to a source of electrical voltage. An example of this is the plugging of a lamp into a wall outlet in a home. When the lamp is plugged in, a voltage is induced in the cord to the lamp which causes an electric field to be created around the cord.

Magnetic fields are produced whenever an electrical current flows in a conductor. In the lamp example, if the lamp is turned on allowing electricity to flow to the lamp, a magnetic field is created around the lamp cord in addition to the electric field.

Modeling Methodology

The electric and magnetic fields and audible noise for the Project were predicted using EMF Workstation: ENVIRO (Version 3.52), a Windows-based model developed by the Electric Power Research Institute (EPRI). It is a program that accurately predicts the magnetic fields produced by linear transmission lines such as those in the Project.

To perform this modeling, detailed information was received from Tri-State on the design of the line, which included projected electrical power flows, operating voltage, tower configuration, conductor size and type, the height and horizontal location of each conductor, conductor sag, and conductor phasing. The modeling was conducted for a new 230 kV single circuit line on a separate 150 foot ROW. One power flow case was modeled for the maximum thermal capacity of the conductor. Table 1 of Attachment 1 shows the transmission line characteristics used to perform this modeling.

These data were input into the ENVIRO program which produced the lateral profiles of the magnetic fields out to 75 feet from the left and right ROW edges. These profiles were then plotted to produce the graphs that are presented below. The profiles were calculated with the lowest phase conductor at 28 feet above the ground for the 230 kV line which meets or

exceeds the minimum ground clearance per the National Electrical Safety Code (NESC) and the Rural Electric Service (RUS) "Design Manual for High Voltage Transmission Lines", Bulletin 1724E-210, which coincides with the lowest point of conductor sag, providing the most conservative results. The calculations are computed at a height of 1 meter (3.3 feet) above the ground. The accuracy of the modeling is dependent on the accuracy of the input data. The resulting field plots are within a few percent of the true value for the conditions modeled.

Modeling Results

The new 230 kV single circuit line was modeled as an H-frame structure, specifically the RUS TM-230. Table 1 of Attachment 1 shows the transmission line characteristics used to perform this modeling.

The electric field results are presented in Figure 1. The new 230 kV line will be located on a 150 foot wide ROW. The outer edges of the ROW are shown as vertical dashed lines in Figure 1.

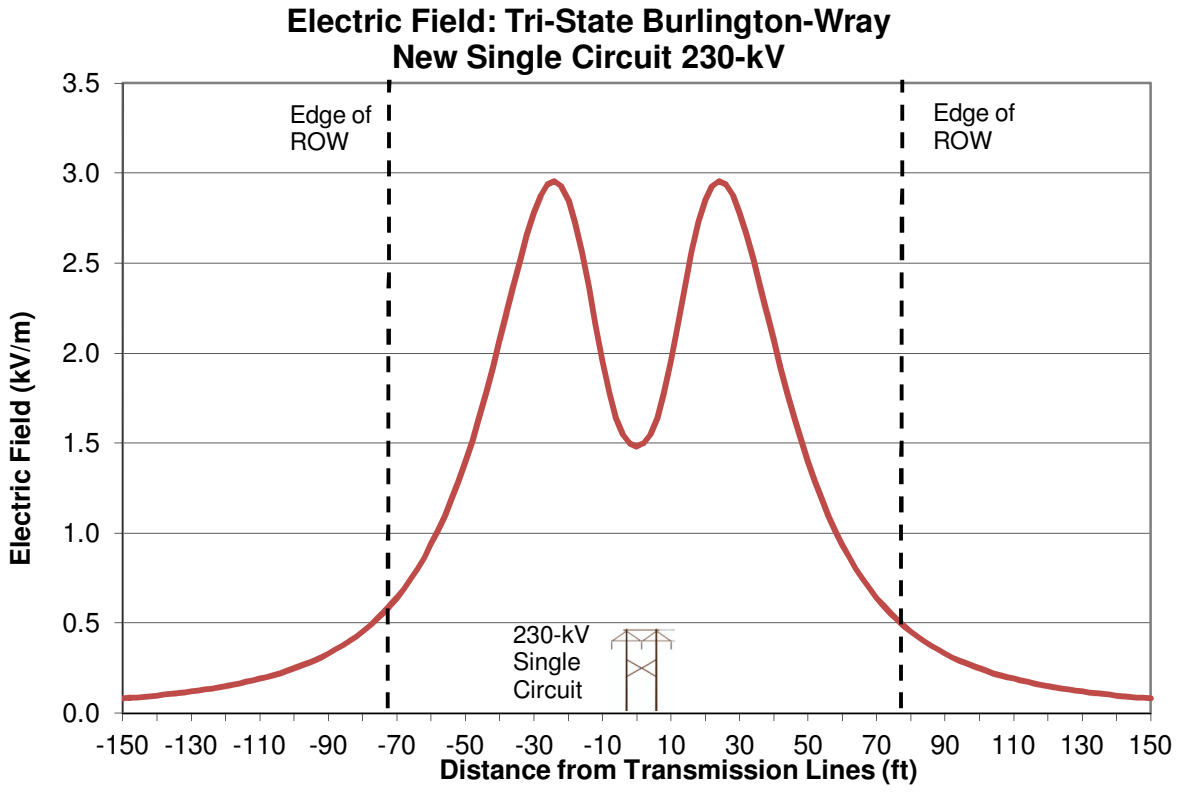

FIGURE 1
Electric Fields for New 230 kV Single Circuit

The results of the electric field modeling plotted in Figure 1 show that on both the left and right easement edge the electric field is approximately 0.5 kilovolt per meter (kV/m). The maximum electric field within the easement is approximately 2.9 kV/m.

The magnetic field results are presented in Figure 2.

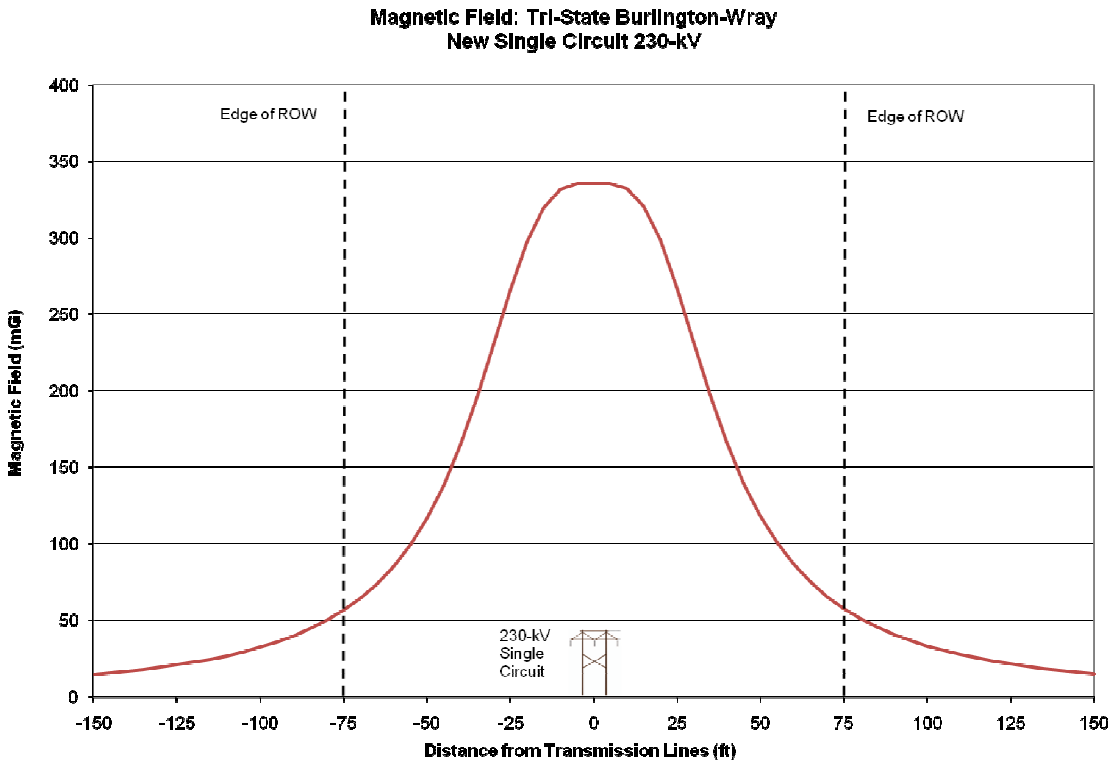

FIGURE 2
Magnetic Fields for New 230 kV Single Circuit

The results of the magnetic field modeling plotted in Figure 2 show that on the left ROW edge the magnetic field is approximately 56 mG and approximately 57 mG on the right ROW edge. The maximum magnetic field within the ROW is approximately 336 mG.

Corona Audible Noise from Burlington-Wray Transmission Line Project

Corona is the electrical ionization of the air that occurs near the surface of the energized conductor and suspension hardware due to very high electric field strength. Corona may result in audible noise being produced by the transmission lines.

The amount of corona produced by a transmission line is a function of the voltage of the line, the diameter of the conductors, the locations of the conductors in relation to each other, the elevation of the line above sea level, the condition of the conductors and hardware, and the local weather conditions. Power flow does not affect the amount of corona produced by a transmission line. Corona typically becomes a design concern for transmission lines at 345 kV and above and is less noticeable from lines like those from the Project that are operated at lower voltages.

The electric field gradient is greatest at the surface of the conductor. Large-diameter conductors have lower electric field gradients at the conductor surface and, hence, lower corona than smaller conductors, everything else being equal.

Irregularities (such as nicks and scrapes on the conductor surface or sharp edges on suspension hardware) concentrate the electric field at these locations and thus increase the electric field gradient and the resulting corona at these spots. Similarly, foreign objects on the conductor surface, such as dust or insects, can cause irregularities on the surface that are a source for corona.

Corona also increases at higher elevations where the density of the atmosphere is less than at sea level. Audible noise will vary with elevation with the relationship of A/300 where A is the elevation of the line above sea level measured in meters (EPRI 2005). Audible noise at 600 meters elevation will be twice the audible noise at 300 meters, all other things being equal. The Project was modeled with an elevation of 4,000 feet.

Raindrops, snow, fog, hoarfrost, and condensation accumulated on the conductor surface are also sources of surface irregularities that can increase corona. During fair weather, the number of these condensed water droplets or ice crystals is usually small and the corona effect is also small. However, during wet weather, the number of these sources increases (for instance due to rain drops standing on the conductor) and corona effects are therefore greater. During wet or foul weather conditions, the conductor will produce the greatest amount of corona noise. However, during heavy rain the noise generated by the falling rain drops hitting the ground will typically be greater than the noise generated by corona and thus will mask the audible noise from the transmission line.

Corona produced on a transmission line can be reduced by the design of the transmission line and the selection of hardware and conductors used for the construction of the line. For instance the use of conductor clamps that hold the conductor in place should have rounded rather than sharp edges and no protruding bolts with sharp edges will reduce corona. The conductors should be handled so that they have smooth surfaces without nicks or burrs or scrapes in the conductor strands.

Modeling Methodology

The audible noise for the Project was predicted using EMF Workstation: ENVIRO (Version 3.52), the same program used to predict the electric and magnetic fields from the Project. The ENVIRO program calculated audible noise for the Project using two methods: the Bonneville Power Administration (BPA) method and the EPRI-High Voltage Transmission Research Center (HVTRC) method. The BPA method is based on research performed at the BPA in Oregon and Washington in the 1980's and 90's. Much of this research was conducted by Mr. Vernon Chartier and others at BPA who took measurements of corona effects from operating transmission lines. The EPRI-HVTRC method is a more analytical approach based on calculations presented in the *EPRI AC Transmission Line Reference Book—200 kV and Above* (EPRI 2005). The wet weather audible noise results between the two methods are quite similar, while the fair weather audible noise results vary a bit more. The BPA method was selected for the Project, and the results are presented in Figure 3 below.

The modeling was conducted for the same scenario as for magnetic fields: a new 230 kV single circuit line on a separate, non-adjacent ROW. Power flow does not affect the amount of corona produced by a transmission line.

The data presented in Table 1 of Attachment 1 were input into the ENVIRO program to calculate the corona audible noise, with the addition of elevation of the line above sea level. The Project was modeled with an elevation of 4,000 feet. Because the equations that predict audible noise were created from empirical measurements, the accuracy of the model is as good as these measurements that produced the original equations. In addition, the model is as good as the accuracy of the parameters input to the model (e.g. the actual elevation of the transmission line at a particular location rather than the average elevation of the entire project). Therefore given these potential uncertainties, the resulting field plots are within a few percent of the true value for the conditions modeled.

Modeling Results

The structures modeled for magnetic fields were also used in modeling corona for the new line. The corona audible noise results are presented in Figure 3. The new 230 kV line will be located on a 150 foot wide ROW. The outer edges of the ROW are shown as vertical dashed lines in Figure 3.

The figure shows two weather conditions for the corona audible noise results, fair and rain. This is to show the range in corona effects due to changing weather. The figures present the audible noise results for L_{50} rain conditions.

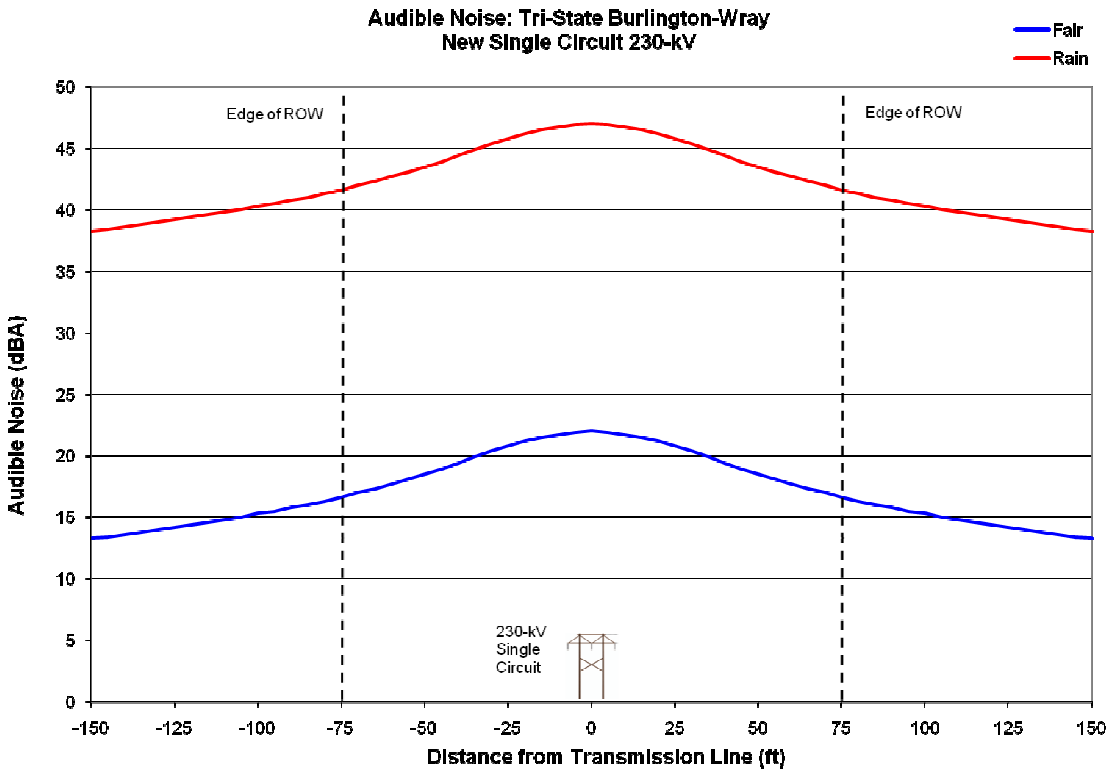

FIGURE 3
Corona Audible Noise for New 230 kV Single Circuit

The results of the corona audible noise modeling plotted in Figure 3 show that on both the left and right ROW edges the audible noise is approximately 17 dBA in fair weather and 42 dBA in wet weather. Figure 3 also shows that 25 feet from both the left and right ROW edges the audible noise is approximately 15 dBA in fair weather and 40 dBA in wet weather. The maximum noise that occurs within the ROW is 22 dBA in fair weather and 47 dBA in wet weather.

References Cited

EPRI, 2005. *EPRI AC Transmission Line Reference Book—200 kV and Above, Third Edition.* December. Electric Power Research Institute, Palo Alto, California.

ATTACHMENT 1

ENVIRO Modeling Inputs

TABLE 1
Transmission Line Characteristics for Input to ENVIRO Modeling

Description	New 230-kV SC
Structure	230-kV: RUS TM-230, ground clearance 28'
ROW	230-kV: Centered in 150'
Conductor Type (and Ground Type)	230-kV: 1272 KCMIL ACSR Bittern
# of Bundles	230-kV: 1
Bundle Spacing (in)	230-kV: 0
Power Flow (Amps)	230-kV: 1538

Notes
Audible noise is calculated at an average elevation of 4,000 feet.

Appendix D:

Tri-State EMF Position Statement

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POSITION STATEMENT

Electric and Magnetic Field (EMF) Health Effects

Lights, appliances, computers, power lines and any other devices that carry or use electricity produce electric and magnetic fields (EMF). The Earth itself also creates natural EMF in varying amounts. Therefore, we are all continuously exposed to EMF as a result of living in a society that so heavily relies on the use of electricity as a source of energy.

In recent years, concerns have been raised that exposure to EMF might cause or contribute to adverse health effects, including cancer. We at Tri-State Generation and Transmission Association are aware of these concerns and we wish to express our position on EMF and our commitment to this matter.

Scientists agree that the answers to these concerns must come from well-conducted research studies. During the last three decades several thousand studies aimed at a better understanding of this issue have been conducted around the world. The consensus of scientists familiar with these studies is that no significant risk to humans from long-term exposure to EMF has been established.

In addressing this issue, Congress in 1991 asked the National Academy of Sciences to review the research literature on the effects from exposure to EMF and for the National Institute of Environmental Health Sciences (NIEHS) to conduct a scientific research program to evaluate the health risk to humans of EMF. The National Academy of Sciences formed the Committee to Review the Research Activities Completed Under the Energy Policy Act of 1992. The Committee issued their report in 1999 titled "Research on Power-Frequency Fields Completed Under the Energy Policy Act of 1992." In the report they state " the committee recommends that no further special research program focused on possible health effects of power-frequency magnetic fields be funded."

The NIEHS in May 1999 prepared their report to Congress on the results of their sponsored research and other research conducted to date around the world. In a letter accompanying this report, the NIEHS Director concluded, “the scientific evidence suggesting that ELF-EMF exposures pose any health risk is weak”. He goes on to say “virtually all of the laboratory evidence in animals and humans and most of the mechanistic work done in cells fail to support a causal relationship between exposure to ELF-EMF at environmental levels and changes in biological function or disease status.” While these scientific reviews were conducted some time ago and EMF research has continued since then, the overall conclusions of these newer studies remain about the same as before.

Tri-State recognizes its responsibility to provide wholesale electric service at the lowest possible cost in a manner that is safe, reliable and environmentally sound. This responsibility includes carefully designing and locating our facilities in strict accordance with the National Electric Safety Code and all applicable federal, state and local regulations. Despite the lack of clear evidence from reliable studies of any adverse effect EMF may have on human health, we will continue to construct and operate our facilities in a manner that minimizes, to the extent prudent and practical, the amount of EMF that is created.

Since there are still unanswered questions and opposing theories, Tri-State agrees that limited research should continue in a credible and objective manner even though the federal government has ceased funding all such research studies. Accordingly, we will continue to be a sponsor of the EMF research program of the Electric Power Research Institute, of which we are a member. We will continue to closely monitor the results of these and other scientific studies as they are completed. Our commitment is to keep our member systems, our employees and our electric consumers informed of the results of this research and promptly and knowledgeably respond to all inquiries with accurate and current information.

7/09