BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

IN THE MATTER OF THE APPLICATION OF TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC. FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE SAN LUIS VALLEY-CALUMET-COMANCHE-TRANSMISSION PROJECT	)	**DOCKET NO. 09_______**

DIRECT TESTIMONY AND EXHIBITS OF MARK J. MURRAY

TABLE OF CONTENTS

SECTION		PAGE
I.	INTRODUCTION AND QUALIFICATIONS	2
II.	PURPOSE OF TESTIMONY	3
III.	OVERVIEW OF THE CHANGE IN PROJECT SCOPE	3
IV.	OVERVIEW OF TRI-STATE'S SITING, PERMITTING, AND NEPA PROCESSES FOR THE PROJECT	4
V.	RIGHT-OF-WAY REQUIREMENTS	11

I. INTRODUCTION AND QUALIFICATIONS

Q: PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A: My name is Mark Murray. My business address is 1100 West 116th Avenue, Westminster, CO 80234.

Q: BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A: I am employed by Tri-State Generation and Transmission Association, Inc. ("Tri-State"). I am Tri-State's Permitting and Land Rights Manager.

Q: PLEASE EXPLAIN YOUR RESPONSIBILITIES AS TRI-STATE'S PERMITTING AND LAND RIGHTS MANAGER.

A: I am responsible for the acquisition of rights-of-way and fee property required for the expansion or improvement of Tri-State's generation and transmission facilities. In addition, I support the siting and permitting activities related to Tri-State's construction of new generation and transmission facilities. My responsibilities also include the administration of Tri-State's real property throughout its four state service area.

Q: HAVE YOU PREPARED A STATEMENT OF YOUR EXPERIENCE AND QUALIFICATIONS?

A: Yes. It is included as **Exhibit No. MJM-1** to this testimony.

Q: ARE YOU FAMILIAR WITH THE TRANSMISSION PROJECT THAT IS THE SUBJECT OF THIS CPCN APPLICATION?

A: Yes, I am.

Q: WHAT IS YOUR INVOLVEMENT IN THAT PROJECT?

A: In my capacity as Tri-State's Permitting and Land Rights Manager, I was involved initially in Tri-State's proposed San Luis Valley Electric System Improvement

Project (the "SLVESIP"). The SLVESIP was the predecessor to and has become an integral part of the current joint project between Tri-State and Public Service Company of Colorado ("Public Service"), which project is the subject of this CPCN Application. I continue to support the current project in connection with the siting, permitting, and land rights acquisition aspects of those portions of the joint project for which Tri-State is responsible.

II. PURPOSE OF TESTIMONY

Q: WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A: The purpose of my testimony is to describe the siting, permitting, and land rights acquisition activities associated with the joint project known as the San Luis Valley-Calumet - Comanche Transmission Project (the "Project").

Q: ON WHOSE BEHALF ARE YOU TESTIFYING?

A: My testimony is offered in support of the CPCN Application filed by Tri-State for its participation in the Project. I also understand that my testimony may be offered in support of the companion CPCN Application filed by Public Service for its participation in the Project.

III. OVERVIEW OF THE CHANGE IN PROJECT SCOPE

Q: PLEASE EXPLAIN TRI-STATE'S ORIGINAL PROJECT CONFIGURATION PRIOR TO THE INVOLVEMENT OF PUBLIC SERVICE.

A: The SLVESIP involved a single-circuit, 230 kV transmission line connecting the existing San Luis Valley Substation with the existing Walsenburg Substation.

Q: DID TRI-STATE COMPLETE THE SLVESIP PROJECT?

A: No, Tri-State had only started to conduct informational meetings with the public and prepared a siting study known as a Macro Corridor Study ("MCS") before the

SLVESIP was expanded to investigate the possible joint project with Public Service. The MCS was completed in conjunction with an evaluation of system alternatives as required by Tri-State's planned lender for this Project, the U.S. Department of Agriculture's Rural Utilities Service ("RUS"). The combined "San Luis Valley Electric System Improvement Project Alternative Evaluation and Macro Corridor Study" is included with my testimony as **Exhibit No. MJM-2**.

Q: WHY IS TRI-STATE NOW PROPOSING A DIFFERENT PROJECT?

A: Tri-State and Public Service both have different needs for transmission into and out of the San Luis Valley. Through joint planning the companies determined their respective needs could be met with a double circuit 230 kV transmission line into the San Luis Valley. The joint planning resulted in the new project configuration which is discussed in more detail by Tri-State witness Andrew Leoni..

IV. OVERVIEW OF TRI-STATE'S SITING, PERMITTING, AND NEPA PROCESSES FOR THE PROJECT

Q: FOR WHICH PROJECT SEGMENTS WILL TRI-STATE TAKE THE LEAD WITH RESPECT TO SITING, PERMITTING, AND LAND RIGHTS ACQUISITION?

A: Both companies will work cooperatively on the overall joint San Luis Valley-Calumet-Comanche Transmission Project. Tri-State will lead the siting, environmental compliance (including NEPA), permitting, and land rights acquisition processes associated with the San Luis Valley-Calumet and the Calumet-Walsenburg segments of the Project. Due to the overlap of the siting tasks and the NEPA process, Tri-State will also lead the siting and environmental compliance processes on the Calumet-Comanche segment of the Project, while

Public Service will lead the permitting and land rights acquisition activities for the Calumet-Comanche segment.

Q: IS THERE AN APPRECIABLE DIFFERENCE BETWEEN THE APPROACHES USED BY BOTH COMPANIES TO SITE, PERMIT, AND ACQUIRE LAND FOR THE PROJECT.

A: No. Both companies use a similar methodology to site their transmission facilities using a constraint/opportunities type analysis. Both companies are subject to local land use permitting regulations, and both use similar methods to acquire land rights.

Q: IS THERE ANY ASPECT OF THIS PROCESS THAT IS UNIQUE TO ONE COMPANY OR THE OTHER?

A: Yes. While both companies complete a siting study to identify alternatives and a preferred route, Tri-State must also comply with additional environmental reviews required as a result of federal financing for Tri-State's construction projects.

Q: TO WHAT ADDITIONAL ENVIRONMENTAL REVIEW IS TRI-STATE SUBJECT?

A: Tri-State must comply with the National Environmental Policy Act ("NEPA"). As Tri-State plans to borrow money from or obtain loan guarantees from the RUS in connection with this Project, the decision RUS will make on Tri-State's funding request is a "federal action" that triggers the NEPA process.

Q: WHAT ARE THE STEPS OF THE NEPA PROCESS?

A: The NEPA process includes public notification, public scoping meetings, alternative analysis and impact assessment, document release, public comment, and decision.

Q: IS PUBLIC SERVICE SUBJECT TO THE NEPA PROCESS?

A: No. Public Service does not obtain money from the government or require a federal permit so Public Service is not subject to NEPA unless the selected route crosses federal lands or impacts areas requiring federal action.

Q: GIVEN THAT TRI-STATE IS SUBJECT TO NEPA, BUT PUBLIC SERVICE IS NOT, WHAT IS PUBLIC SERVICE'S POSITION ON PARTICIPATING IN A PROJECT THAT REQUIRES NEPA COMPLIANCE?

A: Public Service has informed Tri-State that it is willing to follow the NEPA protocol as Tri-State's joint partner seeking to share the same right-of-way corridor for the overall project and with the assumption the implemented NEPA process will not jeopardize Public Service's business interests.

Q: WHO WILL ADMINISTER THE NEPA PROCESS FOR THE JOINT PROJECT?

A. The NEPA process will be administered by RUS in coordination with Tri-State's Transmission Environmental Department.

Q: HAS THE NEPA PROCESS BEGUN FOR THIS PROJECT?

A. No. The NEPA process begins with the Notice of Intent and scoping meetings that will follow sometime after the submittal of the joint CPCN application to the Colorado PUC.

Q. PLEASE DESCRIBE THE ROUTING CHARACTERISTICS FOR THE SAN LUIS VALLEY-CALUMET AND THE CALUMET-WALSENBURG SEGMENTS OF THE OVERALL PROJECT.

A. **Exhibit No. MJM-3** is a Vicinity Map depicting the overall San Luis Valley-Calumet-Comanche Project area. The San Luis Valley - Calumet segment study area is characterized by a wide range of topography and land uses ranging from relatively flat in the western (valley) portion to mountainous terrain in the eastern sections. Land cover within the study area includes agriculture, grasslands, shrublands, and coniferous forests. Highway 160 is the main transportation corridor running in an east/west direction, while State Highways 17 and 150 run north/south in the valley area. Land ownership is primarily private with some federal and state public lands. The Calumet - Walsenburg and Calumet - Comanche segments include primarily open plains, foothills, and grasslands. The proposed new right-of-way for these segments will contain double circuit capable 230 kV transmission structures. The engineering design and configuration of these transmission lines is specifically described in the testimony of Tri-State witness Stephen Mundorff.

Q: DO YOU KNOW THE EXACT ROUTES FOR THE SAN LUIS VALLEY-CALUMET AND THE CALUMET-WALSENBURG SEGMENTS?

A: No. The environmental process with public involvement that will ultimately yield the exact route for these transmission lines has not been completed.

Q: HOW WILL THE FINAL ROUTES FOR THESE TWO SEGMENTS BE IDENTIFIED?

A: The routes for each of these segments will be selected from among alternatives identified through a siting study in compliance with NEPA and in conformance with applicable local land use permitting processes. During the siting study, existing linear corridors will be evaluated in the area as well as other opportunity areas for siting the new transmission line rights-of-way. In the case of the Calumet-Walsenburg transmission line, that segment of the Project will involve the reconstruction of an existing transmission line, therefore, it is anticipated that the new transmission line will be constructed within the existing transmission right-of-way in that location.

Q. WILL THESE SEGMENTS OF THE OVERALL PROJECT BE SITED TO AVOID OR MINIMIZE IMPACTS TO RESIDENTIAL AREAS?

A. Yes. Tri-State believes these segments can be sited to avoid or minimize impacts to residential areas. Vast undeveloped expanses exist between Calumet and Walsenburg with sparsely populated large parcel ownership being the prevailing land use. The San Luis Valley-Calumet segment has some residential development (see **Exhibit No. MJM-2**, section 4.3.1.3 and Figure A-4), however, the project can be sited to avoid or minimize impacts to these areas.

Q. WILL NEW LAND RIGHTS BE REQUIRED AT THE SAN LUIS VALLEY OR CALUMET SUBSTATION SITES?

A: Acquisition of new land rights to accommodate required equipment additions is not anticipated at either substation site. Tri-State owns the existing San Luis Valley Substation and Calumet Substation site and surrounding lands. Both sites will be reviewed to confirm there are adequate land rights to both contain the new electrical substation facilities and allow for space for the construction activities required.

Q. WHAT GOVERNMENTAL ENTITIES WILL REVIEW THE PROJECT?

A: This Commission will review the Project in connection with the decision to issue a Certificate of Public Convenience and Necessity. In addition, the RUS will review and monitor overall project activities due to Tri-State's use of RUS-provided federal funds for its ownership portion of the Project. Other federal, state, and local agencies and entities will also review and provide input during the NEPA compliance process. Local land use approvals will require reviews by Pueblo, Huerfano, Costilla, and Alamosa counties and possibly the City of Alamosa and City of Pueblo. Issuance of construction-related permits will allow further review by various agencies and entities.

Q: HAVE THERE BEEN ANY INTERACTIONS WITH THESE COUNTIES CONCERNING THE JOINT PROJECT?

A. Yes. There have been a number of meetings with different groups. Tri-State has made two presentations to the Valley Six at its regularly scheduled meeting and one presentation to the Action 22 committee. The Valley Six and Action 22 are organizations comprised of local governments and other interested stakeholders in southern Colorado that work at the grassroots and government levels to advocate for the interests of southern Colorado citizens and businesses. Tri-State has also had a number of meetings with Huerfano and Alamosa counties to discuss various aspects of the Joint Project; however, Costilla County has elected not to independently discuss project specifics with Tri-State at this time.

Q. WILL TRI-STATE CONDUCT PUBLIC INVOLVEMENT AND NOTIFICATION ACTIVITIES FOR THE PROJECT?

A. Yes. As a part of the siting and permitting process for the overall Project, Public Service and Tri-State will develop a comprehensive communication plan to notify and involve the public. The public plays an important role in reviewing routing alternatives and providing input that helps determine the preferred alternative for all segments of the Project. Public Service and Tri-State will work closely with the involved jurisdictions and the public in conformance with the NEPA scoping process. The public will also have opportunities to review and comment on the overall project during the local jurisdictions' land use review processes.

Q: WHAT PUBLIC OUTREACH HAS BEEN COMPLETED TO DATE?

A. Public informational meetings were held in October of 2008 for the San Luis Valley to Calumet segment. Tri-State has also spoken at various meetings and forums and has used print, radio, TV, and web resources to share information about the Project.

Q: WHAT IS THE SCHEDULE FOR COMPLETION OF THE SITING AND NEPA PROCESS FOR THE JOINT PROJECT?

A. It is anticipated the siting process and NEPA process will take about 16 months to complete.

Q: WHAT IS THE SCHEDULE FOR COMPLETING THE LOCAL LAND USE PERMITTING PROCESS FOR THE JOINT PROJECT?

A. Once the preferred alternatives have been identified through the NEPA process, land use applications will be prepared and submitted to the respective counties for land use permits. At this time, Tri-State estimates that the local land use permitting process may require six to nine months following determination of the preferred alternatives through the NEPA process, assuming there is no litigation in opposition to the Joint Project at the local level.

Q: WHAT IS TRI-STATE'S SCHEDULE FOR ACQUIRING THE LAND RIGHTS NEEDED FOR THE SAN LUIS VALLEY-CALUMET AND CALUMET-WALSENBURG SEGMENTS OF THE JOINT PROJECT?

A. Tri-State will begin acquisition of the necessary land rights once all land use permits have been secured.

V. RIGHT-OF-WAY REQUIREMENTS

Q: WITH REGARD TO THE SAN LUIS VALLEY-CALUMET TRANSMISSION SEGMENT, PLEASE DESCRIBE THE RIGHT-OF-WAY REQUIREMENTS NEEDED FOR THE DOUBLE-CIRCUIT 230 KV TRANSMISSION LINE.

A. Based on the structure configuration and transmission line design described in Mr. Mundorff's Direct Testimony, and in order to comply with clearance requirements of the National Electric Safety Code, Tri-State intends to acquire a 150-foot wide right-of-way along the entire length of this segment.

Q: WITH REGARD TO THE CALUMET-WALSENBURG TRANSMISSION SEGMENT, PLEASE DESCRIBE THE RIGHT-OF-WAY REQUIREMENTS NEEDED FOR THE NEW TRANSMISSION LINE.

A. First, it is important to note that there is an existing transmission line within the right-of-way intended for the new 230 kV transmission line. As part of the Project, Tri-State will rebuild a portion of the existing 115 kV Stem Beach-Walsenburg transmission line. As described further in Mr. Mundorff's testimony, the rebuilt section of the 115 kV transmission line will be installed on the same structures as the new 230 kV Calumet-Walsenburg transmission line in the existing 100 foot right-of-way. This alignment is subject to the NEPA and siting processes, but will likely utilize the existing right-of-way given limited siting opportunities between Calumet and Walsenburg.

Q: DOES THAT CONCLUDE YOUR TESTIMONY?

A. Yes.

EXHIBIT MJM-1

Mark Murray
4210 W. Lexi Circle
Broomfield, Colorado 80020
303-404-8964

PROFESSIONAL SUMMARY

I am an accomplished senior manager with more than 27 years of professional experience in the electric utility industry. Positions of responsibility have included the direction and management of transmission and generation engineering departments including system planning, transmission system maintenance, and project development, permitting and acquisition. As a results orientated manager I have the ability to provide strategic planning, recognize problems, gather information and make informed decisions. As a professional, I have provided expert testimony at the state public regulatory agencies during legislative sessions and professional testimony in district court. I bring a broad utility background and professional experience along with an eagerness to build teamwork within an organization.

EDUCATION:

Master of Science, Industrial Engineering. New Mexico State University, Albuquerque, New Mexico.

Master of Arts, Computer Resource Management. Webster University, Albuquerque, New Mexico.

Bachelor of Fine Arts, Business Administration Major- Management Information Systems. College of Santa Fe, Albuquerque, New Mexico.

EMPLOYMENT HISTORY

July 1999 – Present **Permitting and Land Rights Manager**
Tri-State Generation & Transmission Association, Inc.
1100 W. 116th Ave. Westminster, Colorado 80234
Manage and direct the permitting land rights department in the overall administration of its land rights and permitting activities. Responsibilities include planning, directing, and managing land and land rights functions including coordinating, acquiring and providing expert legal testimony regarding proposed transmission and generation facilities. Provide coordination with public officials for various permitting efforts required for the installation of new or upgraded facilities through a diversified knowledge of electrical transmission and distribution systems in complex, environmentally sensitive and varied situations. The aforementioned responsibilities are accomplished through the management of a staff of five professionals. Management includes staff development, departmental planning, delegation of project responsibilities, establishing deadlines,

insuring quality and accuracy of work and conducting annual performance evaluations, including goal setting and career counseling.

EMPLOYMENT HISTORY (Continued)

June 1981 – July 1999 Manager of Engineering and Maintenance
Plains Electric Generation & Transmission Cooperative.
2401 Aztec N.E., Albuquerque, New Mexico 87197
Managed and directed the engineering, system planning, transmission system maintenance and construction activities associated with the Cooperative's transmission system. Included in these responsibilities were the preparation and presentation of various RUS documents such as the Power Requirements Study, Construction Work Plan and Long Range Engineering Plan. Coordination of member delivery point requests and system planning studies as required board policy or inter utility coordination. Responsible for assuring compliance with Western System Coordination Council (WSCC) Reliability Management System (RMS) maintenance compliance programs, environmental programs which included planning, operating, training, and providing performance reports. Areas of direct supervision were administration, transmission and substation engineering, transmission and substation maintenance, design, SCADA and warehousing activities.

Manager System Engineering
Managed and directed the engineering, right-of-way, environmental and construction activities associated with RUS construction and maintenance projects for the Cooperative. Included in these responsibilities were the preparation and presentation of the Power Requirements Study, Construction Work Plan and Long Range Engineering Plan. Areas of direct supervision included right-of-way administration, transmission environmental, transmission and generation engineering, design, SCADA and engineering information systems.

Engineering Services Administrator
Developed and maintained the engineering automated computer design systems which were used in the design of electrical system upgrades and additions. Acting as the system manager for the engineering and maintenance departments, I maintained the UNIX and DOS operating systems. Those systems included the Computer Aided Design Drafting (CADD) system, internally developed structure design programs and Aspen One Line software. Utilizing these computer aided tools, I provided design data for electrical system upgrades and additions

ACKNOWLEDGMENTS

- Published article in the AAPL September/October Magazine on CFR 25 Rights of Way on Native American Lands
- Registered Professional Land Surveyor for the State of New Mexico
- Chairman of the Western Utility Group
- Speaker at Mining and Land Resource Institute (2003 and 2004)
- Instructor for the Bureau of Land Management's Electric Systems Short Course taught annually at the Bureau of Land Management facility in Phoenix, AZ

EXHIBIT MJM-2

San Luis Valley Electric System Improvement Project

ALTERNATIVE EVALUATION AND MACRO CORRIDOR STUDY

June 2008

Prepared for Tri-State Generation and Transmission Association, Inc.

EDAW | AECOM

Table of Contents

Page

1.0 Introduction 1-1

1.1 Description of Tri-State Generation and Transmission Association 1-1
1.2 Purpose of the Alternative Evaluation and Macro Corridor Study 1-1
1.3 Purpose for the Project 1-2

2.0 Project Description 2-1

2.1 Proposed Action 2-1
2.1.1 Right-of-Way Considerations 2-1
2.1.2 Proposed Structures 2-1

3.0 Alternative Evaluation 3-1

3.1 Alternatives Considered 3-1
3.1.1 No Action Alternative 3-3
3.1.2 Additional Generation Capacity 3-3
3.1.3 Demand Side Management 3-5
3.1.4 Additional Transmission Capacity 3-9
3.2 Preferred Transmission System Alternative 3-16
3.3 Underground Construction 3-16

4.0 Macro Corridor Study 4-1

4.1 Definition of the Study Area 4-1
4.2 Resource Data Collection and Evaluation 4-1
4.3 Opportunities and Constraints Analysis 4-2
4.3.1 Land Use and Ownership 4-9
4.3.2 Existing Linear Transportation and Utility Corridors 4-12
4.3.3 Water Resources 4-14
4.3.4 Cultural and Historic Resources 4-15
4.3.5 Biological Resources 4-15
4.4 Corridor Identification 4-18
4.5 Future Tasks 4-22
4.5.1 Route Identification and Comparative Analysis 4-22
4.5.2 Field Reconnaissance and Identification of Route-Specific Constraints 4-23
4.5.3 Public and Stakeholder Involvement 4-24
4.5.4 Permit Applications 4-25
4.5.5 NEPA Process 4-25
4.6 Meetings and Consultations Held to Date 4-26

5.0 References Cited 5-1

Tables

Table 2-1:	Typical 230-kV Transmission Line Characteristics	2-1
Table 3-1:	San Luis Valley Peak Loads	3-1
Table 3-2:	Summary of Capacity and Equipment Scenarios for San Luis Valley Combustion Turbine Installation	3-5
Table 3-3:	Transmission Line Alternatives	3-9
Table 3-4:	Unit Costs	3-10
Table 3-5:	Ranking of Alternative 230-kV Options	3-13
Table 4-1:	Project Opportunity and Constraint Criteria	4-3
Table 4-2	San Luis Valley Electric System Improvement Project Corridor Segment Descriptions	4-19

Figures

Figure 1-1:	2007 San Luis Valley Load–Duration Curves	1-3
Figure 2-1:	Project Study Area	2-3
Figure 2-2:	Proposed 230-kV Transmission Structures	2-5
Figure 3-1:	Hourly Loads	3-2
Figure 3-2:	San Luis Valley Irrigation System	3-7
Figure 3-3:	Studied System Alternatives	3-11
Figure 4-1:	Composite Map Showing Opportunities and Constraints	4-5
Figure 4-2:	Composite Map Showing Preliminary Alternative Corridors	4-7

Appendix A
Resource Maps

Figure A-1:	Land Cover
Figure A-2:	Land Ownership
Figure A-3:	Prime Farmland
Figure A-4:	Subdivisions
Figure A-5:	Transportation Resources
Figure A-6:	Communications Facilities
Figure A-7:	Oil and Gas Wells
Figure A-8:	Schools, Parks, and Campgrounds
Figure A-9:	Potential Conservation Areas
Figure A-10:	Existing Electric Utilities
Figure A-11:	Surface Water

Figure A-12: Historic Places
Figure A-13: Vegetation
Figure A-14: Elk Habitat
Figure A-15: Bald Eagle Habitat
Figure A-16: Slope

This page intentionally left blank.

1.0 Introduction

Tri-State Generation and Transmission Association, Inc. (Tri-State) is proposing to construct a 230-kilovolt (kV) transmission line that will connect the existing Walsenburg Substation in Huerfano County, Colorado, to the existing San Luis Valley Substation in Alamosa County, Colorado, traversing a portion of Costilla County. This project is referred to as the San Luis Valley Electric System Improvement Project (Project).

1.1 Description of Tri-State Generation and Transmission Association

Tri-State is a wholesale electric power supplier owned by the 44 electric member distribution systems that it serves. Tri-State generates and transports electricity to its member systems throughout a 250,000-square-mile service territory across Colorado, Nebraska, New Mexico, and Wyoming. Tri-State owns, operates, and maintains an extensive transmission system in these four states consisting of more than 5,200 miles of transmission lines, 135 substations, and switchyards.

Tri-State, founded in 1952 by its original member systems, today serves more than 1.4 million consumers in four states. 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.

1.2 Purpose of the Alternative Evaluation and Macro Corridor Study

The U.S. Department of Agriculture's Rural Utilities Service (RUS) electric program provides capital loans to electric cooperatives for the upgrade, expansion, maintenance, and replacement of the electric infrastructure in rural areas. Tri-State is pursuing financial support from RUS for a new 230-kV transmission line in the San Luis Valley of Colorado. The new transmission line would connect the existing Walsenburg Substation in Huerfano County, Colorado, to the existing San Luis Valley Substation in Alamosa County, Colorado. This line will provide the power delivery infrastructure to increase the reliability and capacity of the existing transmission system and support proposed renewable energy development in the San Luis Valley area.

RUS is required to evaluate environmental impacts of their actions under the National Environmental Policy Act (NEPA) and Council on Environmental Quality NEPA implementing regulations (40 Code of Federal Regulations 1500–1508). RUS guidance regarding NEPA implementation (RUS Bulletin 1794A-603) requires that a Macro Corridor Study (MCS) and Alternative Evaluation (AE) be prepared and accepted by RUS prior to the start of the official NEPA process. Tri-State has prepared this document to evaluate the system alternatives that best meet the purpose and need of the Project as well as to identify potential corridor alternatives for the Project.

1.3 Purpose for the Project

Tri-State provides wholesale power to its member-owned distribution systems, which in turn provide retail power to farms, homes, and businesses in their respective service areas. San Luis Valley Rural Electric Cooperative (SLVREC) serves the bulk of the rural electric load in the area. The San Isabel Electric Association (SIEA) and the Sangre De Cristo Electric Association (SDCEA) serve loads in the larger region around the San Luis Valley. Since SLVREC is an "all-requirements member" (a member that must buy at least 95 percent of its power requirements from Tri-State), Tri-State is obligated to provide energy to serve the SLVREC loads. In 2004, these loads accounted for approximately 51 percent of the total electric load within the San Luis Valley. The remaining loads in the valley are served by Public Service Company of Colorado, a subsidiary of Xcel Energy (Xcel).

The primary purpose for the Project would be to:

- Improve system reliability in the San Luis Valley
- Help prevent voltage collapse under peak loads

The primary purpose for the Project is to solve a critical need to improve the electric service to the SLVREC and allow them to more reliably serve their customers in the San Luis Valley. Currently, if a single outage event occurs on the existing Poncha–San Luis Valley 230-kV transmission line, the remaining system would not be able to supply enough power to meet the peak loads in the area. This single event during periods of high demand would thus lead to a "voltage collapse" throughout the San Luis Valley. Voltage collapse occurs when a portion of the system is heavily loaded to a point beyond its load serving capability.

The purpose for this Project is related to both the capacity of the existing high voltage system and the radial nature of the existing transmission lines. Currently, there are two high voltage transmission lines into the San Luis Valley: Tri-State and Xcel jointly own a 230-kV line extending approximately 70 miles south from the Poncha Substation to the San Luis Valley substation. Xcel owns a 115-kV line that parallels and, in places, is essentially adjacent to the 230-kV line.

Transmission systems are typically designed in a manner that will allow the system to continue to operate in the event of a single component failure, or "single contingency" outage. The two existing lines provide power from essentially the same location (Poncha) and are essentially adjacent and "radial." As a result, these two lines do not provide the reliability that would be achieved by supplying power from a second or alternate power supply source. A new line from a second source would provide redundant service (rather than radial), thus improving the dependability and reliability of the electrical service.

In 1997, Tri-State's system planning engineers described the need for additional energy load-serving capability in the San Luis Valley. This information was summarized in the 1997 *San Luis Valley High Voltage System Study Report* (McElvain 1997), and the follow-up report *San Luis Valley Substation Second 230-kilovolt Source PV Study Report*, prepared in 2004 (McElvain 2004). These reports documented that the San Luis Valley's peak load exceeds the single-contingency capability. The results of the two studies indicated that the current system would not adequately support existing peak loads during a single contingency outage. A potential exists for the voltage to collapse whenever the net San Luis Valley loads exceed 65 megawatts (MW), and a single component failure occurs along the Poncha-San Luis Valley 230-kV line. This is a serious issue, for a collapse often requires a long time period for system restoration and large groups of customers can be without electricity for extended periods of time. Based on the Tri-State and Xcel combined loads served in 2007 (see Figure 1-1), the peak electric loads exceeded 120 MW and the loads exceeded 65 MW over 2,000 hours during the year.

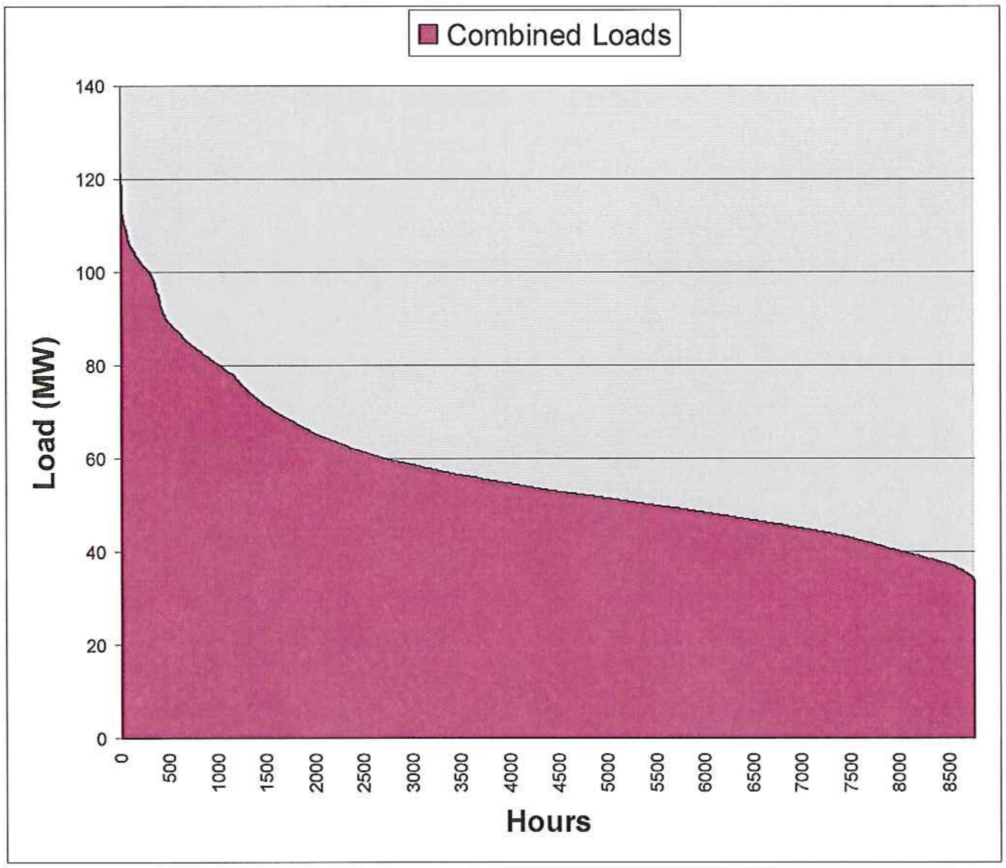


Figure 1-1: 2007 San Luis Valley Load–Duration Curves

Xcel owns two generators in Alamosa, Colorado. These generators, rated at 19 MW and 17 MW (referred to as the Alamosa Terminal Generation), are used to provide emergency backup power. The Alamosa Terminal Generation (including the reactive power component) can provide an incremental load serving capability of approximately 46 MW in the San Luis Valley. If these generators were running coincident with the single-contingency event, the voltage collapse would not occur until the load reaches approximately 111 MW. If the units were not operating, it is uncertain if they would be able to start up and reach synchronization in time to prevent voltage collapse.

In addition to the purpose for the Project described above, the following additional benefits are related to the Project:

- Provide improved transmission support to the surrounding region
- Provide transmission capacity for renewable energy development in the San Luis Valley

In addition to benefits to SLVREA, surrounding member systems such as those of SIEA and SDCEA will also benefit from a stronger system.

Beyond reliability and dependability purposes, several renewable energy projects have been proposed in the San Luis Valley; the transmission system in this area will likely to be used to transmit this "renewable" energy to other customers in and around Colorado. SLVREA and Tri-State have been approached by several renewable resource developers that have expressed interest in developing substantial amounts of renewable energy projects in the San Luis Valley. For example, solar energy projects have been discussed by Sun Edison, SkyFuel Inc., and others. SkyFuel Inc. recently submitted a formal notification to the Colorado Public Utilities Commission. This notification indicates that SkyFuel Inc. is currently reviewing the attributes of multiple sites in the San Luis Valley for concentrating solar power (CSP) plants having collective ratings in excess of 1,000 MW. In addition, there are geothermal resources in the valley that are being investigated, and biomass projects have also been proposed.

In January 2008, Tri-State released a Request for Proposals (RFP) for renewable resources that is anticipated to result in bids from several projects, potentially including project developers in the San Luis Valley. Adequate transmission capacity is a critical element necessary for the development of renewable energy projects in this area. It is quite clear from recent legislation in Colorado (Colorado Senate Bill 07-100) that new transmission capacity to serve areas with the potential for renewable energy development is necessary and is especially desired. In its 2007 transmission planning report (2007), Xcel designated the San Luis Valley as one of four Energy Resources Zones in Colorado. The Xcel report indicated that the existing transmission system was capable of serving up to 200 MW of renewable generation in the San Luis Valley. Improving the electrical system in this area would increase the capability of the system to serve renewable generation projects. The potential projects identified by SkyFuel and others support acceleration of new transmission capacity from the San Luis Valley on the order of 2,000 MW by 2012. This increase represents almost an order of magnitude greater than the current capacity.

2.0 Project Description

2.1 Proposed Action

The proposed Project involves constructing a 230-kV transmission line that will connect the Walsenburg Substation in Huerfano County, Colorado, to the San Luis Valley Substation in Alamosa County, Colorado, traversing a portion of Costilla County. The existing substations are located approximately 65 miles apart, but the length of the transmission line itself will depend on the final route selected. The Project study area encompasses approximately 2,695 square miles and is shown on Figure 2-1. Coordination is ongoing with other utilities that may partner with Tri-State on this Project based on capacity requirements in the area and anticipated development of renewable resources. While potential participation from other utilities may affect the project design, that participation is not known at this time and is not included with the current project description.

2.1.1 Right-of-Way Considerations

The new transmission line is proposed to be constructed within a right-of-way (ROW) approximately 125 to 150 feet in width, depending on final engineering design. Tri-State representatives will 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.

2.1.2 Proposed Structures

The typical physical design characteristics for the transmission structures proposed to be used for the transmission line are listed in Table 2-1. Diagrams showing the proposed transmission structures are presented in Figure 2-2.

Table 2-1:
Typical 230-kV Transmission Line Characteristics

Description of Design Component	Wood H-Frame or Steel Structures
Voltage (kV)	230 kV
Right-of-Way Width (feet)	125–150
Average Span (feet)	800
Typical Range of Structure Heights (feet)	65–110
No. of Structures (per mile)	6–7
Minimum Ground Clearance Beneath Conductor (feet)	28
Maximum Height of Machinery that can be Operated Safely Under Line (feet)	14

Two-pole wood H-frame structures or single-pole steel structures are expected to be used to support the conductors on tangent (straight-line) sections of the transmission line. These structures typically range in height from approximately 65 to 110 feet, depending on the distance between structures and the area topography. Taller structures may be used for crossing streams, roads, or other transmission lines or where unusual terrain exists. The distance between structures typically ranges from approximately 650 feet to 1,100 feet, depending on topography.

The H-frame structures are designed to support three conductors on individual insulators located approximately 19 feet from the top. At the top of the structure, two overhead ground wires (OHGW), or shieldwires, will protect the transmission line from lightning strikes. One of the shield wires will contain fiber optics to be used solely by Tri-State for internal (not commercial) communication needs.

The three conductors on the single-pole steel structures will be supported by braced post insulators that alternate from side to side on the structure. One OHGW containing fiber optics for non-commercial Tri-State communications needs will be located at the top of the structures.

Depending on local conditions, other types of structures may be used as well. For example, three-pole wood angle structures with guy wires will be used where the transmission line changes direction. Along sections of the line where wood H-frame structures are used, three-pole wood dead-end structures with guy wires will be installed every 5 miles to prevent cascading of the structures because of storm damage.

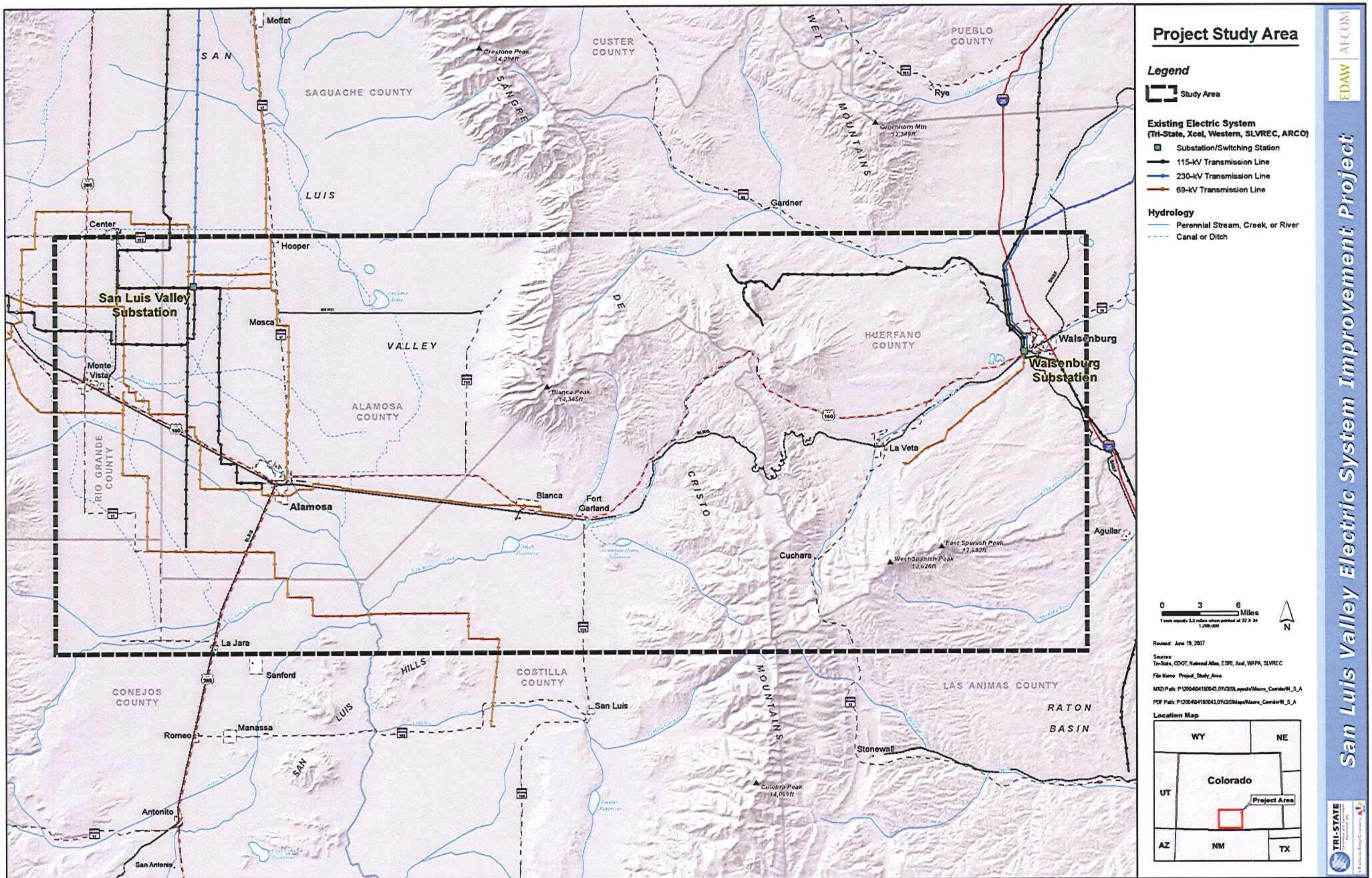


Figure 2-1 - Project Study Area

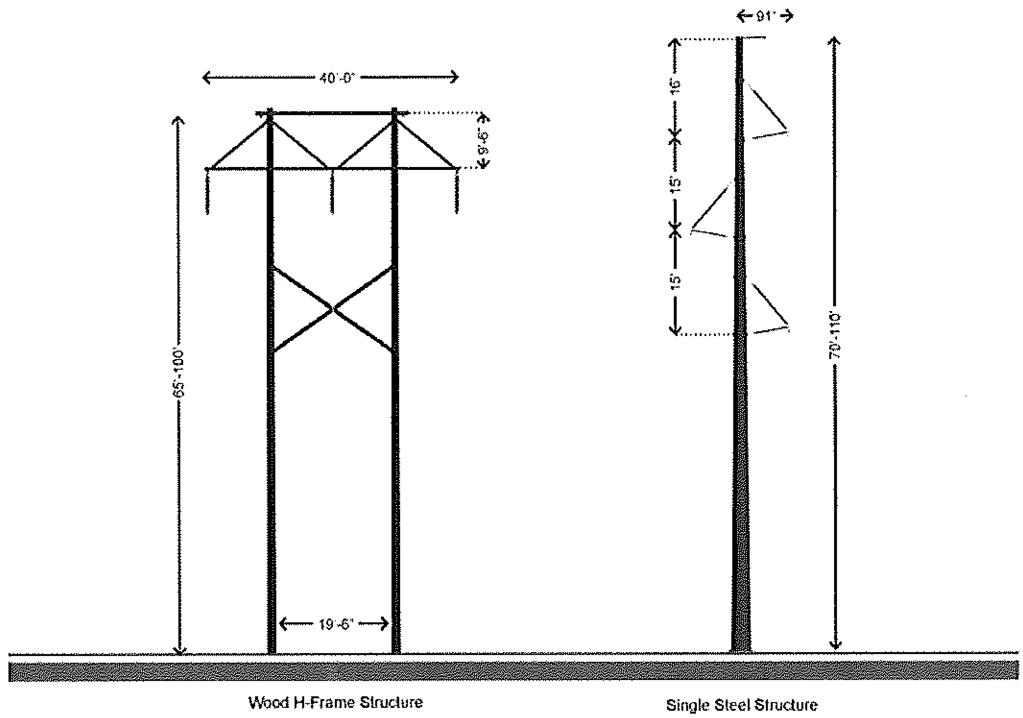


Figure 2-2: Proposed 230-kV Transmission Structures

This page intentionally left blank.

3.0 Alternative Evaluation

3.1 Alternatives Considered

In the sections below, the "no action" alternative, and alternatives that address each aspect of the purpose and need described for the Project are discussed. As mentioned above, the most critical need is to improve the reliability of the electrical service to the San Luis Valley via SLVREC. Each alternative that meets this purpose and need is also explored for its ability to improve the reliability of service for SIEA, SDCEA, and to support renewable energy development in the San Luis Valley.

The types of energy loads on the SLVREC system during peak energy demand is presented in Table 3-1. The peak loads are primarily related to the large amount of agricultural irrigation in the valley.

Table 3-1:
San Luis Valley Peak Loads

Load Type	SLVREC (%)
Agricultural Pumping	82
Commercial	5
Heavy Industry	3
Residential	10
Total	100

The total energy requirements in the San Luis Valley (approximately 120 MW in 2007) have remained steady since 1994. In addition, the types of load and the relative energy needs by type are much the same today. The largest loads are associated with agricultural pumping (i.e., irrigation) during the summer months. Figure 3-1 shows the peak loads during summer 2007.

The 2007 load duration curve in Figure 1-1 shows that during approximately 38 percent of the year (3,300 hours per year), the load varied from 30 to 50 MW. During approximately 39 percent of the year (3,450 hours), the load varied between 50 and 65 MW. For the remainder of the year (approximately 2,010 hours), the loads exceeded 65 MW and varied from 65 to more than 120 MW (Figure 3-1). During these 2,010 hours per year, the region was at risk of voltage collapse. Some of this risk could be mitigated by Xcel's operation of the Alamosa Terminal Generation Facility; however, during approximately 40 hours in 2007, the loads in the San Luis Valley exceeded 111 MW. At that load, the risk of voltage collapse exists even with the Alamosa Terminal Generation Facility in operation. The loads during 2007 are not representative of a "worst case" year. The combined peak loads in the San Luis Valley have exceeded 140 MW in the past and, based on the historic 2.5 percent growth rate, have been projected to exceed 170 MW by 2015.

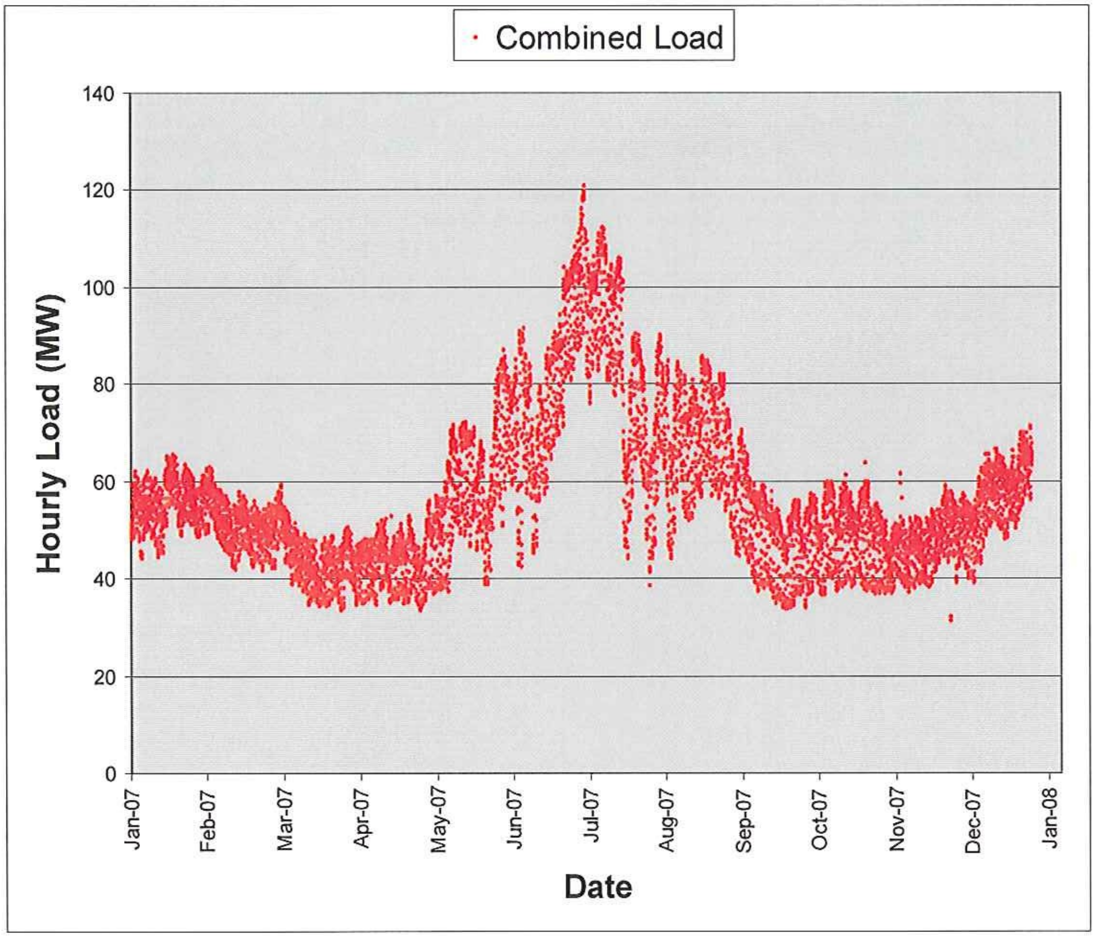


Figure 3-1: Hourly Loads

System problems associated with low voltage, high voltage, or facility overload can often be mitigated with relatively minor system additions. However, the potential for voltage collapse, as is being experienced in the San Luis Valley, is more severe and indicates the maximum capability of the system is being exceeded. Fundamentally, for the system to be able to avoid a voltage collapse in the event of a single-contingency outage, the San Luis Valley requires one or more of the following to be accomplished:

1. More generation must be installed in the San Luis Valley to offset the loads—This option is discussed further in Section 3.1.2 below.
2. Peak loads in the San Luis Valley must be reduced—This option is discussed further in Section 3.1.3 below.
3. More transmission capacity must be built to serve the SLVREC—This option is discussed further in Section 3.1.4 below.

3.1.1 No Action Alternative

If no action is taken to address the potential for voltage collapse in the San Luis Valley, the problem is expected to get worse. The loads in the San Luis Valley have continued to grow, and the energy (megawatt hours [MWh]) of electrical use has continued to climb. There are more hours every year when the San Luis Valley is at risk of experiencing a voltage collapse.

There is a possibility that future development by others may help mitigate the potential for voltage collapse. The addition of generation capacity in San Luis Valley is one alternative that would help, and there are several renewable energy projects that are in the planning stage. If these projects were built and in operation, the potential for voltage collapse would be reduced. In addition, it is likely that in accordance with the intent of Colorado Senate Bill 07-100, new transmission lines capable of serving the renewable energy projects would be built into the San Luis Valley. If the proposed Project is not built, and new generation and transmission facilities are built by others, there is a potential that the energy supply to the San Luis Valley would be improved and the primary purpose and need would be met. However, projects involving new generation and transmission have not been identified in any other utilities' resource plans and there is no assurance they will be planned or built in time to address the needs of SLVREC. In addition, leaving this problem to solutions proposed by others may not yield the most cost-efficient solution, and does not meet Tri-States' obligations to its members.

3.1.2 Additional Generation Capacity

Normally, the San Luis Valley benefits from the ability to import low cost power and energy across the high voltage transmission system. In the event of a failure of a component within this system, approximately 65 MW are expected to continue to be imported across the existing transmission system. To prevent voltage collapse, local generation would need to serve the load above 65 MW. This local generation would either need to be operating at all times when the local load exceeded 65 MW, or would need to be able to start almost instantaneously to serve this load and prevent a voltage collapse. The alternatives available to the Project include all generation resources that are capable of cost-effectively operating approximately 1,500 hours per year or that are capable of operating fewer hours per year and having the ability to start rapidly and dependably to serve the local loads. The primary alternatives available for this type of service include combustion turbines and large diesel engines powering generator sets. Renewable energy sources like wind and solar are not suitable for this type of service; and may actually increase the need for additional transmission capacity as discussed in the purpose and need of this Project as described in Section 1.3.

According to a draft study completed by Tri-Tech Energy Services in 2007, the most economical choice for "emergency generation" in this size range would be simple cycle combustion turbine technology. Combustion turbines are offered in size ranges that could supply 100 MW of power using between one- to three-engine generator sets. The next most economical alternative would be diesel-fired internal combustion engines. However, for this size of installation, between 10 and 20 diesel-fired engine generator sets would be required; the number of generator sets could increase even more if the engines were fired on natural gas. This would add considerably to the complexity and cost of the Project.

Combustion turbines have relatively fast startup times. Currently, Tri-State's heavy frame General Electric (GE) 7EA units installed at the Limon and Knutson Generation Stations take about 30 minutes to reach full power from a cold start. The GE LM6000 aero derivative combustion turbines installed at Tri-State's Pyramid Station are faster and can achieve full power from a cold start in slightly more than 10 minutes.

The downside to combustion turbines in the San Luis Valley is the de-rate in engine output due to elevation. This does not affect the turbine-generator performance and efficiency; however, combustion turbines are mass throughput devices and lower density air at higher elevations impacts the available output capacity. Using an elevation in the San Luis Valley of 7,550 feet, the output of a combustion turbine would be approximately 25 percent less than if operating at sea level. As a result, a larger and more expensive turbine-generator set(s) would be required compared to a unit with the same capacity requirements operating at sea level.

As part of the study completed by Tri-Tech in 2007, a general estimate of the capital cost requirements for a 100-MW combustion turbine installation in the San Luis Valley was developed based on the following options:

- Two frame 7 EA units, 124-MW
- A single, heavy frame combustion turbine, Frame 7-EC, 88-MW
- Three LM 6000 sprint units (aero derivative), 104-MW
- Two frame 6 FA units, 106.5-MW
- For comparison, an estimate was based on generic generation costs provided in the Tri-State Integrated Resource Plan (IRP) (Tri-State 2007)

Each rating is based on summer conditions and elevation consistent with the San Luis Valley area.

The results from the five scenarios above are summarized in Table 3-2 below. It is expected that a 100-MW installation to serve emergency loads in the San Luis Valley would be in the range of $75 million, plus or minus 20 percent. A more detailed site selection, equipment selection, and layout would further reduce this uncertainty band. In addition to the total capital cost for 100 MW, the study assumed $15 million to cover fixed operating and maintenance expenses, for a total cost in 2007 dollars of $90 million. This estimate does not include fuel-related expenses, major overhauls, or revenues associated with the production and sales of electricity.

Table 3-2:
Summary of Capacity and Equipment Scenarios for San Luis Valley Combustion Turbine Installation

Equipment Configuration	2X GE 7EA	1x GE 7-EC	3x GE LM 6000 Sprint	2x GE 6 FA	Tri-State IRP
Equipment Type	Heavy Frame	Heavy Frame	Aero derivative	Heavy Frame	Heavy Frame
Summer Capacity in San Luis Valley, MW	124	88	104	106.5	100
Cost per KW (Dual Fuel)	$774	$697	$832	$774	N/A
Total Installed Cost (Dual Fuel)	$95,976,000	$61,336,000	$86,528,000	$82,431,000	N/A
Cost per kW (Nat. Gas only)	$697	$627	$749	$697	$784
Total Installed Cost (Nat. Gas Only)[1]	$86,378,400	$55,202,400	$77,875,200	$74,187,900	$78,400,000

[1] All cost estimates are based on 2007 dollars.

Based on this analysis, the capital cost of adding local generation in the San Luis Valley would be more than double the expected capital cost of building a 230-kV transmission line.

Although the option of installing emergency backup generation would substantially reduce the risk of a voltage collapse, an allowance for forced outages must be considered. The "availability" of this type of generation is defined as the percentage of time a unit is available for operation, and not in "forced" or unplanned outage repair status. Based on information from the manufactures, reliability and availability estimates of 98 percent and 95 percent, respectively, are reasonable for these units and represent best management practices. This implies that, even when properly operated and maintained, the emergency generation would not be available during approximately 400 hours per year because of unplanned events. In addition, this option would not improve the system for SIEA and surrounding areas. This generation resource could supply energy to the SIEA system only if a transmission line was built between San Luis Valley and Walsenburg. The San Luis Valley–Walsenburg line is evaluated as an alternative for this Project in Section 3.1.4.1. Similarly, additional generation installed in the San Luis Valley would not increase the capacity of the transmission system to serve the potential renewable energy developments in the San Luis Valley.

3.1.3 Demand Side Management

Another option available to reduce or prevent the risk of voltage collapse in the San Luis Valley is to reduce the peak energy demand. As described above, the critical risk exists when the electrical demand exceeds 65 MW; this level of demand is currently exceeded more than 20 percent of the time (2,010 hours per year in 2007).

As can be seen from aerial photos of the San Luis Valley (Figure 3-2), irrigation has become an integral part of the agricultural development in this region. Agricultural production techniques have been monitored closely and irrigation methods specifically have been carefully reviewed to maximize crop production effectiveness. Weather and water requirements are carefully monitored to maximize the effectiveness of the water application and to minimize water loss. In addition, since 1985, Tri-State (through their member cooperatives SLVREC, SIEA, and SDCEA) has been offering financial assistance toward the purchase of high-efficiency motors and pumps to reduce the electrical demand. The SLVREC website (http://www.slvrec.com) provides access to an online energy library and specific information regarding the green power options offered by Tri-State and SLVREC. The cooperatives have had the Energy Efficiency Credits (EEC) Program in place for more than 20 years. This program provides cash rebates to encourage and reward energy-efficient purchases and practices. Through the EEC Program, Tri-State and the Tri-State member cooperatives have already reduced demand by approximately 30 MW (over the entire system) and saved approximately 35,000 MWh of energy.

An alternative to centralized generation and distribution of electrical energy is the installation of distributed generation. Distributed generation is built on the concept of installing generation at or near the point of use. Solar, wind, or other alternative types of generation could be installed by the end user to meet specific needs. Residential loads, for example, can be reduced with the application of small solar or wind energy systems. This would tend to reduce the loads in the San Luis Valley; it would also reduce the maximum coincident peak (MCP) and result in reduced risk of voltage collapse (or subsequently less need for this Project). Irrigation loads, for example, represent a scheduled load and are not a good candidate for solar- or wind-generated power; however, this need could be met with some type of generator located near one or more of the irrigation pumps. Typically, this would need to be powered by gasoline or diesel engines to be available when irrigation was required. The owners and operators of irrigation systems currently have the option of installing local generation; however, the electric cooperative's obligation is to serve the member loads with the best option based on economic and environmental choices. As described in Section 3.1.2 above, there are economic benefits associated with more centralized generation. Although alternative energy resources may already be reducing some of the load growth in the region, to date, alternative generation has not offset a significant portion of the existing load. Load growth in the area continues to be positive.

In summary, programs have already been implemented that are designed to be compatible with the primary loads experienced on the member systems. These programs are effective in promoting energy conservation. They have been in place for more than 20 years and have already been successful in helping to minimize the energy used in the San Luis Valley and to minimize the MCP load. The major factor contributing to the increasing summer MCP is the irrigation loads. Based on the growing residential loads combined with the amount of irrigation in the San Luis Valley, it is unrealistic to expect that peak loads can be cost-effectively reduced below 65 MW by either aggressive load management or through more aggressive energy conservation.

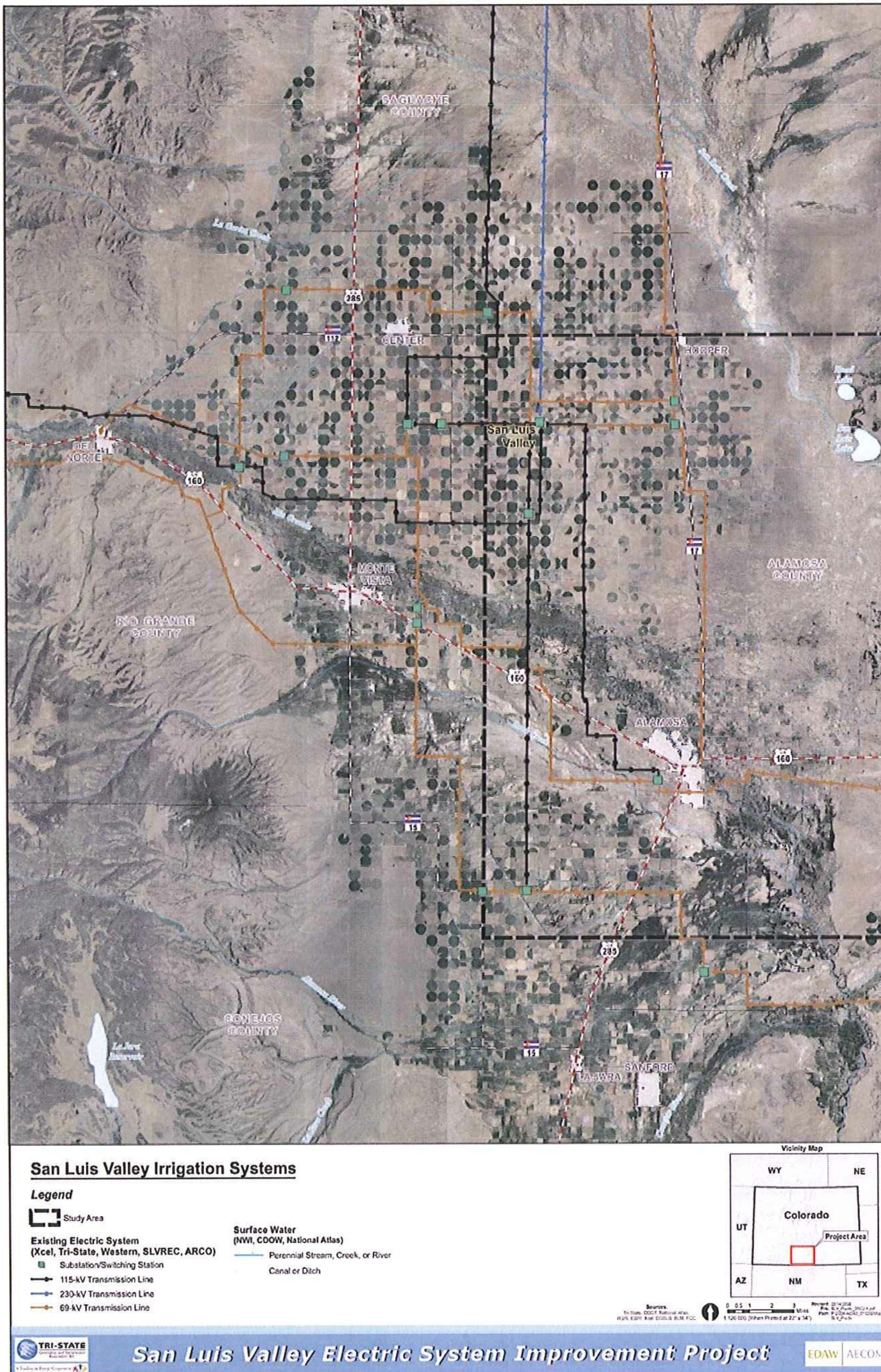


Figure 3-2 - San Luis Valley Irrigation System

3.1.4 Additional Transmission Capacity

In the 1997 Tri-State study (McElvain 1997), both the 115-kV and 230-kV options were investigated. The results of this investigation indicated that another 115-kV line into the San Luis Valley is not sufficient to mitigate the voltage collapse. The critical single-contingency scenario is the loss of the 230-kV feed to the San Luis Valley; a second 115-kV line would not have the capacity to compensate for this contingency.

The 1997 study concluded that the addition of a new 230-kV transmission line could be effective in preventing a potential single-contingency voltage collapse in the valley. Several variations involving a 230-kV line were investigated. As the loads in the San Luis Valley continued to grow, it became necessary to re-evaluate the alternatives that would address the potential voltage collapse issues. The evaluation of alternatives that began in 2004 built upon the conclusions that were reached in the 1997 report and are discussed below.

A list of the transmission alternatives that were evaluated is provided in Table 3-3. The study comparing the alternatives was based on a 2003 heavy summer load case developed by Western Electricity Coordinating Council (WECC) with the already planned Gladstone–Walsenburg 230-kV line added (this line is now in service). Other assumptions used for comparison of the alternative options included the Alamosa Terminal Generation Facility being off-line and the loads in the San Luis Valley varying from 50 MW to the maximum for each alternative being investigated. The relative geographical locations of the alternative interconnection points that were considered are shown in Figure 3-3.

Table 3-3:
Transmission Line Alternatives

Alternative Connection Points	Voltage Collapse Limits (MW)		Estimated Length of New Line (Miles)
	Normal	Single Contingency Outage	
Existing	220	65	0
Cotopaxi	267	206	75
Midway	280	200	110
Penrose	276	202	95
Comanche	294	220	95
Walsenburg	286	206	75
Gladstone	263	138	180
Taos	267	164	100
Llaves	270	172	125
San Juan	264	159	170
Hesperus	266	169	130
Lost Canyon	263	161	155
Stoner	267	168	150
Lone Cone	267	169	150
Cerro	269	183	120
Montrose	268	171	135
Curecanti	272	192	110

Alternative Connection Points	Voltage Collapse Limits (MW)		Estimated Length of New Line (Miles)
	Normal	Single Contingency Outage	
Parlin	268	205	75
Monarch	261	208	70
Poncha-Sargent	235	178	65
San Luis Valley Static Var Concentrator	280	129	6

Potential 230-kV interconnections were identified in basically every direction from the San Luis Valley substation. Each potential interconnection was evaluated for its point-of-collapse in system normal conditions and during the outage of the most critical single-contingency condition. Three of the alternatives considered (the existing system, a connection at Gladstone, and the San Luis Valley to Static Var Concentrator [SVC] connection), would not be able to serve 150 MW of load in the valley during a single-contingency outage. This is the primary need for the Project, and each of the alternatives having single-contingency limits below 150 MW were eliminated from further consideration.

Each alternative able to satisfy the primary needs of the Project was then evaluated based for cost. The cost estimate for each line was developed using the unit costs for attributes associated with each line as shown in Table 3-4.

Table 3-4:
Unit Costs

Attribute	Cost[1]
230 kV (per mile)	$400,000
345 kV (per mile)	$500,000
230 kV Circuit Breaker	$719,000
345 kV Circuit Breaker	$1,133,000
115 kV Circuit Breaker	$466,000
345/230 kV Transformer Cost	$2,123,000
230/115 kV Transformer Cost	$927,000
New Substation Fixed Cost	$1,000,000
115 kV Removal (per mile)	$10,000
SVC Fixed Cost	$1,000,000
SVC Variable Cost (per MVAr)	$40,000
Capacitor Cost (per MVAr)	$40,000

Source: McElvain (2004)

[1] The costs presented in this table were estimated in 2004; current costs are likely to be higher.

The distance or length for each line was estimated based on "straight line" distance, and does not account for additional line length and other costs that would be required to avoid constraints, optimize the line route, and avoid or mitigate environmental impacts. Because each line that could meet the needs of the Project exceeded 70 miles in length, the cost of

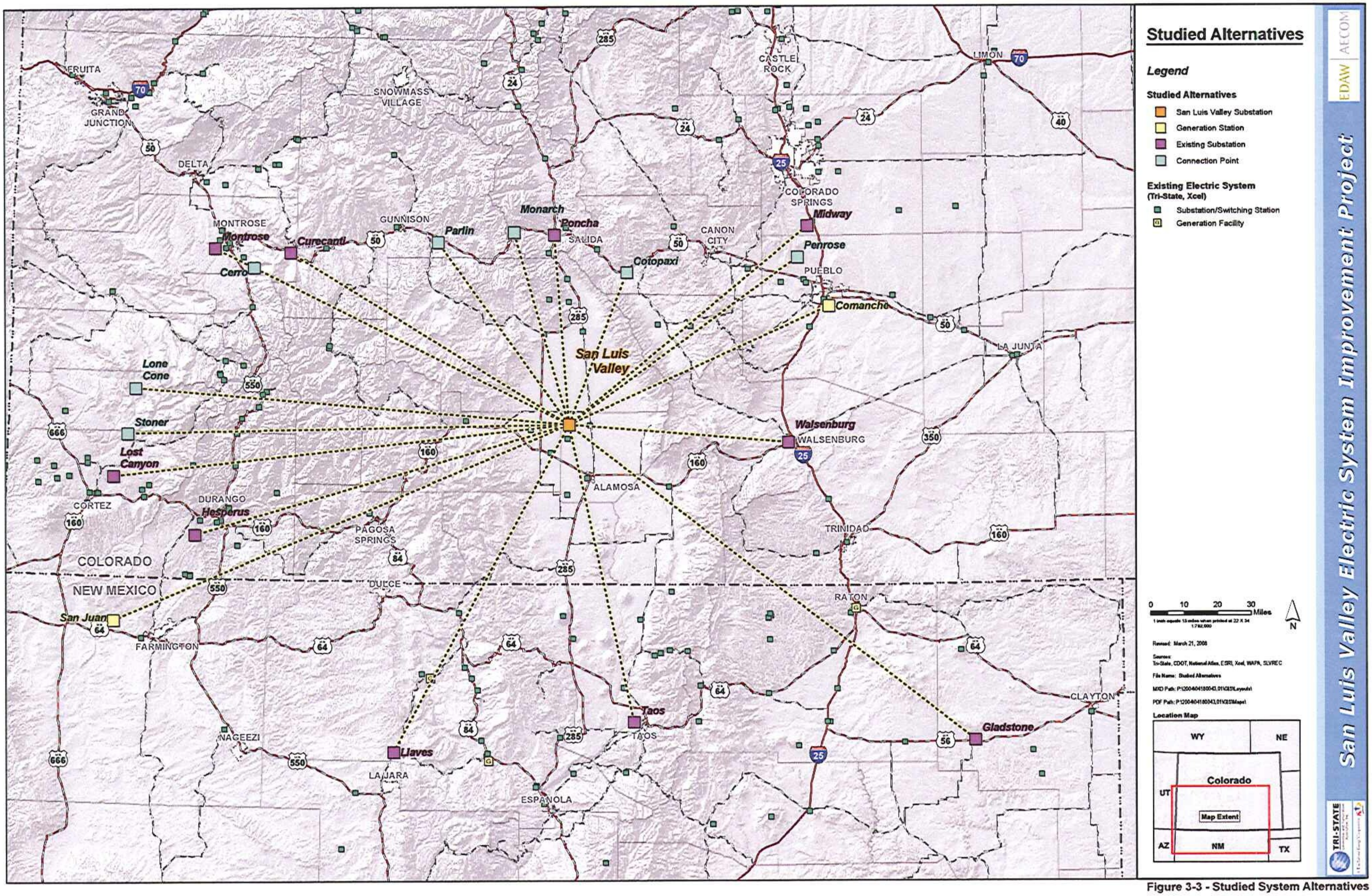


Figure 3-3 - Studied System Alternatives

the line itself becomes the most significant part of the cost estimate. It is expected that the final cost for each alternative would be greater than the cost estimate determined using the straight-line assumption; however, this assumption is reasonable for a comparison of one alternative to another.

Each of the studied alternatives was ranked from best to worst in capital dollars required per megawatt of increased load serving capability during the most critical single-contingency outage. The results of this ranking are presented in Table 3-5. Based on the technical and economic results of this study, the San Luis Valley–Walsenburg 230-kV Transmission Line is the best alternative for meeting the needs of the Project. This alternative results in the lowest investment of $208,000 per megawatt of increased single-contingency load serving capability. It provides an incremental single contingency load-serving capability of 206 MW, which is third best of all the alternatives considered. Further, the San Luis Valley–Walsenburg 230-kV line would strengthen the Walsenburg Substation, resulting in improved electrical support to member systems in southeastern Colorado. As an additional benefit, the modifications will provide a path to the north-south "Front Range" transmission system that will increase the ability for energy projects that are proposed in the San Luis Valley to provide renewable energy to major markets.

Table 3-5:
Ranking of Alternative 230-kV Options

Rank	Point of Connection to San Luis Valley	Single Contingency Load Serving Capability (MW)	Incremental Increase in single Contingency Line capacity (MW)	Cost per MW ($)
1	Walsenburg	206	144	$ 208,333
2	Monarch	208	146	$ 240,000
3	Comanche	220	158	$ 250,000
4	Cotopaxi	206	144	$ 257,282
5	Parlin	205	143	$ 259,088
6	Poncha Sargent	178	116	$ 291,186
7	Penrose	202	140	$ 322,007
8	Midway	200	138	$ 330,458
9	Curecanti	192	130	$ 350,873
10	Cerro	183	121	$ 430,506
11	Taos	164	102	$ 462,660
12	Llaves	172	110	$ 511,041
13	Hesperus	169	107	$ 526,075
14	Montrose	171	109	$ 534,811
15	Lone Cone	169	107	$ 639,587
16	Lost Canyon	161	99	$ 644,041
17	Stoner	168	106	$ 645,649
18	San Juan	159	159	$ 719,565

3.1.4.1 Feasibility Analysis of Selected Transmission Alternatives

With the exception of the Comanche Transmission Line alternative, the top four alternative interconnection points and the Taos interconnection point were selected for further feasibility analysis as follows:

- Walsenburg
- Monarch/Poncha
- Cotopaxi
- Parlin
- Taos

The preferred and four alternatives were selected based on the results of the cost data (presented above) and consideration of some of the major routing obstacles and planning objectives. The Monarch/Poncha interconnection points are geographically close enough to warrant investigation as one line. The alternative to interconnect at Comanche (third lowest in the cost evaluation) was eliminated from this analysis because the routing of a line between Comanche and the San Luis Valley would most likely avoid crossing the existing Sangre de Cristo mountain range by following a route near either Walsenburg or Poncha. Because both of these alternatives were already being evaluated, the option to build a line to Comanche did not offer significant benefits. The interconnection at Taos was included for further evaluation because of the "long-term" planning objectives to strengthen the interconnection between Colorado and New Mexico and the potential benefits of interconnecting to energy resources in that direction.

The feasibility analysis included reviews of how the lines would operate electrically based on the current power flows and a review of the route for "fatal flaws." The "fatal flaw" analysis included a review of the following factors:

- Land Jurisdiction—Land ownership factors that may influence the routing of a transmission line include Federal Land Management agencies, state- and federal-designated wildlife areas, U.S. Department of Defense property, lands owned by Native American tribes, National Parks, and lands with special designation or protection.
- Natural Resources—Wetlands, rivers and streams, soils of concern, and steep slopes may influence the routing of a transmission line.
- Biological Resources—Designated wildlife habitat, endangered and threatened species presence or habitat, and potential conservation areas may influence the routing of a transmission line.
- Cultural Resources—Areas designated on the National Register of Historic Places may influence the routing of a transmission line.
- Land Use—Proximity to airports, schools, parks, residential areas, communication facilities, oil and gas wells, prime farmland, and pivot irrigation may influence the routing of a transmission line.

This analysis indicated that although there were advantages and disadvantages associated with each of the alternatives evaluated, there were no fatal flaws identified for any of the alternative interconnection points. The performance of the system electrically was similar for the interconnection points at Parlin, Monarch/Poncha, and Cotopaxi. Each of these interconnections are influenced by the overall power transfer capability across the total of the transmission (TOT-5) or WECC Path 39. The Curecanti–Poncha 230-kV Transmission Line is 1 of the 10 transmission lines that cross the Continental Divide and connect western Colorado to the Front Range. Platte River Power Authority, Xcel, Western Area Power Administration (Western) and Tri-State own percentages of the transfer capability. Western is the path operator. This path (TOT-5) is often heavily loaded with power flowing from the west to the east, and the power transfer capacity of the path is limited thermally. The two existing lines currently serving the San Luis Valley interconnect to this line, and providing additional power or energy into the San Luis Valley from the Curecanti—Poncha Transmission Line would add complexity to the load flows and potentially affect the thermal limits of the lines. Providing power supply to the San Luis Valley from lines involved with TOT-5 is possible, but not preferred.

The Taos interconnection point would offer a significantly different power flow situation. Further review of this interconnection point revealed that the prevailing flow for most of the year is toward the southwest. Construction of a new transmission line from northwestern New Mexico to southeastern Colorado would be influenced by this flow. To counter the tendency for the energy to flow to the southwest, a phase-shifting transformer would need to be installed at the Taos Substation. In total, the additional cost for this equipment is estimated to be approximately $24 million and includes two 200-million volt-amps (MVA), 230-kV phase-shifting transformers, and a 345/230-kV transformer at Taos, plus shunt capacitors that would need to be installed on the San Luis Valley 115-kV system. This option initially ranked 11th from a cost-effectiveness standpoint; however, this additional cost would change the ranking to 17th (out of 18) on a dollar per megawatt basis.

A line from San Luis Valley to Walsenburg would also offer a benefit by significantly increasing the potential to transmit power out of the San Luis Valley. If renewable energy resources were developed, the energy produced would first displace energy being transferred into the San Luis Valley to serve local loads. After the local loads are met, the additional energy could be transferred out of the valley, up to the capacity of the available transmission system. Xcel has indicated that the existing transmission system has the capacity to transfer 200 MW of energy out of the San Luis Valley.

By convention, the transfer capacity of a transmission line is referred to as MVA. This is similar to the capacity of the line as MW, except that it includes the reactive power (called MVAr), or line losses, that will be incurred. The line losses have not been determined for this Project and involve a detailed study that is specific to the type of generation and size and configuration of the conductor, and requires additional assumptions to be made. Knowing that a new 230-kV line would add approximately 613 MVA during normal operation means that something less than approximately 600 MW of capacity could be served. Typically, energy transfer capacity takes into account the "worst case" single contingency outage. Currently, the "worst case" single-contingency outage would be the loss of the existing joint Tri-State/Xcel 230-kV line. With the Tri-State–Xcel line out of service, the capacity (as indicated by Xcel) of approximately 200 MW is achieved by the existing 115-kV line plus the local area loads. Adding a new 230-kV line (such as the San Luis Valley–Walsenburg Transmission Line) would increase the capacity (based on the existing 230-kV line) to approximately 324 MVA (or approximately 300 MW of capacity). After a new line is installed and operating, there would be a potential opportunity to rebuild the existing line with a larger conductor. This action has the potential to increase the capability to approximately 600 MVA.

3.2 Preferred Transmission System Alternative

A new 230-kV transmission line from the San Luis Valley Substation to the Walsenburg Substation is the best alternative to provide the necessary power and energy to the San Luis Valley to prevent voltage collapse. The addition of this line will also improve the ability to reliably serve the loads within the SIEA and SDCEA systems. This line would also increase the capacity to export additional power and energy from the San Luis Valley and serve a portion of the planned renewable energy development in the valley.

3.3 Underground Construction

Underground construction of transmission lines is often perceived as a way to accomplish the electrical objective of the Project while minimizing visual impacts. However, there would be significant cost, technological, and environmental ramifications associated with underground construction of the transmission line.

Underground construction is frequently used with distribution lines that operate at 25 kV or less. At these relatively low voltages, the problems of electrically insulating each phase and of dissipating the heat generated by the conductors are not a concern. With lines of greater voltage, such as the proposed Project, the material costs, construction costs, and the heating of the cable all become a greater concern.

By far the greatest factor to consider when evaluating overhead versus underground transmission is cost. Experience shows that costs for constructing 230-kV underground transmission lines are approximately 10 times higher than an equivalent overhead line. Costs could be even higher in mountainous terrain.

The reliability of underground lines is comparable to overhead lines. Although underground lines are immune to the effects of weather or lightning, the duration of an outage on an underground line can be weeks because failures are more difficult to locate and repair. An overhead line can be repaired relatively quickly by Tri-State maintenance crews with standard line materials. An underground line repair would have to be done by skilled contract personnel who may or may not be available. The repair of a failed underground splice or termination would take a significantly greater amount of time during which the circuit would not be available to support loads.

The environmental impacts of underground transmission lines differ from those of overhead lines, and, consequently, the siting considerations also differ. The impacts of underground transmission lines on soils, surface water, vegetation, and wildlife resources are likely to be far greater than those of a similarly located overhead line. This is because any underground technology used would require continuous trench 4 feet wide by 5 feet deep with intermediate vaults 7 feet wide by 20 feet long every 2,000 to 2,400 feet.

Given the prohibitive cost, coupled with repair and maintenance issues and higher environmental impact levels, burying any segment of the transmission line is not considered a viable alternative.

This page intentionally left blank.

4.0 Macro Corridor Study

The purpose of the MCS was to identify alternative transmission line corridors between the existing Walsenburg Substation in Huerfano County, Colorado, and the existing San Luis Valley Substation in Alamosa County, Colorado. These identified corridors will provide flexibility to identify a preferred and alternative route for the transmission line while minimizing impacts to important resources identified within the Project study area. The sections below describe the process that was used to identify preliminary alternative transmission line corridors.

For the San Luis Valley Electric System Improvement Project, five distinct phases were identified as follows:

- Phase 1—Definition of the Study Area
- Phase 2—Resource Data Collection and Evaluation
- Phase 3—Opportunities and Constraints Analysis
- Phase 4—Corridor Identification
- Phase 5—Future Tasks including Public Involvement, Route Identification and Comparative Analysis, local land use applications, and NEPA documentation

Phases 1 through 4 are a part of this MCS, while Phase 5 will be the focus of future routing activities and NEPA documentation. Results of each phase are described in more detail in the following sections.

4.1 Definition of the Study Area

The first step in the MCS process involved identifying the study area in which the proposed project would be located. The extent of the study area is determined primarily by the purpose and need for the project and the electric system requirements and components that are needed to best meet the purpose and need. As described in the AE (Section 3.0), studies by Tri-State's Power System Planning Department determined that a new 230-kV transmission line from the San Luis Valley Substation to the Walsenburg Substation offered the best way to meet the purpose and need for the Project. The study area was then identified based on boundaries that provide enough area to offer multiple feasible and reasonably direct corridor alternatives. As shown in Figure 2-1, the study area includes portions of the following Colorado counties: Alamosa, Conejos, Costilla, Huerfano, Las Animas, and Rio Grande.

4.2 Resource Data Collection and Evaluation

The second phase of the MCS involved collecting resource data within the study area from management agencies and state and local governments. Resource data obtained from municipalities, counties, state agencies, and utilities were used to prepare Geographic Information System (GIS) resource maps and included the following resource categories:

- Land Use and Ownership
- Existing Linear Transportation and Utility Corridors
- Water Resources
- Cultural Resources
- Biological Resources
- Geology and Soils

All data collected reflect existing data readily available from the resource and local, state, and federal agencies. No new field data were collected within the Project study area to support the opportunities and constraints analysis.

The resource data were mapped in GIS format and combined with aerial photography to enable the identification of suitable areas for routing the new 230-kV transmission line. As described below, each environmental resource was categorized as an opportunity (suitable area), an avoidance area, or an exclusion area in the GIS opportunity and constraint model. The following sections describe in more detail each set of resource data that was collected as part of this analysis. Resource maps referenced in this section appear at the end of the document in Appendix A.

4.3 Opportunities and Constraints Analysis

Project opportunity and constraint criteria were selected based on resources and Project study area characteristics that provided favorable or unfavorable attributes for locating the transmission line. The criteria classifications include opportunity, avoidance, and exclusion areas associated with each selected resource. Table 4-1 lists the opportunity and constraint criteria that were developed for this Project.

To assist in identification of preliminary alternative corridors, the GIS data for each resource were categorized based on the opportunity or constraint and a GIS-based model was developed to map the areas of opportunity and constraint. The degree of opportunity and constraint is based on the character of the resource, i.e., linear or site specific, natural or human, native or disturbed, and the proximity of the transmission line to the resource. Corridor segments were primarily identified based on areas of greatest opportunity that usually followed existing transportation or utility corridors. Corridors are generally 1 mile in width. Some corridor segments are greater than 1 mile wide to allow for incorporation of more than one opportunity feature. In some cases, areas of avoidance or exclusion fall within the identified corridors; however, the corridor width generally allows enough flexibility to identify routes that will avoid most constraints.

**Table 4-1:
Project Opportunity and Constraint Criteria**

Resource	Opportunity Area (Optimize Use for Routing)	Avoidance Area (Minimize Use for Routing)	Exclusion Area (Exclude for Routing When Possible)
Land Use and Jurisdiction			
Land Use	Rangeland or agriculture; industrial or commercial	—	Incorporated and unincorporated municipal boundaries (except area 100 feet on either side of an existing transmission line), pivots used for irrigation
Residential Areas	—	Within 500 feet of an occupied residence	Within 100 feet of an occupied residence
Airports	—	—	Within approach/departure surface of a public airport runway
Communication/Radio Towers (Federal Communications Commission [FCC] structures)	—	Within 150 feet of FCC structure	Within 50 feet of FCC structure
Oil and Gas Wells	—	—	Within 50 feet of well
School, Parks, Recreation Areas	—	Within 0.25 miles	Within 100 feet
Jurisdiction	—	—	Within boundary of formally designated state lands (conservation areas, state parks, State Wildlife Areas, etc.) and federal Areas of Critical Environmental Concern, wilderness areas, national parks/landmarks/monuments, inventoried roadless areas, National Land Trust, Colorado stewardship-trust lands
Natural Heritage Program Potential Conservation Areas	—	Within boundary	—
Existing Transportation and Utility Corridors			
Roads (interstate, state, county)	Within 0.25 miles of road	Within 0.25 miles of scenic byway (except area 100 feet on either side of an existing transmission line)	—
Railroads	Within 0.25 miles of railroad	—	—
Transmission Lines	Within 0.50 miles of existing transmission line (230 kV, 115 kV, 69 kV)	—	—

Resource	Opportunity Area (Optimize Use for Routing)	Avoidance Area (Minimize Use for Routing)	Exclusion Area (Exclude for Routing When Possible)
Water Resources			
Surface Water	—	Within 0.125 miles of lakes and perennial streams	Within 100 feet of lakes and perennial streams
Canals	Within 100 feet of a canal	—	—
Wetlands	—	Within boundary	—
Cultural Resources			
National Register Historic Places	—	Within 0.125 miles	Within 100 feet
Biological Resources			
Big Game (elk, mule deer, pronghorn)	—	Production areas	—
Bald Eagle	—	Winter concentration	Within 0.50 miles of nest sites and roosting sites
Burrowing Owl	—	Within black-tailed prairie dog communities	—
Sandhill cranes and other migratory birds	—	—	Within National Wildlife Refuges

Avoidance areas included sensitive areas that were 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 for locating the transmission line. 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.

Figure 4-1 illustrates those areas identified as opportunities, avoidance areas, and exclusion areas based on the route selection criteria and resource data gathered. Based on this analysis, several corridor segments were identified as opportunities for locating the Project despite the large number of avoidance and exclusion areas within the study area (Figure 4-2). Though some avoidance and exclusion areas overlap with the identified corridors, the minimum width of corridors is 1 mile, generally allowing enough flexibility to avoid such areas in future routing phases. The following sections describe each of the opportunity and constraint criteria in greater detail.

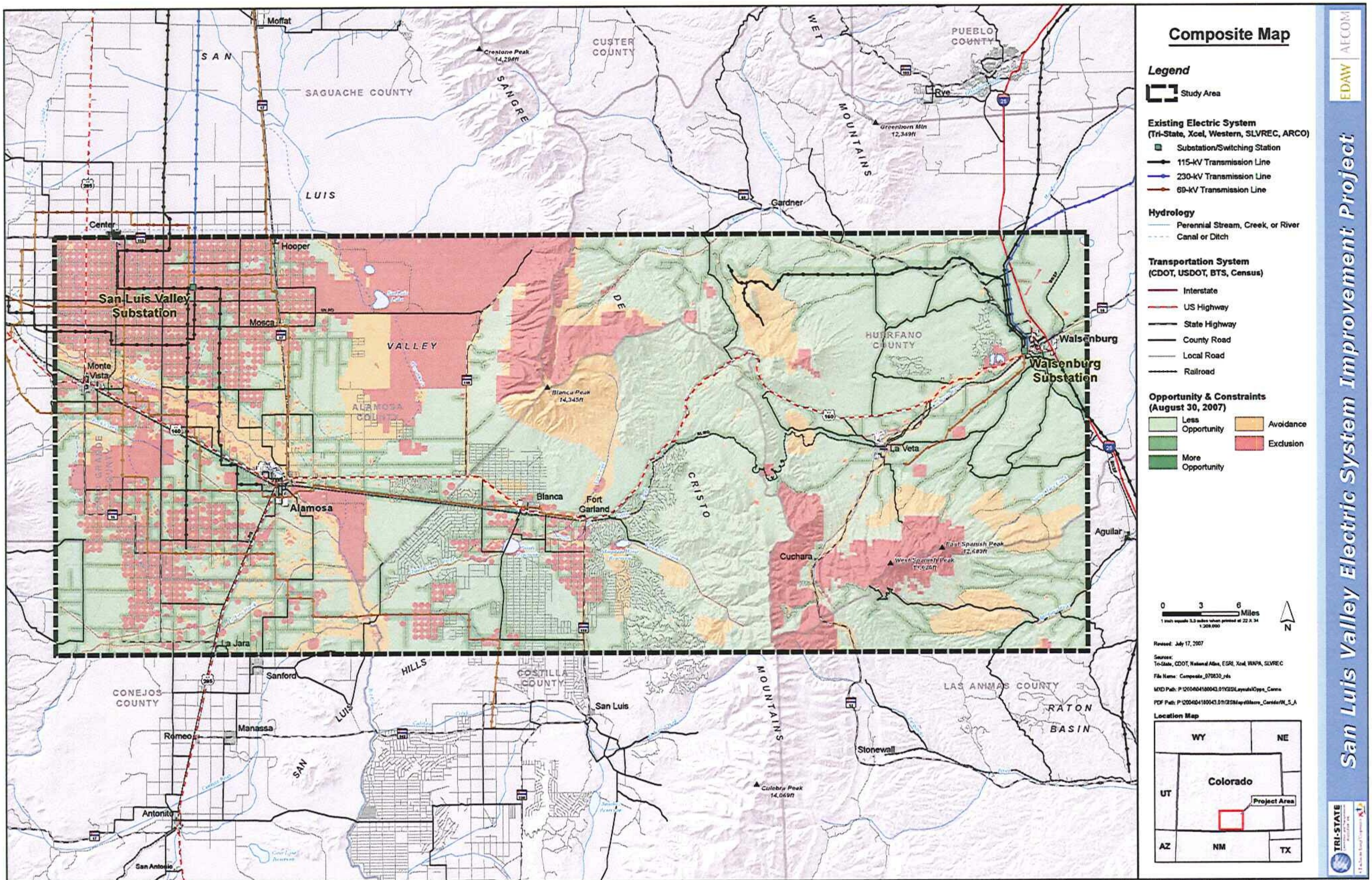


Figure 4-1 - Composite Map Showing Opportunities and Constraints

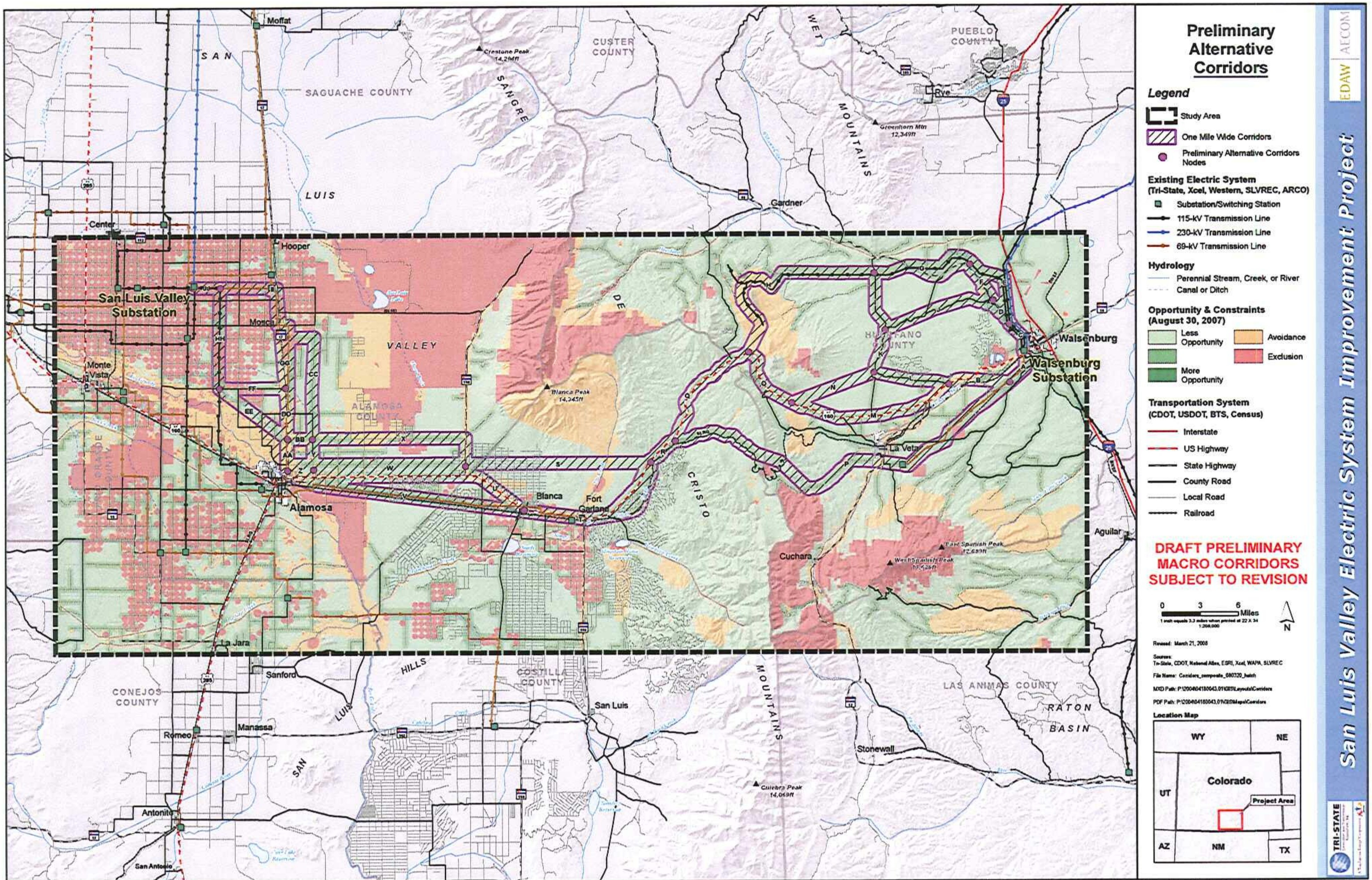


Figure 4-2 - Composite Map Showing Preliminary Alternative Corridors

4.3.1 Land Use and Ownership

Land use and land cover data were obtained from the U.S. Geological Survey (USGS) National Land Cover Dataset (NLCD) (2000). Land cover describes general land use categories rather than specific designations. For instance, the term "developed" is used to describe residential and commercial uses. Figure A-1 shows the distribution of land uses in the Project study area. The categories shrubland, grassland/herbaceous, and evergreen forest constitute the majority of the Project study area. Land use categories such as agriculture, rangeland, industrial and commercial are considered opportune areas for routing the transmission line.

4.3.1.1 Jurisdiction

Data on land ownership were gathered from the Colorado State Land Board, Colorado State University, and the U.S. Department of the Interior National Atlas (National Atlas) as shown in Figure A-2. Approximately 80 percent of the land in the Project study area is privately owned. The Bureau of Land Management has jurisdiction over several parcels in the Project study area, primarily in the north, near the Atlantic Richfield Company (ARCO) 115-kV transmission line in Huerfano County and west of the Sangre de Cristo Wilderness. U.S. Forest Service Lands, including the Cuchara Valley Roadless Area, are located along the eastern slopes of the Sangre de Cristo Mountains, along with parcels in the northern regions of Alamosa County. The state of Colorado has jurisdiction over several thousand acres in the Project study area, many of which are stewardship-trust lands.

Wilderness areas include the Spanish Peaks Wilderness, just east of Cuchara, and the Sangre De Cristo Wilderness, which sits on the border of Huerfano and Alamosa counties. The Great Sand Dunes National Park and Preserve extends into the northern part of the Project study area.

Several State Wildlife Areas (SWAs) are also present in the study area. The Lathrop SWA is located immediately west of the Walsenburg Substation along U.S. Highway 160 (U.S. 160), and the Huerfano SWA runs along the Huerfano River. The Rio Grande, Home Lake, and Higel SWAs are all situated east of Monte Vista, along the Rio Grande. Additionally, the Playa Blanca SWA is located west of Alamosa, and the Blanca SWA is located west of the Closed Basin Canal, between State Highway (SH) 150 and SH 17. The Smith Reservoir SWA and Mountain Home Reservoir SWA are located along Trinchera Creek, south of Fort Garland. The U.S. Fish and Wildlife Service (USFWS) has jurisdiction over the Alamosa National Wildlife Reserve, located east of Alamosa, and the Monte Vista National Wildlife Reserve, located south of Monte Vista.

Exclusion and avoidance areas are identified in Table 4-1. To the extent feasible, corridors were located outside of municipal boundaries. Areas within boundaries of formally designated state lands, such as conservation areas, wilderness areas, state parks, and SWAs were considered exclusion areas, as were national parks, national landmarks, and national monuments. Finally, parcels owned by the National Land Trust, Colorado Stewardship Land

Trust, and inventoried roadless areas were also excluded from potential locations for the Project.

4.3.1.2 Agriculture

Agricultural uses are largely present in the western half of the Project study area. Pivot irrigation use is heavily concentrated in the northwestern corner of the Project study area, in the area west of Alamosa, and in the areas south of Fort Garland and Blanca. The categories of pasture/hay and row crops are also present in limited locales throughout the study area, particularly along the Rio Grande and south of Alamosa.

Data regarding regions of prime farmland were provided by the Natural Resource Conservation Service Soil Survey Geographic Database (SSURGO) data. As shown in Figure A-3, farmland of unique importance covers the northwestern corner of the Project study area, continuing south towards Alamosa and east towards Blanca. There is also a considerable amount of prime farmland in the southwestern corner of the Project study area. Agricultural areas with center pivot irrigation were also excluded to the extent feasible, although transmission lines could be routed along the edges of irrigated fields in the vicinity of the San Luis Valley Substation.

4.3.1.3 Residences and Residential Areas

Subdivision and land ownership data were collected from Costilla County and the San Luis Valley GIS/GPS Authority. The larger residential areas and subdivisions are mainly associated with the towns of Blanca, Alamosa, Fort Garland, and La Veta as shown in Figure A-4. The Forbes Trinchera Ranch Subdivision is roughly estimated to occupy 78,678 acres in Costilla County. Subdivisions are also present in limited areas throughout Huerfano and Alamosa counties.

Individual homes and other structures within the potential corridors have been digitized to aid in the routing of the transmission line. Areas within 100 feet of an occupied residence were designated as exclusion areas and areas within 500 feet of an occupied residence will be avoided during routing whenever possible. Although some residences are located within the identified corridor segments, generally, the width of the identified corridors should allow for flexibility and avoidance of residences.

4.3.1.4 Airports

Information on airports was obtained from the Bureau of Transportation Statistics (BTS). Five public and two private airports are located within the Project study area as shown in Figure A-5. The Spanish Peaks Airport is located north of Walsenburg. The Cuchara Valley at La Veta Airport is located near SH 12 and the city of La Veta, and the Blanca Airport is located south of Blanca. The San Luis Valley Regional/Bergman Field Airport is situated just south of Alamosa, and the Monte Vista Municipal Airport is located along U.S. 160, between Monte Vista and Alamosa. There are two private airports in the Project study area, the Van

Treese Airport and the McCullough Airport, both located south of the San Luis Valley Substation.

The Federal Aviation Administration regulates the proximity of tall structures to approach and departure zones associated with airport runways. Areas within 10,000 feet of a public airport and 5,000 feet of a private airport were therefore excluded from potential locations for the Project to maintain ample clearance for aircraft.

4.3.1.5 Communication and Radio Towers

The Federal Communications Commission (FCC) provided the locations of communication facilities within the Project study area. Communication facilities include television transmission towers, microwave towers, and cellular telephone towers (FCC 2005). These towers are primarily concentrated in and around Alamosa, Blanca, Walsenburg, and Monte Vista; a few isolated towers exist in other parts of the Project study area. The Project will follow all FCC regulations regarding the locations of transmission structures near communication towers. Areas within 50 feet of a communications facility will be excluded and areas within 150 feet of a communications facility were avoided to the extent feasible. The locations of existing communication towers are shown in Figure A-6.

4.3.1.6 Oil and Gas Wells

Data concerning the locations of oil and gas wells were obtained from the Colorado Oil and Gas Conservation Commission. Oil and gas well sites occur primarily in Huerfano County, south of the Walsenburg Substation, and in Las Animas County, along the southeastern border of the Project study area. The wells in Las Animas County are associated with the Raton Basin. A smaller concentration of oil and gas wells are situated along the branching ends of the 115-kV transmission line owned by ARCO. The ARCO transmission line provides power to these wells. The areas within 50 feet of an oil or gas well were designated as exclusion areas. These features are shown in Figure A-7.

4.3.1.7 Schools, Parks, and Recreation Areas

The Census Bureau (2000) provided data on the locations of parks, schools, and campgrounds. To augment Census Bureau data, additional campgrounds and recreational areas within the study area were digitized from regional maps. Because municipal areas were avoided, schools within municipal boundaries were not mapped; however, a number of rural schools were mapped that were identified in the Census Bureau data.

According to the Census Bureau data, there are six campgrounds located in the Project study area. The Great Sand Dunes Oasis is located on the western slope of the Sangre de Cristo Mountains, just off SH 150. The Ute Creek RV Park is situated in Fort Garland, along U.S. 160 and Ute Creek. The Circle the Wagons Square Dance Resort is located in the town of La Veta. The Yucca Campground, Pinon Campground, and Country Host RV Park are located near Walsenburg. In addition, the Census Bureau has identified five parks/other campgrounds in the Project study area. These include the Pinyon Flats Campground, located in Great Sand Dunes National Park; the Santa Fe Trail Council Camp (Spanish Peaks Scout Ranch) and Wahatoya Camp, which are located north of the Spanish Peaks; and Mallet Vega Camp and McCarty Cow Camp, located south of La Veta Pass. Schools, parks, campgrounds, and other recreational areas are shown in Figure A-8. The areas within 100 feet of schools, parks, and recreations areas were designated exclusion areas and areas within 0.25 miles of these features were designated avoidance areas.

4.3.1.8 Natural Heritage Program Potential Conservation Areas

Information pertaining to Potential Conservation Areas (PCAs) in the Project study area was provided by the Colorado Natural Heritage Program (CNHP). PCAs are established using the CNHP's best estimate of the primary area required to support the long-term survival of sensitive plant and wildlife species or natural communities. There are two potential conservation areas within the Project study area: the San Luis Valley Playa Lake PCA and the Sangre de Cristo PCA. The San Luis Playa Lake PCA is located in the northern valley portion of the Project study area and covers approximately 61,145 acres. Similarly, the Sangre de Cristo PCA area enters the Project study area through the northern border and includes the Sangre de Cristo Wilderness and parts of Forbes Trinchera Ranch, covering 67,963 acres. Areas within the boundary of a PCA will be avoided to the extent feasible during routing. These features are shown in Figure A-9.

4.3.2 Existing Linear Transportation and Utility Corridors

Existing linear facilities and ROWs can provide suitable opportunities for routing new transmission lines. For this Project, roads, railroads, and transmission lines were identified and mapped as possible opportunities (see Figures A-5 and A-10). The Colorado Department of Transportation (CDOT) provided road data and BTS provided information on the locations of railroads in the study area.

Locating a transmission line along these linear features may result in fewer environmental impacts because of the existing disturbance and relatively easy access to the ROW. A general description of these transportation features is presented below.

4.3.2.1 Roads

There are several opportunities for routing the transmission line along existing roadways within the Project study area. There are relatively few roads in the western (mountainous) portion of the study area, while the lower portion of the San Luis Valley has a fairly extensive roadway network that includes local roads and state highways. The main highways in the study area are described below.

U.S. Highway 160 traverses the Project study area in an east-west direction, passing through the towns of Fort Garland, Blanca, Alamosa, and Monte Vista. SH 12 branches off U.S. 160 northeast of La Veta and travels south through Cuchara and into the Raton Basin.

From Fort Garland, SH 159 heads south towards the town of San Luis, which lies outside the Project study area. SH 150 splits off U.S. 160 west of Blanca, and heads north to the Great Sand Dunes National Park.

SH 17 and U.S. 285 traverse the study area from north to south. U.S. 285 enters Monte Vista from the north, travels southeast to Alamosa (as U.S. 285/160), and continues south out of the study area. SH 17 travels south through the towns of Hooper and Mosca and joins U.S. 285 in Alamosa and continues south through La Jara and Romeo to Antonito, where it turns to the west. Of these roads, U.S. 160 and SH 17 appear to provide the best opportunities for routing the proposed transmission line.

Within the study area, portions of U.S. 160, SH 12 (Highway of Legends), SH 159, SH 150, and SH 17 are designated as scenic byways. Areas within 0.25 miles of a scenic byway will be avoided to the extent feasible, unless an existing transmission line parallels the roadway.

4.3.2.2 Railroads

The San Luis & Rio Grande Railroad (SLRG) operates in the Project study area and provides a potential opportunity for routing the transmission line within a railroad corridor. The SLRG travels in an east-west direction roughly parallel to U.S. 160. The SLRG rail line begins from a connection with the Union Pacific Railroad near Walsenburg Substation and travels to Alamosa, where it splits, with a branch extending south along U.S. 285. The other branch continues northwest along U.S. 160, passing the city of Monte Vista. At Monte Vista, the SLRG connects with the San Luis Central Railroad and travels to the town of Center. For the purposes of this MCS, areas within 0.25 miles of the railroad line are considered opportunity areas.

4.3.2.3 Transmission Lines

Existing transmission lines may provide opportunities for routing the new line within or adjacent to an existing ROW. Using or paralleling the ROWs of existing lines could potentially reduce impacts associated with construction and operation and maintenance of the line. However, it may not be possible to parallel certain existing transmission lines for reasons of system reliability. Specific assessment should be conducted to determine whether the reliability of the electric system would be jeopardized by placing the new transmission line in proximity to an existing line. The potential risk is that both lines could be taken out of service by an accident or severe weather.

Several utility companies provided information regarding the location of transmission lines, including ARCO, San Luis Valley Rural Electric Cooperative, Tri-State, Xcel, and Western. There are a number of opportunities for locating the Project within 0.50 miles of existing transmission lines in the Project study area as shown in Figure A-10. Xcel operates one 69-kV transmission line between Alamosa and the Mosca Substation, and 69-kV transmission line that runs between the Alamosa Substation and the Home Lake Substation. This 69-kV transmission line continues to the Rio Grande Substation, which lies just outside of the Project study area.

A 115-kV transmission line owned by ARCO begins at the Walsenburg Substation and travels north and then west for about 35 miles. SLVREC operates one 69-kV transmission line that enters the southern border of the study area in Costilla County and heads northwest to the Stockade, Waverly, and Carmel Substations. Tri-State and Xcel operate a 230-kV transmission line that enters the northwestern region of the Project study area and ends at the San Luis Valley Substation.

Tri-State also operates a 115-kV transmission line in the eastern portion of the study area and a 115-kV transmission line in the western portion of the study area. The eastern line enters the eastern border of the Project study area, to the Walsenburg Substation, and continues north out of the study area. The second transmission line runs from the Plaza Substation through the Stanley Substation and south to the Waverly Substation. A 230-kV transmission line owned by Tri-State begins at the Walsenburg Substation and proceeds north and then east. San Isabel Electric Association operates a 69-kV transmission line that begins at the Walsenburg Substation and travels southwest, ending at the Spanish Peak Substation near La Veta.

4.3.3 Water Resources

4.3.3.1 Surface Water and Wetlands

Data on streams, creeks, rivers, canals, and ditches were collected from the Colorado Division of Wildlife (CDOW's 24K network) and the Colorado Division of Water Resources. The Rio Grande and Rock Creek travel parallel to one another, entering from the western boundary of the Project study area and continuing south. Trinchera Creek enters the Project study area through the southern border, east of La Jara, and splits into Ute Creek and Sangre de Cristo Creek. The Cuchara River flows near the Walsenburg Substation, heading south along SH 12 through La Veta. The Huerfano River flows north from the Sangre de Cristo Wilderness area and travels eastward near the northern border of the study area.

The National Wetlands Inventory (NWI) and the National Atlas provided information regarding wetland areas, lakes, reservoirs, canals, and ditches within the Project study area. Two reservoirs exist south of Fort Garland: Smith Reservoir and Mountain Home Reservoir. The San Luis Lake is located east of Mosca in the northern portion of the Project study area. Significant concentrations of wetlands occur along the Rio Grande and a number of wetlands are found within the Alamosa National Wildlife Refuge. A considerable number of wetlands are also found along Rock Creek in the Monte Vista National Wildlife Refuge. Wetlands surveys will be conducted prior to construction so that the transmission line can be routed to minimize impacts to these resources.

Generally, wetlands and surface waters can be avoided through careful pole placement and spanning the transmission line across wetland areas. The maximum distance that can be spanned is approximately 1,100 feet. To prevent construction-related disturbance, such as erosion, sedimentation, and potential water quality impacts, areas within 100 feet of lakes and perennial streams were considered exclusion areas, and areas within 0.125 miles of these features will be avoided to the extent feasible during routing. In addition, structure placement within wetland areas will be avoided when possible. Surface water and wetland features within the Project study area are shown in Figure A-11.

4.3.3.2 Canals

A number of canals are located within the Project study area, particularly in the valley portion of the study area. Named canal features include the Closed Basin Canal, Prairie Ditch, South Lateral, San Luis Valley Ditch, and Lateral 1C. Areas within 100 feet of a canal may provide routing opportunities depending on the width of the available ROW. When the transmission line needs to cross a canal, the canal would be spanned during construction.

4.3.4 Cultural and Historic Resources

The National Register of Historic Places provided information relating to historic sites and regions as shown in Figure A-12. Approximately 20 historic sites exist within the Project study area based on available information. Both Alamosa and Monte Vista have six historic sites each. Additionally, the La Jara Depot is located in the town of La Jara, and Pike's Stockade is situated just east of La Jara, along the Conejos River. Two sites, the Superintendent's Residence at Great Sand Dunes National Park and the Zapata Ranch Headquarters, are located in the northeast portion of Alamosa County. The Francisco Plaza is situated in the city of La Veta, and La Veta Pass Narrow Gauge Railroad Depot is located just south of La Veta Pass. In addition, the Huerfano County courthouse and jail is located just east of the Walsenburg Substation, and the Maitland Arroyo Bridge site is located northwest of the city of Walsenburg, along SH-69.

The areas within 100 feet of historic districts and regions were designated as exclusion areas. During routing, areas within 0.125 miles of historic sites will be avoided to the extent feasible.

4.3.5 Biological Resources

4.3.5.1 Vegetation and Wildlife

Vegetation

The Project study area contains a variety of vegetation/habitat types, including coniferous forest/mixed woodland, plains/foothills grassland, sand dunes, subalpine/alpine meadow, wetlands, riparian, shrub, aspen forest, and sagebrush communities. Other portions of the Project study area are dominated by agricultural land uses and urban development (see Figure A-13).

Wildlife

The Project study area includes habitat for a variety of terrestrial and aquatic species including bald eagles, greater Sandhill cranes, black bears, elk, lynx, mule deer, and pronghorn. Habitats were included in the opportunity and constraints model based on the best available data. These habitats included bald eagle nest sites, communal roost sites, winter concentration habitat, Sandhill crane concentration areas, prairie dog colonies, and pronghorn and elk production areas. Bald eagles and burrowing owls are discussed further under Special Status Species.

Information pertaining to elk *(Cervus elaphus)* habitat in the Project study area was provided by CDOW (2005) and includes winter concentration, production areas, severe winter range, and migration corridors. The majority of elk habitat within the Project study area is associated with the Sangre De Cristo mountain range and the valleys adjacent to the mountains. Severe winter range is the primary habitat for elk within the Project study area, occurring along the eastern portion of the study area in Rio Grande County, in the northern parts of Alamosa and Huerfano counties, south of Blanca, and east of La Veta. Production areas and winter concentration sites are scattered throughout the Project study area. CDOW has identified a migration corridor in the southeastern corner of the Project study area, near the Apishapa River. The elk habitat described above is shown in Figure A-14. Elk production areas were designated as avoidance areas for purposes of the MCS.

CDOW data (2005) show the Project study area contains mule deer *(Odocoileus hemionus)* and pronghorn (*Antilocarpa americana*) habitat. Mule deer habitat found in the Project study area includes severe winter range, concentration areas, and winter concentration areas. Severe winter range constitutes the majority of mule deer habitat in the Project study area. Severe winter range covers the northeastern region of the Project study area and stretches to the south. Severe winter range is also found at the western base of the Sangre de Cristo Mountain Range as well as near the western border of the Project study area, including portions of the Rio Grande. Pronghorn habitat found within the Project study area includes severe winter concentration and winter concentration. Severe winter concentrations are found along the western boundary of the Project study area in Rio Grande County. There are six winter concentration areas scattered throughout the Project study area. Mule deer and pronghorn production areas will be avoided to the extent feasible during routing.

CDOW data show the Project study area also contains summer concentration, fall concentration, and both summer and fall concentrations habitats for black bear (*Ursus americanus*). The majority of the black bear habitat in the Project study area is associated with the Sangre de Cristo Mountains.

The greater Sandhill crane *(Grus canadensis)* is a state species of concern. During migration, greater Sandhill cranes gather on mudflats around reservoirs, in moist meadows, and in agricultural areas (NDIS 2007). According to USFWS, approximately 23,000–27,000 Sandhill cranes migrate biannually through the San Luis Valley (USFWS 2007b). In spring, cranes arrive mid-February and most are gone by mid-April. Peak migration is usually mid-March (during the annual Monte Vista Crane Festival). During fall migration, Sandhill cranes arrive in early September and leave by mid-November. Peak migration usually occurs around mid-October. The majority of the Sandhill cranes are found on the Alamosa/Monte Vista National Wildlife Refuge, although others may migrate and stopover within other portions of the Project study area. To protect sensitive habitat for this species and other species in the valley, National Wildlife Refuges were designated as exclusion areas.

4.3.5.2 Threatened, Endangered and Special Status Species

Federal Species of Concern

Federally threatened species are those species, subspecies, or varieties likely to become endangered within the foreseeable future throughout all or a significant portion of their range. Federally endangered species are those species, subspecies, or varieties already in danger of extinction throughout all or a significant portion of their range. Federally threatened and endangered species are listed in the Federal Register. Federal candidate species, subspecies, or varieties are those species being considered for listing as endangered or threatened, but for which a proposed regulation has not yet been published in the Federal Register. Species listed as threatened and endangered that may occur within the counties included in the Project study area include Mexican spotted owl (*Strix occidentalis lucida*), southwestern willow flycatcher (*Empidonax traillii extimus*), boreal toad (*Bufo boreas boreas*), whooping crane (*Grus americana*), the candidate yellow-billed cuckoo (*Coccyzus americanus*), and the Canada lynx (*Lynx canadensis*).

CDOW (2005) provided information on lynx habitat and potential habitat areas. Potential lynx habitat within the Project study area includes the higher elevations along the entire length of the Sangre de Cristo Mountains. Additional areas of potential habitat include the Cuchara Valley, the Sangre de Cristo Wilderness, and parts of the Spanish Peaks Wilderness. Given the extent of the lynx habitat found within the Project study area, it was not included as an avoidance or exclusion for the MCS.

Electronic resource data for the other threatened and endangered species were not available at the time this MCS was completed. Habitat and occurrences of these additional species will be assessed in greater detail once alternative alignments have been selected. Tri-State will work with CDOW and USFWS throughout the routing process to minimize impacts on threatened and endangered species and their habitats.

State Species of Concern

CDOW is responsible for enforcement of the state threatened and endangered species statute in Colorado. Many of the species on the state list are also protected on a federal level. Information on the state-threatened burrowing owl and bald eagle were included in the MCS because existing data were readily available.

Burrowing Owl

Burrowing owls (*Athene cunicularia*) are a state-threatened species in Colorado. Burrowing owls are known to inhabit abandoned burrows of small mammals, particularly prairie dogs. The Breeding Bird Atlas shows there are four occurrences of nesting burrowing owls in the San Luis Valley. Prairie dog colonies are designated as avoidance areas because they provide potential nesting habitat for the burrowing owl.

Bald Eagle

The bald eagle was de-listed from the Endangered Species Act on June 28, 2007, but is still protected under the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and under the Colorado's Threatened and Endangered Species statute. The bald eagle inhabits suitable habitat near reservoirs and rivers. CDOW (2005) provided information on bald eagle habitat in the Project study area. Within the Project study area, both winter concentrations and bald eagle roost sites are known to occur.

An important winter concentration area for bald eagles is located along the entire length of the Rio Grande within the Project study area. USFWS has recommended that potential corridors along the Rio Grande be eliminated from further consideration given the presence of this important habitat (USFWS 2007a). Winter concentration areas are also located along segments of Sangre de Cristo Creek, Ute Creek, Trinchera Creek, and La Jara Creek. Winter concentration areas are also found within Mountain Home Reservoir, in a smaller area north of Blanca, along the Closed Basin Canal in the Blanca Wildlife Habitat Area of Critical Environmental Concern, two areas situated just south of Rock Creek in Rio Grande County, and one site in the very northwestern corner of the Project study area. There are five bald eagle roost sites within the Project study area. These roost sites are found along Ute Creek, Sangre De Cristo Creek, adjacent to SH 150 immediately west of the Sangre de Cristo Mountain range in Alamosa County, and along sections of the Rio Grande and Conejos rivers. These habitats are shown in Figure A-15. Areas within 0.50 miles of a bald eagle nest or communal roost site were designated as exclusion areas and will be avoided during routing to the greatest extent feasible. Winter concentration areas would be avoided to the greatest extent feasible.

During the selection of route alternatives, additional information will be collected regarding federal and state listed and sensitive species.

4.4 Corridor Identification

Identification of the alternative corridors is a detailed process that includes reviewing resource data, identifying routing opportunities and constraints, and consulting with local jurisdictions and public agencies. The opportunities and constraints analysis map was used to identify a number of preliminary alternative corridors as shown in Figure 4-2. The corridors were divided into segments that begin and end at logical termini or where one segment branches off from another segment. A description of each of the segments is presented below in Table 4-2.

Table 4-2
San Luis Valley Electric System Improvement Project Corridor Segment Descriptions

Segment	Opportunity Along Existing Transportation Corridor	Opportunity Along Existing Transmission Line	General Description	Special Considerations
A		SIEA 69-kV transmission line to Walsenburg Substation.	3 miles; grasslands; private land.	
B	Opportunity to locate along U.S. Highway 160 in western portion and along SLRG railroad in eastern portion of segment.		4.8 miles; grasslands; private land.	Provides a corridor between SIEA 69-kV transmission line to U.S. Highway 160 and provides alternative to routing south to La Veta. This portion of U.S. Highway 160 is a Scenic Byway. Crosses northern end of subdivision and the Cucharas River.
C		North from Walsenburg Substation along the ARCO 115-kV and Tri-State 115-kV and 230-kV transmission lines.	2.6 miles; grasslands; private land.	Provides opportunity to make use of existing utility corridor with multiple existing lines.
D	Along BNSF railroad and SH 69.		2.3 miles; grasslands; private land and state land.	Historic bridge; small area of subdivision; abandoned railroad grade.
E		Along the ARCO 115-kV and Tri-State 115-kV and 230-kV transmission lines.	6.6 miles; grasslands; private land.	Provides opportunities for location within an existing utility corridor.
F	Follows SH 69 and BNSF railroad.	Follows ARCO 115-kV transmission line.	3.4 miles; grasslands; private land.	Some residences within corridor.
G	Along SH 69.	Along ARCO 115-kV transmission line.	7.6 miles; grasslands; private land and some state land.	Small amount of elk winter habitat and subdivision present within corridor.
H		Follows ARCO 115-kV transmission line.	17.4 miles; grasslands, shrublands, and forest; private, state, and BLM lands.	Elk habitat and subdivision within corridor; provides opportunity for location within an existing utility corridor.
I	Follows Huerfano CR 520.		4.7 miles; mostly grasslands; mostly private land and some state land.	Corridor within elk severe winter range.
J	Follows Huerfano CR 521.		9 miles; mostly grasslands; private land; provides an alternative to the ARCO 115-kV transmission line corridor.	

Segment	Opportunity Along Existing Transportation Corridor	Opportunity Along Existing Transmission Line	General Description	Special Considerations
K	Follows Huerfano CR 520.		3.5 miles; mostly grasslands; private and state land.	Segment within elk winter habitat.
L	Follows Huerfano CR 510.		6 miles; mostly grasslands; private land; alternative to the U.S. Highway 160 corridor.	Small portion of subdivision within corridor.
M	Follows U.S. Highway 160 for 13.3 miles.		13.3 miles; mostly grasslands; mostly private land and some state land.	Segment within a Scenic Byway and elk winter habitat. Small portion of subdivision within corridor.
N			6.9 miles; grasslands and shrublands; mostly private land and some state land; connection between Huerfano CR 510 with U.S. Highway 160 and segments I/E and M.	Subdivision and elk winter habitat within corridor.
O	Along U.S. Highway 160.		5.5 miles forest, shrublands and grasslands; private land and BLM land.	Some elk habitat within corridor.
P	Follows Huerfano CR 421 for 4.3 miles and SLRG railroad for 7 miles to U.S. Highway 160.	Southwest along SIEA 69-kV transmission line for 10.7 miles to Spanish Peak Substation.	30.3 miles; mostly grasslands in eastern portion with some forest, mostly forested in western portion; majority private land with some USFS and state lands.	Encompasses portions of State Stewardship Lands and Inventoried Roadless Areas. Crosses large subdivision and elk severe winter range. Dense oil and gas development along eastern portion.
Q	Along U.S. Highway 160.		9.7 miles forest, grasslands and shrublands; private land.	Corridor runs along edge of subdivision and small area of elk habitat; proximity to Sangre de Cristo Creek.
R	Along U.S. Highway 160 and SLRG Railroad.		2.6 miles; grasslands and shrublands; private land.	Sangre de Cristo Creek, subdivision, and elk habitat within corridor.
S			14.6 miles; grasslands and shrublands; private land; provides an alternative to corridor segments along U.S. Highway 160.	Some elk and bald eagle habitat and subdivision present within corridor.

Segment	Opportunity Along Existing Transportation Corridor	Opportunity Along Existing Transmission Line	General Description	Special Considerations
T	Along U.S. Highway 160 and SLRG Railroad.	Along Xcel 69-kV transmission line in western portion.	12.5 miles; grasslands, shrublands, and agricultural; private land.	Subdivision, pivot irrigation, and elk habitat within corridor. Corridor includes portions of Fort Garland and Blanca. Historic districts located south of U.S. Highway 160 and along SH 159. Crosses Ute Creek and Sangre de Cristo Creek.
U	Along U.S. Highway 160, small portion along SH 150.		5.8 miles; grasslands and agricultural; private land.	Bald eagle habitat and subdivision within corridor. Scenic Byway along 160. Portion of Blanca within corridor.
V	Along SLRG railroad.	Along Xcel 69-kV transmission line.	19 miles; grasslands, shrublands, and agricultural; private, state, and USFWS lands.	Pivot irrigation, residences and subdivision, bald eagle habitat and USFWS refuge within corridor.
W	Along U.S. Highway 160 and Alamosa CR 6S.		12 miles; grasslands and shrublands; private, BLM, and state lands.	Subdivision present within corridor.
X	SH 150, Alamosa CR 4S.		14.3 miles; grasslands and shrublands; private and BLM lands.	Crosses Area of Critical Environmental Concern and Potential Conservation Area; bald eagle habitat; subdivision.
Y	Along Alamosa CR 112.		2.4 miles; grasslands and shrublands; private land.	Subdivision within corridor.
Z	Follows U.S. Highway 160.		2.1 miles; shrublands and agriculture.	Residences; bald eagle habitat present within corridor; proximity to Alamosa.
AA	Along CR 17.	Along Xcel 69-kV transmission line.	2.5 miles; shrublands and agriculture; private land.	Bald eagle habitat, Scenic Byway, and residences present within corridor; proximity to Alamosa.
BB	Along Alamosa CR 4S.		2 miles; shrublands; private land.	Residences present within corridor.
CC	Alamosa CR 4N, Alamosa CR 112.		10.3 miles; shrublands; private land and some state and BLM land.	Pivot irrigation, subdivision present within corridor.
DD	Along SH 17.	Along Xcel 69-kV transmission line.	4 miles; shrublands and agriculture; private land.	Subdivision; Scenic Byway; pivot irrigation within corridor.

Segment	Opportunity Along Existing Transportation Corridor	Opportunity Along Existing Transmission Line	General Description	Special Considerations
EE			6.7 miles; shrublands and agriculture; private land and small amount of state land; follows canal and connects to Xcel 115-kV transmission line.	Pivot irrigation; bald eagle habitat; residences.
FF	Along Stanley Road.		5.2 miles; shrublands and agriculture; private land and some state land.	Pivot irrigation; subdivision within corridor.
GG	Along SH 17.	Along Xcel 69-kV transmission line.	4 miles; shrublands and agriculture; private land.	Scenic Byway; subdivision; pivot irrigation within corridor.
HH		Along Xcel 115-kV transmission line.	8 miles; agriculture; private land.	Dense pivot irrigation; subdivision. Requires coordination with Xcel regarding parallel locating or double circuit.
II	SH 17, Alamosa CR 8N.	Xcel 69-kV transmission line.	8.3 miles; agriculture; private land.	Pivot irrigation; Scenic Byway; proximity to Mosca; residential present within corridor.
JJ	Along Alamosa CR 8N.	Along Xcel 69-kV and 115-kV transmission lines.	2.2 miles; agriculture; private land.	Dense pivot irrigation.

ARCO	Atlantic Richfield Company	SH	State Highway
BLM	U.S. Bureau of Land Management	SIEA	San Isabel Electric Association
BNSF	Burlington Northern Santa Fe	SLRG	San Luis and Rio Grande
CR	County Road	USFS	U.S. Forest Service
kV	Kilovolt		

4.5 Future Tasks

4.5.1 Route Identification and Comparative Analysis

Through a process that includes impact assessment and public and agency involvement, specific alternative routes within each of the corridors will be identified (Phase 5 of the siting process). This allows for the quantification of Project-related impacts associated with each route alternative. Potential routes that are identified will need to meet the Project objectives, which require that the routes:

- Connect both substations
- Maximize opportunities and minimize constraints and avoidance areas through more detailed analysis
- Are cost-effective

The route refinement process will involve assessing the environmental consequences that are expected as a result of implementation of the Project. Potential routes will be analyzed on a segment-by-segment basis using routing criteria developed through the public/agency consultation process. These criteria will expand upon the opportunity and constraints criteria used to identify preliminary corridors. For each of the routing criteria, segment impacts will be quantified to allow for easy comparison. Impacts associated with each of the route alternatives will then be totaled and a rank will be assigned to each route alternative with 1 representing the least impact and a higher number (depending on the number of alternatives considered) representing the most impact. An alternative's ranking will reflect the relative impact that a given route alternative has on resources compared to the impacts of the other alternatives. The total gives a relative indication of the overall impact each route alternative would have on the surrounding environment.

4.5.2 Field Reconnaissance and Identification of Route-Specific Constraints

Field reconnaissance will be conducted on the ground and by helicopter during the resource quantification and the route refinement process. Ultimately, a preferred and at least one alternative route will be selected for further analysis. These routes will be presented in a second series of public meetings and will be analyzed in detail in an Environmental Assessment (EA). The routes that are carried forward for final analysis will represent a rational balance between the need for reliable electric service, with potential environmental impacts, public acceptance, engineering considerations, economics, regulatory requirements, and land use.

Additional route-specific constraints will include identifying and mapping floodplains, soils, and slope that could influence routing decisions. These items are discussed in the following sections.

4.5.2.1 Floodplains

The 100-year floodplain delineation is typically used to define floodplain hazard areas. Local and state governments, as well as the Federal Emergency Management Agency (FEMA), strongly discourage development within floodplains. Floodplains can generally be spanned or avoided through careful pole placement. Once an alignment and alternatives are chosen, hardcopy FEMA floodplain maps would be analyzed to determine whether any floodplains are present.

4.5.2.2 Soils

Soil data were obtained from SSURGO. For the preliminary analysis of routing opportunities, data on the erosion potential of soils by water and wind were mapped, but were not included in the opportunities and constraints model because highly erodible soils are present throughout the study area and these data were not very useful in assisting with the identification of potential corridors. Data on soils will be included in the analysis once routes have been selected.

4.5.2.3 Slope

Slope was identified and mapped using the USGS National Elevation Dataset 30-meter Digital Elevation Model and the Spatial Analyst extension in ArcGIS 9.1. Slope in the Project study area ranges from zero to 85 percent. As shown in Figure A-16, the majority of the Project study area contains slope of less than 25 percent. Along the Sangre de Cristo Mountains, Cuchara Valley, the Sangre de Cristo Wilderness, and the Spanish Peaks Wilderness, the slope ranges from 25 percent to greater than 40 percent.

Slope may be classified as either an opportunity or a constraint depending on its degree and orientation. Opportunities associated with slope exist where landforms provide visual screening of the transmission line. In contrast, steep terrain is typically avoided or excluded during routing because constructing a transmission line and access roads on steep slopes could require complex engineering and may result in potential environmental impacts. For the preliminary analysis of routing opportunities, slope data were not included in the opportunities and constraints model. Slope data will be included in the next phase of routing.

4.5.3 Public and Stakeholder Involvement

Public and stakeholder involvement and Project communication will be integral to the evaluation of the identified corridors, the identification and refinement of routes, and the selection of a preferred and an alternative route for detailed environmental analysis. Information regarding the Project is available on Tri-State's website (www.tristategt.org) and is updated as progress occurs.

An expanded public involvement process will include public scoping workshops that will begin the formal NEPA process. At these workshops, hosted by RUS, Tri-State will present the preliminary corridors and routes to the public and solicit input regarding issues of concern. This will assist in refining those alternatives as well as determining the level of analysis necessary to address the issues relevant to the proposed Project alternatives. Public input will continue to be a part of the Project through the NEPA process and the development of the EA for the Project.

Stakeholders are those people and organizations that may be affected or have some interest in the Project. Potential stakeholders for this Project identified to date include the following entities:

- Businesses, residents, and property owners along the identified corridors
- U.S. Representative John Salazar
- Cities of Alamosa and Walsenburg
- Towns of La Veta, Fort Garland, and Blanca
- Counties of Alamosa, Conejos, Costilla, Huerfano, Las Animas, and Rio Grande
- San Luis Valley County Commissioners Association (Valley 6)
- Action 22, Inc.
- USFWS
- CDOW

- CDOT
- Alternative energy providers
- Homeowner associations

Presentations were given on September 24, 2007, to the Valley 6 Association and on December 12, 2007, to Action 22, Inc., a regional organization of southern Colorado stakeholders. A formal presentation, Planning for SLV Power Needs, also was given about the Project during the Southern Rocky Mountain Agricultural Conference on February 13, 2008.

Notification of public meetings will be sent to stakeholders and will be posted in local news media prior to the meetings. An email newsletter is also being developed for the Project that will be sent to officials of these key organizations and other interested individuals with project updates and background information.

As mentioned, meetings with affected counties occurred during the corridor identification process. This county outreach will continue throughout the remainder of the routing and NEPA processes.

4.5.4 Permit Applications

To comply with county land use requirements, land use permit applications will be submitted for the Project to Alamosa, Costilla, and Huerfano counties. Tri-State will work with county planning departments to submit individual county applications that demonstrate compliance with local land use planning policy and regulations. Permit applications also will contain supplementary information, such as a description of the Project, Project maps and graphics, construction methods and timing, and discussion of pertinent resources potentially affected by the Project and measures to minimize effects. The applications will be accompanied by one or more meetings with the counties, generally including a presentation and discussion during a county planning commission or board of commissioners meeting. These meetings will provide the public with additional opportunities to comment on the Project.

4.5.5 NEPA Process

As part of the environmental review for the Project, an EA will be prepared in accordance with NEPA, the Council on Environmental Quality implementing guidelines, and RUS Bulletins 1794A-601 and 1794A-603 guidance for preparation of EAs and public scoping. Specifically, the EA will include descriptions of the Project, the need for the Project, alternatives evaluated, the affected natural and human environments, potential environmental impacts, and recommended measures to mitigate anticipated impacts. Public scoping meetings are expected to be held in early to mid summer 2008 and continued outreach to Project stakeholders will occur as part of the EA process. Public comments received will be considered as part of the EA analysis, including recommendations for short- and long-term Project mitigation.

4.6 Meetings and Consultations Held to Date

Preliminary corridor information was presented to personnel from Huerfano County and Alamosa County commissioners at initial meetings held on October 9 and 10, 2007, respectively. Costilla County declined a meeting, but the county commissioners indicated they will address the Project through their normal application process.

A meeting was also held with USFWS at the Alamosa National Wildlife Refuge on October 22, 2007 (USFWS 2007a). Subsequent conversations occurred with both USFWS and CDOW representatives, and a meeting was held with CDOW staff on April 29, 2008, in Monte Vista. Comments from the county and agency representatives were collected and analyzed for consideration in revising and refining the alternative corridors. The comments from the counties focused on the need and schedule for the Project and no specific changes were made to the preliminary corridors. The counties did provide general guidance on permitting procedure. USFWS did recommend that corridor segment EE along the river west of Alamosa be removed from consideration given the quality of the habitat and the heavy use of the area by a variety of avian species. Corridors may be further refined in the public scoping process, but currently represent a solid base on which to proceed.

5.0 References Cited

CDOW (Colorado Division of Wildlife). 2005. GIS Data for Wildlife of Colorado.

FCC (Federal Communications Commission). 2005. Geographic Information Systems. http://wireless.fcc.gov/geographic/index.htm?job=licensing_database_extracts.

McElvain, F.R. 2004. *San Luis Valley Substation Second 230-kilovolt Source. PV Study Report.* Prepared on behalf of Tri-State Generation and Transmission Association, Inc. January.

———. 1997. *San Luis Valley High Voltage System Study Report.* Prepared on behalf of Tri-State Generation and Transmission Association, Inc., F. David Graeber & Associates, Public Service Company of Colorado, San Luis Valley Rural Electric Cooperative, Inc., and Western Area Power Administration. June.

NDIS (Natural Diversity Information Source). 2007. Greater Sandhill Crane Species Account. http://ndis.nrel.colostate.edu/wildlifespx.asp?SpCode=040701. Accessed on November 6, 2007.

Tri-State (Tri-State Generation and Transmission Association, Inc.). 2007. Integrated Resource Plan—Draft, January.

Tri-Tech Energy Services. 2007. Draft Cost Estimate of Generation Option for San Luis Valley, Colorado

USFWS (U.S. Fish & Wildlife Service). 2007a. Meeting notes from October 22, 2007. Attendees included Mike Blenden and Clarke Dirks (USFWS), Jim Clare (San Luis Valley Rural Electric Cooperative), and Nicole Korbe (Tri-State Generation and Transmission Association, Inc.) on October 22, 2007.

———. 2007b. Sandhill Cranes in the San Luis Valley. http://www.fws.gov/Alamosa/Cranes.html. Accessed on November 4, 2007.

Xcel (Xcel Energy). 2007. *Designation of Energy Resource Zones and Transmission Planning Report.* October 31.

THIS PAGE INTENTIONALLY LEFT BLANK.

Appendix A—Resource Maps

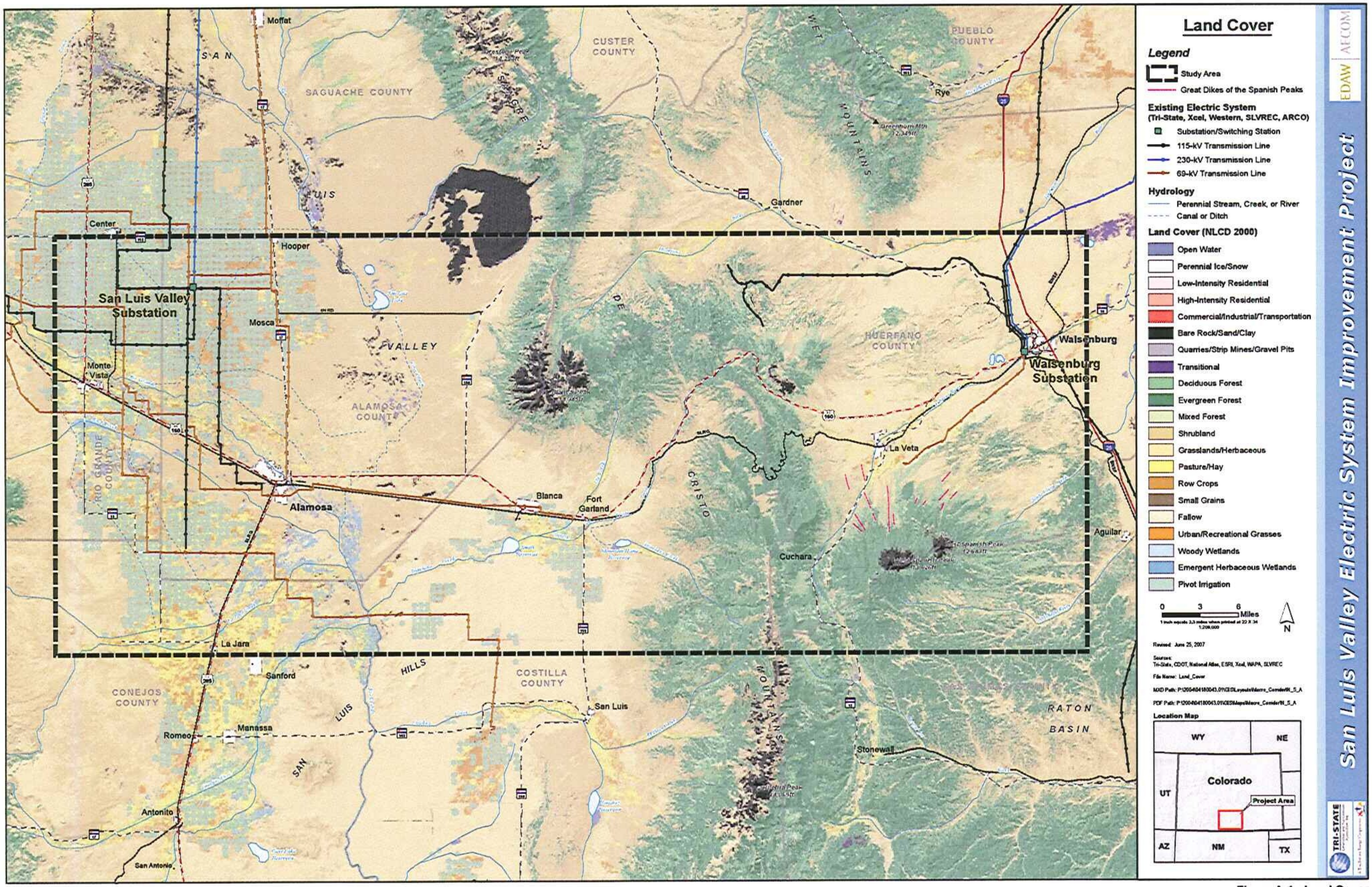


Figure A-1 - Land Cover

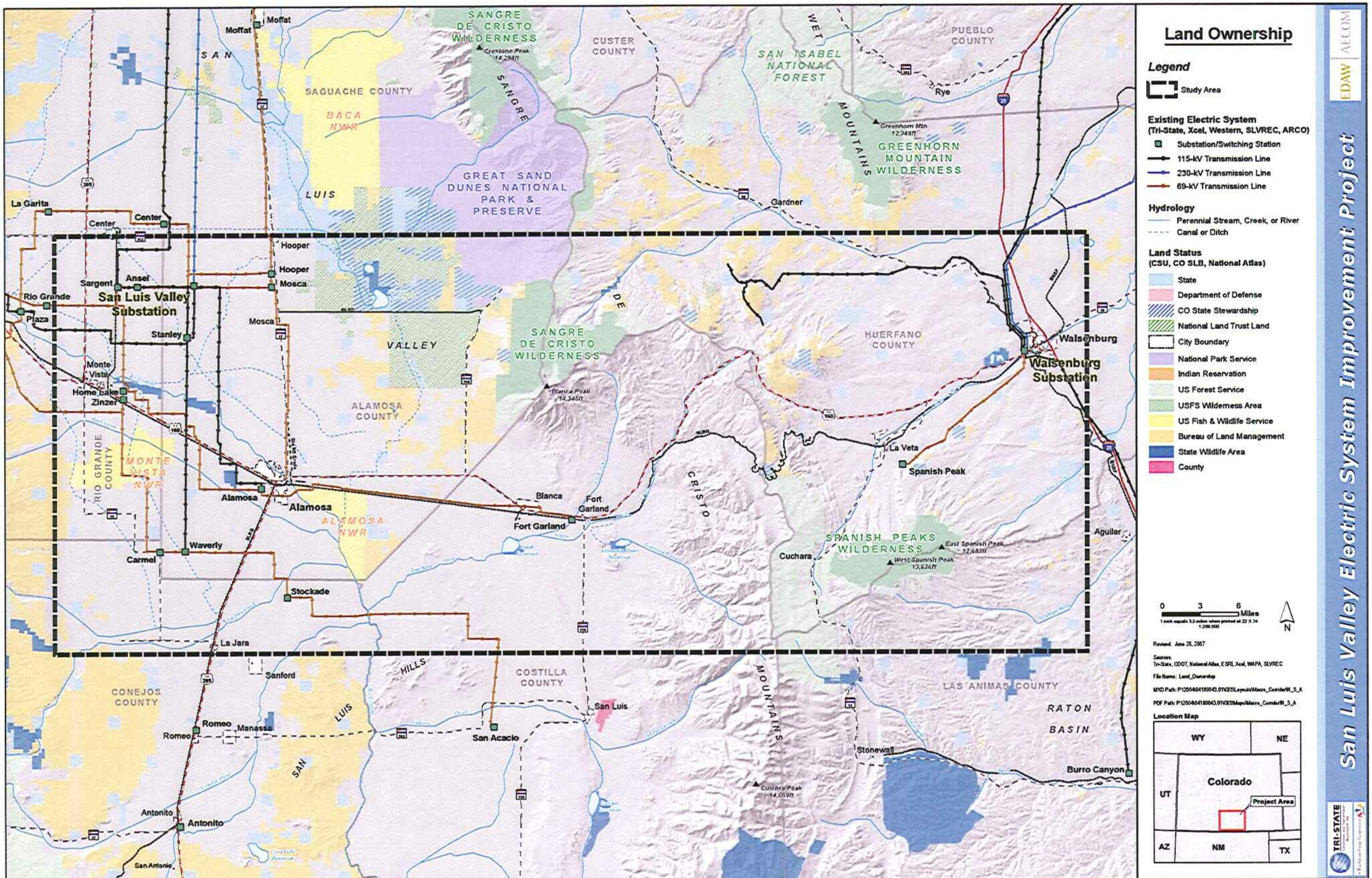


Figure A-2 - Land Ownership

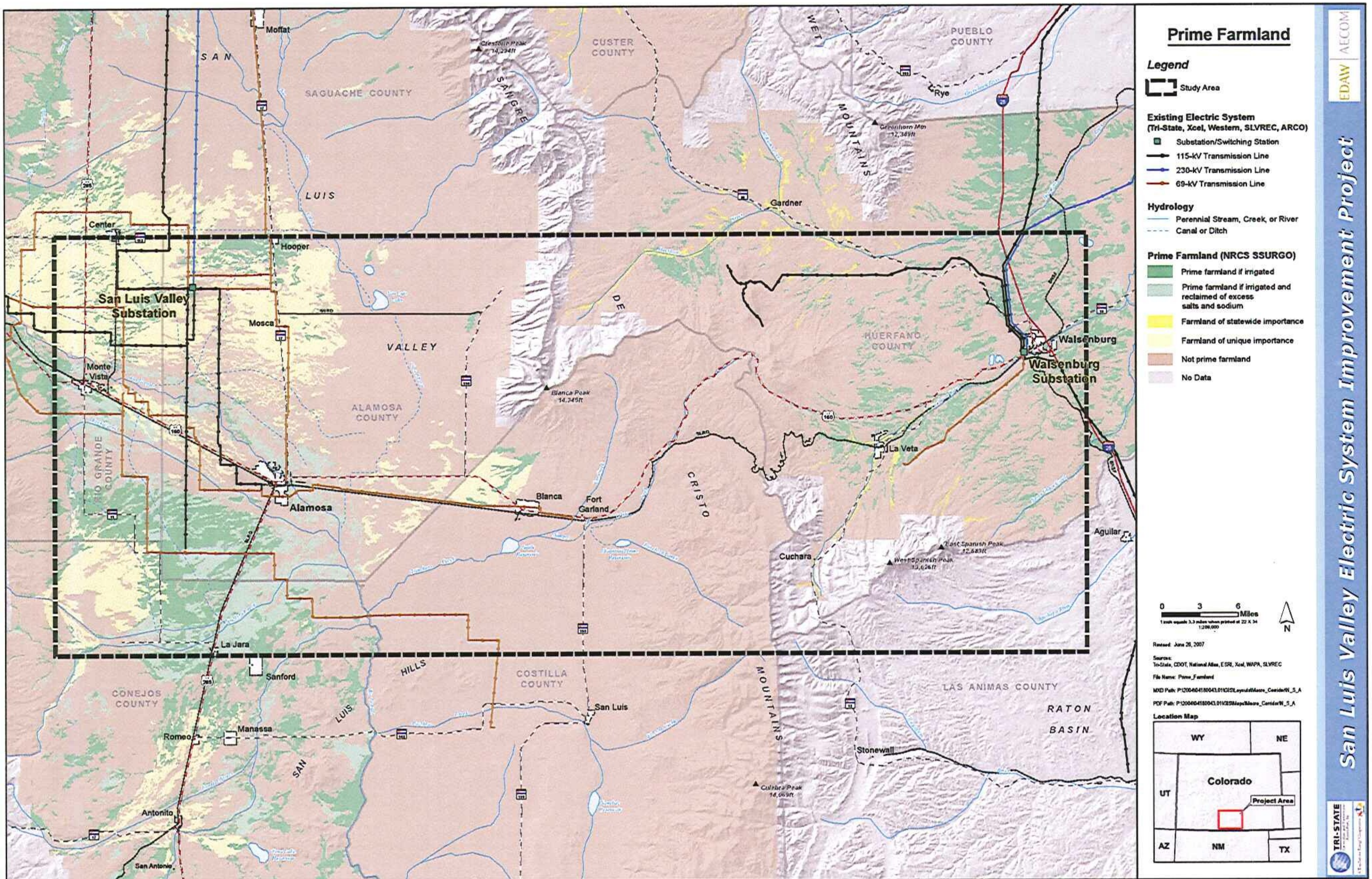


Figure A-3 - Prime Farmland

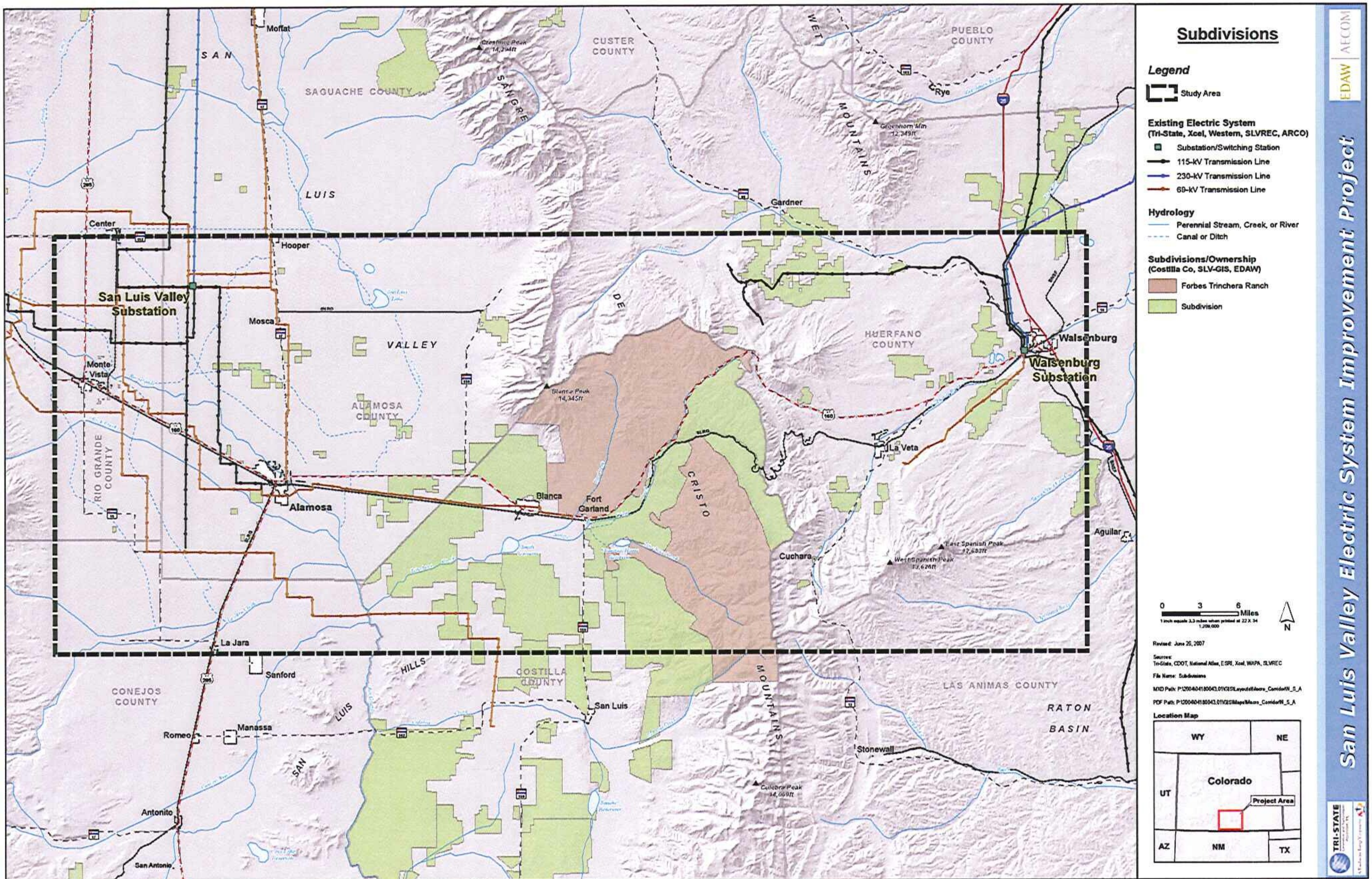


Figure A-4 - Subdivisions

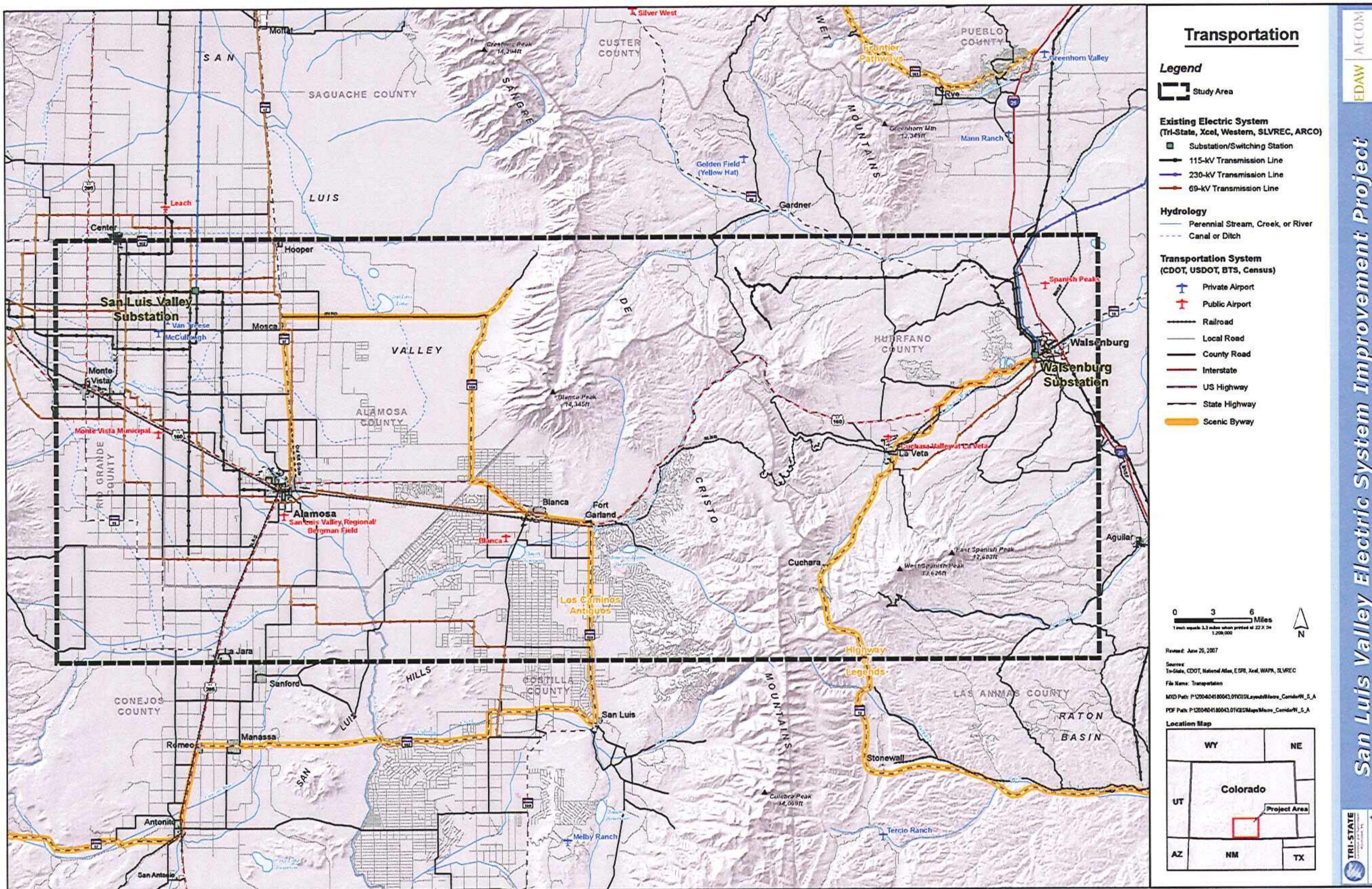


Figure A-5 - Transportation Resources

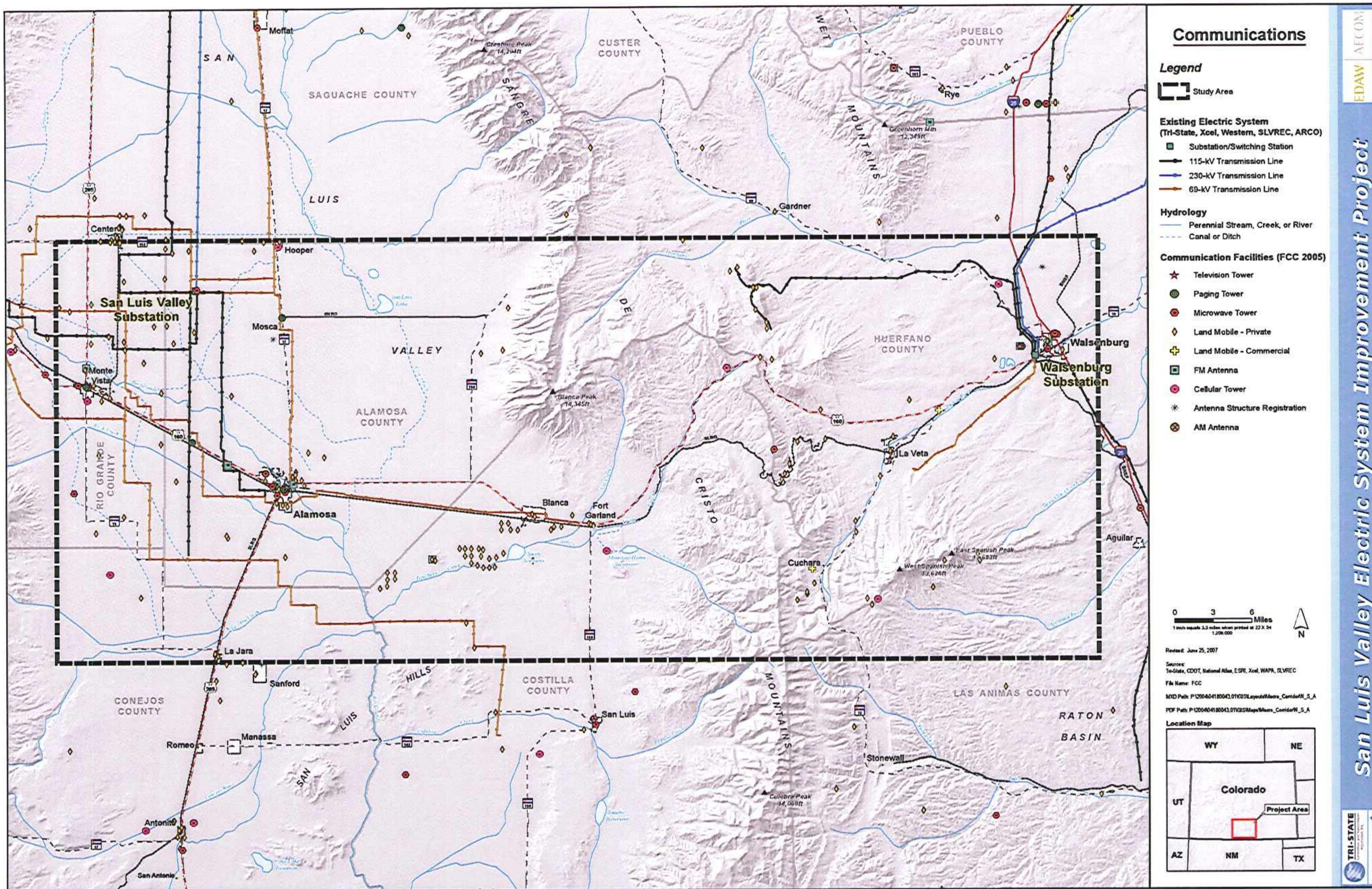


Figure A-6 - Communication Facilities

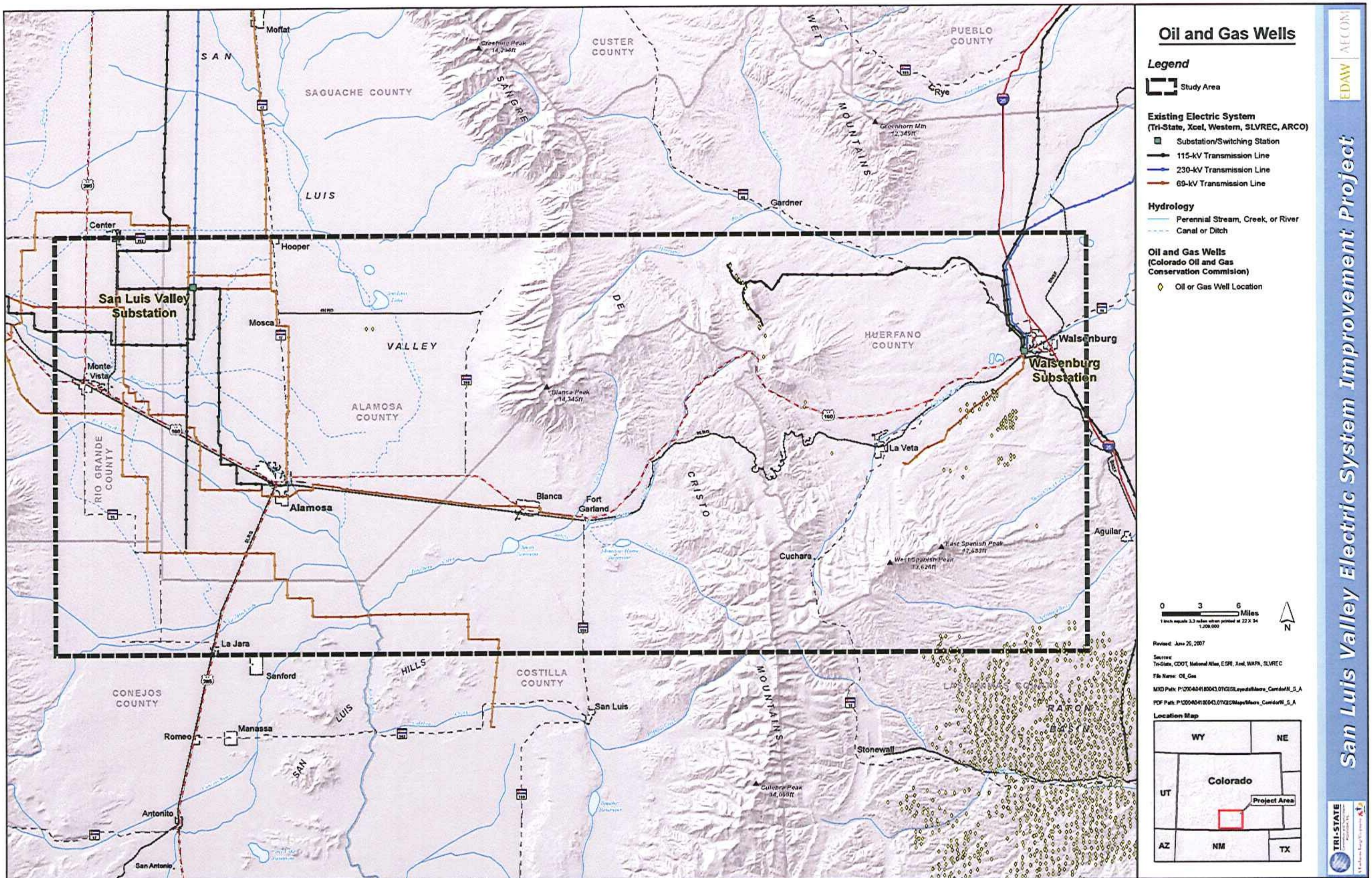


Figure A-7 - Oil and Gas Wells

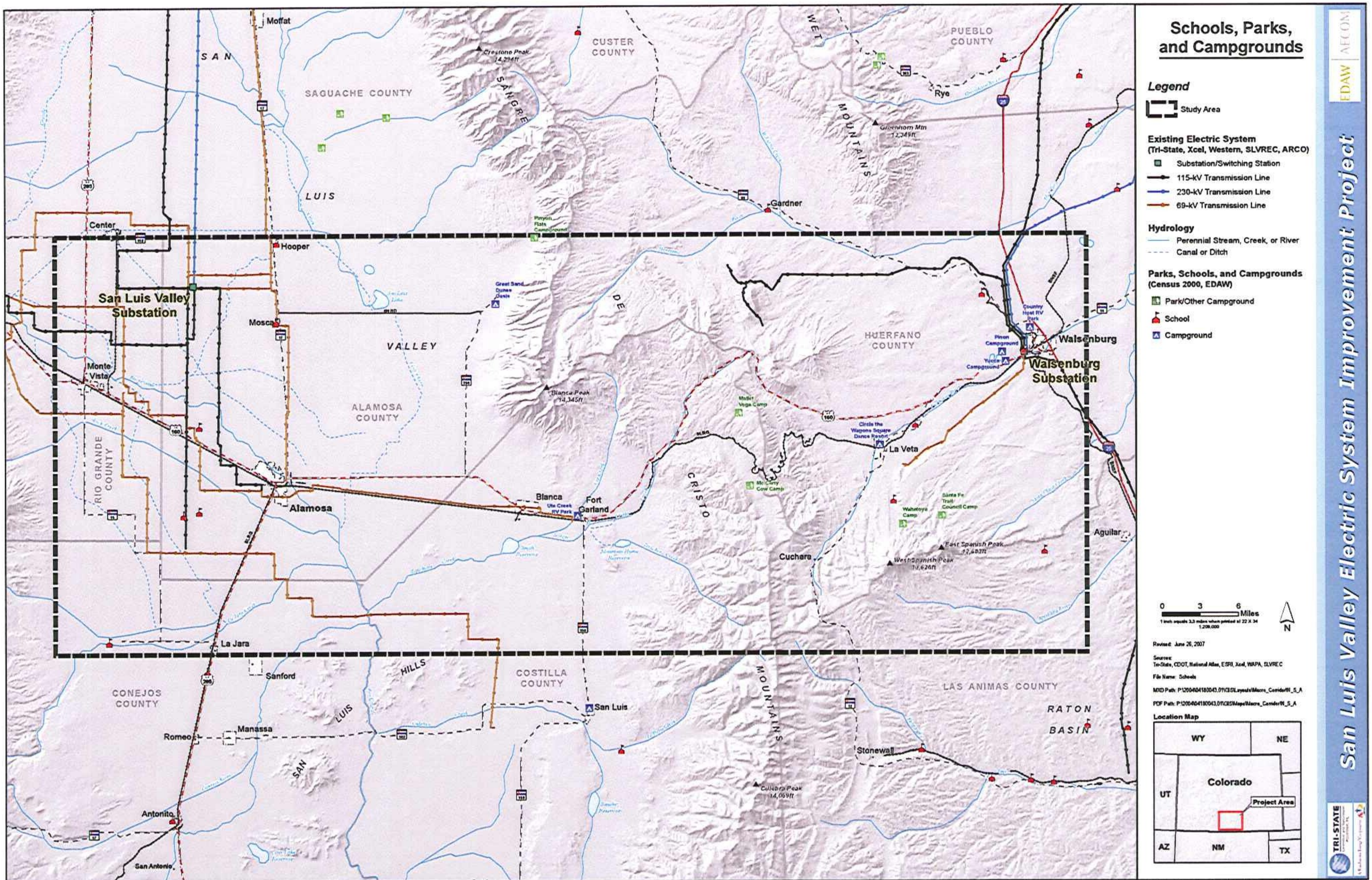


Figure A-8 - Schools, Parks, and Campgrounds

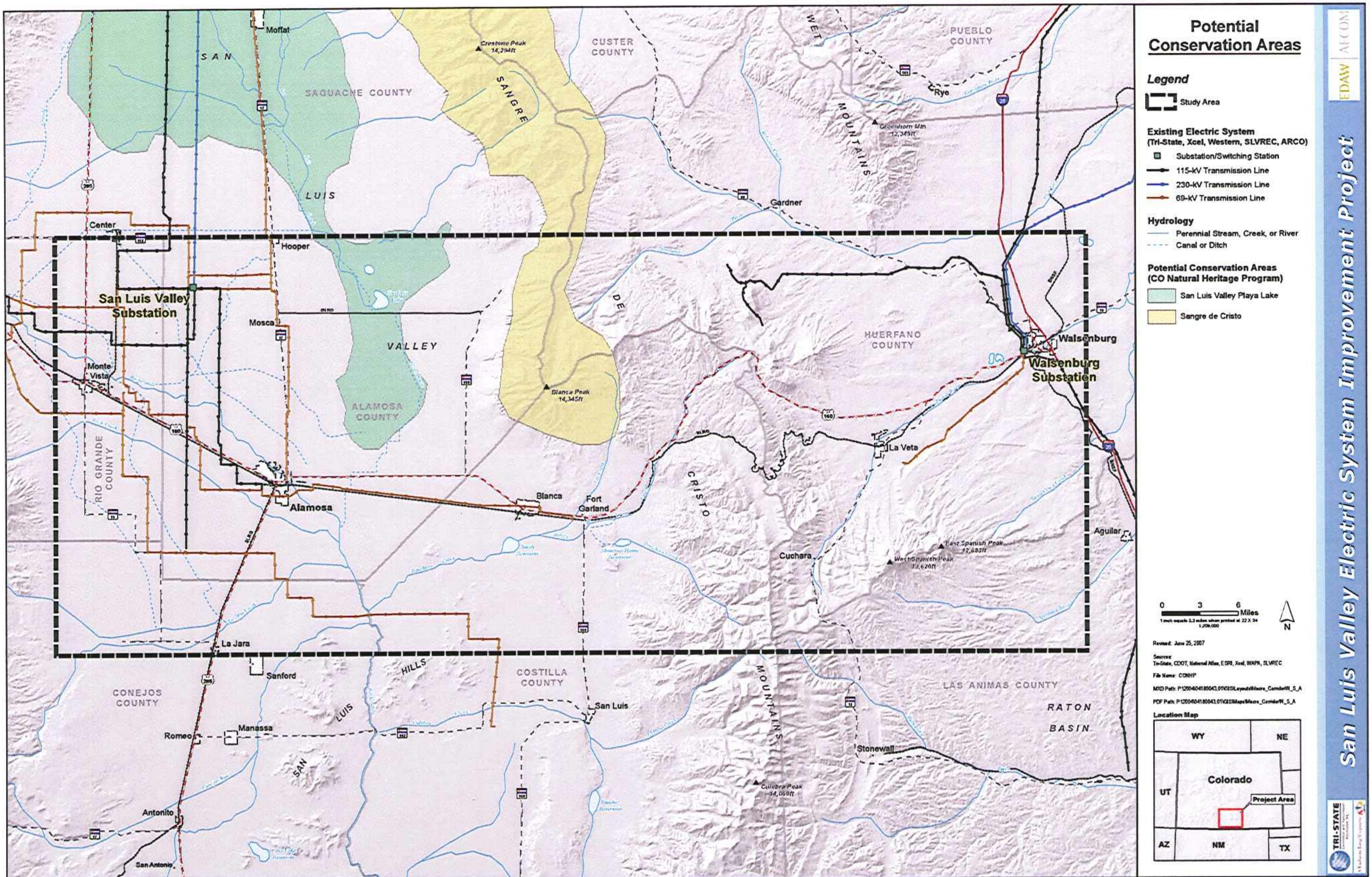


Figure A-9 - Potential Conservation Areas

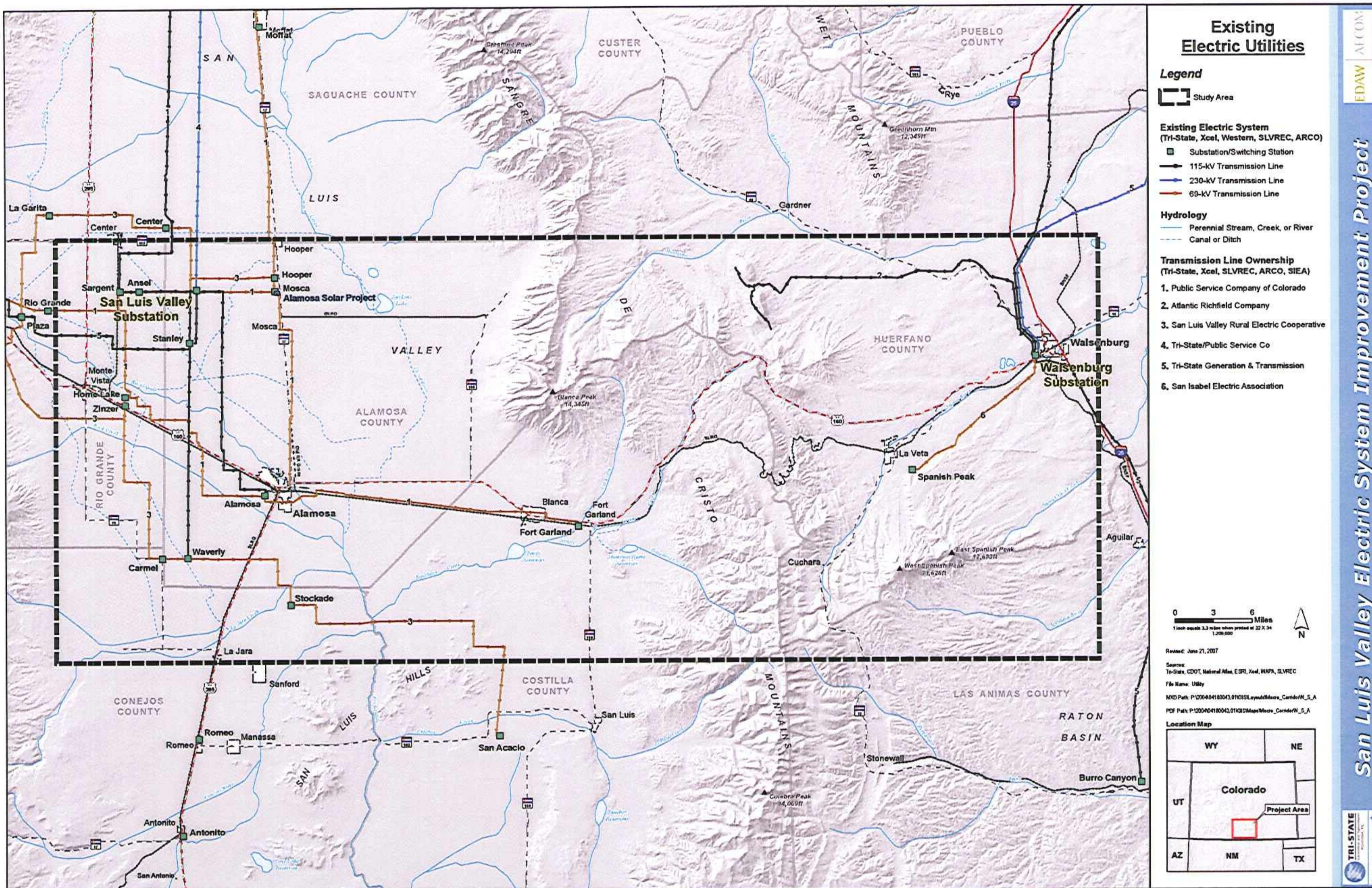


Figure A-10 - Existing Electric Utilities

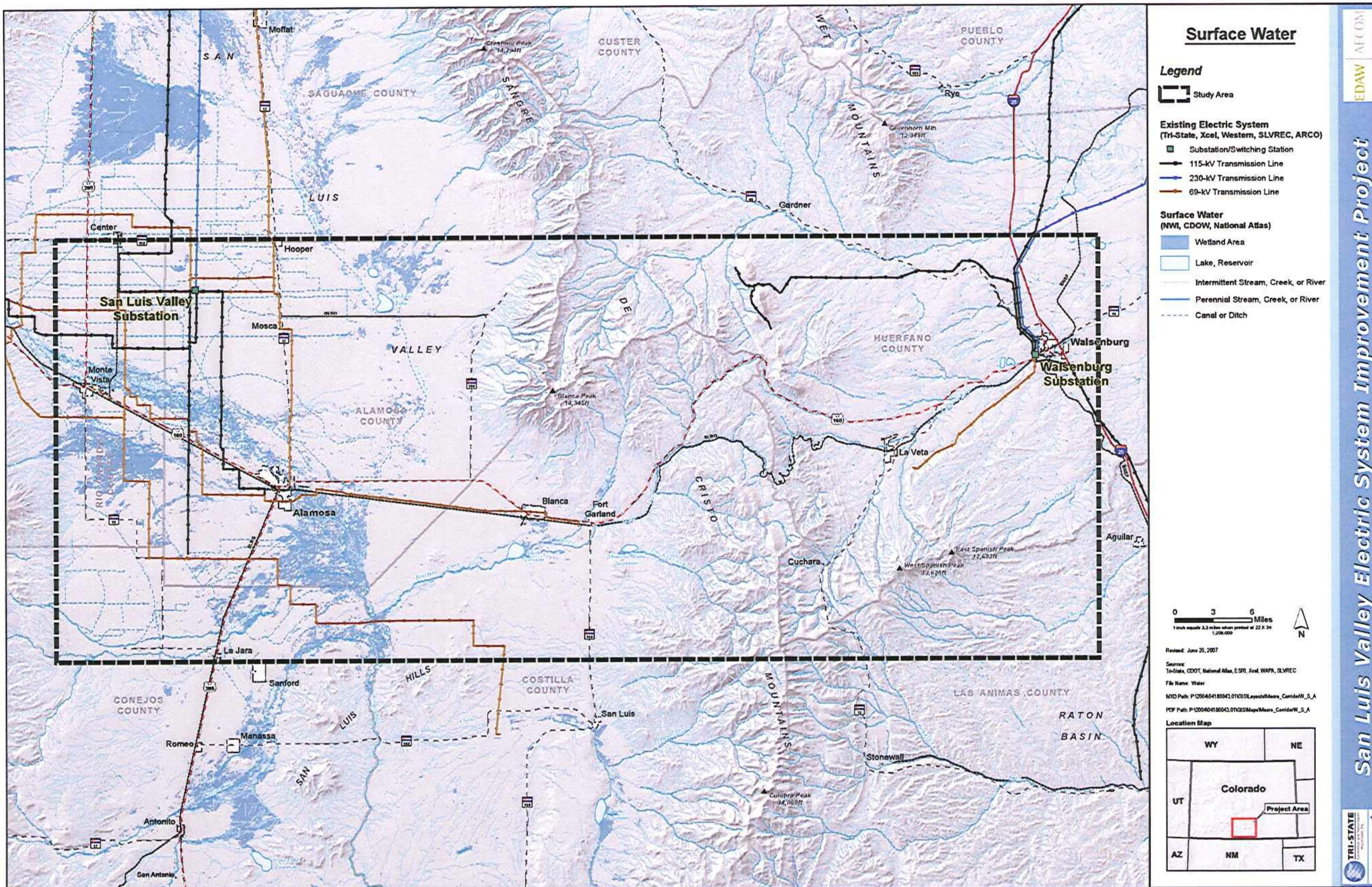
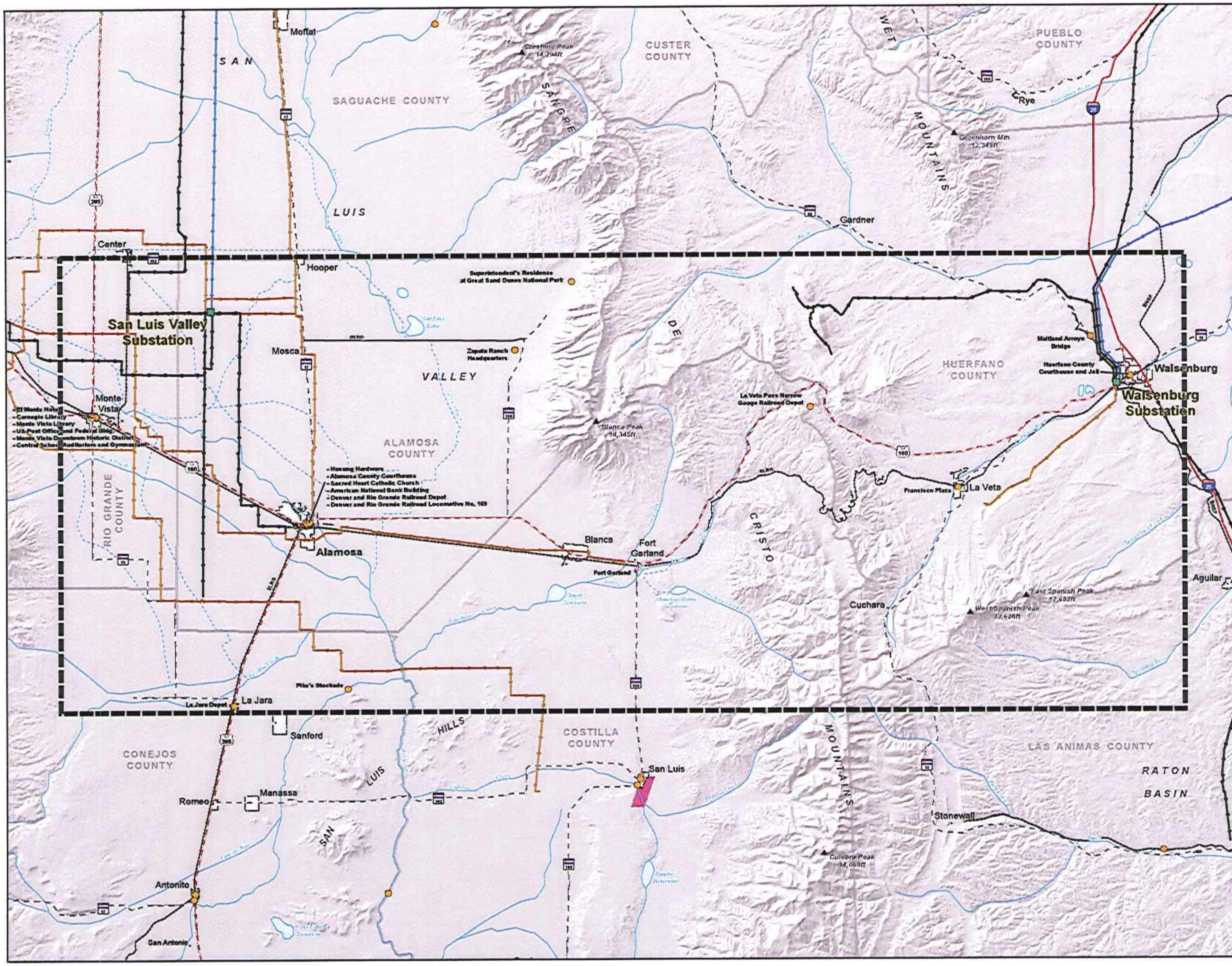


Figure A-11 - Surface Water



Historic Places

Legend

Study Area

Existing Electric System (Tri-State, Xcel, Western, SLVREC, ARCO)

- Substation/Switching Station
- 115-kV Transmission Line
- 230-kV Transmission Line
- 69-kV Transmission Line

Hydrology

- Perennial Stream, Creek, or River
- Canal or Ditch

Historic Places (National Register of Historic Places)

- Historic Place
- Historic Region

0 3 6 Miles

1 inch equals 3.3 miles when printed at 22 X 34
1:209,000

N

Revised: June 25, 2007

Sources:
Tri-State, CDOT, National Atlas, ESRI, Xcel, WAPA, SLVREC

File Name: NHP

MXD Path: P:\2004\04180043.01\GIS\Layouts\Macro_Corridor\N_S_A

PDF Path: P:\2004\04180043.01\GIS\Maps\Macro_Corridor\N_S_A

Location Map

San Luis Valley Electric System Improvement Project

EDAW | AECOM

TRI-STATE

Figure A-12 - Historic Places

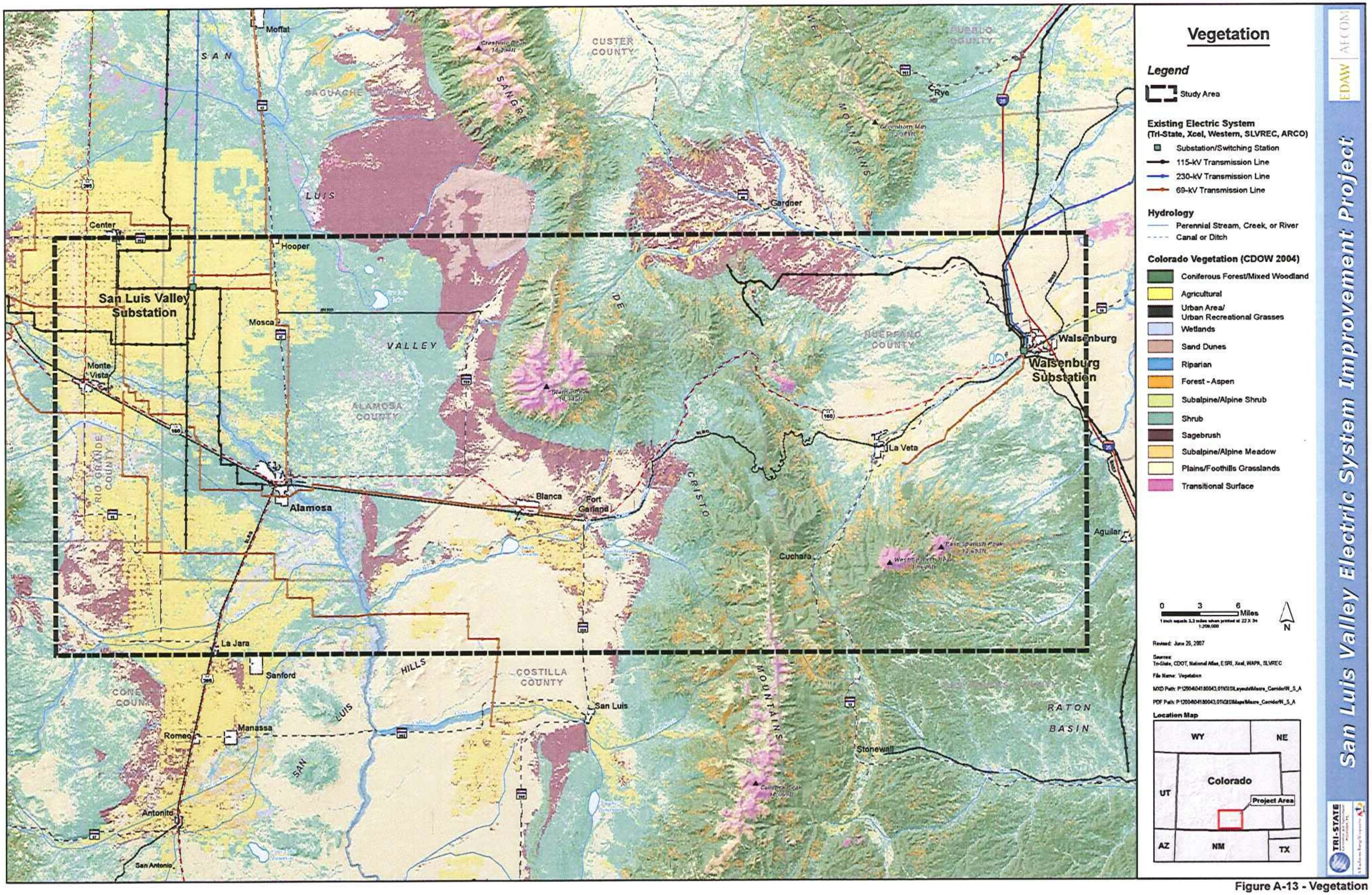


Figure A-13 - Vegetation

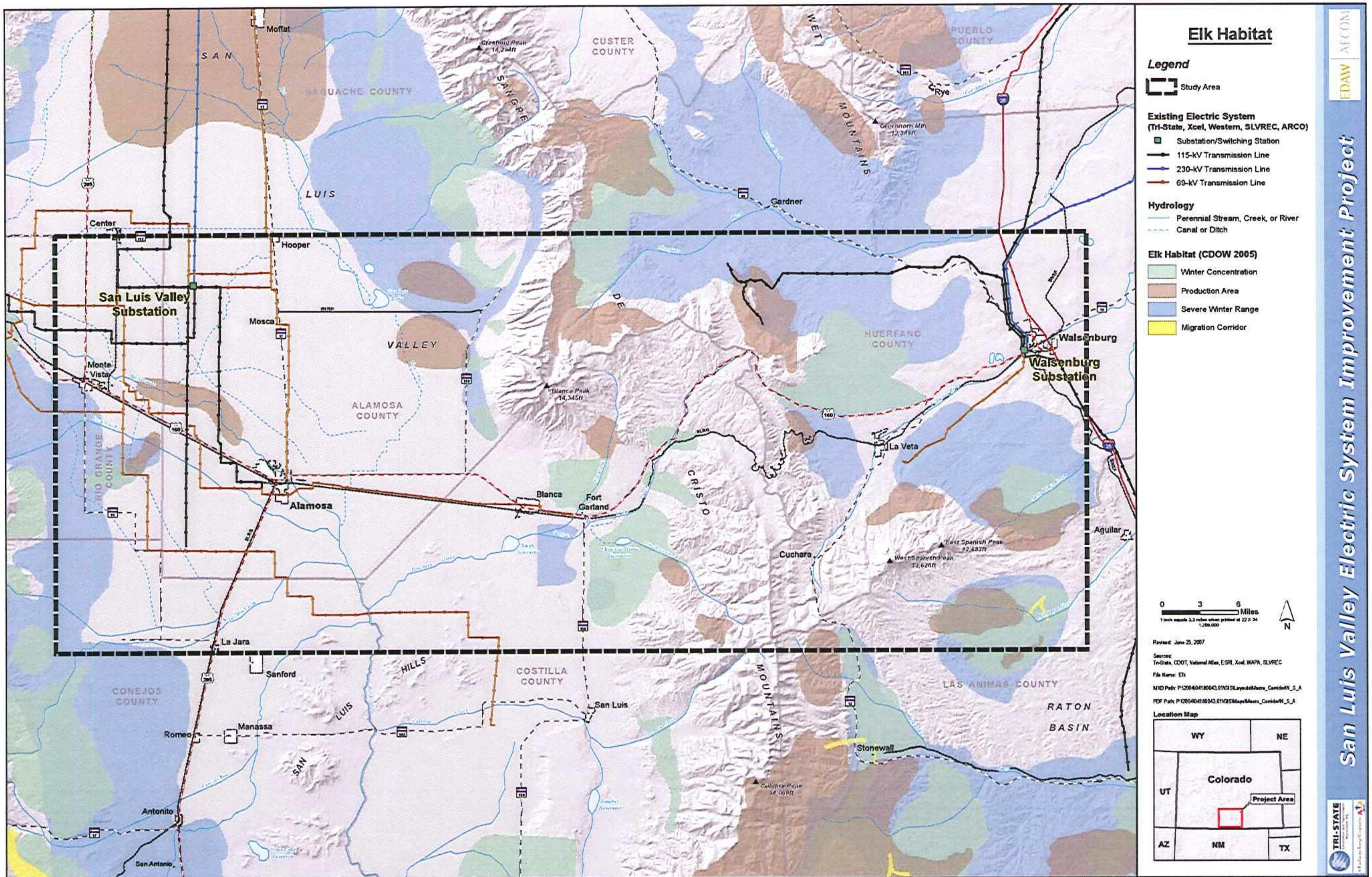


Figure A-14 - Elk Habitat

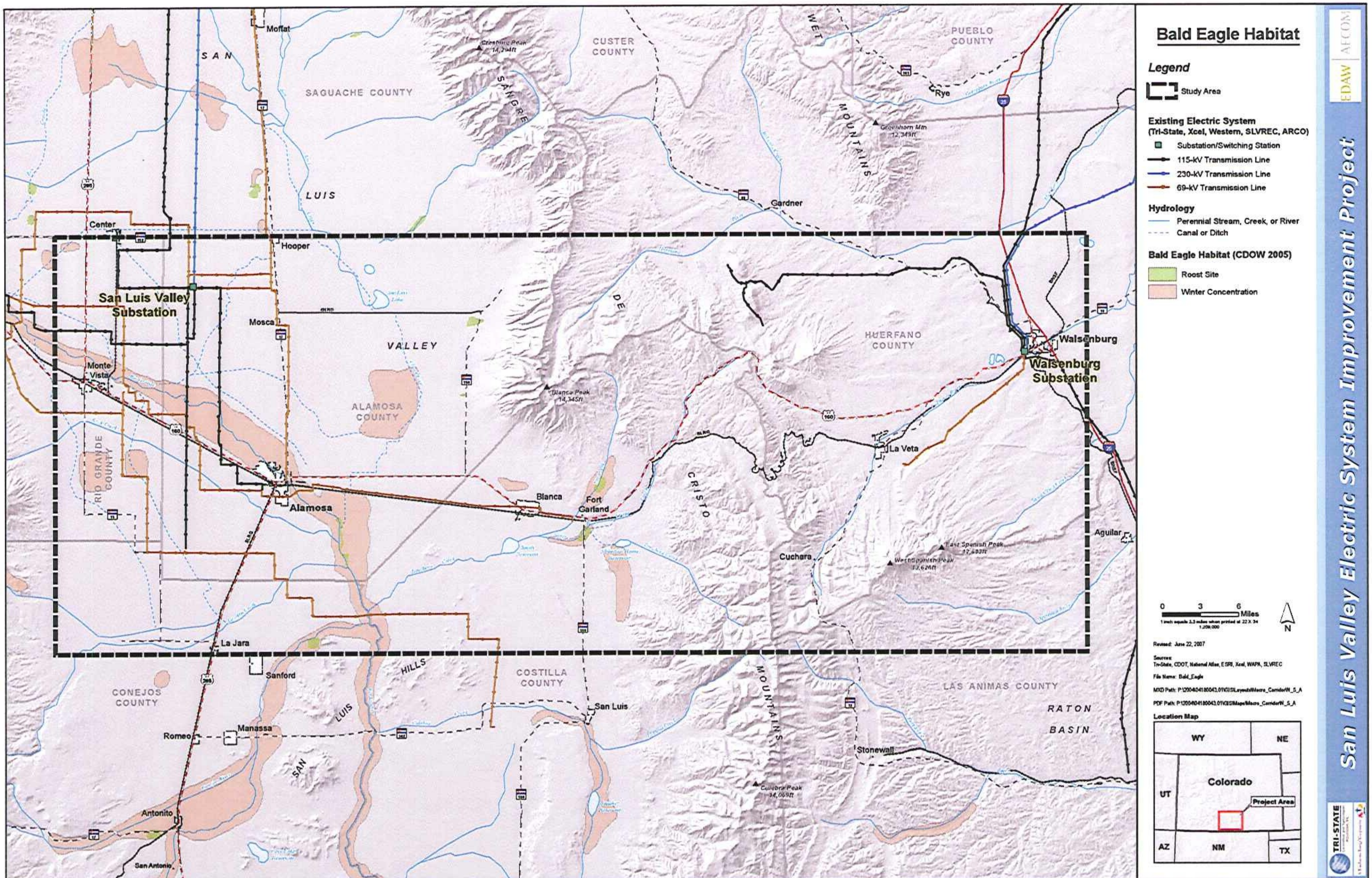


Figure A-15 - Bald Eagle Habitat

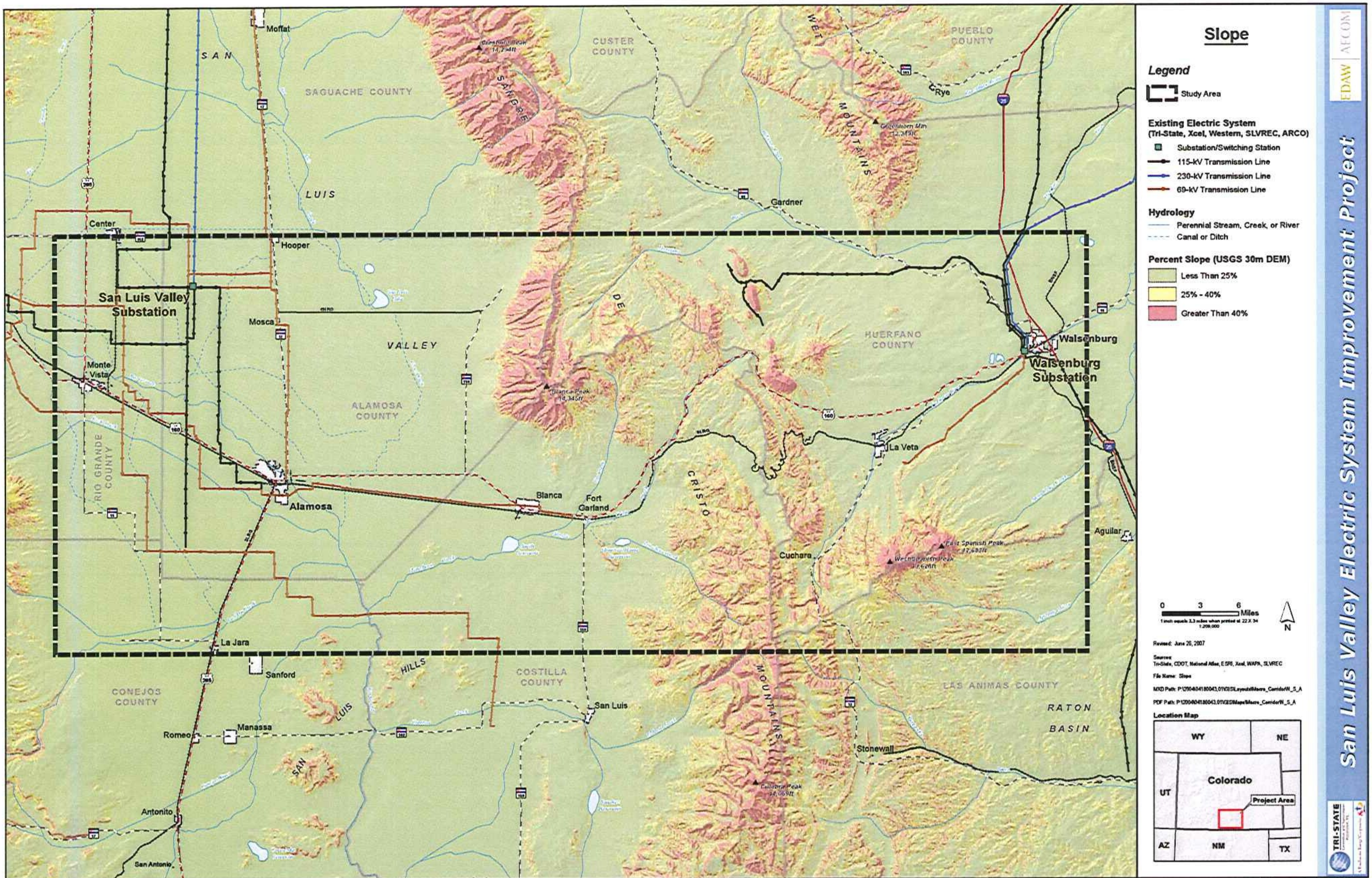


Figure A-16 - Slope

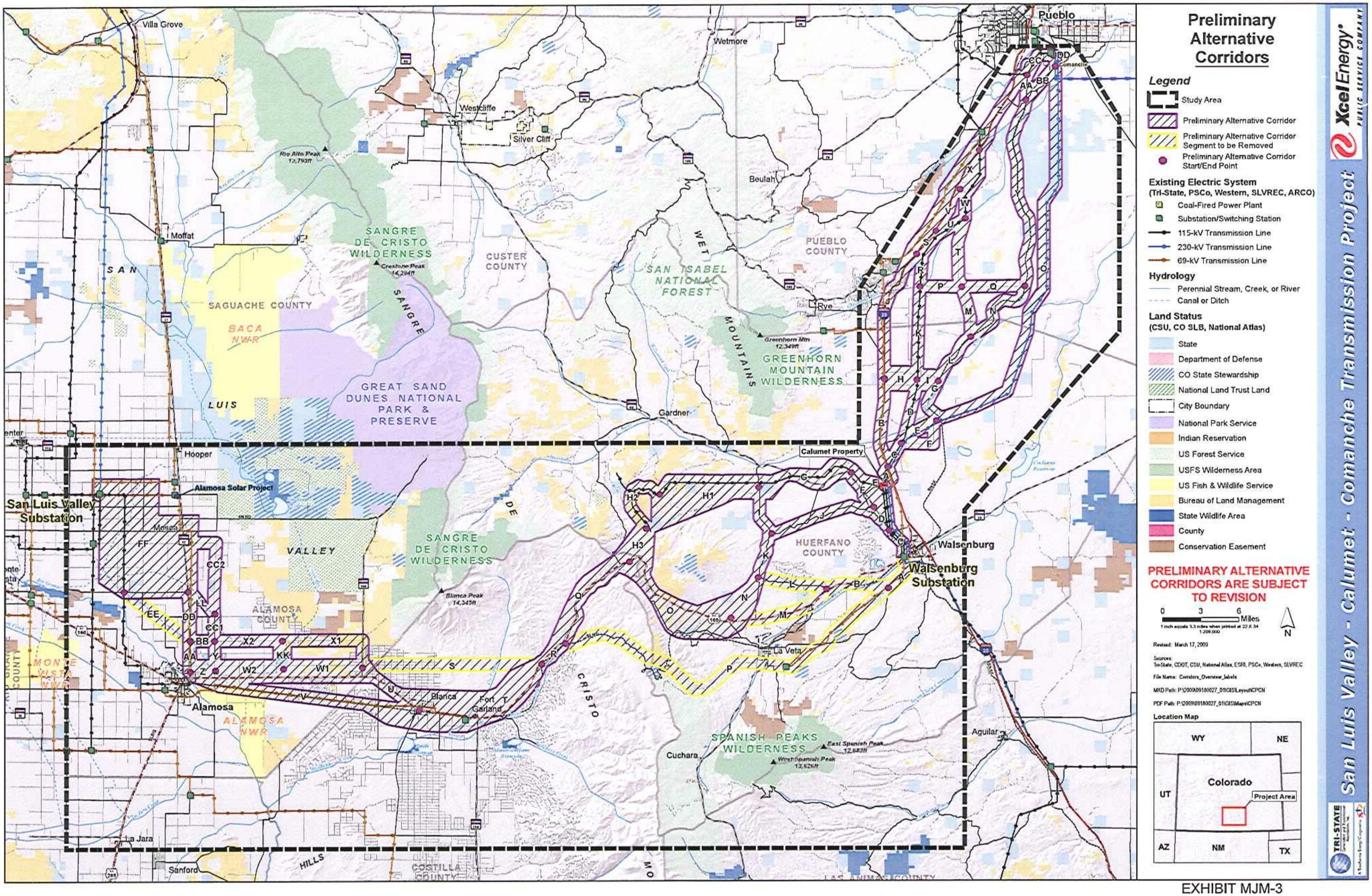


EXHIBIT MJM-3