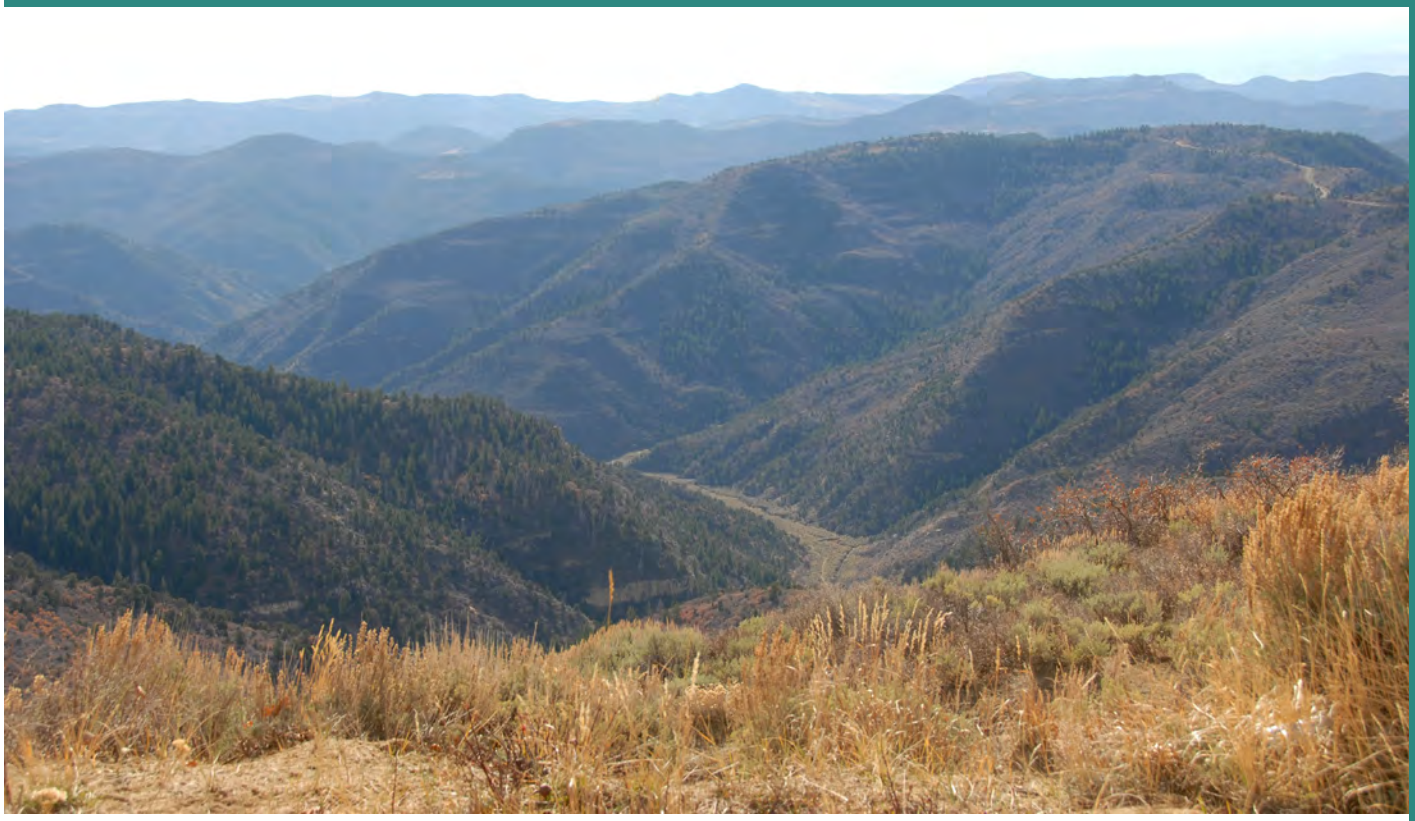
TransWest Express Transmission Project

Draft

Environmental Impact Statement

(Volume I)





BLM

Wyoming State Office

June 2013

Western AREA POWER ADMINISTRATION

Mission Statement

The BLM's multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

Mission Statement

Western is a Federal agency under the Department of Energy that markets and transmits wholesale electrical power through an integrated 17,000-circuit mile, high-voltage transmission system across 15 western states. Western's mission: Market and deliver clean, renewable, reliable, cost-based Federal hydroelectric power and related services.

BLM/WY/PL-13/021+5101

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Wyoming State Office

and

United States Department of Energy

WESTERN AREA POWER ADMINISTRATION

In Reply Refer To:
WYW–177893
COC–72929
UTU–87238
NVN–86732
DOE/EIS-0450

Dear Reader:

Enclosed for your review and comment is the Draft Environmental Impact Statement (EIS) for the proposed TransWest Express Transmission Project (Project) and accompanying land use plan amendments for affected Bureau of Land Management (BLM) areas and National Forest units. TransWest Express LLC (Applicant) submitted applications for right-of-way (ROW) grants and special use permits to use portions of the National System of Public Lands in southern Wyoming, northwestern Colorado, across Utah, and into southern Nevada. The Applicant also has submitted a statement of interest and entered into a pre-development agreement with the Western Area Power Administration (Western) to potentially obtain financing for the Project from the borrowing authority granted to Western under the American Recovery and Reinvestment Act of 2009 (Recovery Act) (Public Law 111-5). The Applicant-proposed transmission line route and route alternatives cross public lands administered by 14 BLM Field Offices and five national forests over four states. The BLM Wyoming State Office and Western have been designated as joint lead Federal agencies for the National Environmental Policy Act of 1969 (NEPA) process, and are mutually overseeing the preparation of the EIS.

This Draft EIS was prepared in consultation with over 50 cooperating agencies and in accordance with the NEPA, as amended; and Council on Environmental Quality, Department of the Interior, Department of Energy, and Department of Agriculture regulations for implementing NEPA outlined in 40 Code of Federal Regulations (CFR) Parts 1500-1508, 43 CFR Part 46, 10 CFR 1021, and 36 CFR 220, respectively. Accompanying land use plan amendments were prepared for areas not consistent with the administering agency plan pursuant to the Federal Land Policy and Management Act of 1976, the National Forest Management Act of 1976, and the BLM and United States (U.S.) Forest Service (USFS) land use planning regulations at 43 CFR 1610.5 and 36 CFR 219.10.

The Draft EIS analyzes the consequences of the agencies' decisions on granting a BLM ROW and USFS special use permits to construct and operate a high voltage, direct current (DC) transmission system. Western and the Applicant are engaged in pre-development activities that precede Western's and the Department of Energy's decision whether to provide funding for a Recovery Act project. The Draft EIS also informs Western's decision on whether to use its borrowing authority to partially finance and hold partial ownership with TransWest in the resulting transmission facilities and capacity. The Project would provide the transmission infrastructure and capacity to deliver approximately 3,000 megawatts of electric power from renewable and other energy sources in south-central Wyoming to a substation hub in southern Nevada. The Applicant-proposed project would consist of an approximately 725-mile-long

600-kilovolt, high voltage DC transmission line and two terminals, each containing an alternating current/direct current (AC/DC) converter station. The northern AC/DC converter station would be located near Sinclair, Wyoming, and the southern AC/DC converter station would be located near the Marketplace Hub – a group of substations approximately 25 miles south of Las Vegas, Nevada. A ground electrode system (required for transmission line emergency shutdown) would be installed within 100 miles of each terminal. The Project would retain an option for future interconnection with the Intermountain Power Project transmission system in Millard County, Utah.

Alternatives to the proposed project were developed in response to issues raised during the NEPA scoping period. The Project has been divided geographically into four regions for analysis based on common locations where project alternative routes converge and can be combined with other alternative routes in the region. Each region contains an Applicant-proposed route and two to five alternative routes that are analyzed in this EIS, as well as the No Action Alternative. The BLM, through consultation with other Federal, State, and local cooperating agencies, has identified an agency preferred alternative within each of the four Project regions that would all combine to create a continuous route from Wyoming to Nevada, totaling approximately 760 miles. The BLM and USFS have identified plan amendments for each of the land use plans that would require modifications if the proposed or an alternative route is selected.

The Draft EIS and accompanying plan amendments are not decision documents. Their purpose is to inform the public and interested parties of the relative impacts of the proposed action and alternatives, and to solicit comments from other agencies and the public. The Draft EIS also provides information to other regulatory agencies for use in their decision-making process for permits required to proceed with the Project.

The BLM and Western will host public meetings to discuss the Draft EIS. Dates, times, and locations of these meetings will be distributed in newsletters, announced in the local news media, and posted on the Project website at http://www.blm.gov/wy/st/en/info/NEPA/documents/hdd/transwest.html.

The BLM and Western invite public comment on the Draft EIS, the Agency Preferred Alternative, and accompanying plan amendments. Your review and comment on the content of this document are critical to the project analysis and associated plan amendments. Comments should be as specific as possible. Please include suggested changes and sources or methodologies if applicable, and references to relevant section, page, and volume numbers of the document. Responses to substantive comments (further defined in 40 CFR 1503.3 and in Section 6.9.2.1 of BLM Handbook H-1790-1) will be included in the Final EIS.

The publication of the Notice of Availability in the *Federal Register* by the U.S. Environmental Protection Agency begins the 90-day comment period. Written comments will be accepted by fax, email, or letter. Please refer to "TransWest Transmission Project Comments" in your correspondence. Please provide your comments to:

Bureau of Land Management, Wyoming State Office
Attn: Sharon Knowlton, TWE Project Manager
P.O. Box 20678
Cheyenne, Wyoming 82003
E-mail: TransWest_WYMail@blm.gov
(307) 775-6124
Fax: (307) 775-6203

The Draft EIS is available for review during normal business hours at the following locations or at the following website: http://www.blm.gov/wy/st/en/info/NEPA/document/hdd/transwest.html:

BLM Wyoming State Office
BLM Rawlins Field Office
BLM Rock Springs Field Office
BLM Little Snake Field Office
BLM White River Field Office
BLM Grand Junction Office
BLM Cedar City Field Office
BLM Fillmore Field Office
BLM Moab Field Office
BLM Price Field Office
BLM Richfield Field Office
BLM St. George Field Office
BLM Vernal Field Office
BLM Egan Field Office
BLM Caliente Field Office
BLM Las Vegas Field Office
USFS Dixie National Forest

Before including your address, phone number, email address, or other personal identifying information in your comment, be aware that your entire comment – including your personal identifying information – may be made publicly available. While you may ask us to withhold your personal identifying information from public release, we cannot guarantee that we will be able to do so. BLM and Western will not consider anonymous comments. Comments, including names and street addresses of respondents (unless otherwise withheld), will be available for public review at the BLM Wyoming State Office from 7:45 a.m. to 4:30 p.m. Monday through Friday, excluding federal holidays. Comments may be published as part of the NEPA document and other related documents. All submissions from organizations or businesses will be made available for public inspection in their entirety.

Thank you for your interest and participation in this NEPA process.

Sincerely,

Donald A. Simpson
State Director, BLM Wyoming

Mark A. Gabriel
Administrator, Western Area Power Administration

Enclosures – As Stated

Executive Summary

This Executive Summary is intended to provide a brief overview of the proposed Project, alternatives, and conclusions from the impact analyses. For the supporting documentation and detailed analyses please see the full environmental impact statement (EIS).

ES.1 Project Overview

The TransWest Express Transmission Project (Project) is proposed as an extra high voltage, direct current (DC) transmission system extending from south-central Wyoming to southern Nevada (**Figure ES-1**). The proposed transmission line (and alternatives) cross four states (Wyoming, Colorado, Utah, and Nevada) encompassing lands owned or administered by the Bureau of Land Management (BLM), United States (U.S.) Forest Service (USFS), National Park Service (NPS), Bureau of Reclamation, Utah Reclamation Mitigation and Conservation Commission, various state agencies, Native American tribes, municipalities, and private parties. The Project would provide the transmission infrastructure and capacity necessary to deliver approximately 3,000 megawatts (MW) of electric power from renewable and/or other non-renewable energy resources in south-central Wyoming to southern Nevada. One MW (or 1 million watts) of power can deliver approximately 6.5 million kilowatt-hours (kWh) of electricity in 1 year. An average U.S. household consumes about 10,655 kWh of electricity in a year. Therefore, 1 MW of power provides electricity for 610 households' annual use (American Wind Energy Association 2008). The Project would transmit power for over 1,800,000 households annually.

In April 2010, TransWest Express LLC (TransWest/Applicant) and Western Area Power Administration (Western), an agency of the U.S. Department of Energy, entered into a Memorandum of Understanding (MOU) in which Western agreed to act as joint lead agency with the BLM in the preparation of the EIS in accordance with the National Environmental Policy Act of 1969, as amended (NEPA).

ES.1.1 BLM and Western's Purpose and Need

The purpose of the BLM's federal action is to respond to TransWest's application for a right-of-way (ROW) to construct, operate, maintain, and decommission a transmission line on public lands. The need for this action is to fulfill BLM's responsibility under the Federal Land Policy and Management Act of 1976 and BLM ROW regulations to manage the public lands for multiple uses, including transmission of electric energy (43 Code of Federal Regulations 2806).

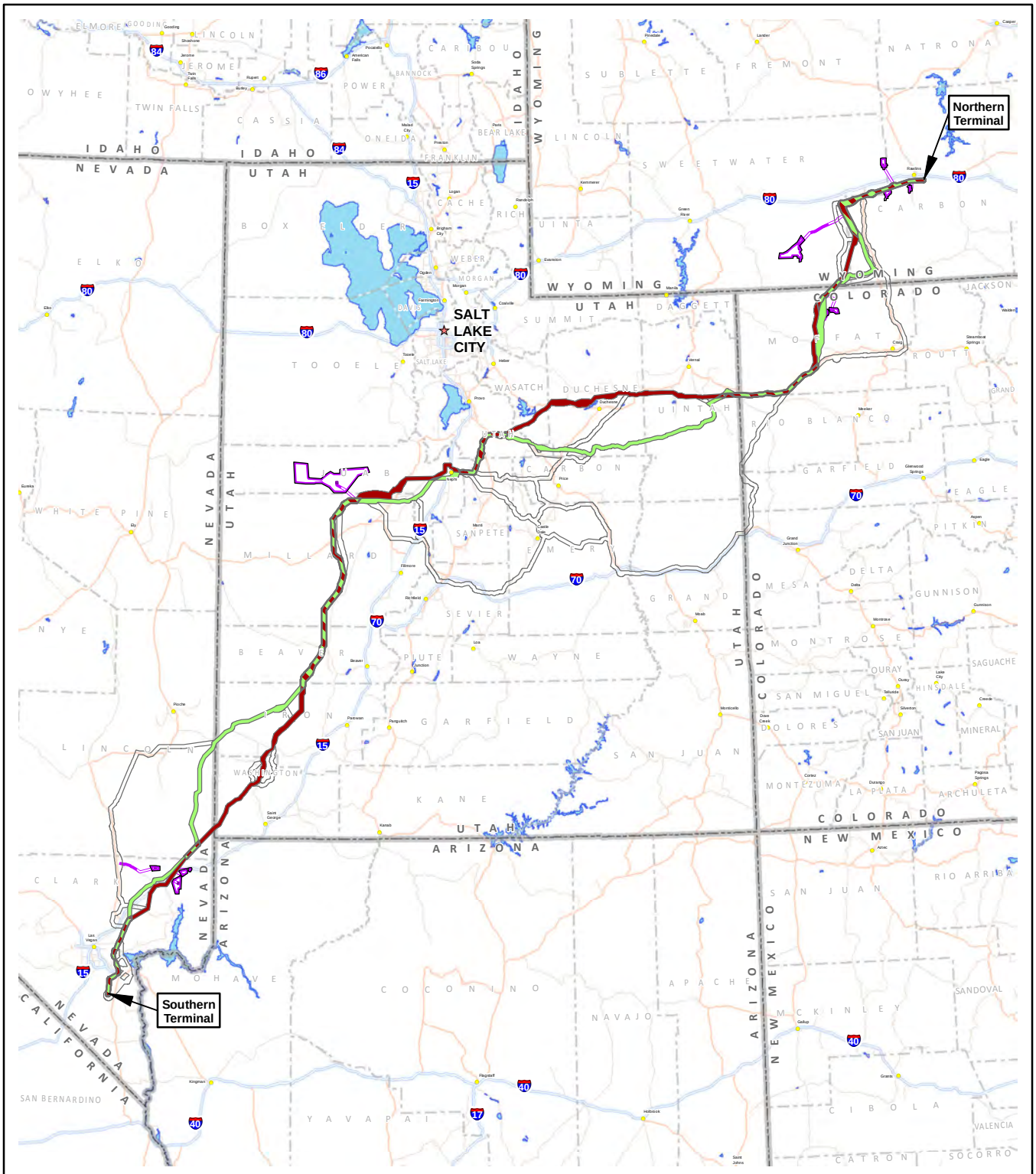
Western's purpose and need is to carry out Federal policy to facilitate renewable energy development and transmission expansion as established by the American Recovery and Reinvestment Act's 2009 amendment of the Hoover Power Plant Act of 1984 (Public Law 98-381, Title III, § 301) (Hoover Act). The Hoover Act provides Western the authority to borrow funds from the U.S. Treasury to construct, finance, facilitate, plan, operate, maintain, and/or study construction of new or upgraded electric power transmission lines and related facilities within Western's marketing area and which would deliver or facilitate the delivery of power from renewable resources.

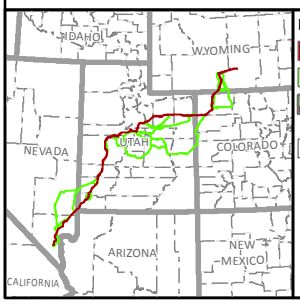
ES.1.2 Decisions to Be Made

BLM decisions to be made are to:

- Decide whether to grant, grant with modification, or deny a ROW to construct, operate, and maintain the proposed facilities for a transmission line on public lands;
- Decide whether one or more BLM land use plans should be amended to allow the proposed transmission line;

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Project Corridors

- Applicant Proposed
- Agency Preferred
- Agency Proposed and Applicant Preferred
- Alternative

- Potential Ground Electrode Siting Area
- Potential Ground Electrode Site
- Potential Ground Electrode Overhead Electrical Line

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure ES-1
Project Location

0 20 40 80 Miles
0 20 40 80 km
1:4,750,000

N

Western AREA POWER ADMINISTRATION

Exported On: 5/22/2013

- Determine the most appropriate location for the transmission line on public lands, considering multiple-use objectives; and
- Determine the terms and conditions (stipulations) for the construction, operation, maintenance, and decommissioning of the transmission line on public lands that should be applied to the ROW grant.

Western's decision is whether it would use its borrowing authority to partially finance and hold partial ownership with TransWest in the resulting transmission facilities and capacity.

The BLM and Western have prepared this EIS to disclose and analyze the potential direct, indirect, and cumulative impacts of the proposed action and alternatives, as required by NEPA, to facilitate public participation, and to assist the BLM and Western decision-makers in making the decisions listed above. The NEPA analysis includes disclosure of applicant-committed design features and proposed mitigation to reduce resource impacts.

Depending on the chosen alternative, this Project potentially would cross other federal lands. Accordingly, Project implementation would require other federal agencies to make decisions related to granting ROWs. The BLM has included those agencies, as well as non-federal agencies and/or municipalities with jurisdictional authority or special expertise with respect to resource issues addressed by the NEPA analysis as cooperating agencies in this EIS process. Over 50 agencies are participating in the process, including 9 federal agencies, 4 states, 24 counties, 6 conservation districts, and 1 grazing board that have signed MOUs as cooperating agencies for the Project.

ES.1.3 TransWest's Goals and Objectives for the Proposed Project

TransWest's primary goal is to provide the transmission infrastructure and capacity necessary to reliably and cost-effectively transmit up to 3,000 MW of electric power from Wyoming to the desert southwest. TransWest would work within the following Project-specific objectives:

- Provide for efficient, cost-effective, and economically feasible transmission of approximately 20,000 gigawatt hours per year of clean and sustainable electric energy from Wyoming to markets in the desert southwest region;
- Meet North American Electric Reliability Corporation Reliability Standards and Western Electricity Coordinating Council planning criteria and line separation requirements;
- Maximize use of existing and designated utility corridors and access roads to the extent practical;
- Provide these benefits in a timely manner to the desert southwest region and the broader Western U.S. to meet the region's pressing environmental and energy needs. TransWest has identified a need for the Project by the expected in-service date of 2015 or as soon as the regulatory reviews can be completed; and
- Provide for flexibility and maximize the use of infrastructure to increase future transmission capacity by configuring the Project to allow for future interconnection with the Intermountain Power Project (IPP) transmission system near Delta, Utah.

ES.1.4 Conformance with Existing Plans and Regulations

Actions that result in a change in the scope of resource uses, terms, conditions, and decisions of federal agency land use plans, including the approval of this proposal, may require amendment of one or more of the plans.

The BLM, Western, and cooperating agencies worked together to develop routes that would conform to existing federal land use plans. However, this objective was not reached for a number of the alternative routes analyzed in the Draft EIS. Plan amendments that would be necessary to implement each of the evaluated alternatives were identified by affected agencies and analyzed in Chapter 4.0 of the Draft EIS. The specific

land use plan amendments that are needed will depend upon which route is selected in the agencies' Records of Decision (RODs). In the Final EIS, the BLM will identify the agency preferred alternative and the requisite proposed plan amendments necessary to implement that alternative.

Each of the proposed BLM plan amendments would: 1) expand an existing utility corridor; 2) create a new utility corridor while allowing for exceptions to other resource stipulations if avoidance measures or impact minimization are not feasible within the designated corridor; or 3) create a one-time exception through a ROW exclusion area. Depending on the route alternative, potential plan amendments include the following:

- Region I. One or two plan amendments would be required. The BLM Rawlins (Wyoming) and Little Snake (Colorado) Field Offices (FOs) plans may be affected.
- Region II. One or up to four plan amendments would be required. The BLM White River (Colorado), Vernal, Price, and Salt Lake (Utah) FOs, and the Fishlake National Forest (Utah) plans may be affected.
- Region III. None or one plan amendment would be required. The BLM Caliente (Nevada) FO plan may be affected.
- Region IV. None or one plan amendment would be required. The BLM Las Vegas (Nevada) FO plan may be affected.

Other BLM or USFS management plans could be amended depending upon the specifics of the route that is selected in the ROD. Proposed amendments to plans that potentially are affected by the various alternatives are identified and analyzed in the Draft EIS.

Chapter 4.0 describes the proposed plan amendments required under each alternative, followed by an analysis of the environmental impacts and planning implications associated with adoption of these amendments. **Table A-1** in **Appendix A** provides a list of the major federal, state, and local permits and approvals that could be required for construction, operation, and maintenance of the Project.

ES.1.5 Agency and Public Participation

BLM and Western conducted pre-scoping activities in 2009 and 2010 with the BLM FOs, USFS, and the cooperating agencies. Comments received during pre-scoping were considered in developing the alternative corridors presented to the public during the scoping period. The Notice of Intent for the Project was published in the Federal Register on January 4, 2011, and a Project newsletter was concurrently mailed to approximately 23,000 interested parties. The BLM and Western held 23 public scoping meetings throughout the Project area. The meetings were advertised through display advertisements in local newspapers and public service announcements were submitted for broadcast on local media. The BLM and Western received a total of 622 scoping comment submittals. Through the scoping process, the following concerns were expressed:

- Corridor alternatives, as related to avoidance of sensitive resources, including special status species habitat, impacts to visual resources, areas with special designations or management, and/or historic or cultural sites;
- Conflicts with existing or potential future land uses;
- Impacts to fish, wildlife, vegetation, special status species, and habitat including greater sage-grouse; big game migration and winter/spring range habitat for elk, mule deer, and pronghorn; bighorn sheep and desert tortoise habitat; habitat loss for raptors and migratory bird species; potential for increased bird collisions with transmission lines; and development of mitigation measures;
- Public health and safety, including fire risk, firefighter safety, electromagnetic fields, potential sabotage activities, structure/conductor failure near homes and increased construction traffic on roadways;

- Impacts to areas with special management designations, including to BLM Areas of Critical Environmental Concern (ACECs), BLM Wilderness Study Areas (WSAs), USFS Inventoried Roadless Areas (IRAs), national monuments/landmarks, national historic trails, and state and federal parks;
- Cumulative impacts of numerous transmission lines being proposed within already overcrowded corridors;
- Socioeconomic impacts, particularly property values and tax base where the Project would cross private lands or be located near urban areas; and
- Noxious weed control and reclamation, including potential for the spread of noxious and invasive weeds along new ROWs, and the need for appropriate control measures.

Cooperating agency participation continued to occur during the preparation of the EIS. The public is encouraged to review and provide comment during the Draft EIS comment period.

ES.2 Proposed Action and Alternatives

ES.2.1 Proposed Action

The Applicant proposed action would consist of the following facilities and improvements:

- A 600-kilovolt (kV) DC transmission line, approximately 725 miles in length, extending across public (state and federal) and private lands in Wyoming, Colorado, Utah, and Nevada. The transmission line ROW would be approximately 250 feet wide.
- Two terminal stations to be located on private or public lands at either end of the transmission line, near Sinclair, Wyoming, and at the Marketplace Hub in the Eldorado Valley, near Boulder City, Nevada.
- Access routes, including improvements to existing roads, new overland access, and new unpaved roads to access the proposed Project facilities and work areas during the construction, operation, and maintenance Project phases.
- Two ground electrode facilities to be located on private or public lands within 100 miles of each of the Northern and Southern terminals. These ground electrode facilities would be used to maintain system operations in the event of the loss of one or more poles (or circuits).
- Communication systems: a network of 12 to 15 fiber optic communication and regeneration sites, typically within the 250-foot-wide transmission line ROW, and microwave facilities at each terminal.

ES.2.1.1 Design Options

Two design options have been included to maintain Project flexibility. Under Design Option 2, the Project would construct a 600-kV DC transmission line to deliver energy from the Northern Terminal in Sinclair, Wyoming, to a new alternating current (AC)/DC converter station near the existing IPP substation near Delta, Utah. From the new AC/DC converter station in Utah, a single circuit 1,500-MW, 500-kV AC transmission line would be constructed to one of the existing substations in the Eldorado Valley, south of Boulder City, Nevada (Marketplace Hub).

Under Design Option 3, the Project would utilize a two-phase approach. During phase one, the portion of the transmission line from Sinclair, Wyoming, to the IPP substation near Delta, Utah, would be constructed (with 3,000-MW, 600-kV DC capability for phase two conversion) and operated as a 1,500-MW, 500-kV AC transmission system. Phase two would involve constructing the remaining portion of the 3,000-MW, 600-kV DC line from IPP to the Southern Terminal, south of Boulder City, Nevada, construction of the Northern and Southern terminals and ground electrode systems, and converting operations to a DC system. This approach would be required if the demand for Wyoming resources in the desert southwest proves to be slower in development than expected.

Implementation of the design options would only be considered under the conditions that sufficient capacity became commercially available to transmit energy delivered by the Project to California, and that the Project was able to establish commercial interconnection agreements with the utility owning and operating the IPP transmission line.

ES.2.1.2 Alternative Route Planning

In developing a proposed route to facilitate the transmission of power to markets in the desert southwest region, multiple regional corridor studies were conducted. The Project history and process used in evaluating alternatives while developing the applicant's proposed route is documented in TransWest's Project Description Technical Report (PDTR) (**Appendix D**). The lead agencies conducted a corridor refinement process to identify potentially feasible corridors to be analyzed in the EIS, eliminating corridors that were duplicative or presented extensive resource constraints. The following criteria were used to retain alternatives for detailed analysis in the EIS:

- Does the alternative meet the applicants' required objectives for the proposed Project?
- Is the alternative technically and economically feasible?
- Does the alternative address resource conflicts?
- Does the alternative result in measurably diminished adverse environmental effects (fewer detrimental effects, less severe effects, or shorter-term effects) than the applicant's proposed corridor for any resource?

After receiving and addressing input from the BLM Interdisciplinary Team and cooperating agency reviewers, a range of alternative corridors were presented to the public during the public scoping period (January through April 2011). Scoping comments identified several issues that helped to inform the lead agencies' identification of those alternative corridors to retain for further analysis.

ES.2.1.3 Elements Common to all Action Alternatives

Regardless of the transmission route or design option selected, there are specific Project requirements, constraints, and Project elements that apply to all action alternatives. These elements include federal environmental protection requirements and plan amendments, applicant-committed design features and environmental protection measures, and the facilities associated with the Northern and Southern terminals.

ES.2.1.4 Transmission Line Design, Construction, Operation and Maintenance

The EIS Project description of alternatives and ancillary facilities was developed from the Project Preliminary Plan of Development (TransWest 2010) and from the PDTR (**Appendix D**). Chapter 2.0 provides descriptions of typical transmission line construction ROW and temporary work areas, the three types of transmission line structures under consideration, and typical tower erection and conductor stringing construction processes. Additional details on proposed Project facilities, construction methods, Project operation, and maintenance practices, including vegetation management, are provided in **Appendix D**.

During construction, the majority of the disturbance areas would be within the 250-foot-wide transmission line ROW; all disturbance areas would be located within the 2-mile transmission line corridor. During the operation and maintenance of the transmission line, tower location sites and communication sites would remain disturbed in place and all would be located within the 2-mile transmission line corridor. Access roads also would be located within the 2-mile transmission line corridor, to the extent practicable.

ES.2.1.5 Northern and Southern Terminals

Terminals would be located at both the northern and southern ends of the Project. Both terminal stations would include an AC/DC converter station and adjacent AC substation. The AC/DC converter station would include a 600-kV DC switchyard; AC/DC conversion equipment; transformers; and multiple equipment, control,

maintenance, and administrative buildings. Two buildings would house the AC/DC conversion equipment; smaller buildings would house the control room, control and protection equipment, auxiliary equipment, and cooling equipment. Connections to the existing transmission infrastructure also would be constructed. The three major components (AC/DC converter station, 500-/230-kV AC substation, and 230-kV AC substation) are planned to be co-located and contiguous.

The Northern Terminal would be located approximately 3 miles southwest of Sinclair, Wyoming (Carbon County), on private lands. The Southern Terminal would be located at the Marketplace Hub in the Eldorado Valley, approximately 15 miles southwest of the metropolitan area of Boulder City, Nevada.

If Design Option 2 was implemented, the Northern Terminal would be constructed as in the proposed action. The Southern Terminal would be relocated to the IPP in Millard County near Delta, Utah. If Design Option 3 was implemented, a substation would be constructed near IPP under phase one and the Southern Terminal would be constructed in Nevada under phase two.

Section 2.4.3.1, Northern and Southern Terminals, provides descriptions of the Northern and Southern Terminal facilities and disturbance areas.

ES.2.1.6 Ground Electrode Systems

One ground electrode system would be required within approximately 100 miles of each of the Northern and Southern terminals to establish and maintain electrical current continuity during normal operations, and any unexpected outage of one of the two poles (or circuits) of the 600-kV DC terminal or converter station equipment. Facilities would consist of a small above-ground building and surrounding underground electrode bed wells and a lower voltage connector line from the 600-kV DC transmission line to each of the conceptual ground electrode sites. General siting areas and conceptual alternative site locations have been identified in Regions I and III; selection of specific location of the ground electrode systems would be identified during final engineering and design stages. The alternative route and potential design option selected would influence which set of ground electrode location alternatives could be considered for use.

ES.2.1.7 Project Design Features, Best Management Practices, and Required Stipulations

Project design features, best management practices (BMPs), and required stipulations are requirements for the construction, operation, maintenance, and decommissioning of the transmission line, regardless of which alternative is chosen in the ROD. These actions were all developed or mandated to avoid, minimize, or reduce impacts to resources and are required for implementation of the Project on BLM and USFS lands. **Appendix C** contains applicant-committed design features and environmental protection measures that TransWest voluntarily has proposed to minimize and/or avoid resource impacts regardless of land jurisdiction. TransWest has committed to review and augment their list of applicant-committed design features as needed to minimize impacts to the extent possible, as well as ensure conformance with all BMPs and resource- or area-specific stipulations related to surface disturbing activities from all pertinent resource management plans (RMPs) and land resource management plans.

ES.2.1.8 Route Action Alternatives

Due to the length of the transmission line, the alternative transmission routes were split into four distinct regions for the purpose of presenting clear impact comparisons between alternative segments:

- Region I: Sinclair, Wyoming, to northwest Colorado near Rangely, Colorado;
- Region II: Northwest Colorado to IPP near Delta, Utah;
- Region III: IPP to North Las Vegas, Nevada; and
- Region IV: North Las Vegas to Marketplace Hub near Boulder City, Nevada.

The alternative transmission line routes are depicted by region in **Figures 2-21** through **2-24**. The alternatives within each of these regions can be combined to define a distinct end-to-end route from Wyoming to Nevada.

Each alternative route is defined by a reference line, a nominal 250-foot-wide transmission line ROW, and a 2-mile transmission line corridor. Potential refinements to the reference line, referred to as micro-siting options, represent adjustments requested by the agencies to minimize resource or siting constraints. Final transmission line alignments and 250-foot-wide transmission line ROW locations would be determined during final engineering; however, all alignment changes would remain within the 2-mile transmission line corridor. Corridor alternative variations and alternative connectors also have been included in some locations to address specific regional or local concerns, or to provide additional routing flexibility in constrained areas. **Tables 2-3** and **2-4** summarize alternative variations and micro-siting options and alternative connectors by region.

The following subsections outline the alternative routes as well as the micro-siting options, variations, and connectors, by region.

ES.2.1.9 Region I: Sinclair, Wyoming, to Northwest Colorado near Rangely, Colorado

Region I alternative routes, micro-siting options, alternative variations, alternative connectors, and ground electrode system alternative facilities are depicted on **Figure 2-21**.

Alternative I-A (Applicant Proposed)

TransWest's proposed reference line would begin in Sinclair, Wyoming, and would travel west just south of the I-80 corridor to Wamsutter. At Wamsutter, it would turn south and generally follow the Carbon-Sweetwater county line along a corridor preferred by the Wyoming Governor's Office and Carbon and Sweetwater counties. It then would continue south-southwest across the Wyoming-Colorado state line and south along a corridor preferred by Moffat County where it would intersect with U.S. Highway 40 just west of Maybell, Colorado. The reference line generally would parallel U.S. Highway 40, turning west toward the Colorado-Utah border.

Alternative I-B

Alternative I-B was the TransWest original proposed action. It was subsequently withdrawn and replaced by a revised ROW application reflecting their current proposed action. It was retained as Alternative I-B because it would follow an existing utility corridor, thereby reducing the proliferation of new corridors. The alternative would be the same as Alternative I-A to Wamsutter, and then differ as Alternative I-B would continue west for several miles before turning south along the West-wide Energy Corridor (WWEC). Alternative I-B would follow the WWEC to near the Colorado state line, where it would converge with Alternative I-A for approximately 15 miles, then diverge to the south and parallel Alternative I-A to the east with an offset of approximately 5 miles. It then would intersect with U.S. Highway 40 and follow Alternative I-A to the end of Region I.

Alternative I-C

This alternative was developed to reduce the overall proliferation of utility corridors and associated impacts by following existing designated utility corridors. Alternative I-C would begin by following Alternative I-A to near Creston, Wyoming, where Alternative I-C would turn south and parallel Wyoming State Highway 789 toward Baggs, Wyoming. From there, Alternative I-C would continue south, deviating from Highway 789 to the east and passing east of Baggs. After crossing into Colorado, this alternative would parallel Colorado State Highway 13 into Craig, Colorado. Alternative I-C would pass east and south of Craig, turning to the west after crossing U.S. Highway 40, generally paralleling the highway and joining with Alternative I-A to the end of Region I.

Alternative I-D (Agency Preferred)

Alternative I-D was developed to reduce multiple resource concerns, including impacts to visual resources and greater sage-grouse. It would follow the route of Alternative I-A, going west from Sinclair, Wyoming (Carbon County, Wyoming), basically paralleling I-80 in a designated WWEC, until turning south near Wamsutter. It would follow Alternative I-A south for approximately 15 miles. Alternative I-D then would diverge to the east, where it generally would parallel Highway 789 at an offset distance of 2 to 5 miles to the west. Before reaching the Baggs area, Alternative I-D would turn west and follow the Shell Creek Stock Trail road for approximately 20 miles, where it would cross into Sweetwater County and again join Alternative I-A while turning south into Colorado (Moffat County).

Region I Alternative Variations, Alternative Connectors, and Micro-siting Options

There are no alternative variations within Region I. Four alternative connectors were developed in Region I to provide the flexibility to combine alternative segments to address resource conflicts. Micro-siting options have been developed to address specific land use concerns in all Region I alternative routes related to the Tuttle Ranch Conservation Easement.

Region I Ground Electrode System Alternative Facilities

There are eight potential locations for ground electrode systems in Region I. Three locations would apply to all alternatives; the remaining five locations would apply to only certain alternatives.

ES.2.1.10 Region II: Northwest Colorado to IPP near Delta, Utah

Region II alternative routes, micro-siting options, alternative variations, and alternative connectors are depicted on **Figure 2-22**. There are no ground electrode system alternative facilities in Region II.

Alternative II-A (Applicant Proposed)

The TransWest proposed reference line would continue into Utah in a westerly direction, then deviate south from Highway 40 toward Roosevelt, Utah. From Roosevelt, it would pass north of Duchesne, again paralleling Highway 40 for several miles, then turn southwest toward Nephi, near U.S. Highways 6 and 89. The reference line would pass through Salt Creek Canyon then north around Nephi. It would continue west and then turn southwest following a path north of and adjacent to IPP. Portions of this corridor have been identified as preferred in a joint resolution by representatives of Juab and Millard counties.

Alternative II-B

Alternative II-B was developed to address impacts to private lands and to generally follow established utility corridors. These corridors are designated for underground utilities only and use of the corridor for the transmission line would require a plan amendment. The route would travel southwest in Colorado from the beginning of Region II, cross the Yampa River, and pass east of Rangely, Colorado. It would continue southwest where it would cross the Colorado-Utah state line and turn generally south, crossing back into Colorado in the Baxter Pass area. At that location, it would intersect the Interstate 70 (I-70) corridor, turning in a southwesterly and westerly direction, paralleling I-70. After passing south of Green River, Utah, Alternative II-B would diverge from I-70 and turn to the north along U.S. Highway 191. This highway generally would be followed until just south of the Emery-Carbon county line, where Alternative II-B would turn west and pass near the county line for approximately 25 miles. It generally would turn south, passing west of Huntington, Utah, before turning northwest passing northeast of Mount Pleasant, Utah. From there, it would pass through Salt Creek Canyon to Nephi, and then south around Nephi. It then would turn southwest and west adjacent to IPP, following a path south of Alternative II-A.

Alternative II-C

Alternative II-C also would decrease impacts to private lands and generally would follow established utility corridors as well as avoid USFS IRAs. Alternative II-C would follow Alternative II-B through Colorado, along

I-70 into Utah, and north at Highway 191. Approximately 15 miles north on Highway 191, Alternative II-C would diverge from Alternative II-B and turn in a general westerly direction toward Castle Dale. Approximately 3 miles east of Castle Dale, this alternative would turn south and roughly parallel Utah State Highway 10 at a distance of approximately 3 miles to the east. The alternative would cross Highway 10 near the Emery-Sevier county line and turn west, again generally following the I-70 corridor into the Salina, Utah, area. Alternative II-C would pass south of Salina, turn north, and parallel U.S. Highway 50 toward Scipio, Utah. The alternative would turn west and pass Scipio on the south, then turn north, passing east of Delta, Utah, continuing into IPP.

Alternative II-D

This alternative was developed to avoid USFS IRAs and to provide additional northern route options to avoid impacts to historic trails and areas designated for special resource management along the southern routes (Alternatives II-B and II-C). It would begin along the same route as Alternative II-A. However, as it would enter Utah, it would diverge briefly to follow a designated utility corridor, causing it to zigzag once across Alternative II-A. It then would diverge to the south of the designated utility corridor and turn west-southwest. Alternative II-D would cross into Carbon County northwest of Price, and then turn southwest in the Emma Park area along Highway 191. It would follow this highway west of Helper, and then turn west toward Salt Creek Canyon where it would join and follow Alternatives II-B and II-E, then join and follow Alternative II-A into IPP.

Alternative II-E

Alternative II-E also was developed to provide additional northern route options to address the previously-mentioned resource impacts from the southern routes. This alternative would follow Alternative II-D into Utah and along the designated utility corridor, zigzagging across Alternative II-A. It then would rejoin Alternative II-A to continue east through Duchesne, Utah. Approximately 10 miles east of Duchesne, Alternative II-E would turn southwest and generally parallel Highway 191, offset by 1 to 6 miles. At the Utah-Carbon county line, this alternative would turn west through the Emma Park area, then northwest along U.S. Highway 6 until it would rejoin with Alternative II-A, following its siting to Salt Creek Canyon. At this canyon, Alternative II-E would begin to follow the alignment of Alternative II-B south of Nephi, then join and follow Alternative II-A adjacent and into IPP.

Alternative II-F (Agency Preferred)

This alternative combines portions of other alternatives in the region and contains unique segments in the Emma Park area that together would minimize impacts to USFS IRAs, Tribal and private lands, greater sage-grouse habitat, and avoid impacts to NHTs. It would begin in southwest Moffat County (Colorado) by following Alternative II-A in designated WWEC and BLM utility corridors. As it enters Utah (Uintah County), it would separate from Alternative II-A to the northwest and follow the designated utility corridors, which then turn southwest and cross Alternative II-A. It then would diverge to the south off of the designated WWEC (still following the BLM-designated corridor) and turn west-southwest, crossing the Uintah and Ouray Indian Reservation. It then would cross into Duchesne County, where it would turn west-southwest out of the BLM utility corridor and generally follow the southern county line, crossing into Carbon County northwest of Price where it would turn west-northwest and follow Highway 6 to Thistle (Utah County) through a portion of designated WWEC and BLM utility corridors. It then would turn south, following Highway 89 for about 10 miles before cutting south-southwest (Sanpete County) to Highway 132. At this highway, it would turn west into Nephi (Juab County) and follow a path south around the community, then turn southwest following a BLM-designated utility corridor that turns west into IPP north of Delta (Millard County), which is the end of the Project's Region II.

Region II Alternative Variations, Alternative Connectors, and Micro-siting Options

One alternative variation was developed to address potential impacts to the scenic and recreation issues along the Reservation Ridge Scenic Backway, while also considering BLM policy (IM 2012-043) regarding greater sage-grouse. Five alternative connectors were developed in Region II to provide the flexibility to combine alternative segments to address resource conflicts. Micro-siting options have been developed to address concerns with construction in Uinta National Forest IRAs at a location where the designated WWEC offsets

from a continual corridor in Alternative II-A, and within USFS IRAs along the edges of the Manti-La Sal National Forest in Alternatives II-A, II-E, and II-F.

ES.2.1.11 Region III: IPP to North Las Vegas, Nevada

Region III alternative routes, alternative variations, alternative connectors, and ground electrode system alternative facilities are depicted on **Figure 2-23**. There are no micro-siting options in Region III.

Alternative III-A (Applicant Proposed)

The TransWest proposed reference line would leave IPP to the west and turn south toward Milford, Utah, following the WWEC. For the remainder of Utah, the reference line roughly would parallel Interstate 15 (I-15) approximately 20 miles west of the highway. The reference line would pass west of Milford, then generally trend south-southwest, passing east of Enterprise, Utah, and directly west of Central, Utah; exiting Utah just north of the southwest corner of the state. In Nevada, the line would cross I-15 west of Mesquite, Nevada, and remain on the south side of I-15 until reaching the North Las Vegas area northeast of Nellis Air Force Base.

Alternative III-B (Agency Preferred)

Alternative III-B was developed to decrease resource impacts in southwestern Utah (including potential impacts to the Mountain Meadows National Historic Landmark and Site and IRAs in the Dixie National Forest). It would begin following Alternative III-A through Millard and Beaver counties. Near the Beaver-Iron county line, it would diverge toward the west. Alternative III-B would follow a west-southwest course, crossing into Lincoln County, Nevada, near Uvada, Utah, where it would turn to a general southerly direction, rejoining Alternative III-A to the northwest of Mesquite. It then would diverge to the west from Alternative III-A approximately 16 miles west of Mesquite, cross into Clark County, pass southeast of Moapa, Nevada, pass through the designated utility corridor on the Moapa Reservation, and rejoin Alternative III-A approximately 4 miles north of the end of Region III.

Alternative III-C

Alternative III-C also was developed to address the same resource impacts as Alternative III-B and to take advantage of an existing corridor with existing transmission line development, thereby potentially consolidating cumulative transmission line impacts. This alternative would follow Alternatives III-A and III-B before diverging from them shortly after traveling west out of IPP, where it would follow the existing IPP power line to the south for approximately 30 miles and then rejoin Alternative III-B to the Utah-Nevada state line. After passing into Nevada at Uvada, Alternative III-C would turn west away from Alternative III-B, passing north of Caliente, Nevada; turning south approximately 15 miles west of Caliente. This alternative would follow that southern course, intersecting with U.S. Highway 93 and paralleling the highway for all but the last 15 miles into North Las Vegas. Alternative III-C would rejoin Alternative III-A northeast of Nellis Air Force Base at the end of Region III.

Region III Alternative Variations and Alternative Connectors

Three alternative variations were developed to address potential impacts to the Mountain Meadows National Historic Landmark resulting from Alternative III-A. Two alternative connectors were developed in Region III to provide the flexibility to combine alternative segments to address resource conflicts.

Region III Ground Electrode System Alternative Facilities

There are eight potential locations for ground electrode systems in Region III. Three of the locations would apply only to Alternative III-A, three would apply only to Alternative III-B, one would apply only to Alternative III-C, and one would apply only if Design Option 2 were to be implemented.

ES.2.1.12 Region IV: North Las Vegas to Marketplace Hub near Boulder City, Nevada

Region IV alternative routes, alternative variations, and alternative connectors are depicted on **Figure 2-24**. There are no micro-siting options or ground electrode system alternative facilities in Region IV.

Alternative IV-A (Applicant Proposed and Agency Preferred)

The TransWest proposed action would follow a designated WWEC, pass North Las Vegas to the east, and cross the congressionally designated Sunrise Mountain Instant Study Area (ISA). Crossing the ISA may entail congressional legislation modifying the designation (see Section 3.15, Special Designations, for details). It would run between Whitney, Nevada, and the Lake Las Vegas development skirting the edge of Henderson, Nevada. It would then turn in a general southwest direction to the Marketplace endpoint.

Alternative IV-B

Alternative IV-B was developed to provide an alternative that does not require crossing the Sunrise Mountain ISA. It would follow the proposed alternative for approximately 7 miles, diverge to the southeast as it passed directly east of Nellis Air Force Base and travel south through the Lake Mead National Recreation Area (NRA), passing between the Lake Las Vegas development and Lake Mead. Along the south edge of Lake Las Vegas, it would turn southwest, north of Boulder City, Nevada, then turn west and join with Alternative IV-A west of Henderson to the Marketplace endpoint.

Alternative IV-C

Alternative IV-C also would provide an alternative that does not cross Sunrise Mountain ISA. In addition, it would decrease impacts to populated areas. This alternative would follow Alternative IV-B through the Lake Mead NRA and between the Lake Las Vegas development and Lake Mead to north of Boulder City. It would then continue south before it turned southwest around the southeast edge of Boulder City, and into the Marketplace endpoint.

Region IV Alternative Variations and Alternative Connectors

One alternative variation was developed to address impacts to private lands. Five alternative connectors were developed in Region IV to provide the flexibility to combine alternative segments to address resource conflicts.

ES.2.2 No Action Alternative

Under the No Action Alternative, the BLM or USFS would not issue ROW grants or special use permits and the Project would not be constructed. Under the No Action Alternative, Western would not provide funding to the Project.

ES.2.3 Alternatives Considered but Eliminated

During scoping, numerous questions were raised regarding the ability to route the transmission line, or portions of the transmission line, underground. Underground cable systems have been considered and evaluated for the Project. To date, underground cable technology required to meet the applicant's objectives is not available, nor is it reasonably foreseeable that it would become available within the timeframe for the construction of the Project. Therefore, undergrounding all or portions of the Project was not considered a viable alternative and has been eliminated from further analysis.

Additionally, a number of corridor segments were considered through the public scoping period, but subsequently have been eliminated from detailed analysis in this EIS by the lead agencies. **Table 2-22** identifies the segments and notes the rationale for elimination from detailed analysis.

ES.2.4 Agency Preferred Alternative

The BLM determined the preferred alternative within each Project region with input from the cooperating agencies. The agency preferred alternative is subject to change when public input received during the Draft EIS public comment period is considered. The agency preferred alternative was identified using criteria linked to Council on Environmental Quality criteria for determining significant impacts. These criteria were broadened and refined based on input from the Project's cooperating agencies regarding other key resource concerns as follows:

1. Maximizes the use of appropriate (e.g., non-underground-only) existing designated utility corridors by locating within or paralleling areas of existing utility ROWs.
2. Minimizes the need for plan amendments through conformance to land use plans.
3. Avoids or minimizes resource impacts that are regulated by law (Endangered Species Act, Clean Water Act, National Historic Preservation Act, wilderness, WSAs, ISAs, IRAs, etc.) after consideration of Project design features and agency BMPs. This includes impacts to greater sage-grouse.
4. Avoids or minimizes proximity to private residences and residential areas, thereby addressing concerns with public health and safety, aesthetics, visual effects, and others.
5. Avoids or minimizes resource impacts that demonstrate potentially unavoidable adverse impacts (residual impacts) after consideration of Project design features and agency BMPs, even though they may not be specifically regulated by law.
6. Minimizes use of private lands, assuming natural resource impacts are more or less similar.
7. If multiple alternatives meet the preceding criteria, the agency preferred alternative would be the alternative that minimizes construction, operation, and maintenance expense and/or time.

ES.3 Affected Environment and Environmental Consequences

The following section summarizes the affected environment and environmental consequences analysis contained in Chapter 3.0 of the Draft EIS. A summary of impacts from the Project's action alternatives is provided by Project region in **Tables 2-23** through **2-26**. **Table 2-27** compares the applicant proposed route with the agency preferred route on a Project-wide basis (sum of impact parameters across the four Project regions). Cumulative impacts of the Project are presented in Chapter 5.0.

ES.3.1 Air Quality

The existing air quality of most of the analysis area is typical of the largely undeveloped regions of the western U.S. Current sources of air pollutants in the region include wildland fires, mining, agriculture, industrial sources, urban transportation, vehicular travel on unpaved roads, construction activities, and disturbed land. All of the northern portions of the analysis area have been designated as attainment areas for all pollutants that have ambient air quality standards; however, Clark County, Nevada, is designated as nonattainment or maintenance area for specific pollutants. Impacts to air quality include increases in criteria pollutants, including fugitive dust emissions, emissions of hazardous air pollutants, and green house gas emissions. Neither the construction nor operations phase of the proposed action or alternatives is expected to cause or contribute to any violation of any state or federal ambient air quality standard; interfere with the maintenance or attainment of any state or federal ambient air quality standard in the analysis area; increase the frequency or severity of any existing violations of any state or federal ambient air quality standard in the analysis area; delay the timely attainment of any standard, interim emission reduction, or other air quality milestone promulgated by the U.S. Environmental Protection Agency (USEPA) or state air quality agency; cause any adverse impacts to air quality related values; cause any adverse impact to air quality related values in a federal Class I area; or exceed state or federal general conformity thresholds. Impacts by region and alternative are shown in **Tables 2-23** through **2-26**.

ES.3.2 Geological, Paleontological, and Mineral Resources

The proposed Project covers several physiographic provinces including the Wyoming Basins, Colorado Plateau, Middle Rocky Mountains, and Basin and Range provinces. Region I analysis area has low earthquake activity, moderate to high susceptibility and low incidence of landslides, and contains areas that may be subject to ground subsidence. There are important fossil bearing formations and major mineral resources in the area. Region II analysis area has a number of potentially active fault zones, moderate to high incidence and susceptibility to landslides, and areas that may be subject to ground subsidence. There are important fossil bearing formations and major mineral resources in the area. Region III has several potentially active faults, generally low landslide susceptibility, and contains some areas with subsidence risk. There are three high-potential fossil-bearing formations and important mineral resources in the area. Region IV analysis area has some fault areas but ground movement from an earthquake is expected to be low and there is low incidence and susceptibility to landslides. The Las Vegas Valley experiences subsidence due to groundwater withdrawal but the analysis areas does not cross any subsidence areas. There are no high fossil potential formations in the area.

Impacts from landslides or unstable ground would result in damage to structures and ultimately disruption in service. Electrical transmission lines have reportedly been impacted by ground stability hazards on the Wasatch Plateau and structural failure and relocation of transmission line routes have resulted because of landslides due to anomalous precipitation events. Ground subsidence also would result in the loss of ground support to structures with the potential to damage and disrupt operations. The risk of damage from seismicity, landslides, or subsidence would be substantially reduced through implementation of BMPs, design features, and mitigation. The proposed Project is not expected to preclude or restrict access to minerals resources. Project construction and operation would not be expected to result in the loss or damage of scientifically important paleontological resources. Indirect impacts may occur to paleontological resources over an extended period of time because of increased access to medium to high fossil potential formations. The BMPs and design features that protect paleontological resources discussed in construction impacts would lessen the risk; however, the resource would still be at risk through the continuation of natural processes (e.g., erosion) and unauthorized collection. Impacts by region and alternative are shown in **Tables 2-23** through **2-26**.

ES.3.3 Soils

All four Project regions contain soils that are prone to compaction, prone to wind or water erosion, have limited revegetation potential, or which are corrosive to cement and steel structures. Additionally, Region II contains soils that are susceptible to the development of large sinkholes, piping, and subsidence. The Region I, II, and III analysis areas contain prime farmlands.

In general, the impacts to soils associated with construction of the transmission line would be temporary. Direct impacts to soil resources would include the clearing or crushing of surface cover (vegetation, duff, litter) and blading/grading of soils for structure construction. During construction, the soil profiles would be mixed with a corresponding loss of soil structure. Soil compaction would result from the movement of heavy equipment and vehicles during construction activities. Soil compaction and a reduction in ground cover would lead to an increase in bulk density, increased runoff, and erosion. Long-term losses of prime farmland could occur if structure foundations or facilities are required in prime farmlands. Agency BMPs would reduce impacts to soils from uneven settling, compacted surfaces, and physical crusts reducing water infiltration. Monitoring of erosion controls after storm events would keep erosion control in effective working order and reduce or prevent sediment from moving off-site. Implementation of design features, agency BMPs, and mitigation measures would effectively control erosion from disturbed areas reducing the loss of surface soils and potential sedimentation effects. Additional mitigation has been proposed to locate structures away from prime farmlands. Impacts by region and alternative are shown in **Tables 2-23** through **2-26**.

ES.3.4 Water Resources

The water resources analysis area consists of 179 hydrographic watersheds within the North Platte, Great Salt Lake, Upper Colorado, and Lower Colorado River hydrographic regions. The North Platte Region drains the

east side of the Continental Divide and ultimately empties to the Gulf of Mexico. The Upper Colorado Region, Lower Colorado Region, and Great Basin Region all drain the western side of the Continental Divide; the Upper and Lower Colorado regions ultimately drain toward the Gulf of California, while the Great Basin Region generally drains toward the Great Salt Lake. Surficial aquifers are present in the floodplains of major surface water features and the low-lying areas of the Basin and Range area. Springs and seeps are found throughout the analysis area. Region I, II, III, and IV analysis areas contain 9, 28, 11, and 3 impaired waterbodies, respectively.

Water quality could be impacted both directly and indirectly from construction of waterway crossings, which could result in channel instability and increased sediment supply from disturbed areas directly adjacent to the crossings. This may in turn cause increased sediment from mass wasting of channel banks, and down-cutting of the streambed, with resultant changes in channel geomorphology. Consultation would be conducted with the managing land agency regarding relevant standards and guidelines for waterbody road-crossing methods. Direct impacts would be greatest for short periods of time during construction and through the reclamation process until successful revegetation occurred. The applicant will develop a management plan to avoid, reduce, and/or minimize adverse impacts to any streams having impaired uses due to elevated sediment concentrations or constituents that might be present in stormwater runoff. Indirect impacts to water quality could occur from ground disturbance in upland areas when precipitation events would cause overland runoff to erode bare soils and transport sediment to waterways. The design features and BMPs discussed in the Erosion Control Plan and Storm Water Pollution Prevention Plan would minimize runoff and erosion from disturbed areas. Although increased erosion would be expected because the disturbance would be dispersed along the linear path of the Project, no alterations to the existing drainage patterns or increases of off-site erosion would be expected from the disturbance of upland areas by the Project. Because existing water rights (current depletion) would be utilized, no new impacts to other water users or the water source would be anticipated. Impacts by region and alternative are shown in **Tables 2-23** through **2-26**.

ES.3.5 Vegetation

There are 20 vegetation communities and developed/disturbed land located within the analysis area. The shrubland cover type is the dominant land cover type within the analysis area, comprising 54 percent of the area. Forest and woodlands cover type comprises the second largest percentage (21 percent) of the analysis area.

Direct surface disturbing impacts to vegetation would include the trampling/crushing of vegetation, the removal of vegetation, and soil compaction. Indirect effects to vegetation would include increased erosion, sedimentation, fugitive dust generation, habitat fragmentation, and the potential spread and establishment of noxious and invasive weed species. Noxious weed invasions into disturbed areas may result in incremental changes to the fire regimes for each vegetation community. The land cover type with the highest overall risk of accidental fires spreading upon ignition is sagebrush shrubland. The removal of woody vegetation over 6 feet in height could result in changes in vegetation community structure. Depending on the species present, woody communities could temporarily or permanently shift to communities dominated by herbaceous and/or low growing shrubs. In addition, increased light and open areas in the ROW could lead to increased noxious and invasive weed species establishment and spread. Although vegetation communities would recover at varying rates, it is estimated that overall, herbaceous-dominated plant communities would require a minimum of 3 to 5 years to establish adequate ground cover to prevent erosion and provide forage for wildlife species and grazing operations. Woody-dominated plant communities would require at least 10 to 25 years for recolonization; re-establishment of mature woodlands would require at least 30 to 50+ years. Depending on composition, recovery could take up to 31 to 100 years to achieve mature trees of similar stature to pre-construction conditions. Impacts by region and alternative are shown in **Tables 2-23** through **2-26**.

ES.3.6 Special Status Plant Species

A total of 304 special status plant species were evaluated for potential occurrence within the 2-mile transmission line corridor. After consideration of habitat requirements and known distribution, 141 special

status plant species were carried forward for detailed analysis in this EIS. This includes 15 federally listed and 3 candidate species. Region II contains the highest number of special status plant (84) followed by 51 species in Region III. Region I and IV each contain fewer than 25 species.

The types of direct and indirect effects of construction activities generally are the same as those discussed for vegetation resources, and could result in loss of individuals and/or populations and loss of potentially suitable habitat. Other direct effects include the potential loss of pollinators, increased opportunities for illegal collection of individual special status plant species, and habitat fragmentation. Additional indirect impacts associated with operations would result from the vegetation maintenance for the ROW. Design features, BMPs, and additional proposed mitigation would reduce these impacts.

Based on species occurrence information and habitat associations, the special status plant species that may be impacted by the Project in Region I include 23 BLM sensitive species and 1 federally listed species. Within Region II, there are 62 BLM sensitive species, 18 USFS sensitive species, and 14 federally listed plant species that may be impacted by the Project. Within Region III, there are 46 BLM sensitive species, 2 USFS sensitive species, 5 Nevada state-listed species, and 4 federally listed species that may be impacted by the Project. Within Region IV, there are 18 BLM sensitive species, 8 NPS sensitive species, 5 Nevada state-listed species, and 1 federally listed species that may be impacted by the Project. Impacts by region and alternative are shown in **Tables 2-23** through **2-26**.

ES.3.7 Wildlife

Big game species that occur within the analysis area include pronghorn, mule deer, white-tailed deer, elk, moose, Rocky Mountain bighorn sheep, and desert bighorn sheep. Small game species that occur within the analysis area include upland game birds, small mammals, furbearers, and waterfowl. A diversity of nongame species (e.g., small mammals, raptors, passerines, and reptiles) occupies a variety of habitat types within the analysis area.

Construction-related impacts primarily are habitat loss, fragmentation, and wildlife mortalities as a result of vehicle collisions and crushing of nests/burrows. Implementation of design features and agency restrictions to prevent disturbance to wintering big game species in identified crucial winter habitat would minimize direct impacts to wintering big game species. Similarly, direct impacts to small game would be limited during sensitive periods (e.g., nesting and breeding). TransWest also has committed to implementing raptor seasonal timing restrictions in applicable areas. Remaining impacts to wildlife would be limited to habitat loss and/or fragmentation. Similarly, noise and human presence impacts to wildlife species would be limited to habitat loss outside of key breeding times within important habitat types and protection buffers.

The primary operation-related impact associated with transmission lines and associated facilities is wildlife mortalities as a consequence of electrocution or collision with transmission line components. Other potential impacts include habitat avoidance due to the presence of a transmission line or maintenance noise and human presence. To minimize potential operation-related impacts to wildlife as a result of the proposed Project, TransWest's design feature requires that the Project meet or exceed the raptor safe design standards described in the Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 (Avian Power Line Interactive Committee 2006). Anti-perching within key greater sage-grouse habitat also would benefit other wildlife prey species. Even with implementation of the proposed design features, there would be some remaining potential for avian collisions with the transmission line and towers. However, the potential for electrocution impacts to bird species would be negligible. Wildlife prey species also would be impacted given the potential for increased avian predator populations nesting on power line structures. Impacts by region and alternative are shown in **Tables 2-23** through **2-26**.

ES.3.8 Special Status Wildlife Species

A total of 120 special status wildlife species were carried forward in this EIS: 12 terrestrial invertebrates, 19 reptiles, 51 birds, and 38 mammals. There are 12 federally listed wildlife species (1 reptile, 7 birds, and

4 mammals) within the Special Status Wildlife Analysis Area, as well as 2 federal candidate species (greater sage-grouse and western yellow-billed cuckoo).

Construction impacts account for all disturbances caused during construction of the proposed Project, including vegetation removal, increased human activity, and increased noise levels. The primary impacts associated with operation of transmission lines and associated facilities are mortalities as a consequence of electrocution or collision with Project components.

Based on species occurrence information and habitat associations, special status wildlife species that may be impacted in Region I include 2 federally listed and 2 candidate species and 64 BLM sensitive and state-protected species. The federally listed and candidate special status species are the greater sage-grouse (Candidate), western yellow-billed cuckoo (Candidate), black-footed ferret (Endangered; Experimental Non-essential), and the grey wolf (Endangered in Utah and Colorado; Experimental Non-essential in Wyoming). Region I impacts by alternative are shown in **Tables 2-23**.

Special status wildlife species that maybe impacted in Region II include 5 federally listed and 2 candidate species and 65 BLM sensitive, USFS sensitive, and state-protected species.

The federally listed and candidate special status species are the greater sage-grouse (Candidate), western yellow-billed cuckoo (Candidate), Mexican spotted owl (Threatened), black-footed ferret (Endangered), Canada lynx (Threatened), grey wolf (Endangered in Utah and Colorado), and the Utah prairie dog (Threatened). Region II impacts by alternative are shown in **Tables 2-24**.

Special status wildlife species that may be impacted in Region III include 5 federally listed and 2 federal candidate species and 77 BLM sensitive, USFS sensitive, and state-protected species. The federally listed and candidate special status species are the desert tortoise (Threatened), California condor (Endangered; Experimental Non-essential), greater sage-grouse (Candidate), Yuma clapper rail (Endangered), western yellow-billed cuckoo (Candidate), southwestern willow flycatcher (Endangered), and the Utah prairie dog (Threatened). Region III impacts by alternative are shown in **Tables 2-25**.

Special status wildlife species that may be impacted in Region IV include 3 federally listed and 1 federal candidate species and 65 BLM sensitive, USFS sensitive, and state-protected species. The federally listed and candidate special status species are the desert tortoise (Threatened), western yellow-billed cuckoo (Candidate), southwestern willow flycatcher (Endangered), and the Yuma clapper rail (Endangered). Region IV impacts by alternative are shown in **Tables 2-26**.

ES.3.9 Aquatic Biological Resources

There are 26 game fish species, subspecies, or hybrids that occur within the analysis area. Most of the species are trout; other species are from the catfish, sunfish, temperate bass, perch, sturgeon, and smelt families. Waterbodies within the analysis area also support nongame fish species represented by suckers, minnows, and sculpins; invertebrate communities that include a mixture of worms, immature and adult insect groups, crustaceans, snails, and other groups; and habitat for amphibians (salamanders, toads, and frogs) and aquatic reptiles (turtles). Aquatic invasive species and whirling disease are issues within streams and lakes/reservoirs in all four states.

Equipment and vehicle traffic within the ROW and access roads could cross small and moderate-size streams or springs. Vehicle crossings would result in mortalities to macro invertebrates and possibly early life stages of fish. Through the implementation of BMPs, design measures, and additional mitigation measures, stream crossings would not permanently remove habitat and detrimentally affect fish population numbers, and macroinvertebrate composition and numbers would recover during subsequent colonization. Stream crossings would alter bottom substrates, and construction at stream crossings would remove riparian vegetation that provides cover for fish, shading, bank stability, and increased food and nutrient supply. The disturbed area would be restored to pre-construction conditions after construction is completed. Given the relatively small

width of the disturbance area associated with an individual stream crossing, impacts would be considered low in relation to the entire stream system.

The installation of culverts would result in a permanent loss of aquatic habitat. Stream crossings by vehicles and equipment pose a risk of transferring invasive aquatic species between drainages during construction. This risk would be reduced through Invasive Aquatic Species Protection mitigation measures. Effect determination of new and existing water depletions would be made after the water sources are identified and an evaluation of their potential connection to surface flows is completed.

ES.3.10 Special Status Aquatic Species

Fifty-five special status aquatic species were evaluated in terms of potential occurrence within the analysis area. Twenty fish, 5 amphibians, and 3 invertebrates were carried forward in this EIS, including 7 federally listed and 1 candidate fish species. Aquatic habitat in the analysis area used by special status aquatic species includes streams, springs, and wetlands. No lakes or reservoirs are inhabited by special status aquatic species. Region II contained the highest number of species (19), followed by 12 species in Regions I and III. One species occurs within the Region IV analysis area.

The types of direct and indirect effects of construction activities generally are the same as those discussed for aquatic biological resources, including disturbance to aquatic habitat from vehicle crossings and culvert installation, removal of riparian vegetation, and increased in sedimentation and fuel spill risks. Impacts by region and alternative are shown in **Tables 2-23** through **2-26**.

An effect determination of new and existing water depletions would be completed after identifying the water sources for construction and whether there is any connection between these water sources and surface flows in the Colorado Basin, Utah Lake/Provo River drainage, and the Platte sub-basin.

ES.3.11 Cultural Resources

The analysis area for cultural resources encompasses a 2-mile-wide corridor along each alternative, including portions of Wyoming, Colorado, Utah, and Nevada. A cultural resource files search was conducted to identify all previously conducted archaeological investigations and previously recorded cultural resources within the analysis area. There have been 122 historic sites and 72 historic components previously documented in the Wyoming portion of analysis area, 257 historic sites and 33 historic components previously documented in the Colorado portion of the analysis area, 721 historic sites and 61 historic components previously documented in the Utah portion of the analysis area, and 221 historic sites and 18 historic components previously documented in the Nevada portion of the analysis area.

The Project's ground-disturbing activities would have the potential to directly impact historic properties, including traditional cultural properties and properties of traditional religious and cultural importance to Native American Tribes. These physical impacts could occur to both known sites and subsurface sites and could result in the vertical and horizontal displacement of soil containing cultural materials, damage to or destruction of artifacts and features, and loss of archaeological data. Visual impacts to historic properties (as well as cultural/historic landscapes) where setting is an aspect of integrity could occur as a result of introducing visual elements out of character with a property located within the visual area of potential effects.

At this time, the number of historic properties that would be adversely affected by the Project is unknown. As stipulated in the draft Programmatic Agreement (PA), an intensive Class III pedestrian inventory would be required after the agency preferred alternative is selected by the BLM and Western and before construction, to allow for the National Register of Historic Places (NRHP) evaluation of identified sites, impact assessments, and mitigation, if necessary. If the BLM and Western determine that a property would be adversely affected, mitigation would be proposed in accordance with the draft PA. Visual impacts to historic properties where setting contributes to their NRHP eligibility and from which the Project would be visible would be determined through viewshed analysis, on-site inspection, and photo inspection. Adverse effects to the integrity of a

property's setting would be minimized or mitigated as stipulated in the draft PA. Any previously unknown cultural resources (other than isolates) discovered during construction activities would be handled as detailed in the draft PA. Site file search data by region and alternative are shown in **Tables 2-23** through **2-26**.

ES.3.12 Visual Resources

The analysis area for visual resources comprises the viewsheds of the Project's reference lines out to 20 miles in locations where they cross tree-covered landscapes and out to 5 miles in shrub, grassland, and cropland landscapes. Project's setting intersects the high plains, mountains, plateaus, valleys, and desert landscapes of Wyoming, Colorado, Utah, and Nevada, respectively, and includes the following physiographic provinces: Wyoming Basin Province; Uinta Basin section of the Colorado Plateaus Province; Northern Canyonlands section of the Colorado Plateaus Province; Middle Rocky Mountains Province; High Plateaus of Utah section of the Colorado Plateaus Province; Great Basin section of the Basin and Range Province; and Sonoran Desert section of the Basin and Range Province.

Visual resources impacts would occur during the construction phase of the Project and would be caused by vegetation clearing within the ROW and ground disturbance for access roads, transmission line, terminal, and electrode bed construction. Impacts would continue into the operational phase with visibility of structures, overhead conductors, cleared ROWs in tree-covered landscapes, access roads, terminal areas, and electrode bed areas and associated roads and small voltage electrical lines. In undeveloped areas, transmission line elements would contrast with existing characteristic landscapes to a moderate to strong degree. In viewsheds with existing electrical transmission line structures and ground disturbances, contrasts would be weak to moderate, depending on distance from the observer and number and type of structures. In all cases, construction activities occurring in the immediate foreground of the observer would cause greater contrasts than those appearing at a further distance. Direct impacts to people and scenery would be expected to be moderate to high and contrasts would comply with BLM Visual Resource Management (VRM) Class IV management objectives, and be consistent with USFS Low and Very Low Scenic Integrity Objectives (SIO) and USFS Modification and Maximum Modification Visual Quality Objectives (VQO). Project construction activities, as discussed in the plan of development, that are located within 0.5 mile of high or moderate sensitivity viewers and have strong or moderate contrasts, would not be expected to comply with BLM VRM Class III, or be consistent with USFS SIO High or Medium, and USFS VQO Retention or Partial Retention management objectives. Mitigations involving distances greater than 0.5 mile typically would reduce visual contrasts to moderate and, therefore, result in compliance with VRM Class III, and consistency with SIO Medium and VQO Partial Retention management objectives.

Indirect viewshed impacts would result from disturbance by human recreational activities, artifacts of activities, and vehicles with access to scenic landscapes by the Project's permanent access roads. Indirect impacts during operation would be expected to comply with agency management objectives in BLM VRM Class III and IV areas and be consistent with USFS SIO Medium and Low or USFS VQO Partial Retention, Modification, or Maximum Modification management objectives. Indirect impacts in the immediate foreground 0.25 mile from sensitive viewers may not comply with BLM VRM Class II management objectives or be consistent with USFS SIO High or USFS VQO Retention management objectives. It is expected these impacts would be mitigated (if possible) on a case-by-case basis. Impacts by region and alternative are shown in **Tables 2-23** through **2-26**.

ES.3.13 Recreation Resources

The majority of recreation resources within the analysis area occur on federal lands managed by the BLM and USFS. Dispersed, unstructured activities typify the recreational uses occurring on public (federal and state) lands throughout the majority of the analysis area. Dispersed recreation in the analysis area includes motorized and non-motorized activities such as undeveloped camping, fishing, hiking, horseback riding, rock and ice climbing, mountain biking, snowmobiling, caving, off-highway vehicle (OHV) trail riding or open area use, and driving for pleasure. Developed recreation sites on federal and state lands in the analysis area include campgrounds, picnic areas, information and interpretive sites, trailhead facilities, boat ramps, and

fishing accesses. Most are provided by federal agencies, though there are some city- or county-managed recreation areas as well as privately owned recreation facilities.

During construction, noise or visual presence of construction activities could temporarily affect the experiences of visitors participating in dispersed or developed recreation opportunities near the construction area (generally limited to those areas within the 2-mile transmission line corridor). Construction is expected to affect recreation use particularly on the weekends; seasons of use may vary by region. At peak construction levels, human activity would be high and noise generally would be above existing background levels within the entire width of the 2-mile transmission line corridor. Some user groups would be more affected by habitat removal, noise and visual disturbance than others; for example, hunters, wildlife viewers and non-mechanized users groups, whose recreation experience is dependent upon quiet wilderness experiences or undisturbed wildlife would be more affected than OHV users or other activities for which vegetation removal, noise, and human activity does not affect the recreation experience. Construction also could temporarily affect the ability of visitors to participate in dispersed recreation opportunities by limiting access. Operations would result in permanent visual impacts to areas along the transmission line, including areas used for dispersed recreation. While these impacts would not appreciably affect the availability of the recreation resource used while engaging in dispersed recreational activities (i.e., big game or fishing habitat), the setting in which they occur would be affected visually and some user groups may choose to recreate elsewhere. In general, suitable substitute locations would exist nearby for the same dispersed recreational activities. Exceptions are described by region. Project access routes would be evaluated on a case-by-case basis by the appropriate federal or state land manager to determine whether to close to the public, close and reclaim, or leave open as part of the transportation network. Closed roads may become an attractive nuisance and lead to unauthorized OHV use. Impacts by region and alternative are shown in **Tables 2-23** through **2-26**.

ES.3.14 Land Use

The analysis area includes portions of 4 states, 5 national forests, 15 BLM FOs, 24 counties, and 56 communities. Over 60 percent of the analysis area is federally managed land. The majority of the Region I analysis area is BLM land, mostly used for oil and gas production and grazing. Approximately 50 percent of the Region II analysis area is BLM land; approximately 10 percent is USFS land. Major land uses include oil and gas development, grazing, agriculture, forestry, and recreation. Over 75 percent of the Region III analysis area in is BLM land. Most of the BLM land is within military operation areas. Nearly one-third of the Region IV analysis area is BLM land and one-third is federal land managed by the NPS (Lake Mead NRA) and the Department of Energy. Major land uses include urban development in the Las Vegas metropolitan area, and recreation areas and trails associated with the conservation areas on the eastern edge of the urban area.

Impact considerations include consistency with federal, state, regional, or local land use plans; impacts to agricultural activities and/or livestock grazing; and changes to land use authorizations and effects to realty actions on federal lands. No changes to current jurisdiction from the construction and operation of the Project alternative routes are anticipated. Most of the affected counties provide for the development of large transmission lines and associated facilities through zoning regulations; however, transmission lines development is not addressed in all zoning ordinances. Locations where the Project would not conform to existing federal agency management plans are discussed in Chapter 4.0. It is not anticipated that occupied residences would be removed within the 250-foot-wide transmission line ROW under any alternative. Potential land use authorizations conflicts would be addressed on a case-by-case basis with each federal land management agency. Short-term disruption of farming activities along the ROW could occur locally during construction. With the exception of land occupied by towers and access roads, farmland and range land within the construction zone would be available for agricultural use following the completion of construction. Direct impacts to grazing include the loss of forage, fragmentation of grazing allotments, potential impacts to lambing areas and disruption of lambing periods, increased mortality and injuries to livestock resulting from increased vehicle traffic, and temporary displacement of livestock from preferred grazing areas or range improvements (including water sources). Indirect impacts would include the spread of noxious and invasive species and fragmentation of allotments. The implementation of the proposed mitigation measures would minimize impacts to range improvements. Impacts to land use by region and alternative are shown in **Tables 2-23** through **2-26**.

ES.3.15 Special Designation Areas

Special designation areas (SDAs) are units of land managed by federal or state agencies for the protection and enhancement of specific resource values. Congressionally designated SDAs within the analysis area include national wildlife refuges, wilderness areas, WSAs, wild and scenic rivers (WSRs), national conservation areas (NCAs), national historic trails, and other similar management areas. Agency-designated SDAs consist of ACECs (BLM) and IRAs and unroaded/undeveloped areas (USFS).

Within Region I, the SDAs that would be impacted by one or more of the alternatives are the Continental Divide National Scenic Trail, the Dinosaur National Monument, and two trails being considered for inclusion into the National Historic Trails system (the Overland Trail and the Cherokee Trail).

Within Region II, the SDAs that would be impacted by one or more of the alternatives are the Dinosaur National Monument, Old Spanish National Historic Trail, Oil Spring Mountain WSA and ACEC, White River Riparian ACEC, McInnis Canyons National Conservation Area, Badger Wash ACEC, Demaree WSA, Lower Green River Wild and Scenic Rivers Glossary/ACEC, Lears Canyon ACEC, Nine Mile Canyon ACEC, San Rafael Canyon ACEC, and Rock Art ACEC, 5 IRAs and 6 unroaded/undeveloped areas within the Ashley National Forest, 2 IRAs and 7 unroaded/undeveloped areas within the Fishlake National Forest, 7 IRAs and unroaded/undeveloped areas within the Manti-La Sal National Forest, and 9 IRAs within the Uinta National Forest.

Within Region III, the SDAs that would be impacted by one or more of the alternatives are the Desert and Pahranagat national wildlife refuges, Old Spanish National Historic Trail, the Beaver Dam Wash NCA, Beaver Dam Slope ACEC, Mormon Mesa Ely ACEC, Beaver Dam Slope ACEC, Clover Mountains Wilderness, Kane Springs ACEC, Delamar Mountains Wilderness, Mormon Mesa ACEC, Coyote Springs Valley, Arrow Canyon Wilderness, and the Muddy River and Meadow Valley Wash WSRs. The proposed action or alternatives also would encompass portion of six IRAs and four unroaded/undeveloped areas within the Dixie National Forest. Additionally, there are four USFWS proposed wilderness areas within the analysis area.

Within Region IV, the SDAs that would be impacted by one or more of the alternatives are the Sloan Canyon NCA, Black Mountain Wilderness, Sunrise Mountain ISA, Rainbow Gardens ACEC, River Mountains ACEC, and the Lake Mead NRA. Impacts to SDAs from construction and operation of the Proposed Project depend on the location of the crossing as well as the relevant and important values for which SDA was or is being proposed to be designated. Impacts to SDAs by region and alternative are shown in **Tables 2-23** through **2-26**.

ES.3.16 Transportation

The transportation analysis area includes both the national, state, and local road and railroad transportation network serving the alternative routes, as well as improved and unimproved routes within the local roadway network, railroads, airports, and controlled airspaces. Some portions of the analysis area have extensive local roadway networks (urban and suburban areas), while other portions of the analysis area have few to no local roads (rural and remote areas).

Construction of new access roads would be required in some areas to access structure sites lacking direct access from existing roads, or where topographic conditions prohibit safe overland access to the site on unpaved roads. Road construction may require temporary road closures and/or detours that create access difficulties to public and private property, but adherence to design features and agency BMPs would help to limit and plan for the closures. Project construction would create minor and incidental increases in local traffic, but is not expected to create substantial congestion for extended periods. Construction would add vehicle travel to the roadway network and could introduce travel obstructions on local roads creating potential safety issues. After considering design features, BMPs, and other Project approval requirements, minor and temporary safety issues would be created but no hazardous or unsafe conditions would be created. Increased traffic and travel on roads by heavy vehicles would contribute to local roadway degradation resulting in the

need for additional road maintenance. Overall impacts on road maintenance would be minor in flat and rolling terrain and moderate in steep and mountainous terrain.

Transmission line towers and lines are a navigation issue if they are located too close to airport operations or military airspace operating areas. The Project may create operation and safety issues near airports and may create unresolved conflicts in military airspace operating areas, but incorporation of design features and agency BMPs are expected to lessen the extent of the safety issues to permissible levels. If not, it currently is assumed that any routes with irresolvable issues related to airports or airspace would require additional mitigation to be applied, including the possibility of suggested reroutes. Impacts to transportation by region and alternative are shown in **Tables 2-23** through **2-26**.

ES.3.17 Social and Economic Resources

The geographic extent of the social and economic conditions analysis area comprises 23 counties in which one or more of the alternative routes are located and the communities within those counties that are likely to host non-local construction workers associated with the Project. The analysis area is predominately rural, with the exception of the Las Vegas, Nevada, and St. George, Utah, metropolitan areas; however, social conditions and lifestyles in the analysis area vary considerably. All 23 counties in the analysis area gained population during the last decade. There are six Indian Reservations located in the analysis area.

Construction of the two terminals would entail a 27- to 28-month construction period in one location. Average direct construction employment for the Northern and Southern terminals would be 113 and 76 jobs, respectively. Benefits to firms supplying goods and services to the Project (such as contractors involved in construction, and those serving temporary lodging and consumer needs) would include increases in sales, possible new business starts, and hiring additional employees or increased hours worked for existing owners and employees. Approximately 0.7 secondary jobs would be generated in the Rawlins/Carbon County and Las Vegas Valley economies for each direct job associated with the Project. There would be temporary population influxes into the communities near the Northern Terminal, but little Project-related population influx expected in the Las Vegas Valley. Overall demand would be composed of a combination of a few ownership units, conventional single family and apartment rentals, RV/camper parking spots, and motel rooms.

Construction of the transmission line would be completed using three 200-mile “spreads,” each with its own work force, fleet of construction equipment, and schedules. Employment would average approximately 140 jobs for each spread. Approximately 0.44 secondary jobs would be generated; however, the widespread nature of the construction activity would result in a dispersal of the temporary effects across multiple communities. Impacts of transmission line construction would be similar in type to those associated with development of the terminals; primary differences stem from the movement of the construction activity along the corridor over time and associated implications for temporary housing and potential demands on emergency response as construction proceeds away from the larger towns and into more rural areas. No high and adverse effects to human health or other environmental resources have been identified as part of this assessment, effectively minimizing the potential for disproportionate affects to low-income populations or members of the potentially affected tribes or reservations. Impacts by region and alternative are shown in **Tables 2-23** through **2-26**.

ES.3.18 Human Health and Safety

Potential health and safety concerns related to power transmission during construction include worker injuries, exposure to hazardous materials, contaminated sites, excessive noise, and risks to workers and the community from accidents. Health and safety concerns associated with operations include electrical shock, electric and magnetic fields, corona, stray and induced voltage, collision hazards, fire risk, and public access to transmission structures and substation equipment.

Project construction would produce noise from heavy equipment needed to build the proposed transmission line routes and electrical substations. Construction noise levels would range from 74 to 88 decibels on the

A-weighted scale (dBA) at 50 feet from any work site. Noise levels temporarily would exceed the USEPA guideline for residential noise (55 dBA) at a distance of about 1,600 feet (USEPA 1974). Design features, BMPs, and mitigation measures would be used to reduce noise levels and limit sensitive receptors exposure during key time periods. Impacts associated with the release or spill of hazardous materials to the environment or people during construction or discovery of contaminated soil or groundwater are expected to be minimal with the implementation of design features. The effects of operation of the Project would involve potential electric and magnetic fields impacts on residences, sensitive receptors, nearby communities, recreation areas, lightning, corona effect on communication sites, stray and induced voltage, noise, fire, and the health and safety of maintenance workers. Through the implementation of design features and the limited number of sensitive receptors adjacent to the reference line, minimal to no impacts to public health are anticipated. Impacts by region and alternative are shown in **Tables 2-23** through **2-26**.

ES.3.19 Wild Horses

There are 10 wild horse herd management areas (HMAs)/herd areas (HAs) located within the analysis area. During periodic wild horse roundups, BLM uses helicopters within the HMAs/HAs to assist in directing the horses into the designated collection areas. Due to the necessary use of helicopters, BLM prefers to locate transmission lines within HMAs/HAs parallel to existing transmission lines when feasible. In general, impacts to wild horses and HMAs would result from noise and increased human activity during installation of the transmission line poles, clearing and grading existing and new access roads, vehicle operation in areas where overland vehicle travel would occur, and use of temporary laydown areas. Construction activities and operation of the transmission line could impact the ability of the BLM to conduct future wild horse gathers in and near the transmission line area. Impacts by region and alternative are shown in **Tables 2-23** through **2-26**.

ES.3.20 Lands with Wilderness Characteristics

There are 49 units of lands with wilderness characteristics (LWCs) within the analysis area. While all 49 units meet the criteria for LWCs, only 1 LWC unit (Mexican Mountain, within the Price FO) has approved RMP decisions that intend to manage these units as natural areas to protect, preserve, and maintain wilderness characteristics. Eleven units within the Vernal, Moab, and Price FOs were evaluated in an RMP process, but determined to not manage these areas for their wilderness characteristics. The remaining 37 units shown have not been formally evaluated in an RMP process for appropriate management decisions for wilderness characteristics.

Inventory units that are determined to meet criteria for LWC could be intersected or include built portions of the proposed Project and, as a result, some remaining portions may no longer meet the criteria for size (greater than 5,000 acres), naturalness, or solitude. Within Region I, portions of up to 8 LWC units could be eliminated for LWC consideration by the proposed action or its alternatives. Within Region II, portions of up to 8 LWC units could be eliminated for LWC consideration by the proposed action or its alternatives. Within Region III, portions of up to 9 LWC units could be eliminated for LWC consideration by the proposed action or its alternatives. There are no LWC units within Region IV. Impacts by region and alternative are shown in **Tables 2-23** through **2-26**.

Abbreviations and Acronyms

µg/m^3	micrograms per cubic meter
AASHTO	American Association of State Highway and Transportation Officials
AC	alternating current
ACEC	area of critical environmental concern
ACHP	Advisory Council on Historic Preservation
AFB	Air Force Base
AGL	above ground level
AML	appropriate management level
amsl	above mean sea level
Applicant	TransWest Express LLC
AQRV	air quality related value
ATV	all-terrain vehicle
AU	analysis unit
AUM	animal unit month
AWBP	Aransas-Wood Buffalo National Park
AWEA	American Wind Energy Association
BA	biological assessment
BCHA	Bird Habitat Conservation Area
BE	biological evaluation
BGEPA	Bald and Golden Eagle Protection Act
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	best management practice
BO	biological opinion
CAA	Clean Air Act

CDA	Colorado Department of Agriculture
CDNST	Continental Divide National Scenic Trail
CDOT	Colorado Department of Transportation
CDOW	Colorado Division of Wildlife
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CMP	Comprehensive Management Plan
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COM Plan	Construction, Operation, and Maintenance Plan
CPW	Colorado Parks and Wildlife
CTC	centralized traffic control
CWA	Clean Water Act
CWMU	cooperative wildlife management unit
DC	direct current
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
DRUA	Dispersed Use Recreation Area
dv	deciview
ECM	Environmental Compliance Monitors
EDRR	Early Detection Rapid Response
EHV	extra-high voltage
EIS	environmental impact statement
EMF	electric and magnetic field

ERMA	Extensive Recreation Management Area
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FLM	Federal Land Manager
FLPMA	Federal Land Policy and Management Act of 1976
FO	field office
FR	Federal Register
g	gravity
GHG	greenhouse gas
GIS	geographic information system
GSM	General Soil Map
GWh/yr	gigawatt hours per year
HA	herd area
HAP	hazardous air pollutant
HMA	herd management area
Hoover Act	Hoover Power Plant Act of 1984
HUC	Hydrographic Unit Code
I-15	Interstate 15
I-70	Interstate 70
I-80	Interstate 80
IBA	Important Bird Area
ID	Interdisciplinary
IM	Instruction Memoranda
IPCC	Intergovernmental Panel on Climate Change
IPP	Intermountain Power Project

IR	Impaired Waters Assessment Report
IRA	inventoried roadless area
ISA	Instant Study Area
km	kilometer
KOP	key observation point
kV	kilovolt
kWh	kilowatt-hour
LADWP	Los Angeles Department of Water and Power
LATN	Low Altitude Tactical Navigation
LCCRDA	Lincoln County Conservation, Recreation, and Development Act
LRMP	Land Resource Management Plan
LRP	limited revegetation potential
LWC	Lands with Wilderness Characteristics
MBTA	Migratory Bird Treaty Act
MFP	management framework plan
$MgCl_2$	magnesium chloride
MIS	management indicator species
MLRA	Major Land Resource Area
MOA	Military Operations Areas
MOU	Memorandum of Understanding
MTR	military training route
Mw	moment magnitude
MW	megawatt
MWh	megawatt hour
NAAQS	National Ambient Air Quality Standards
NCA	National Conservation Area
NDOT	Nevada Department of Transportation

NDOW	Nevada Department of Wildlife
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NESC	National Electric Safety Code
NFMA	National Forest Management Act
NFS	National Forest System
NHD	National Hydrography Dataset
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NHT	National Historic Trail
NNL	National Natural Landmark
NOAA	National Oceanographic and Atmospheric Administration
NO_2	nitrogen dioxide
NOI	Notice of Intent
NO_X	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRA	National Recreation Area
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NST	National Scenic Trail
NTTG	Northern Tier Transmission Group
NTTR	Nevada Test and Training Range
NVUM	national visitor use monitoring
NWR	National Wildlife Refuge
NWSRS	National Wild and Scenic River System
OHV	off-highway vehicle

ORV	off-road vehicle
PA	Programmatic Agreement
PDTR	Project Description Technical Report
PFYC	Potential Fossil Yield Classification
PGA	peak ground acceleration
P.L.	Public Law
PM	particulate matter
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 microns or less
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
POD	Plan of Development
Project	TransWest Express Transmission Project
ppb	parts per billion
ppm	parts per million
ppmw	parts per million by weight
RA	Recreation Area
Recovery Act	American Recovery and Reinvestment Act of 2009
RFFA	reasonably foreseeable future action
RHA	Rivers and Harbors Act
RMP	Resource Management Plan
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
ROW	right-of-way
RPPR	Regional Project Planning Review
RRTT	Rapid Response Team for Transmission
SAR	Small Arms Range
SCD	soil conservation district
SDA	special designation area

SEO	State Engineer's Office
SEZ	Solar Energy Zones
SHPO	State Historic Preservation Office
SIO	Scenic Integrity Objective
SIP	State Implementation Plan
SMA	special management area
SO_2	sulfur dioxide
SPCC Plan	Spill Prevention, Control, and Countermeasures Plan
SRMA	special recreation management area
STATSGO	State Soil Geographic
STS	Southern Transmission Systems
SSURGO	Soil Survey Geographic
SWA	state wildlife area
TAC	The Anschutz Corporation
TCP	traditional cultural property
TDS	total dissolved solid
TERP	Terminal Instrument Procedures
TIP	Transmission Infrastructure Program
TMDL	total maximum daily load
TransWest	TransWest Express LLC
TSP	total suspended particulate
TWE	TransWest Express
VRI	Visual Resource Inventory
VRM	Visual Resource Management
VQO	Visual Quality Objective
UDOGM	Utah Division of Oil, Gas, and Mining
UDOT	Utah Department of Transportation

UDWR	Utah Division of Wildlife Resources
UGS	Utah Geological Survey
URMCC	Utah Reclamation Mitigation and Conservation Commission
URUD	unroaded/undeveloped
U.S.	United States
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USGS	United States Geological Survey
USFWS	United States Fish and Wildlife Service
UTTR	Utah Test and Training Range
WBD	Water Boundary Dataset
WDOT	Wyoming Department of Transportation
Western	Western Area Power Administration
WECC	Western Electricity Coordinating Council
WGFD	Wyoming Game and Fish Department
WHMA	Wildlife Habitat Management Area
WRCC	Western Region Climate Center
WSA	wilderness study area
WSR	Wild and Scenic Rivers
WUS	Waters of the U.S.
WWEC	West-wide Energy Corridor

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1.0 Introduction

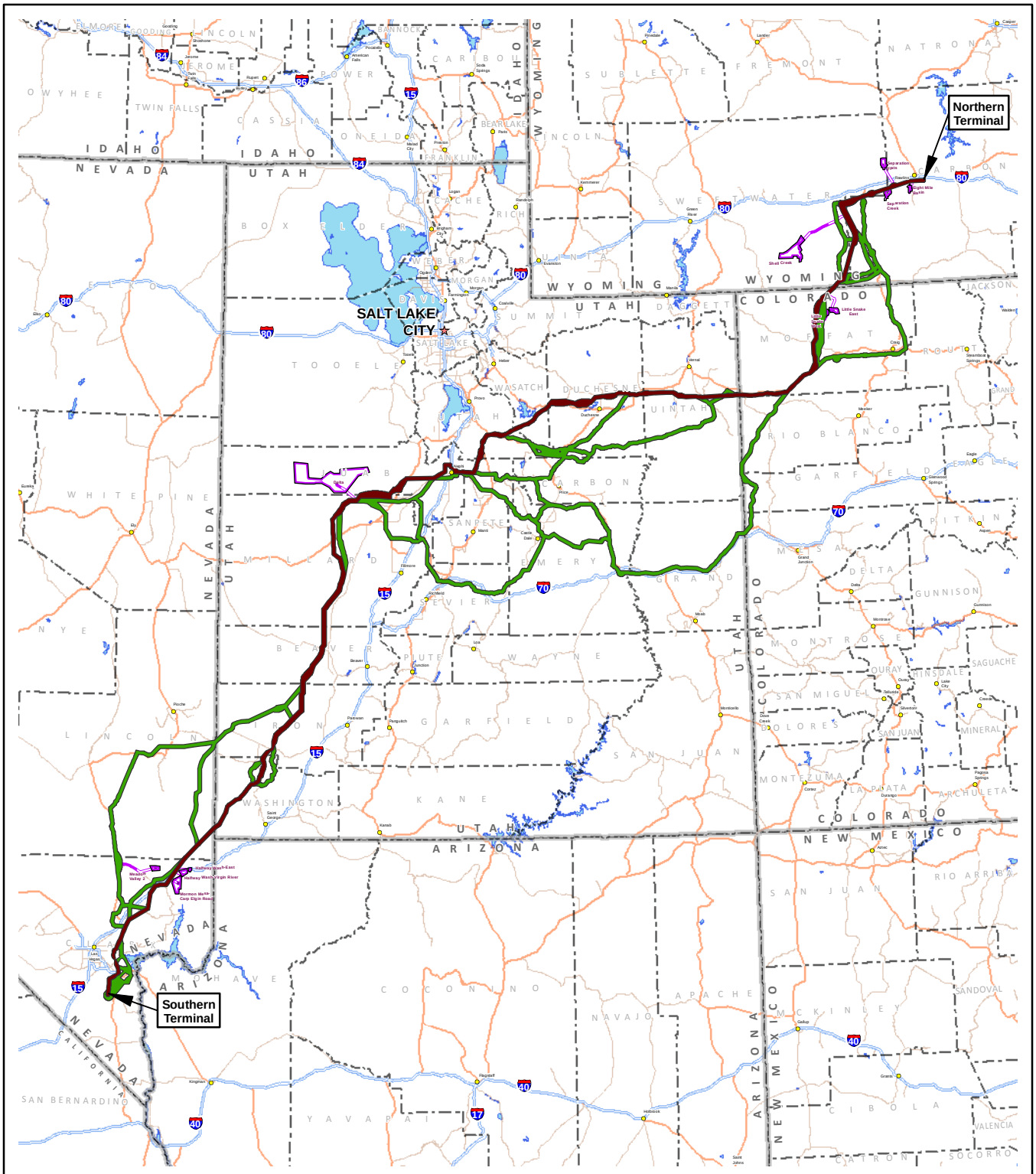
The TransWest Express (TWE) Transmission Project (Project) is proposed as an extra high voltage (EHV), direct current (DC) transmission system extending from south-central Wyoming to southern Nevada (**Figure 1-1**). The proposed transmission line (and alternatives) cross four states (Wyoming, Colorado, Utah, and Nevada) encompassing lands owned or administered by the Bureau of Land Management (BLM), United States (U.S.) Forest Service (USFS), National Park Service (NPS), Bureau of Reclamation, Utah Reclamation Mitigation and Conservation Commission (URMCC), various state agencies, Native American tribes, municipalities, and private parties. The Project would provide the transmission infrastructure and capacity necessary to deliver approximately 3,000 megawatts (MW) of electric power from renewable and/or other non-renewable energy resources in south-central Wyoming to southern Nevada. One MW (or 1 million watts) of power can deliver approximately 6.5 million kilowatt-hours (kWh) of electricity in 1 year. An average U.S. household consumes about 10,655 kWh of electricity in a year. Therefore, 1 MW of power provides electricity for 610 households' annual use (American Wind Energy Association [AWEA] 2008). The Project would transmit power for over 1,800,000 households annually.

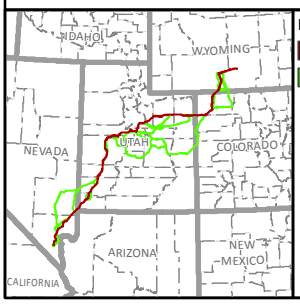
The TransWest Express LLC (TransWest/Applicant) proposed action would consist of an approximately 725-mile-long, 600-kilovolt (kV), DC transmission line and two terminals, each containing a converter station that converts alternating current (AC) to DC or vice-versa. The northern AC/DC converter station would be located near Sinclair, Wyoming, and the southern near the Marketplace Hub in the Eldorado Valley, approximately 25 miles south of Las Vegas, Nevada. The Project would retain an option for a future interconnection with the Intermountain Power Project (IPP) transmission system in Millard County, Utah. The Project has been divided geographically into four regions for analysis in this environmental impact statement (EIS). Each Project region contains a proposed route and two to four alternative routes that are analyzed in this EIS. The BLM has identified a preferred alternative within each of the four Project regions that would all combine to create a complete preferred alternative from Wyoming to Nevada. A more detailed description of the proposed and alternative routes, Project facilities and design, and construction schedule is presented in Chapter 2.0. Project operation, maintenance, and decommissioning also are considered.

The following describes the Project ownership, and the BLM right-of-way (ROW) application process.

- In November 2007, National Grid filed a ROW application with the BLM to construct and operate portions of an EHV transmission line between Wyoming and delivery points in the southwestern U.S.
- In 2008, The Anschutz Corporation (TAC) formed TransWest Express LLC, a wholly owned subsidiary of TAC, and acquired the Project from National Grid. In September 2008, National Grid and TransWest submitted an amended ROW application to the BLM requesting the assignment of the application and related project files to TransWest. As a result, TransWest became the project applicant.
- TransWest submitted an amended ROW application in December 2008 and again in January 2010 to reflect changes and refinements in the proposed Project. The application was assigned case file number WYW-177893.
- In April 2010, TransWest and Western Area Power Administration (Western), an agency of the U.S. Department of Energy (DOE), entered into a Memorandum of Understanding (MOU) in which Western agreed to act as joint lead agency with the BLM in the preparation of the EIS in accordance with the National Environmental Policy Act of 1969, as amended (NEPA). BLM's status as a joint lead agency was based on its potential federal action to grant a utility ROW across BLM lands. Western's status as a joint lead agency was based on its potential federal action to provide federal funds for the Project. Each of these decisions will be informed by the NEPA analysis contained in this EIS.

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Project Corridors

- Applicant Proposed
- Alternative

- Potential Ground Electrode Siting Area
- Potential Ground Electrode Site
- Potential Ground Electrode Overhead Electrical Line

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 1-1
Project Location

0 20 40 80 Miles
0 20 40 80 km
1:4,750,000

N

Western AREA POWER ADMINISTRATION

Exported On: 6/5/2013

- On September 9, 2011, Western and TransWest executed a Development Agreement in which the entities agreed to jointly fund the development phase of the Project, each responsible for 50 percent of the development costs if Western decides to participate in the Project. Under this Agreement, Western could acquire a 50 percent joint ownership in the Project. As with BLM's decision on whether to grant a ROW for the project, Western's decision on whether to invest federal funds into the development and future phases of this Project will be informed by the results of this NEPA analysis.

To ensure it meets NEPA disclosure requirements, this EIS has been prepared in compliance with the Council on Environmental Quality (CEQ) Regulations for Implementing NEPA (40 Code of Federal Regulations [CFR] 1500). The BLM Wyoming State Office and Western have been designated as joint lead federal agencies for the NEPA process, and are mutually overseeing the preparation of the EIS. Accordingly, this EIS also conforms to both the BLM's and Western's requirements for NEPA implementation as described in the BLM NEPA Handbook (H-1790-1) and the DOE's NEPA Implementing Procedures (10 CFR 1021), respectively. However, depending on the chosen alternative, this Project potentially would cross other federal lands. Accordingly, project implementation would require other federal agencies to make decisions related to granting ROWs. The BLM has included those agencies, as well as non-federal agencies and/or municipalities with jurisdictional authority or special expertise with respect to resource issues addressed by the NEPA analysis as cooperating agencies in this EIS process. The cooperating agency relationship ensures that the BLM engages and considers comments of these agencies when making Project decisions and includes information required to satisfy the environmental and public review processes associated with those decisions. The cooperating agencies are responsible for assisting the BLM with identifying issues to be addressed, providing associated data or feedback, development of alternatives, and for review and feedback on the NEPA document. As part of the process for satisfying these requirements, this Draft EIS analyzes the environmental impacts of construction, operation, and maintenance of the transmission system on all lands crossed by the Project. While the EIS contains sufficient information to allow the BLM and Western to choose among alternatives, in some instances, cooperating agencies may require additional information before making decisions related to specific lands within their jurisdiction. The general steps in the EIS process are illustrated on **Figure 1-2**.

1.1 Lead Federal Agencies' Purpose and Need, and Decisions

The lead federal agencies' purpose and need for the major federal actions for the proposed Project are described below.

1.1.1 BLM's Purpose and Need

In accordance with the Federal Land Policy and Management Act of 1976 (FLPMA) (Section 103(c)), public lands are to be managed for multiple use that takes into account the long-term needs of future generations for renewable and non-renewable resources. The Secretary of the Interior is authorized to grant ROWs on public lands for systems of generation, transmission, and distribution of electric energy (Section 501(a)(4)).

The purpose of the BLM's federal action is to respond to TransWest's application for a ROW to construct, operate, maintain, and decommission a transmission line on public lands. The need for this action is to fulfill BLM's responsibility under FLPMA and BLM ROW regulations to manage the public lands for multiple uses, including transmission of electric energy (43 CFR 2806). To advance these objectives, BLM designates utility corridors through BLM lands and endeavors to co-locate large, linear facilities such as transmission lines within those corridors, thereby avoiding the proliferation of new routes through sensitive lands and wildlife habitats (43 United States Code [U.S.C.] 1763). These designated corridors conform with long-range corridor needs established by the DOE under Section 368 of the Energy Policy Act and correlate with designated corridors on adjoining public lands.

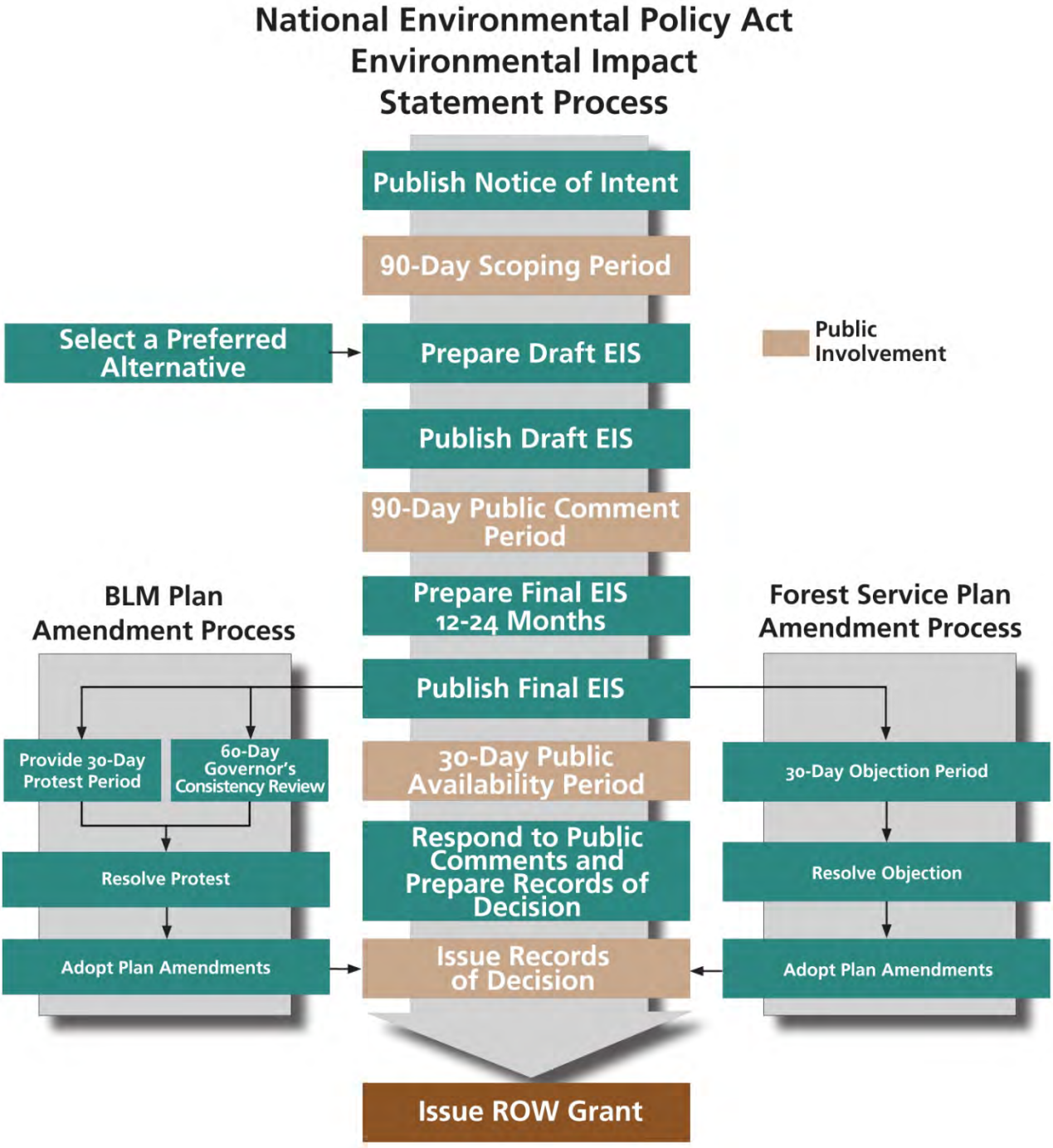


Figure 1-2 National Environmental Policy Act Environmental Impact Statement Process

The agencies' purpose and need is further guided by the Energy Policy Act of 2005, which recognized the need to improve domestic energy production, develop renewable energy resources, and enhance the infrastructure (e.g., transmission lines) for collection and distribution of energy resources across the nation. To this end, the BLM and USFS are charged with analyzing applications of utility and transportation systems on federal lands they administer. When analyzing applications, the agencies' also must consider the recommendations in the 2011 Western Electricity Coordinating Council (WECC) 10-Year Regional Transmission Plan regarding future transmission needs (WECC 2011).

1.1.1.1 BLM's Decisions

The BLM must review and authorize each component of the project that involves the use of public lands (e.g., construction staging/storage areas, access roads, the transmission line towers and conductors, and other ancillary facilities). This use would be authorized by a ROW grant supported by the environmental record. When a ROW grant is offered, a Record of Decision (ROD) documents the BLM's decision and its rationale for the route authorized, adopts construction and mitigation measures proposed by the Proponent (usually contained in the Proponent's Plan of Development [POD]), and adds terms and conditions deemed necessary by the BLM to provide resource protection not included in the Proponent's Proposal. The BLM decisions to be made are to:

- Decide whether to grant, grant with modification, or deny a ROW to construct, operate, and maintain the proposed facilities for a transmission line on public lands;
- Decide whether one or more BLM land use plans should be amended to allow the proposed transmission line;
- Determine the most appropriate location for the transmission line on public lands, considering multiple-use objectives; and
- Determine the terms and conditions (stipulations) for the construction, operation, maintenance, and decommissioning of the transmission line on public lands that should be applied to the ROW grant.

The BLM has prepared this EIS to disclose and analyze the potential direct, indirect, and cumulative impacts of the proposed action and alternatives, as required by NEPA, to facilitate public participation and to assist the BLM decision-maker in making the decisions listed above. The BLM Wyoming state director is the agency official who will be making the decisions in the ROD.

1.1.2 Western Area Power Administration's Purpose and Need

Western's purpose and need is to carry out Federal policy to facilitate renewable energy development and transmission expansion as established by the American Recovery and Reinvestment Act's 2009 amendment of the Hoover Power Plant Act of 1984 (P.L. 98-381, Title III, § 301) (Hoover Act). The amended Hoover Act provides Western the authority to borrow funds from the U.S. Treasury to construct, finance, facilitate, plan, operate, maintain, and/or study construction of new or upgraded electric power transmission lines and related facilities. These transmission lines and related facilities must have at least one terminus in Western's marketing area and deliver or facilitate the delivery of power from renewable resources constructed or reasonably expected to be constructed after the enactment of the amended Hoover Act.

1.1.2.1 Western Area Power Administration's Decision

Western's decision is whether it would use its borrowing authority to partially finance and hold partial ownership with TransWest in the resulting transmission facilities and capacity. Specifically, funding would be used to construct, operate, maintain, and decommission a transmission line. This decision would be managed through agreements that would include defining the respective rights and obligations associated with ownership of the Project; address construction, operation, and maintenance associated with the transmission line; and provide for acquisition of ROWs for the Project.

Prior to committing funds for construction, Western must certify that a project is in the public interest; a project will not adversely impact system reliability, system operations, or other statutory obligations; and it is reasonable to expect the proceeds from the project will be adequate to make repayment of the loan from Treasury. In addition, the Project will need to satisfy the requirements of Western's Transmission Infrastructure Program (TIP) and its authority under the Hoover Act. As with BLM's decision, Western's decision is informed by the required NEPA analysis and disclosure in this EIS.

1.2 Cooperating Agencies

The CEQ regulations implementing NEPA allow the lead agencies to invite other federal, state, tribal, or local agencies to serve as cooperating agencies in preparing the EIS (40 CFR 1501.6). A cooperating agency must hold legal jurisdiction over resources that could be impacted by the project, or provide special expertise with respect to resource issues addressed by the NEPA analysis. In addition, a MOU generally is implemented between the lead agencies and each cooperating agency.

Forty-two cooperating agencies have signed a MOU for the Project. These agencies are listed in **Table 1-1**.

Table 1-1 Project Cooperating Agencies

Federal	
USFS, Intermountain Region, Ogden, Utah representing: - Ashley National Forest - Dixie National Forest - Fishlake National Forest - Manti-La Sal National Forest - Uinta-Wasatch-Cache National Forest[1]	
U.S. Fish and Wildlife Service (USFWS) representing: - Mountain Prairie Region, Lakewood, Colorado - Pacific Southwest Region, Sacramento, California	
NPS - Intermountain Region, Lakewood, Colorado - Pacific West Region, San Francisco, California	
U.S. Army Corps of Engineers (USACE) - South Pacific Division - Northwestern Division	
U.S. Army Region 8	
Navy Region Southwest, San Diego, California	
Bureau of Reclamation, Lower Colorado Region	
Bureau of Indian Affairs (BIA) Western Region, representing: - Rocky Mountain Region, Billings, Montana - Southwest Region, Albuquerque, New Mexico	
Utah Reclamation Mitigation and Conservation Commission	
State	
State of Wyoming	State of Colorado
State of Utah	State of Nevada

Table 1-1 Project Cooperating Agencies

County	
Wyoming: Carbon, Sweetwater	
Colorado: Garfield, Mesa, Moffat, Rio Blanco	
Utah: Beaver, Carbon, Daggett, Duchesne, Emery, Grand, Iron, Millard, Juab, Piute, Sanpete, Sevier, Uintah, Utah, Wasatch, Washington	
Nevada: Clark, Lincoln	
Other	
Little Snake River Conservation District	Saratoga-Encampment-Rawlins Conservation District
Medicine Bow Conservation District	Sweetwater County Conservation District
Douglas Creek Conservation District	White River Conservation District
N-4 State Grazing Board	

[1] In March of 2008, the Uinta National Forest and the Wasatch-Cache National Forest were combined into one administrative unit (Uinta-Wasatch-Cache National Forest). Each of these forests continues to operate under individual forest plans approved in 2003. When the term Uinta National Forest is used, it refers to the Uinta Planning Area of the Uinta-Wasatch-Cache National Forest.

1.3 TransWest's Goals and Objectives

TransWest's primary goal is to provide the transmission infrastructure and capacity necessary to reliably and cost-effectively transmit up to 3,000 MW of electric power from Wyoming to the desert southwest. TransWest's objectives for the Project are to:

- Allow consumers access to renewable energy sources and contribute to meeting national, regional, and state energy and environmental policies, including state-mandated renewable energy portfolio and greenhouse gas reduction targets;
- Meet increasing customer demand with improved electrical system reliability;
- Allow consumers access to domestic energy sources and contribute to complying with national energy policy;
- Provide system flexibility and increased access to the grid for third-party transmission users;
- Expand regional economic development through increased employment and enlargement of the property tax base; and
- Maintain the standard of living associated with highly reliable electricity service.

While meeting these broad objectives, TransWest would work within the following Project-specific objectives:

- Provide for the efficient, cost-effective, and economically feasible transmission of approximately 20,000 gigawatt hours per year (GWh/year) of clean and sustainable electric energy from Wyoming to markets in the desert southwest region. This estimate is based on 8,760 hours per year of 3,000-MW transmission capacity.
- Meet North American Electric Reliability Corporation (NERC) Reliability Standards and WECC planning criteria and line separation requirements.
- Maximize the use of existing and designated utility corridors and access roads to the extent practical to minimize adverse effects of the Project.
- Provide these benefits in a timely manner to the desert southwest region and the broader Western U.S. to meet the region's pressing environmental and energy needs. TransWest has identified a need

for the Project by the expected in-service date of 2015 or as soon as the regulatory reviews can be completed.

- Provide for flexibility and maximize the use of infrastructure to increase future transmission capacity by configuring the Project to allow for future interconnection with the IPP transmission system near Delta, Utah.

1.4 Relationship to Programs, Policies, and Plans

1.4.1 Federal Multi-agency Programs

The West-wide Energy Corridor (WWEC) Programmatic EIS was prepared jointly by the U.S. Department of the Interior (DOI) and the DOE for energy corridors in 11 western states and completed in January 2009. The RODs for the WWEC Programmatic EIS designated energy transmission corridors and provided guidance, best management practices (BMPs), and mitigation measures to be used for any power lines proposed to be constructed within the corridors on public lands. The Programmatic EIS provides a framework (further described in Chapter 2.0) for the development of Project alternatives. The analysis in this EIS refers to the analysis from the WWEC Programmatic EIS, to the extent applicable, and incorporates by reference all BMPs and mitigation measures in the RODs for the WWEC Programmatic EIS.

In October of 2009, nine federal entities including the CEQ, the USDI, the U.S. Department of Agriculture (USDA), the DOE, the Department of Commerce, the Department of Defense (DOD), the U.S. Environmental Protection Agency (USEPA), the Federal Energy Regulatory Commission (FERC), and the Advisory Council on Historic Preservation (ACHP) signed a MOU committing each of the signatories to increase their coordination to expedite and simplify the process for analyzing, permitting, and building transmission lines on federal lands.

On October 5, 2011, the Obama Administration announced the formation of a Rapid Response Team for Transmission (RRTT) comprised of the nine agencies who signed the MOU. This team was formed to more quickly advance the permitting for seven pilot transmission projects, including this Project.

The RRTT mission (CEQ 2011) is to “accelerate responsible and informed deployment of these seven key transmission facilities by:

- Coordinating statutory permitting, review, and consultation schedules and processes among involved federal and state agencies as appropriate through Integrated Federal Planning,
- Applying a uniform and consistent approach to consultations with Tribal governments, and,
- Expeditiously resolving interagency conflicts and ensuring that all involved agencies are fully engaged and meeting schedules.”

1.4.2 Federal Agency Roles, Requirements, and Decisions

The following sections briefly describe the roles, policies, plans, programs, and decisions of the federal lead agencies and those agencies whose jurisdictional lands may be requested for Project facilities. Also included are the federal agencies that must consult with the lead agencies, or review and approve applications for certain activities.

The level of involvement by various federal agencies in EIS decisions largely depends on whether lands and resources under agency jurisdiction would be directly or indirectly affected by project facility construction, operation, and decommission. **Table 1-2** provides miles of potential transmission line ROW that would be required for the Project and Project alternatives in the various federal jurisdictions.

Table 1-2 Miles of Proposed Project Transmission Line ROW by Jurisdiction

Federal Agency	Proposed Action (Miles)	All Alternatives (Miles)
USDI – BLM	447	872
USDI – Bureau of Reclamation	7	6
USDI – BIA/Tribal	0	24
USDI – NPS	0	22
USDA – FS (USFS)	39	176
DOE	0	3
URMCC	1	0
State – Wyoming, Colorado, Utah, and Nevada	43	192
Private	188	611
Total	**725**	**1,907**

Figure 1-2 provides the steps in the EIS process and shows how BLM Resource Management Plan (RMP) and USFS Land and Resource Management Plan (LRMP) amendments would fit in to the process. The plan amendment process for these two agencies is described briefly below and discussed in detail in Chapter 4.0.

1.4.2.1 Bureau of Land Management

The BLM is a joint lead federal agency for the Project, along with Western. The technical guidance and guidance documents used for EIS preparation include: 1) the CEQ implementing regulations for NEPA (40 CFR 1500-1508); 2) the BLM NEPA Handbook (H-1790-1); 3) the USDI NEPA regulations (43 CFR 46); 4) the BLM Planning Regulations (43 CFR 1601 and 1610); 5) the BLM Land Use Planning Handbook (H-1601-1); 6) relevant BLM Instruction Memoranda (IM), including IM Nos. 2011-059, 2011-060, and 2011-061; 7) the RMPs for the individual BLM field offices (FOs); and 8) the proponents' POD and Project Description Technical Report (PDTR), which describe how and where the Project would be constructed. **Table 1-3** lists the BLM FOs potentially crossed by the Project and their pertinent RMPs.

Table 1-3 Current BLM Resource Management Plans Relevant to the Project

State	Field Office	Current RMP
Colorado	Grand Junction	Grand Junction Resource Area RMP, January 1987.
Colorado	Little Snake	Little Snake FO RMP, October 2011.
Colorado	White River	White River FO RMP, July 1997.
Nevada	Caliente	Ely District RMP, August 2008.
Nevada	Las Vegas	Las Vegas FO RMP, October 1998.
Nevada	Las Vegas	Las Vegas FO RMP Approved ROD Maintenance Record, January 2007.
Utah	Cedar City	Pinyon Management Framework Plan (MFP), June 1983.
Utah	Cedar City	Cedar Beaver Garfield Antimony Planning Area RMP, October 1986.
Utah	Fillmore	Warm Springs Resource Area RMP, April 1987.
Utah	Fillmore	House Range Resource Area RMP, October 1987.
Utah	Moab	Moab FO RMP, October 2008.

Table 1-3 Current BLM Resource Management Plans Relevant to the Project

State	Field Office	Current RMP
Utah	Price	Price FO RMP, October 2008.
Utah	Richfield	Richfield FO RMP, October 2008.
Utah	Saint George	Saint George FO RMP, March 1999.
Utah	Salt Lake	Pony Express Resource Area RMP and Rangeland Program Summary for Utah County, January 1990.
Utah	Vernal	Vernal FO RMP, October 2008.
Wyoming	Rock Springs	Green River Resource Area RMP, August 1997.
Wyoming	Rawlins	Rawlins FO RMP, December 2008.

Actions that result in a change in the scope of resource uses, terms, conditions, and decisions of federal agency land use plans, including the approval of this proposal, may require amendment of one or more of the plans in **Table 1-3**. As required by 43 CFR 1610.2(c), the BLM notified the public of potential amendments to RMPs in the Notice of Intent (NOI) to Prepare an EIS (see *Federal Register*, Volume 76, No. 2, Tuesday, January 4, 2011). All authorizations and actions proposed for approval in the EIS would be evaluated to determine if they conform to the decisions in the referenced land use plans. If the BLM determines that plan amendments are necessary, compliance with NEPA for any land use plan amendments would occur simultaneously with the consideration of the Project as described in 43 CFR 1610. Refer to Chapter 4.0 for additional details regarding the need for plan amendments and how they may relate to the Project.

As illustrated in **Figure 1-2,** the proposed BLM plan amendments would be included in the Final EIS and would then be subject to a 30-day protest period, a 60-day Governor's consistency review, and a resolution of protests. The BLM may adopt the plan amendments after this public review, and attach the adoption decisions to the ROD.

The Project authorization decisions would be documented in the Project ROD prepared by the BLM. The BLM would consider the decisions of other federal land management agencies that are required for the Project before issuing or denying the Project ROW (43 CFR 2882.2).

Under the authority granted by the FLPMA (43 U.S.C. 1701), the BLM would issue ROW grants for BLM-administered lands crossed by the proposed Project.

1.4.2.2 Western Area Power Administration

As a joint lead federal agency along with the BLM, Western is assisting with preparation and review of the EIS. Under the Hoover Act, as amended by Section 402 of the Recovery Act, Western was granted authority to borrow funds from the U.S. Treasury to (among other things) construct, finance, facilitate, plan, operate, maintain, and/or study construction of new or upgraded transmission facilities that deliver renewable energy. Prior to committing funds, Western must certify that a project is in the public interest; a project will not adversely impact system reliability, system operations, or other statutory obligations; and it is reasonable to expect the proceeds from the project will be adequate to make repayment of the loan.

On March 4, 2009, Western solicited interest in proposed transmission projects that resulted in the submission of Statements of Interest, including one for this Project.

Western is considering whether to participate in the Project as a joint owner with TransWest as part of Western's TIP. For Western to participate, Western needs the Project to satisfy Western's TIP requirements.

As with the BLM's decision, Western's decision is informed by the required NEPA analysis and disclosure in this EIS.

1.4.2.3 Bureau of Reclamation

The Bureau of Reclamation is a cooperating agency on the Project. Project facilities could be located on Bureau of Reclamation lands in the vicinity of Lake Mead in southern Nevada. The Bureau of Reclamation would issue the Right of Use Authorization for any transmission facilities to be located on Bureau of Reclamation lands and a separate ROD that would outline the Bureau of Reclamation's decision and the terms and conditions under which the Right of Use Authorization would be granted.

1.4.2.4 Bureau of Indian Affairs

As a cooperating agency, the BIA would participate in the development of the EIS. If portions of the Project would be located on tribal lands, the BIA also would prepare a ROD and ROW grant for tribal lands. Tribal lands are crossed by alternatives in Uintah and Duchesne counties, Utah (Uintah and Ouray Indian Reservation), and in Clark County, Nevada (Moapa Indian Reservation). It should be noted that, although one of the alternative routes crosses the Moapa Indian Reservation in southern Nevada, the utility corridor within which the alternative would be located is administered by the BLM; therefore, no additional BIA approval would be required if the alternative route remains within the designated BLM-administered utility corridor through the Moapa Indian Reservation.

1.4.2.5 National Park Service

The NPS is a cooperating agency on the Project. The Project transmission line corridor alternatives contain a small portion of Dinosaur National Monument lands at the eastern end of the Deerlodge access road approximately 12 miles from the Dinosaur National Monument proper. Consideration of a ROW across the Deerlodge road lands is included in the EIS because of land use and other resource constraints in the area. Because no application has been received by the NPS from TransWest to date for this alternative, no potential NPS plan amendments have been identified.

Project transmission line corridor alternatives have been developed across portions of the Lake Mead National Recreation Area (NRA) administered by the NPS because of limited available width within an existing utility corridor within the Sunrise Mountain Instant Study Area (ISA) established by Congress. The current Lake Mead NRA Management Plan would not allow construction and operation of the Project. As a consequence, the Lake Mead Management Plan could require amendment to open new utility corridors to accommodate the Project. NPS policy directs the use of authority under 16 U.S.C. 79 for electric transmission ROWs, which typically limits authorizations to 100-foot-wide ROWs. Deviation from NPS guidance on the application of 16 U.S.C. 79 to electric transmission line approvals likely would require a policy waiver from the NPS.

1.4.2.6 U.S. Forest Service

The USFS is a cooperating agency on the Project. The proposed Project and alternative corridors being analyzed would cross USFS lands under the jurisdiction of up to five different national forests. The National Forest Management Act (NFMA) (16 U.S.C. 1601-1614) requires the Secretary of Agriculture to develop and revise LRMPs for lands under its jurisdiction.

LRMPs provide direction, goals, and criteria for management, including standards and guidelines for resource use and land management practices. **Table 1-4** lists the national forests potentially crossed by the Project and their pertinent LRMPs.

Table 1-4 Current USFS Land and Resource Management Plans Relevant to the Project

State	National Forest	Current LRMP
Utah	Ashley	LRMP for the Ashley National Forest, October 1986
Utah	Dixie	LRMP for the Dixie National Forest, September 1986
Utah	Fishlake	LRMP for the Fishlake National Forest, June 1986
Utah	Manti-La Sal	LRMP Manti-La Sal National Forest, November 1986
Utah	Uinta	LRMP Uinta National Forest, May 2003

According to the NFMA (16 U.S.C. 1604(f)(4)) and its implementing regulations, all actions authorized subsequent to the plan must be in conformance with the approved LRMP. An action must be clearly consistent with decisions of the LRMP to be in conformance. To be clearly consistent, an action must comply with: 1) all stipulations, constraints, standards, and guidelines listed in a LRMP; and 2) all stipulations developed specifically for the proposed Project for the purpose of avoiding or reducing impacts on sensitive resources identified in the LRMP.

Under the NFMA, LRMPs may be amended after final adoption. The NFMA regulations at 36 CFR 219.10(f) state: "Based on an analysis of the objectives, guidelines, and other contents of the forest plan, the Forest Supervisor shall determine whether a proposed amendment would result in a significant change in the plan." The Forest Service Land and Resource Management Planning Handbook (Forest Service Handbook 1909.12) provides a framework for consideration. Section 5.32 of the Forest Service Handbook lists four factors to be used when determining whether a proposed change to a LRMP is significant or not significant. These significance factors include timing; location and size; goals, objectives, and outputs; and management prescriptions. The resulting findings are based on relevant information and documented in the USFS ROD. As illustrated on **Figure 1-2**, the USFS plan amendment approval process is conducted in conjunction with the development of the special use permit, requires a 30-day objection period, and requires a resolution of objections.

On January 12, 2001, the USFS published the Roadless Conservation Final Rule in the *Federal Register* (*Federal Register* 66 (9): 3243-3273), including the text of the Final Rule, and the reasons for its adoption. The Final Rule describes USFS policy concerning roadless areas throughout the National Forest System (NFS) and specifies that constructing new access roads or reconstructing existing unclassified roads that cross inventoried roadless areas (IRAs) would not be allowed (unless approved under specific exceptions). The Final Rule was implemented on May 12, 2001, and has been recently affirmed. On October 21, 2011, the U.S. Court of Appeals for the Tenth Circuit decided *Wyoming v. USDA* and found the USFS's adoption of the 2001 Roadless Area Conservation Rule does not violate federal law.

The USFS would require preparation of a Biological Evaluation (BE) for the Project. USFS policy (FSM 2670.32) states that all programs and activities would be reviewed in a BE as part of the NEPA process to determine the potential effect of such proposed activities on regional forester-designated sensitive species. Further, it is policy to avoid or minimize impacts to species whose viability has been identified as a concern, and permitted activities must not result in loss of species viability or create significant trends toward federal listing. The objectives of this policy are to ensure that species do not become endangered or threatened because of USFS actions, and that viable populations of all native and desired nonnative wildlife, fish, and plant species are maintained in habitats distributed throughout their geographic range on USFS lands (FSM 2670.22).

The USFS decision maker, in consultation with affected forests, would use this EIS to inform his/her decision regarding: 1) the choice of a preferred alternative; 2) whether to issue a Special Use Authorization under the NFMA; 3) under what terms and conditions a permit should be issued; and 4) the need to amend LRMPs.

1.4.2.7 U.S. Fish and Wildlife Service

The USFWS is a cooperating agency on the Project. The USFWS is responsible for ensuring compliance with the Endangered Species Act (ESA), the Bald and Golden Eagle Protection Act (BGEPA), and the Migratory Bird Treaty Act (MBTA). The BLM, as the lead federal agency for ESA Section 7 consultation, is responsible for initiating informal consultation (e.g., communication) with the USFWS to determine the likelihood of effects on listed species. In accordance with the ESA, formal consultation (as described below) with the USFWS is required when the action agency determines that a project may affect a listed species or designated critical habitat. The consultation process determines if a project is likely to jeopardize the continued existence of a species, or destroy or adversely modify critical habitat. Formal consultation begins with the BLM's written request for consultation and the submittal of a Biological Assessment (BA) and concludes with the issuance of a Biological Opinion (BO) from the USFWS. The BLM has entered into informal consultation with the USFWS for the Project.

The BLM will prepare a draft BA to assess potential impacts on federally listed species and their habitats from the agency preferred alternative. The draft BA would be submitted to the USFWS for review and concurrence. The USFWS would issue a letter of concurrence on the BA, or a BO, depending on the level of effects on listed species.

1.4.2.8 Advisory Council on Historic Preservation

ACHP oversees implementation of Section 106 of the National Historic Preservation Act (NHPA), which requires the lead federal agencies to consider the effects of the agencies' undertakings on properties listed in or eligible for the National Register of Historic Places (NRHP). NRHP properties can include a diversity of archaeological, historical, and traditional cultural properties. Regulations for Protection of Historic Properties (36 CFR 800) implement Section 106, and define a process for federal agencies to consult with the State Historic Preservation Office (SHPO) and other interested parties as they assess the effects of their undertakings. Pursuant to these regulations, the BLM has initiated Section 106 consultation with the Wyoming, Colorado, Utah, and Nevada SHPOs.

A Programmatic Agreement (PA) currently is being prepared for the Project. The PA is a document that records the terms and conditions agreed upon to resolve potential effects to historic properties of a federal agency program or complex undertaking in accordance with Section 106 of the NHPA. The PA for this Project defines the general and specific measures that would be undertaken by BLM, Western, TransWest, and the SHPOs to ensure Western's and BLM's objectives and responsibilities regarding protection of historic properties under the NHPA are fulfilled. Primary signatories for the PA include the BLM, Western, the USFS, TransWest, the SHPOs, and the ACHP. Those tribes whose lands would be crossed by the selected transmission line route also would be invited to sign the PA.

1.4.2.9 U.S. Army Corps of Engineers

The USACE is a cooperating agency on the Project. Section 404 of the Clean Water Act (CWA) establishes a permit program administered by the USACE to regulate the discharge of dredge and fill materials into the waters of the U.S. (WUS), including their adjacent wetlands. The Project would be under the jurisdiction of the Omaha, Sacramento, and Los Angeles districts of the USACE. The Applicant would be responsible for conducting wetland delineations for the proposed routes and filing the Section 404 application(s) and other CWA certifications.

Section 10 of the Rivers and Harbors Act (RHA) establishes a permit program to prevent unauthorized obstruction or alteration of any navigable WUS by construction in, over, or under said waters. Section 10 also

is administered by the USACE. The Applicant would be responsible for filing Section 10 permit application(s) for crossings at navigable waters.

1.5 Additional Governmental Requirements

Table A-1 in **Appendix A** provides a list of the major federal, state, and local permits and approvals that could be required for construction, operation, and maintenance of the Project.

1.6 Right-of-way Easement Acquisition Process on Non-Federal Lands

TransWest, or Western if they choose to participate in the proposed Project, would negotiate details regarding needed land acquisition across non-federal lands (e.g., private, county, state), either in fee or as an easement for the transmission line and associated facilities (substations, etc.), with each landowner. A private land easement, usually negotiated with the landowner, is the legal instrument that would be used to convey ROW to Western or TransWest. The easement would give TransWest or Western the right to operate and maintain the transmission line in the permanent ROW and, in return, would compensate the landowner for the use of the land.

The easement negotiations between TransWest or Western and the landowner could include compensation for loss of use during construction, loss of nonrenewable or other resources, and the restoration of unavoidable damage to property during construction. Although BLM does not enforce stipulations on private lands, Project implementation on these lands does have to comply with those regulatory requirements that also apply to private land (e.g., ESA, CWA). Thus, TransWest or Western and their contractors would be responsible for ensuring that the Project complies with these requirements. Additionally, private landowners may negotiate stipulations to address resource impacts as part of their agreements with TransWest or Western.

If a fee ownership or an easement cannot be negotiated with the landowner, federal and state laws allow in some cases for the acquisition of property rights for facilities to be built in the public interest. Western, as a federal agency investing in the Project, would have the ability to acquire the rights needed under eminent domain laws prevailing in the affected states. However, Western has committed to working with citizens and landowners to address any concerns regarding acquisition of any private lands required for Project implementation, should it decide to participate. Western views effective public involvement and engagement as a much more productive route than exercising eminent domain authority.

1.7 Scoping and Public Involvement

1.7.1 Public Scoping

The BLM and Western conducted pre-scoping activities in 2009 and Spring 2010 with the BLM FOs, USFS, and the cooperating agencies. Comments received during pre-scoping were considered in developing the alternative corridors presented to the public during the scoping period.

The NOI for the Project was published in the *Federal Register* on January 4, 2011. A Project newsletter was concurrently mailed to approximately 23,000 interested parties including federal, state, and local agencies; tribal governments; and potentially affected landowners within the proposed 2-mile transmission line corridors for the proposed and alternative routes. The BLM and Western placed display advertisements in local newspapers, and public service announcements were submitted for broadcast on local radio and television announcing the public scoping meetings. TransWest also conducted additional outreach related to the scoping process.

The BLM and Western held 23 public scoping meetings with a total attendance of 678 individuals. Dates and locations of the public meetings are provided in **Table 1-5**. All of the public scoping meetings were held from 4:00 p.m. to 7:00 p.m.

Table 1-5 Scoping Meetings

Vernal, Utah	January 25, 2011	St. George, Utah	February 17, 2011
Craig, Colorado	January 26, 2011	Pine Valley, Utah	February 22, 2011
Rangely, Colorado	January 27, 2011	Central, Utah	February 23, 2011
Grand Junction, Colorado	January 31, 2011	Enterprise, Utah	February 24, 2011
Moab, Utah	February 1, 2011	Caliente, Nevada	February 28, 2011
Castle Dale, Utah	February 2, 2011	Overton, Nevada	February 29, 2011
Duchesne, Utah	February 7, 2011	Henderson, Nevada	March 1, 2011
Nephi, Utah	February 8, 2011	Las Vegas, Nevada	March 2, 2011
Delta, Utah	February 9, 2011	Rawlins, Wyoming	March 8, 2011
Richfield, Utah	February 14, 2011	Rock Springs, Wyoming	March 9, 2011
Milford, Utah	February 15, 2011	Baggs, Wyoming	March 10, 2011
Cedar City, Utah	February 16, 2011		

The public meetings were conducted as open houses with seven information stations: Project Scope and Applicant's Interests and Objectives, NEPA and Agencies' Purpose and Need, Engineering/ Construction/Maintenance, Lands Acquisition, Map Book Table, GoogleEarth™ Demonstration, and Geographic Information System (GIS) Comment Station. Public scoping comments were electronically submitted at the GIS comment station at the meetings, through the BLM Project website, or by U.S. Mail.

During the scoping period, the BLM and Western met with representatives of several county commissions. The meetings were scheduled to coincide with the scoping meeting in their respective county. The meetings provided Project information and explained the EIS process. Packets containing the materials available to the public at the scoping meetings were distributed to the commissioners. In addition to the county commissioners, the BLM and Western met with the Clark County, Nevada, Conservation Program on March 1, 2011.

The BLM and Western received a total of 622 comment submittals (e.g., letter, comment form, email) containing 2,319 individual comments during the public scoping period. The public scoping comments were compiled in a database and analyzed for content. Reports were generated, categorizing the issues first by the Project region and then by resource and/or topic. The individual comments were keyed to a Project map for easy identification.

1.7.2 Consultation and Coordination with Federal, State, and Local Governments, and Federally Recognized Indian Tribes

The BLM and Western continue to participate in the coordination and consultation with federal, state, and local agencies, and tribal representatives about the potential for the proposed Project and alternatives to affect sensitive resources (40 CFR 1508.5; 1608.6; Forty Questions No. 14[a], 14[b], 14[c], and the CEQ Advisory Memorandum, *Designation of Non-Federal Agencies to be Cooperating Agencies in Implementing the Procedural Requirements of NEPA, July 1999*).

1.8 Issues to be Analyzed

After evaluating the comments received during the scoping, several key issues emerged. The issues were synthesized into topical areas that represent the most frequent public concerns about the proposed Project. These issues and topical areas defined the focus of the NEPA analyses disclosed in this EIS. A detailed summary of the scoping issues is contained in the Project Scoping Summary Report, which is posted on the BLM Wyoming State Office website: http://www.blm.gov/wy/st/en/info/NEPA/documents/hdd/transwest.html.

1.8.1 Corridor Alternatives

Most corridor-related comments were related to alternative locations. Concerns regarding particular corridor alternatives were related to avoidance of sensitive resources, including special status species habitat, impacts to visual resources, areas with special designations or management, and/or historic or cultural sites. Many of the commenters were landowners concerned about public health and safety issues and impacts to property values. A description of the pre-scoping corridor screening process is presented in **Appendix B**, TransWest Express Transmission Project Corridor Screening Report.

1.8.2 Potential Private and Public Land Use Conflicts

Conflicts with existing or potential future land uses were a common concern for many of the Project alternatives.

- Corridor alternatives located in Colorado potentially would conflict with private landowner properties, a new airport location, state land uses, and federal lands with special management designations.
- Corridor alternative concerns within Wyoming primarily were associated with impacts to agricultural lands, special status species, historic and cultural resources, and visual resources.
- In Utah, landowners in the Fruitland and Duchesne areas were concerned that the Project would conflict with agricultural activities and limit economic growth. Concerns about corridor alternatives were related to impacts to reservoirs in northern Utah, agriculture lands, Uinta/Ashley national forests, wilderness study areas (WSAs), and the Mountain Meadows National Historic Landmark (NHL) and Site.
- Numerous comments about conflicts with existing or potential future land uses came from the Las Vegas area, specifically north of Las Vegas (Apex) and the Henderson area.

1.8.3 Impacts to Fish, Wildlife, Vegetation, Special Status Species, and Habitat

Comments about potential impacts to greater sage-grouse were of high concern in Wyoming, Colorado, and Utah. Wildlife concerns in Wyoming and Colorado included impacts to big game migration and winter/spring range habitat for elk, mule deer, and pronghorn. There were numerous concerns regarding impacts to desert tortoise habitat in southern Utah and Nevada, as well as impacts to bighorn sheep where the proposed Project would traverse desert mountain ranges. Habitat loss for raptors and migratory bird species, as well as potential for increased bird collisions with transmission lines, were a concern throughout the analysis area.

1.8.4 Concerns about Wildlife Mitigation

Wildlife mitigation measures were important concerns, particularly in areas where the proposed corridor and alternative corridors potentially would affect special status species and wildlife. Many of the comments provided recommendations such as construction timing, buffer zones, perching deterrents, and mitigation plans. Compensatory mitigation for wildlife habitat loss also was recommended, particularly for impacts to migratory birds.

1.8.5 Noxious Weed Control and Reclamation

In nearly all scoping meeting locations, concerns were expressed about the potential for the spread of noxious and invasive weeds along new ROWs, and the need for appropriate control measures. Concerns and suggestions were expressed regarding the choice of appropriate seed mixtures for surface disturbance reclamation, especially as related to benefits to wildlife and livestock grazing.

1.8.6 Public Health and Safety

Numerous comments about public health and safety were received from areas where the proposed Project would cross or be adjacent to private property. Residents in the community of Central, Utah, were concerned

about fire risk related to co-locating the transmission line with gas pipelines as well as concerns about firefighter safety in an area with a high risk of wildland fires. Several residents in Henderson, Nevada, voiced concerns about the effects of electromagnetic fields on humans, potential sabotage activities, and structure/conductor failure near homes. Increased construction traffic on roadways was a concern throughout the analysis area.

1.8.7 Impacts to Areas with Special Management Designations

Throughout the Project area, comments were received about potential impacts to BLM Areas of Critical Environmental Concern (ACECs), BLM WSAs, USFS IRAs, national monuments/landmarks, national historic trails (NHTs), and state and federal parks. Primary concerns were visual changes that could be viewed from managed or protected areas.

1.8.8 Cumulative Impacts

Attendees expressed concern regarding the cumulative effects of numerous transmission lines being proposed within already overcrowded corridors throughout various geographies within the analysis area. Specific areas of concern were along Interstate 80 (I-80) in Wyoming; through the Dixie National Forest and Central, Utah; and in the Las Vegas area on the east side of the Las Vegas Valley.

1.8.9 Socioeconomic Impacts (Property Values and Tax Base)

Many landowners were concerned about how the Project would affect property values, particularly where the Project would cross private lands or would be located near urban areas. Throughout the analysis area, there were comments that the Project could provide economic benefit to their rural communities through expansion of the tax base and temporary employment during construction.

1.9 Organization of this EIS

The Project Draft EIS was organized to facilitate comparison of corridor alternatives and to enable the agencies to efficiently determine the agency preferred alternative. The Draft EIS addresses the direct, indirect, and cumulative environmental impacts resulting from developing the Project. The content and scope of each chapter is described below.

Chapter 1.0 – Introduction

Chapter 1.0 provides an introduction to the Project and includes a description of the proposed Project, the agencies' purpose and need, and the applicant's interests and objectives. This chapter discusses the federal approval process, decisions to be made, and authorizing federal laws. Relevant state and local regulations are summarized in **Appendix A**. The pre-scoping corridor screening process is presented in **Appendix B**. A summary of the scoping process and issues identified during the scoping period are presented.

Chapter 2.0 – Project Description and Alternatives

Chapter 2.0 provides a description of the alternatives to be analyzed, including the No Action Alternative. Each transmission line alternative is described in terms of its land requirements and the ancillary facilities required for implementing the alternative. The process for identifying the corridor alternatives to be analyzed (or not analyzed) in the EIS is outlined in this chapter. Detailed descriptions of BMPs, design features, and agency stipulations are presented in **Appendix C**. TransWest's detailed description of the technical components of the project are contained in **Appendix D**.

Chapter 3.0 – Affected Environment and Environmental Consequences

For each resource that could be impacted by the Project, Chapter 3.0 describes the analysis area, existing conditions, and environmental consequences of each Project alternative (including the No Action Alternative). Additionally, Chapter 3.0 provides the regulatory background, sources for baseline data, and a description of the impact indicators and methodology used to determine Project impacts. Proposed mitigation measures to

avoid or minimize these impacts and residual impacts after implementation of this mitigation also are disclosed. Resource-specific details not contained in the EIS sections can be found in **Appendix E** through **Appendix I**.

Chapter 4.0 – Federal Agency Land Use Plan Amendments

Chapter 4.0 addresses the federal land use plan amendments required for the Project. Plan amendments are related to the specific land management plan and alternative corridor. Environmental impacts and planning implications associated with each plan amendment are described.

Chapter 5.0 – Cumulative Impacts

Chapter 5.0 discloses the cumulative impacts of the proposed Project when considered with other non-connected past, present, and reasonably foreseeable future actions (RFFAs). As per CEQ's *Considering Cumulative Effects Under the National Environmental Policy Act* (CEQ 1997), the cumulative effects of past and present actions are summarized in Chapter 3.0 under the current affected environment sections for each resource. The cumulative impacts section then considers RFFAs and their additional impacts for all Project alternatives.

2.0 Project Description and Alternatives

2.1 Project Overview

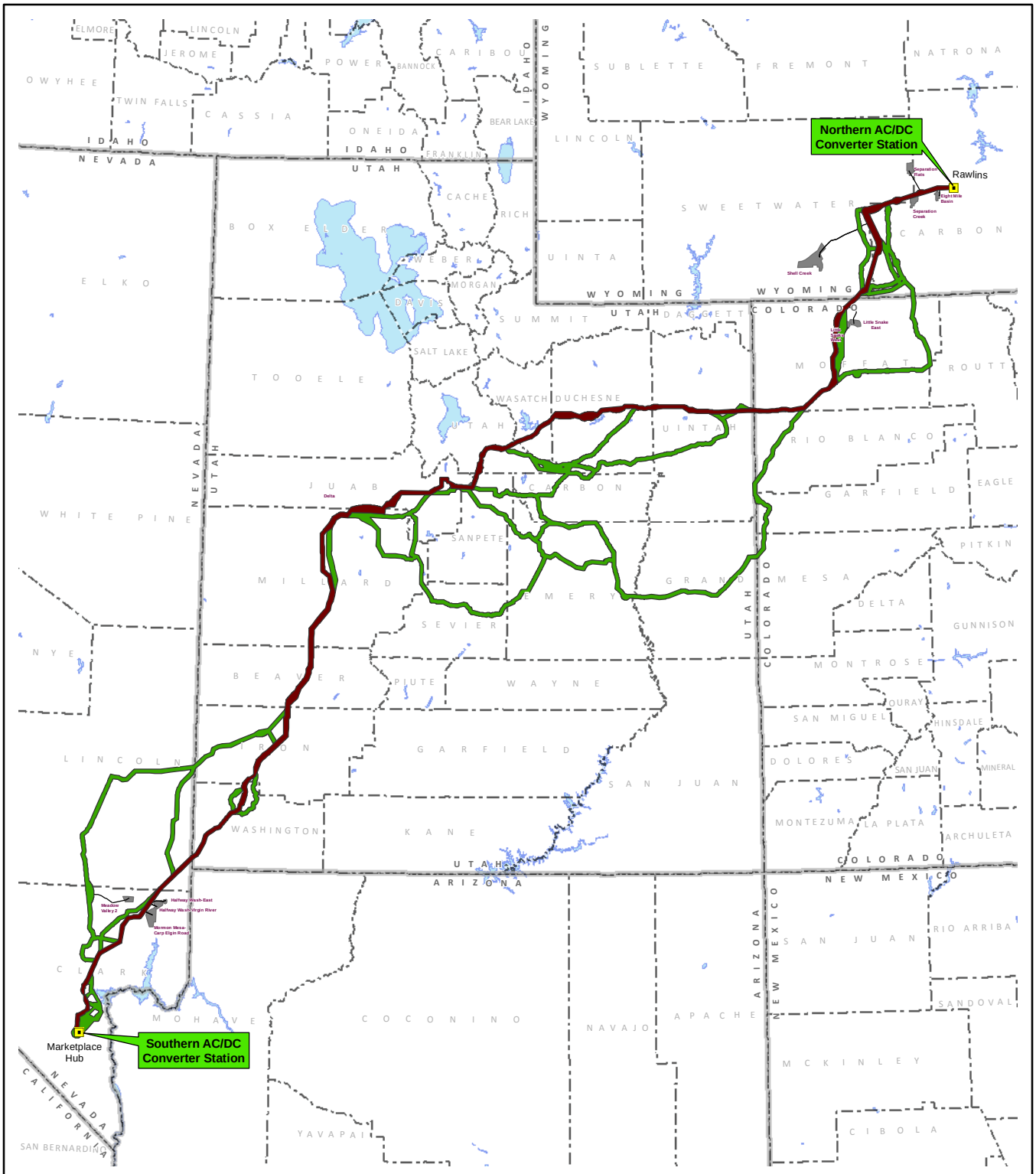
2.1.1 Proposed Action

The proposed action would consist of the following facilities and improvements:

- A 600-kV DC transmission line, approximately 725 miles in length, extending across public (state and federal) and private lands in Wyoming, Colorado, Utah, and Nevada. The transmission line ROW would be approximately 250 feet wide. Alternative transmission line routes have been developed to analyze the range in resource impacts. **Figure 2-1** depicts these routes that range up to 904 miles in length.
- Two terminal stations would be located on private or public lands at either end of the transmission line, near Sinclair, Wyoming, and at the Marketplace Hub in the Eldorado Valley near Boulder City, Nevada. Terminal facilities would include converter stations and related substation facilities necessary for interconnections to existing and planned regional AC transmission systems.
  - Facilities within the Northern Terminal Station would be situated on approximately 235 acres and include an AC/DC converter station to convert alternating electrical current to direct current, thereby allowing power from the AC system to be transmitted on the Project transmission system.
  - Facilities within the Southern Terminal Station would be situated on approximately 205 acres and include an AC/DC converter station to convert direct current to alternating current, allowing power transmitted on the Project transmission system to enter the regional grid serving California, Nevada, and Arizona. The Project also would be capable of transmitting power in a south-to-north direction, although the primary purpose of the line would be for north-to-south power transfers.
- Access routes, including improvements to existing roads, new overland access and new unpaved roads to access the proposed Project facilities and work areas during the construction, operation, and maintenance phases.
- Ancillary facilities including:
  - Communications systems: a network of 12 to 15 fiber optic communication and regeneration sites, typically within the 250-foot-wide transmission line ROW, and microwave facilities at each terminal.
  - Two ground electrode facilities, each sited on approximately 160 acres with 20 to 90 acres of ground disturbance during operation, to be located on private or public lands in either Wyoming or Colorado, and Utah or Nevada. A low voltage electrical line would connect the ground electrode facilities to the terminals. A ground electrode is required to maintain an electrical circuit through the ground to maintain system operations following emergency events resulting in unexpected loss of one of the two poles (or circuits) of the Project terminal or converter station equipment. One ground electrode facility would be located within 100 miles of each of the Northern and Southern terminals.

The proposed Project has the capability to transmit power generated by existing and/or reasonably foreseeable renewable or non-renewable sources in Wyoming. These include a variety of proposed wind projects, which are analyzed in detail in separate NEPA analyses and whose cumulative impacts, if applicable, are disclosed in Chapter 5.0 of this EIS. It is important to note that none of these projects are exclusively dependent upon this proposed transmission line, nor is this transmission line dependent exclusively on any of those projects.

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2.1.2 Design Options

Design options would meet the Project's stated objectives only if transmission capacity becomes available to transmit the energy delivered from Sinclair, Wyoming, to Delta, Utah, by the Project on to Southern California via the existing IPP 2,400-MW, 500-kV DC Southern Transmission Systems (STS). Because capacity is not currently available on the STS, the design options currently do not meet the Project's interests and objectives. Implementation of the design options would only be considered under the conditions that sufficient capacity, approximately 1,500 MW, became commercially available to transmit energy delivered by the project to California; and that the Project was able to establish commercial interconnection agreements with the utility owning and operating the IPP transmission line (currently Los Angeles Department of Water and Power [LADWP]).

If implemented, these design options would consider the same alternative transmission line routes as the proposed action; however, each would require development of different terminal locations, electrode bed system locations, tower types, and ancillary facilities as summarized below.

2.1.2.1 Design Option 2 – DC from Wyoming to IPP; AC from IPP to Marketplace Hub

Under this design option, this project would deliver energy to the IPP near Delta, Utah, then complete delivery of energy to markets in the Desert Southwest region through both the 1,500-MW, 500-kV transmission line proposed as part of this project and through the existing STS between Delta, Utah, and Adelanto, California.

Design Option 2 would entail construction of a 3,000-MW, 600-kV DC transmission line approximately 442 miles in length, from the Northern Terminal in Sinclair, Wyoming, to a new DC/AC converter station near the existing IPP substation near Delta, Utah. From the new DC/AC converter station in Utah, a single circuit 1,500-MW, 500-kV AC transmission line approximately 348 miles in length would be constructed to one of the existing substations in the Eldorado Valley, south of Boulder City, Nevada (Marketplace Hub).

Compared to the proposed action, Design Option 2 would:

- Replace the 600-kV DC transmission line with a single circuit 500-kV AC line from near IPP in Millard County, Utah, to one of the existing Marketplace Hub substations in Clark County, Nevada;
- Eliminate the Southern Terminal and ground electrode system in Clark County, Nevada, and replace these facilities with similar facilities near IPP in Millard County, Utah;
- Require additional new facilities, including a double circuit 345-kV transmission line (less than 5 miles in length and similar configuration as those described for the 600-kV DC transmission line) for interconnection at IPP and a 500-kV series compensation station (similar to a 500-kV substation) located near the halfway point in the southern 500-kV AC line.

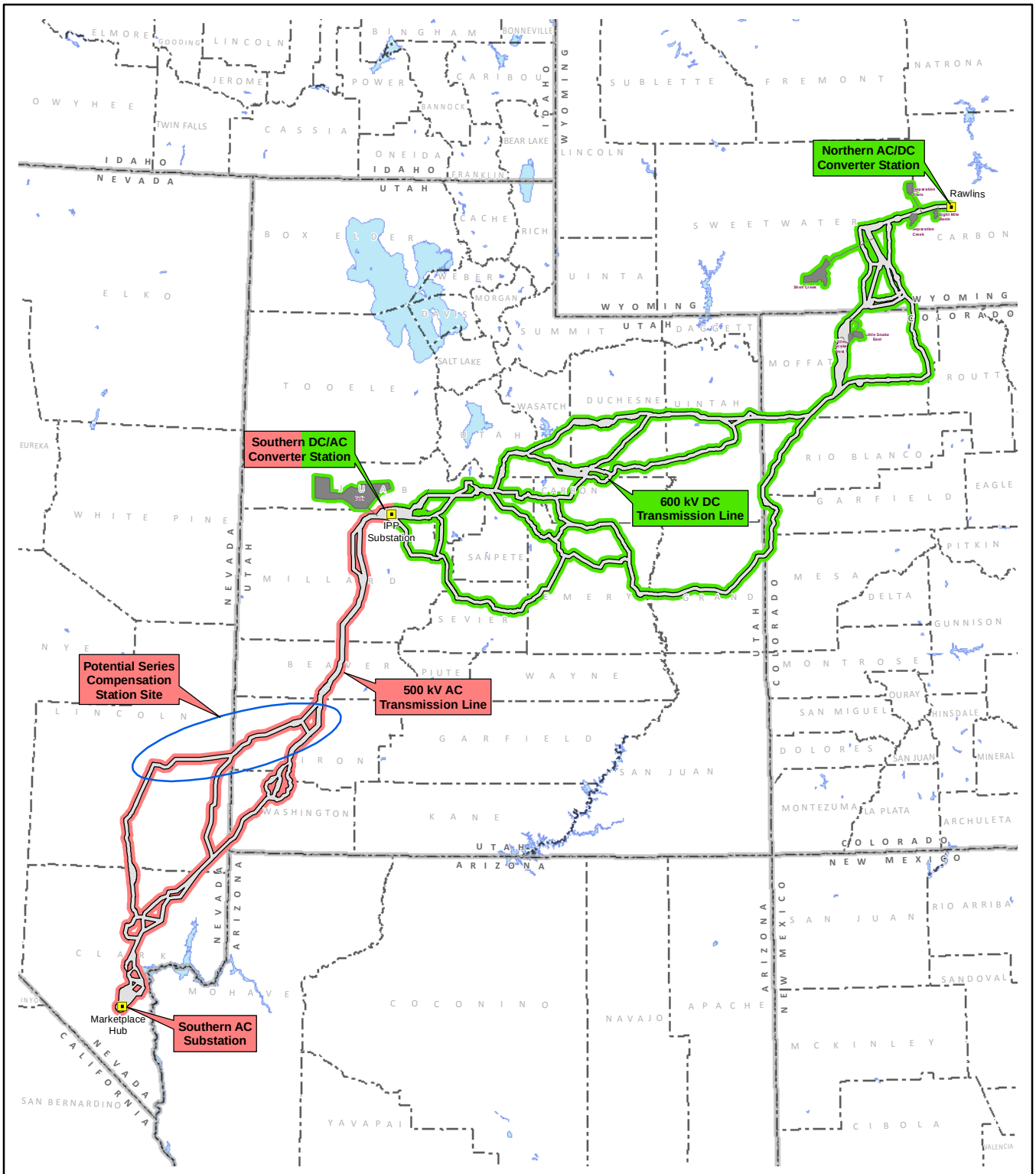
Figure 2-2 depicts the configuration of Design Option 2.

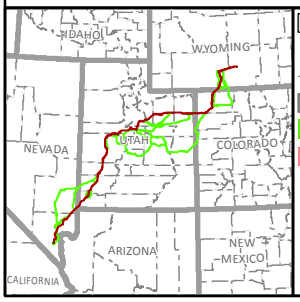
2.1.2.2 Design Option 3 – Phased Build Out

This design option would utilize a two-phase approach. The phased approach is more costly than building out the full system as a single non-phased project and would only be required if the demand for Wyoming resources in the Desert Southwest proves to be slower in development than expected.

Phase one would entail construction of a 3,000-MW, 600-kV DC transmission line approximately 442 miles in length between the location of the proposed Northern Terminal in Sinclair, Wyoming, to the IPP substation near Delta, Utah. This portion of transmission line would require an AC configuration (three conductors and structures to support them), because this phase initially would be operated as a 1,500-MW, 500-kV AC transmission system.

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- Project Corridor Alternative
- Connecting Substation
- Potential Overhead Electrical Line
- Potential Ground Electrode Siting Area
- 600 kV DC
- 500 kV DC

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 2-2
Design Option 2
DC from Wyoming to IPP,
AC from IPP to Marketplace Hub

0 20 40 80 Miles
0 20 40 80 km
1:4,750,000
N

Western AREA POWER ADMINISTRATION

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Phase two would occur at some point in the future when market demands warrant converting the line's operation from 1,500 MW to 3,000 MW. This phase would involve constructing the remaining portion of the 3,000-MW, 600-kV DC line from IPP to the Southern Terminal, south of Boulder City, Nevada, construction of the Northern and Southern terminals and ground electrode systems, and converting operations to a DC system. The subsequent conversion from 500-kV AC to 600-kV DC would not require physical changes to the structure or wire system constructed in phase one; one of the three conductor bundle sets would be de-energized and left in place.

Compared to the proposed action, Design Option 3 would:

- Construct a 600-kV DC transmission line from Sinclair, Wyoming, to IPP near Delta, Utah, with an AC configuration (three conductors and structures to support them) for AC operation until phase two completion.
- Construct a 500-/345-kV substation near the IPP in Millard County, Utah, for AC operation until phase two completion.
- Require additional new facilities including a double circuit 345-kV transmission line (less than 5 miles in length for interconnection at IPP) and a 500-kV series compensation station located near the halfway point in the northern 500-kV AC line for operation until phase two completion.
- Delay construction of southern 600-kV DC transmission line from IPP to Marketplace Hub, the Northern and Southern terminals and ground electrode systems.

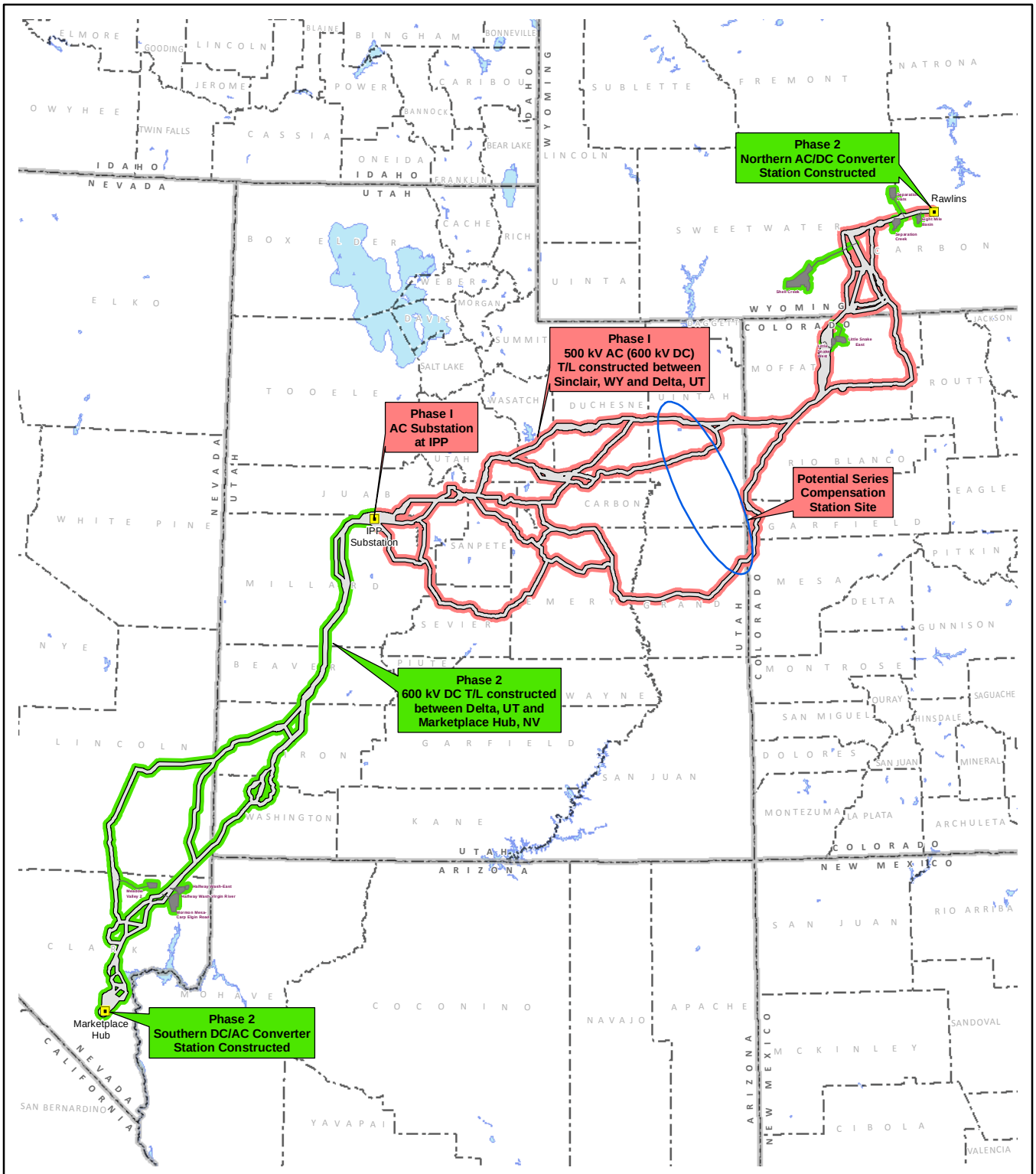
Figure 2-3 depicts the configuration of Design Option 3.

2.2 TransWest Express Transmission Project Planning

System planning studies have been underway since 2005 to assist in identifying a range of alternatives for the Project. The Project was included in a Regional Planning Project Review (RPPR) conducted in accordance with WECC Planning Procedures (TWE 2008). Findings included in the RPPR Conceptual Technical Report concluded that this Project would help to serve the needs of the broad region of Utah, Arizona, Nevada, and southern California in a cost-effective manner while minimizing potential environmental impacts. Studies carried out by the Northern Tier Transmission Group (NTTG) (a subregional transmission group of WECC) and WestConnect supported the development of lines from southern Wyoming to the desert southwest (NTTG 2007; WestConnect 2008). Three important criterion evaluated by TransWest in planning and developing the proposed route for the Project were: 1) capacity of the facility; 2) reliability standards; and 3) the use of designated corridors.

Capacity. The Project would provide the transmission infrastructure necessary to reliably and cost-effectively provide up to 3,000 MW of electric power capacity from Wyoming to the desert southwest (TWE 2010). The 3,000-MW capacity would be sufficient to support the reasonably foreseeable renewable generation sources anticipated in south-central Wyoming as well as other existing sources. At 3,000 MW, the Project would be one of the largest transmission elements within the WECC system and could facilitate achieving renewable energy goals and Renewable Portfolio Standards in the southwest.

Reliability. Transmission systems in the U.S. are planned, operated, and maintained to meet reliability standards and guidelines of the NERC. Additionally, transmission owners and operators are governed by WECC reliability standards that may be in addition to, or more stringent than those required by NERC. The WECC reliability standards affect the Project ROW requirements as well as separation distance requirements from other high voltage lines. See the PDTR (**Appendix D**) for additional information on reliability standards and other required criteria.



Project Corridor Alternative
Connecting Substation
Potential Overhead Electrical Line
Potential Ground Electrode Siting Area
Phase I
Phase II

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 2-3
Design Option 3
Phased Build-Out

0 20 40 80 Miles
0 20 40 80 km
1:4,750,000
N

Western AREA POWER ADMINISTRATION

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Reliability standards that limit the operational capacity of any single transmission system element are based on a complex contingency analysis that considers the impact to system operations following various events (i.e., equipment failures, line outages). TransWest has developed minimum line separation requirements based on voltages of other parallel lines and average span distances of the proposed Project transmission line. Application of the NERC and WECC reliability standards and preliminary transmission system contingency analyses indicate that the proposed Project transmission line should be optimally no closer than 1,500 feet from parallel transmission lines rated at 345 kV and higher, and no closer than 250 feet from lines that are operated at less than 345 kV. TransWest has developed a Transmission Line Co-location Framework that provides additional information on the co-location of the Project within corridors with existing transmission lines. The framework was designed to provide flexibility to co-locate transmission lines closer as needed to mitigate resource impacts. See the PDTR (**Appendix D**) for additional information on this framework.

Use of Designated Corridors. Proposed and alternative Project corridors follow designated energy corridors on public lands to the greatest extent practicable, including those collectively recommended by the DOE in November 2008 as WWECs pursuant to Section 368 of the Energy Policy Act of 2005; corridors identified by the BLM and the USFS in their respective land management plans; and corridors designated within state and county plans. The ROD to designate the WWECs served to amend the federal land management plans to incorporate the corridors. The decision also adopts Interagency Operating Procedures for the administration of energy transport development within the corridors. These agency-designated utility corridors and the Project proposed and alternative corridors are depicted in **Figure 2-4** through **Figure 2-7**. Generally, the designated corridors encompass existing transmission lines and other existing and planned linear facilities. The designated corridors represent opportunities for siting transmission lines, particularly when a linear ROW has been permitted or constructed through an environmentally sensitive area. In this situation, the existing ROW would be treated as a corridor that provides an opportunity to minimize additional environmental impacts.

Environmental organizations filed a complaint in federal court challenging the designation of multiple corridors identified in the WWEC programmatic EIS, including several corridors along the proposed Project and alternatives considered in this EIS. The WWEC programmatic EIS “corridors of concern” identified by the plaintiffs that overlap with the proposed Project route and alternatives are depicted in **Figure 2-4** through **Figure 2-7**. The complaint was dismissed as a result of a settlement agreement between the plaintiffs and the federal defendants dated July 11, 2012.

2.3 Alternative Corridor Development and Selection Process

2.3.1 TransWest Proposed Action and Alternative Corridors

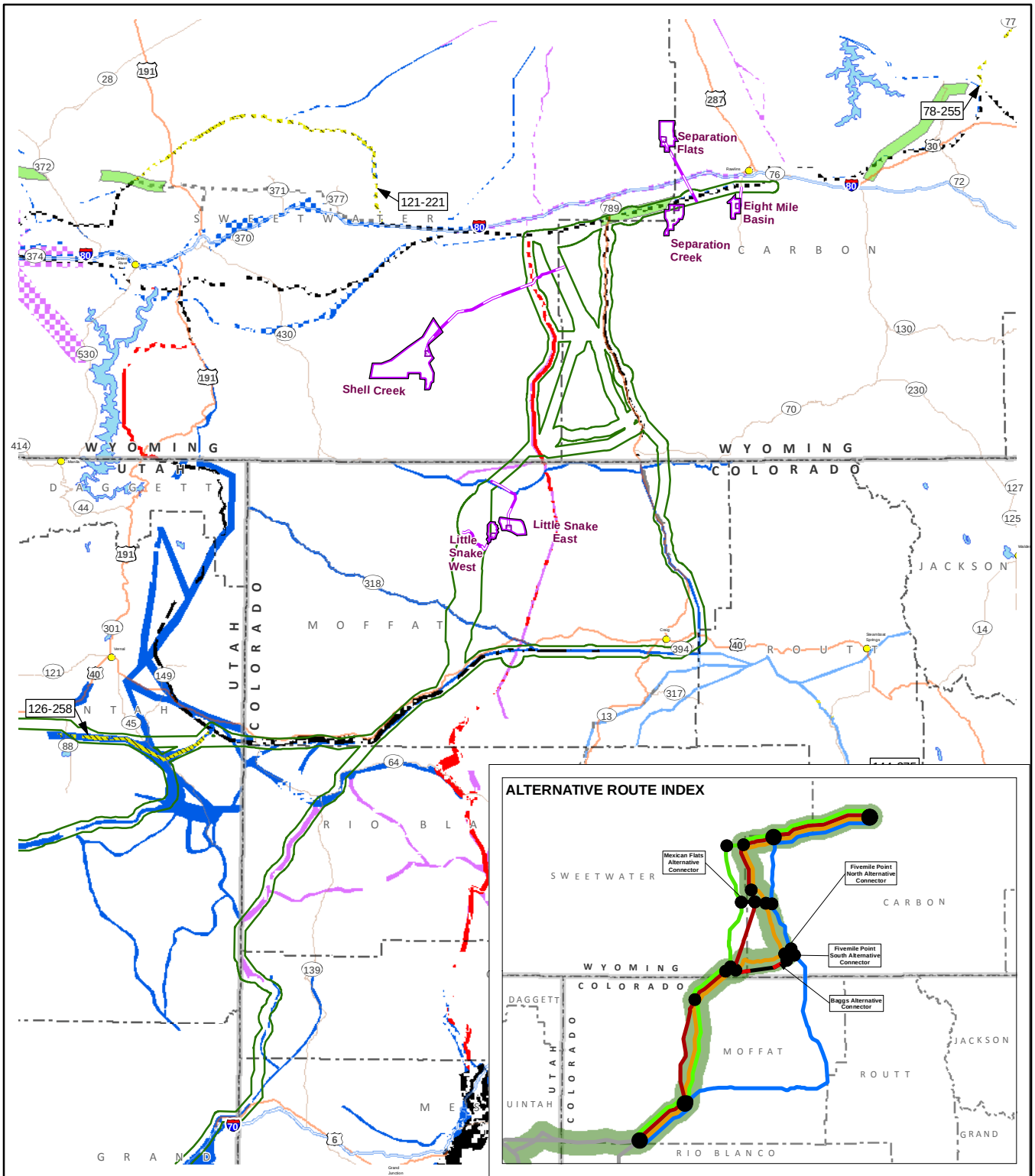
In developing a proposed route to facilitate the transmission of power to markets in the desert southwest, multiple regional corridor studies were conducted. These studies focused on corridors up to 4 miles wide that had been identified as desirable by electrical system planners. During this process, environmental data and federal land management plans were reviewed, federal agency communication and consultation was undertaken to refine the corridor segments, and reference lines (see Section 2.5, Alternative Transmission Line Routes and Ancillary Facilities) were developed based on environmental and engineering constraints and constructability review. The Project history and process used in evaluating alternatives while developing the applicant’s proposed route is documented in the PDTR (**Appendix D**).

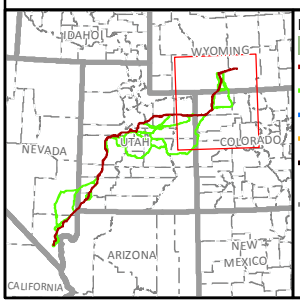
In SF 299 ROW filings with the BLM, TransWest provided maps illustrating a proposed Project corridor from Project origin to terminus as well as corridors identified through the TransWest regional siting studies. The lead agencies reviewed all potential corridors, solicited additional agency-developed alternative corridors, and screened the corridors included in the January 2010 Amended SF 299 as well as the corridors updated in the July 2010 Preliminary POD.

2.3.2 Pre-Scoping Corridor Screening

The lead agencies conducted a corridor refinement process to identify potentially feasible corridors to be analyzed in the EIS, eliminating corridors that were duplicative or presented extensive resource constraints.

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DEIS Alternative Routes
- Agency Preferred
- Applicant Proposed I-A
- Alternative I-B
- Alternative I-C
- Agency Preferred I-D
- Alternative Variation or Connector
- Segment not in this Region

- Project Corridor
- Potential Ground Electrode Siting Area
- Potential Ground Electrode Site
- Potential Ground Electrode Overhead Electrical Line
- Wyoming Governor's Sage-grouse Corridor

Designated Utility Corridors
WWEC FEIS
- All
- Electric Only
- Underground Only
- Corridor of Concern
- 10-0 Corridor of Concern ID

RMP and LRMP
- All
- Electric Only
- Underground Only
- USFS Window

TRANSWEST EXPRESS TRANSMISSION PROJECT

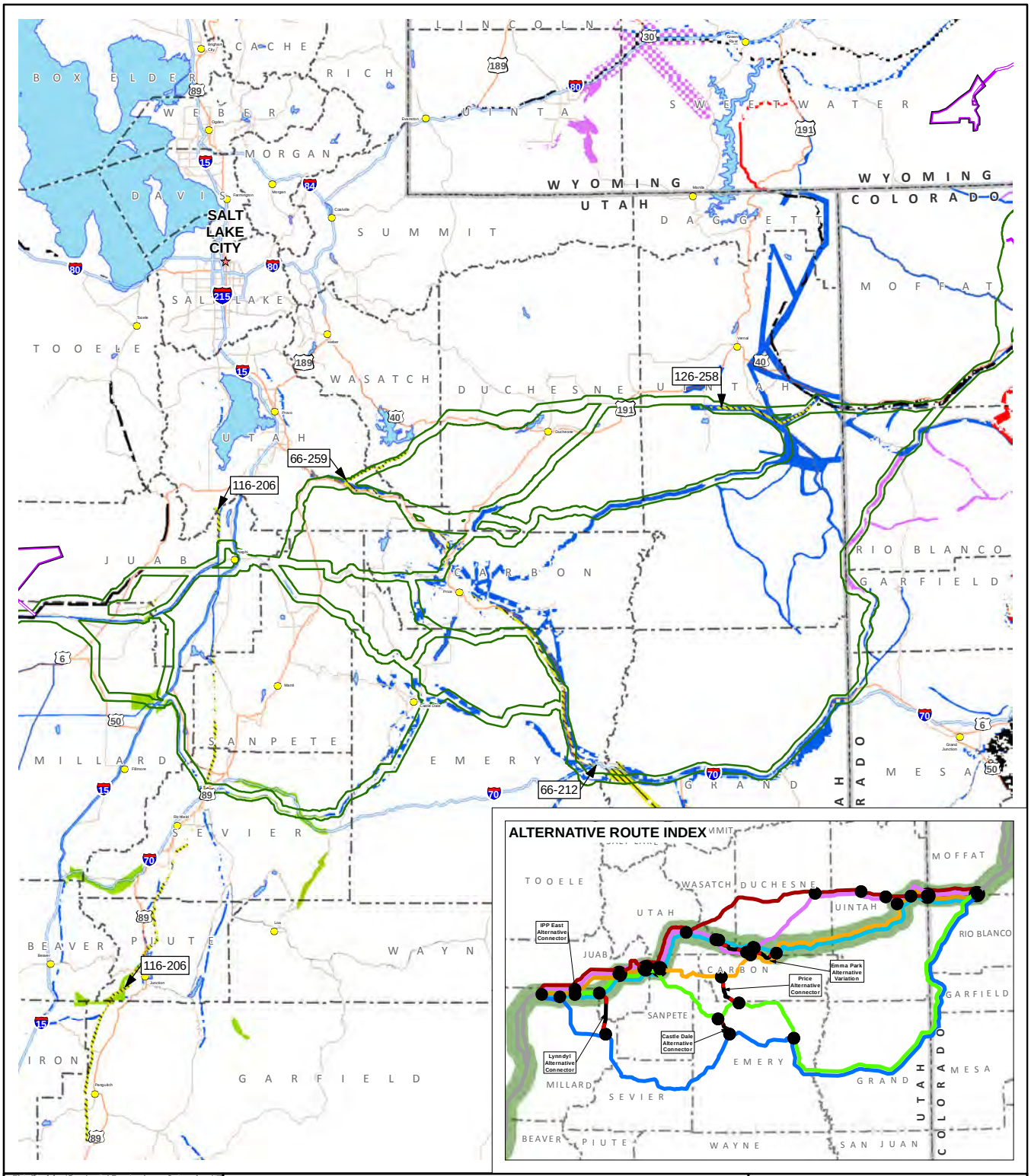
Figure 2-4
Region I
Designated Utility Corridors

0 5 10 20 Miles
0 5 10 20 km
1:1,750,000
N

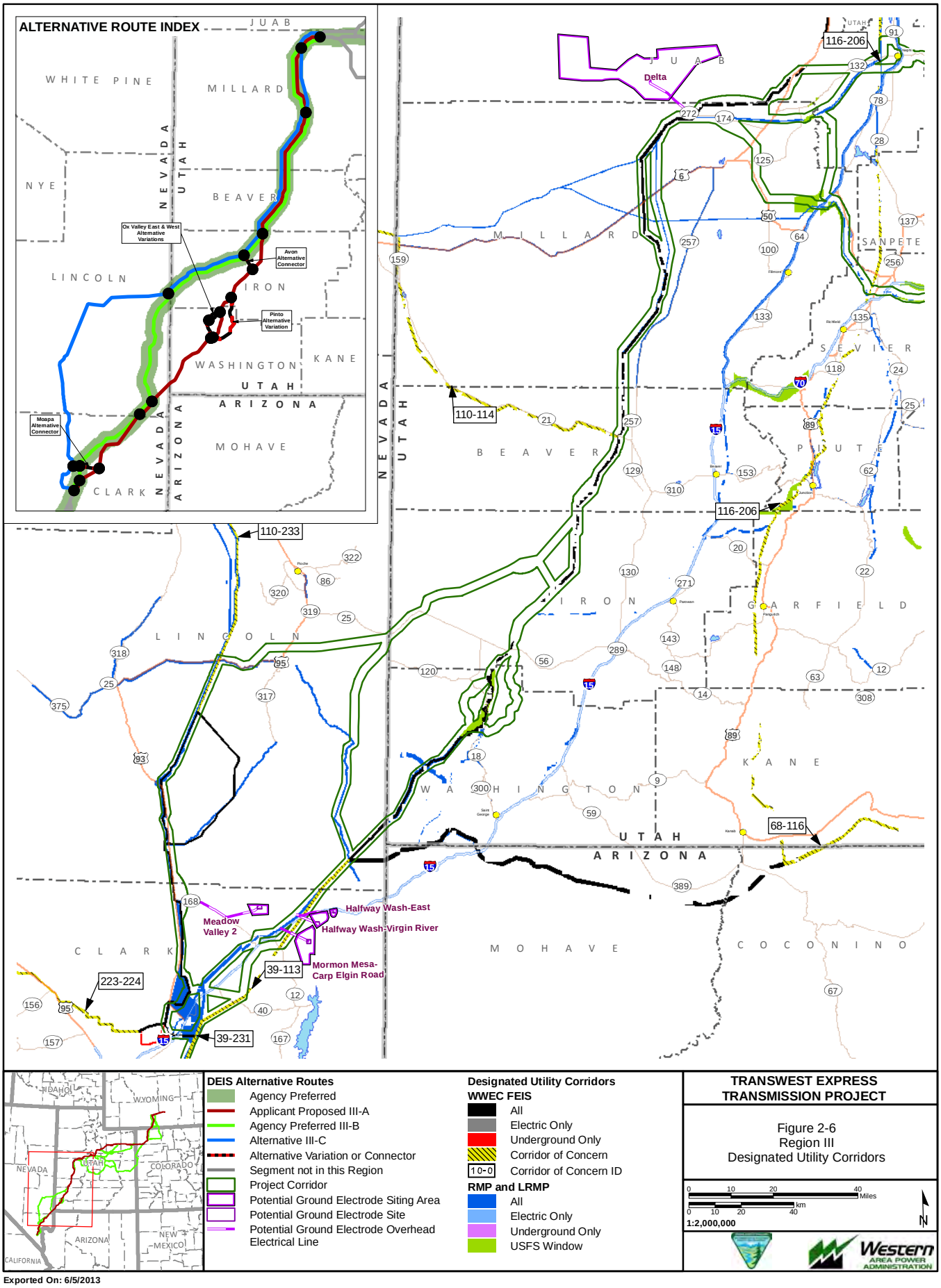
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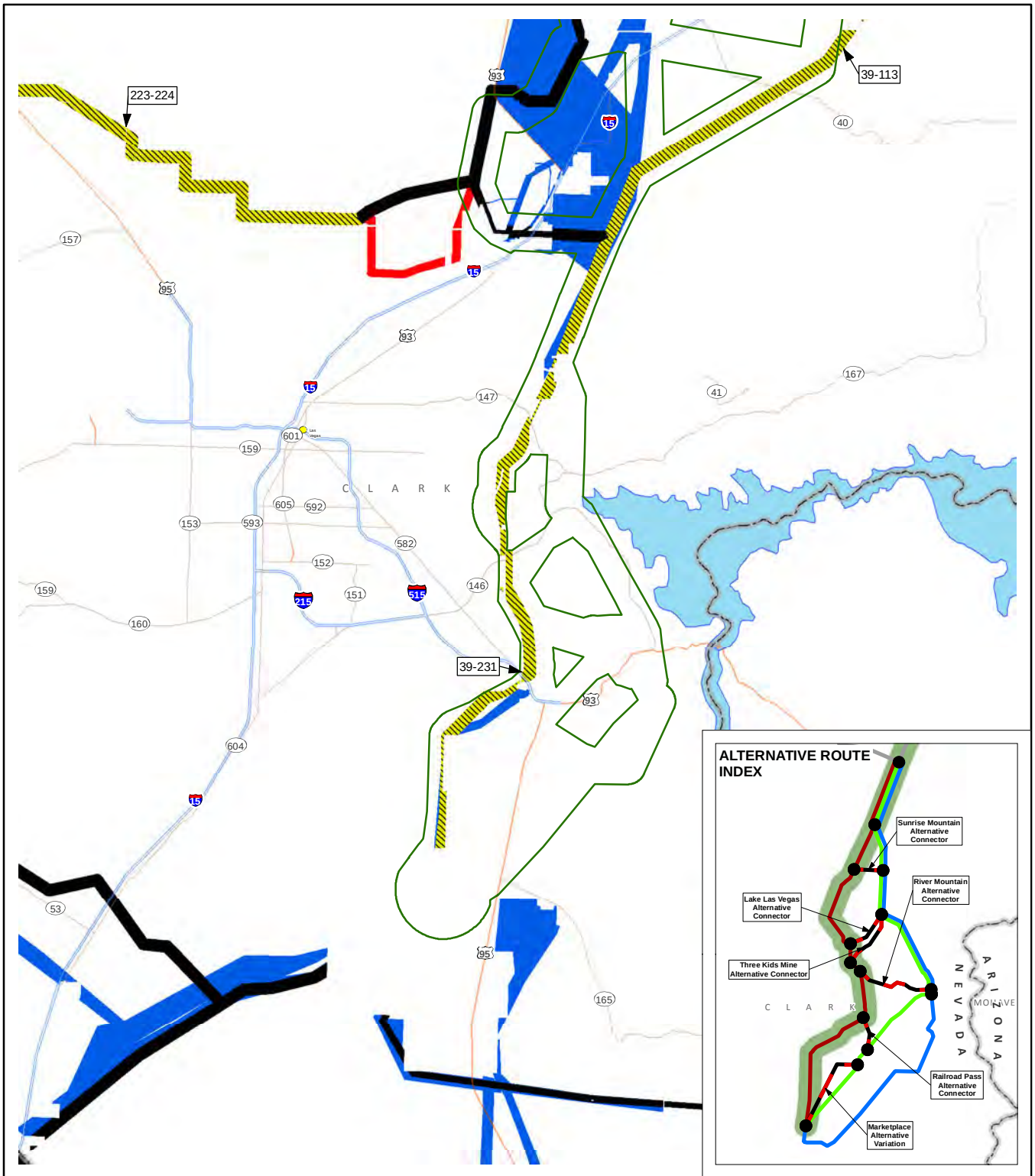
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This review used available data from government and other sources, aerial photography, and input from land management agencies received during pre-scoping meetings. A description of the methods and the results of this process are presented in the TransWest Express Transmission Project Corridor Screening Report (**Appendix B**).

The following criteria were used to retain alternatives for detailed analysis in the EIS:

- Does the alternative result in measurably diminished adverse environmental effects (fewer detrimental effects, less severe effects, or shorter-term effects) than the applicant's proposed corridor for any resource?
- Does the alternative address resource conflicts?
- Is the alternative technically and economically feasible?

Comparative reviews of alternative corridors also were conducted to arrive at a reasonable range of alternative corridor segments to carry into public scoping. The screening review considered the identified environmental constraints, agency input, length within existing utility corridors, and overall length. The rationale for not advancing a particular corridor segment forward for further analysis was based on the criteria listed above. In some instances, corridor segments were added or modified to address identified environmental concerns or changes in Project design.

The results of the pre-scoping review were shared with lead agency Interdisciplinary (ID) teams, and cooperating agencies in the form of maps and supporting rationale for alternative corridor selection. After receiving and addressing input from reviewers, a range of alternative corridors were presented to the public during the public scoping period (January through April 2011). These alternative corridors are illustrated on maps in **Appendix B**.

2.3.3 Formulation of EIS Transmission Line Alternatives

Numerous comments on the alternatives were received during public scoping. These comments were recorded and evaluated in the public scoping summary report (BLM and Western 2011). The evaluation of scoping comments identified several issues that helped to inform the lead agencies' identification of those alternative corridors to retain for further analysis. In addition, corridor alternative variations and alternative connectors were added to address specific regional or local concerns or to provide additional routing flexibility in constrained areas.

Due to the length of the transmission line, the alternative transmission routes were split into four distinct regions for the purpose of presenting clear impact comparisons between alternative segments:

- Region I: Sinclair, Wyoming, to northwest Colorado near Rangely, Colorado;
- Region II: Northwest Colorado to IPP near Delta, Utah;
- Region III: IPP to North Las Vegas, Nevada; and
- Region IV: North Las Vegas to Marketplace Hub near Boulder City, Nevada.

Region boundaries were largely based on areas where the alternative reference line routes converge (i.e., have common nodes or intersection points). The regions were developed so that the alternatives within each region could be selected independently of the alternatives selected in the other regions. Alternative variations and alternative connectors within each region were added for analysis in response to public and agency input on specific issues. Because these variations and connectors are linked with specific alternatives within a region and analyzed with their respective alternative, they are not considered or analyzed as independent alternatives.

In late October 2011, after completing adjustments to the alternatives based on input received during public scoping, the lead agencies presented the EIS alternatives to be retained for detailed analysis to the ID teams and the cooperating agencies. TransWest reviewed the alternatives proposed for inclusion in the EIS analysis and provided revised reference lines, accounting for utility separation criteria and, to the extent practicable, identified resource constraints. This process of alternatives adjustments was repeated in May of 2012, in response to the review of the Preliminary Draft EIS by the ID teams and cooperating agencies. At this time, the BLM also began to develop the agency preferred alternative.

Figure 2-8 provides the corridors retained for further analysis. The corridors not recommended for further analysis also are shown.

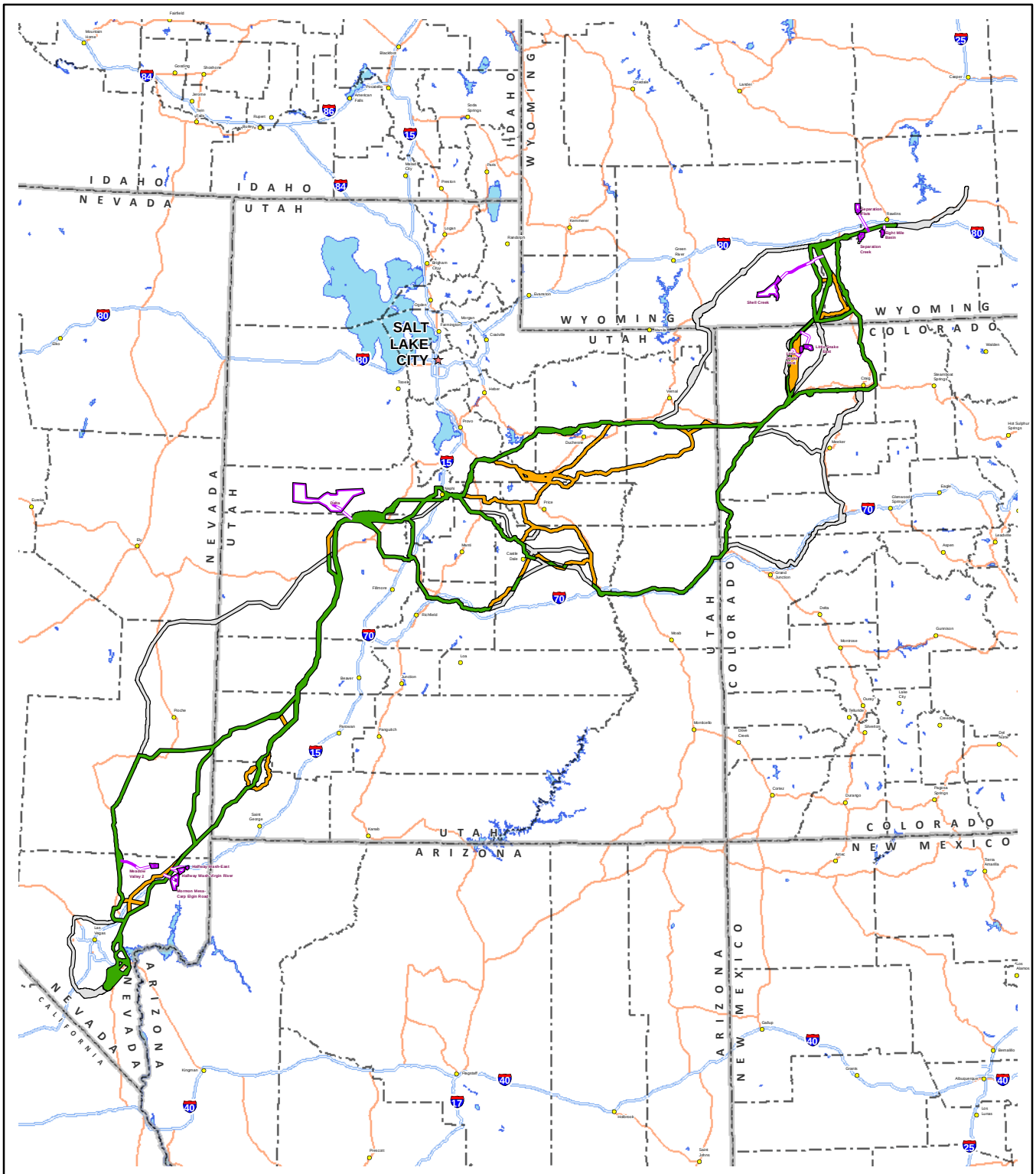
The TransWest proposed action was analyzed as presented by TransWest, including modifications by TransWest in southern Wyoming, adjacent northern Colorado, west-central Utah between Nephi and Delta, and west of Delta (see **Appendix B**). The following factors influenced the selection of corridor alternatives to be carried forward in the analysis:

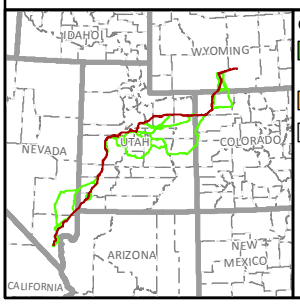
- The TransWest-proposed corridor crosses the Sunrise Mountain ISA. In recognition of the siting issues surrounding the narrow existing utility corridor, corridor alternatives have been developed for analysis on Lake Mead NRA land administered by the NPS.
- The TransWest-proposed corridor includes potential alignments that would cross IRAs in the Uinta, Manti-La Sal, and Dixie national forests. In recognition of these potential crossings, corridor alternatives have been developed that avoid those areas.

The following alternative corridors were added for analysis based on input received from public scoping, the ID teams, and cooperating agencies:

- Five alternative segments were added between I-80 and the Wyoming-Colorado state line to decrease impacts to visual and other resources in the area (recommendation of the BLM Rawlins FO).
- One alternative segment was added between the Wyoming-Colorado state line and U.S. Highway 40 to decrease impacts to visual, land use, and other resources in the area (recommendation of the BLM Little Snake FO).
- Six alternative segments were added in Utah through Uintah, Duchesne, Carbon, Utah, Wasatch, and Sanpete counties to decrease impacts to NHTs, land use, and other resources in the area (recommendation of the USFS).
- Seven alternative segments were added in Utah through Duchesne, Carbon, Utah, and Wasatch counties in consideration of greater sage-grouse planning efforts while also considering the decreased impacts in the point listed above (recommendation of the BLM Utah State Office).
- Eight alternative segments were added (and four segments removed) near Castle Dale, Utah, to avoid a NHT (recommendation of the BLM Price FO).
- A segment was added west of Delta, Utah, to avoid cultural and other resources in the Sevier River area (recommendation from the BLM Fillmore FO).
- An alternative segment was added in Iron County, Utah, to avoid greater sage-grouse habitat in the Escalante Desert area (recommendation of the BLM Cedar City FO).
- Four alternative segments were added near Central, Utah, to avoid or decrease multiple resource impacts (recommendation of the USFS and public scoping comments).
- An alternative segment was added within an existing transmission line utility corridor and co-located with existing utilities across the Moapa Indian Reservation to avoid the proliferation of utility corridors (recommendation from the BLM Southern Nevada District, and public scoping comments from the Logandale area).

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Corridors - Scoping vs. DEIS

- Scoping Corridor - Carried Forward to DEIS
- Corridor Not in Scoping - Added to DEIS
- Corridor - Not Carried Forward in DEIS
- Potential Ground Electrode Siting Area
- Potential Ground Electrode Site
- Potential Ground Electrode Overhead Electrical Line

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 2-8
Corridors Carried Forward to the DEIS

0 20 40 80 Miles
0 20 40 80 km
1:5,000,000

N

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2.4 Elements Common to All Action Alternatives

Regardless of the transmission route or design option selected, there are specific Project requirements, constraints, and elements that apply to all action alternatives. These elements include federal environmental protection requirements and plan amendments, applicant design features and committed measures, and facilities associated with the Northern and Southern terminals.

2.4.1 Federal Requirements

In accordance with laws governing the management and use of federal lands and interstate commerce, federal agencies are empowered to grant long-term utility uses on federal lands subject to compensation, environmental stipulations, and renewal at the end of the term specified. To reach decisions to grant utility uses, involved agencies evaluate Project conformance with agency plans and policies to ensure proponent commitments and agency BMPs are sufficient to adequately protect the natural and human environment. After consideration of any residual environmental impacts, these factors help the agencies determine if the Project is in the public interest. A plan conformance review for all alternatives, the need for plan amendments, and a list of conceptual plan amendments are contained in Chapter 4.0 of this EIS.

The performance standards contained in the WWEC programmatic EIS provide a framework for the environmental protection measures that would be implemented by the lead and cooperating agencies on federal lands under their jurisdiction. Implementation of these standards was a required step in evaluating effects on resources in the impact analysis. In addition to these broad-based practices, additional local plan decisions and guidelines are included to supplement the WWEC measures. A summary of the WWEC measures and other relevant agency BMPs are included in **Appendix C**.

2.4.2 Applicant Project Description and Design Features

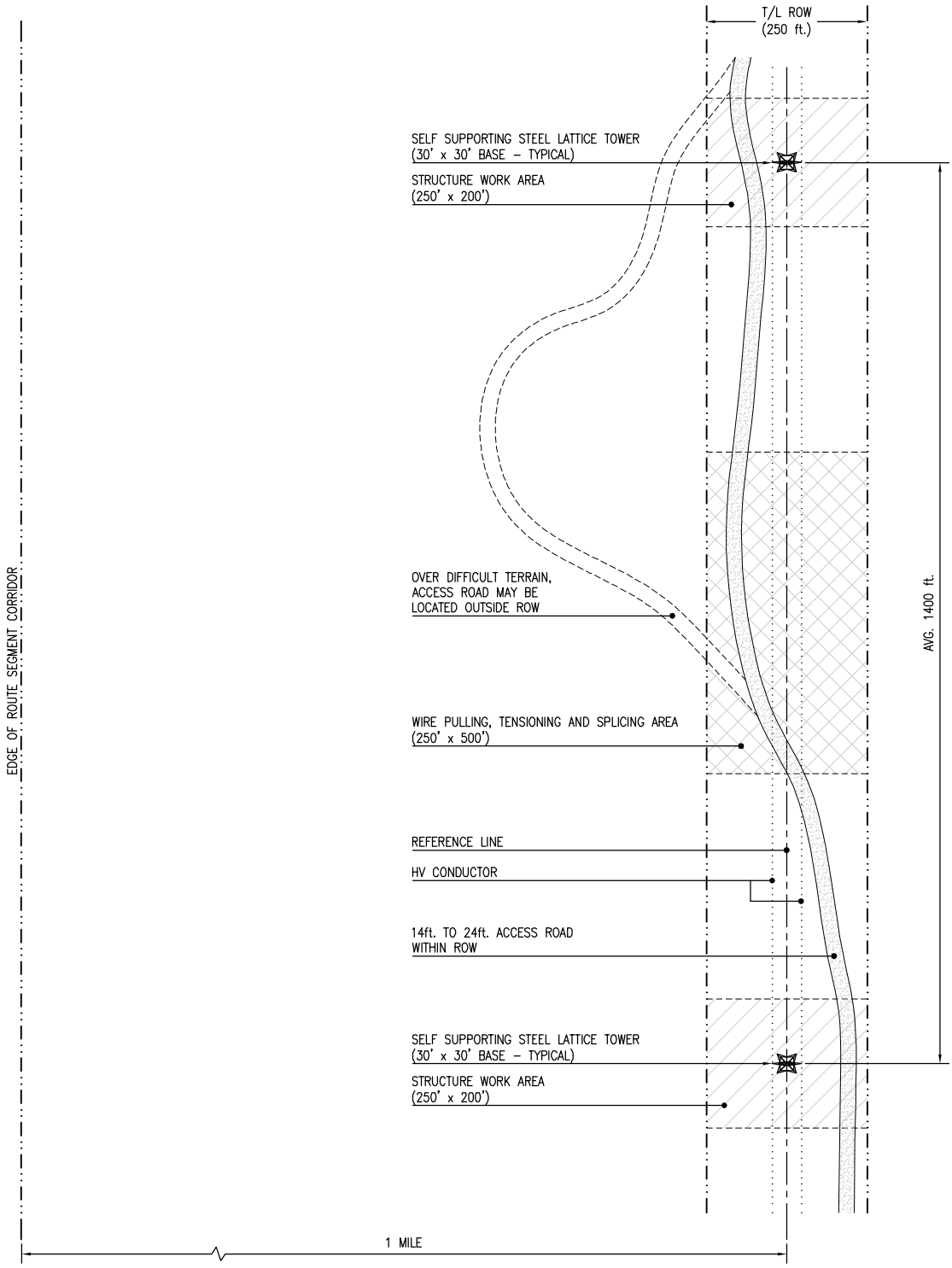
2.4.2.1 Project Description

The EIS description of alternatives and ancillary facilities was developed from the Project Preliminary POD (TWE 2010) and from the PDTR (**Appendix D**). **Figure 2-9** depicts a typical transmission line construction ROW and temporary work areas; **Figure 2-10** depicts the three types of transmission line structures under consideration. Typical tower erection and conductor stringing construction is depicted in **Figure 2-11**. All of the details on proposed Project facilities, construction methods, Project operation, and maintenance practices, including vegetation management, are provided in **Appendix D**. **Table C-3** (**Appendix C**) provides the TransWest committed environmental protection measures (i.e., design features), which are part of the proposed Project.

During the construction of the transmission line, areas for access roads, tower construction sites, communication sites, line stringing and tensioning sites, and other temporary work areas (e.g., staging areas, concrete batch plants, storage yards, helicopter fly yards) would be disturbed. The majority of the disturbance areas would be within the 250-foot-wide transmission line ROW; all disturbance areas would be located within the 2-mile transmission line corridor.

During the operation and maintenance of the transmission line, tower location sites and communication sites would remain disturbed in place and all would be located within the 2-mile transmission line corridor. Access roads also would be located within the 2-mile transmission line corridor, to the extent practicable.

The Project terminals and ground electrode system sites are detailed in Section 2.4.3, Facilities Common to All Action Alternatives, and the alternative routes of the transmission line are detailed in Section 2.5, Alternative Transmission Line Routes and Ancillary Facilities.

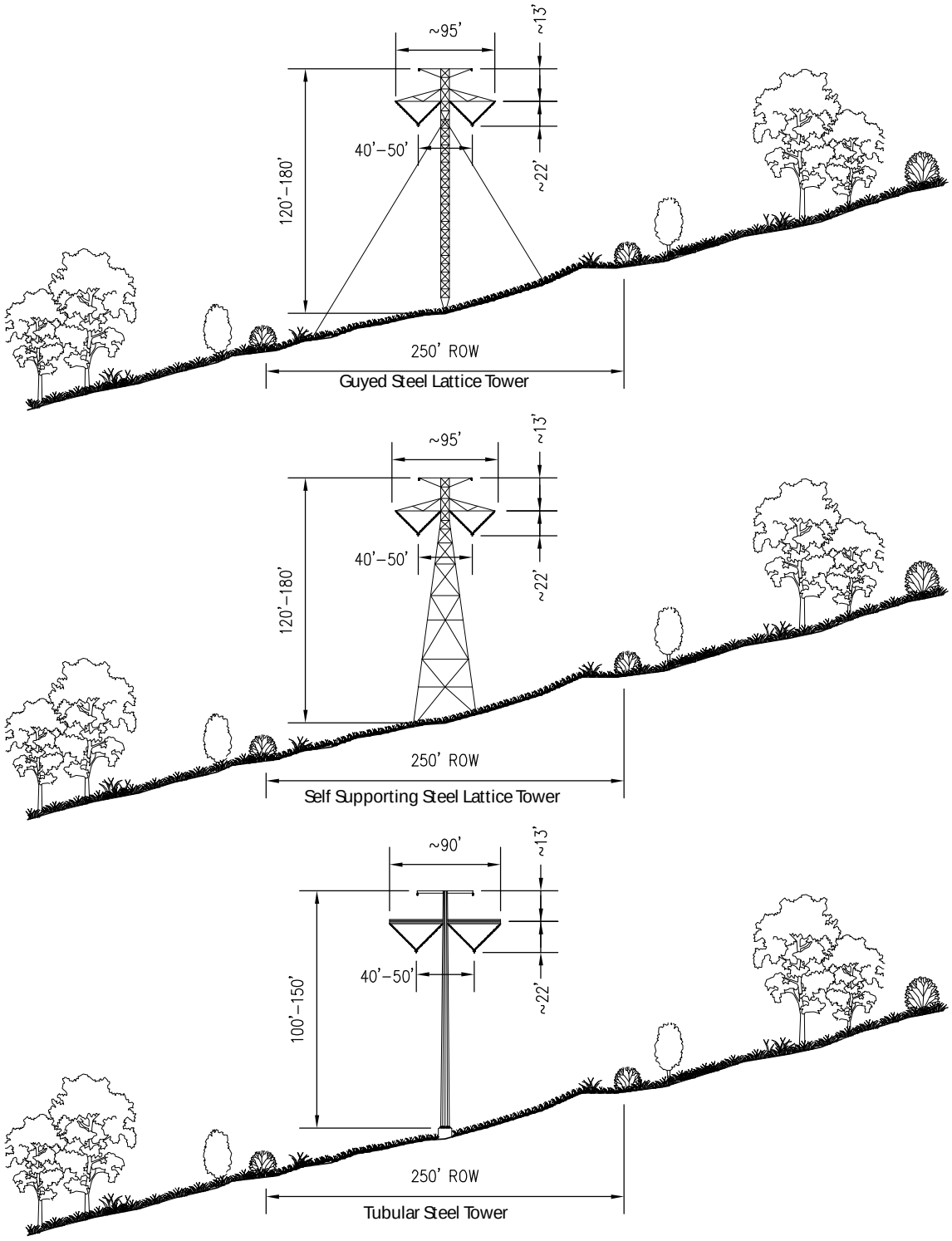


TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 2-9

Typical Transmission ROW
and
Temporary Work Areas

Source: TWE 2011

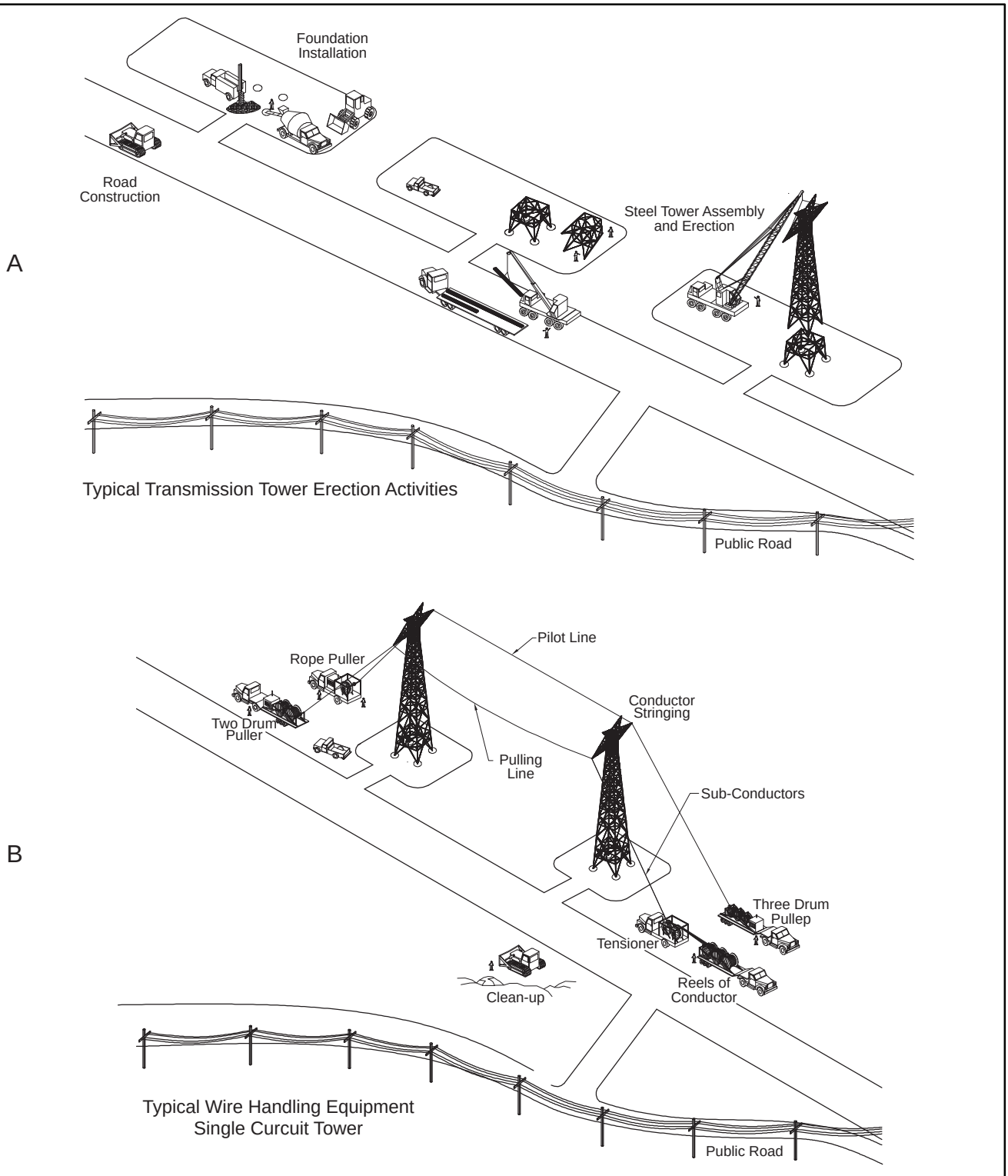


Transwest Express Transmission Project

Figure 2-10

Potential Transmission Line Structure Types

Source: TWE 2011



Transwest Express Transmission Project

Figure 2-11

Typical Tower Erection and Conductor Stringing Construction

Source: TWE 2011

2.4.2.2 Project Design Features, Best Management Practices, and Required Stipulations

Project design features, BMPs, and required stipulations are requirements for the construction, operation, maintenance, and decommissioning of the transmission line, regardless of which alternative is chosen in the ROD. These actions were all developed or mandated to avoid, minimize, or reduce impacts to resources, and they are required for implementation of the Project on BLM and USFS lands.

Design features are environmental protection measures that TransWest voluntarily has proposed to minimize and/or avoid resource impacts regardless of land jurisdiction. TransWest has committed to review and augment the list of applicant-committed design features as needed to minimize impacts to the extent possible, as well as to ensure conformance with all pertinent RMPs and LRMPs. A description of the current applicant-committed design features organized by major resource topics and project phase is found in **Appendix C**.

BMPs from the BLM FO RMPs and standards and guidelines from the USFS LRMPs are general requirements that minimize environmental impacts by ensuring compliance with laws, agency policies, and regulatory requirements. BMPs required by land use plans are not included in **Appendix C** as the list is extensive and many of those requirements are addressed by the applicant-committed design features presented in **Appendix C**. Further information regarding these BMPs can be found in the respective RMPs and LRMPs listed in **Tables 1-3** and **1-4**.

Required stipulations are resource- or area-specific conditions related to surface disturbing activities required for any permitted project on BLM or USFS lands. BLM and USFS stipulations are specific to each forest and BLM FO. Stipulations are described in **Appendix C**, and locations along the Project alternatives identified as no surface use areas are depicted in **Figures 2-12** through **2-15**. Details regarding the effectiveness of these stipulations in addressing resource impacts can be found in the respective Final EIS analyses for the RMPs and the LRMPs listed in **Tables 1-3** and **1-4**. Specific disclosure of the effects of these stipulations on impacts of this Project is provided by resource area in Chapter 3.0 of this EIS.

2.4.3 Facilities Common to All Action Alternatives

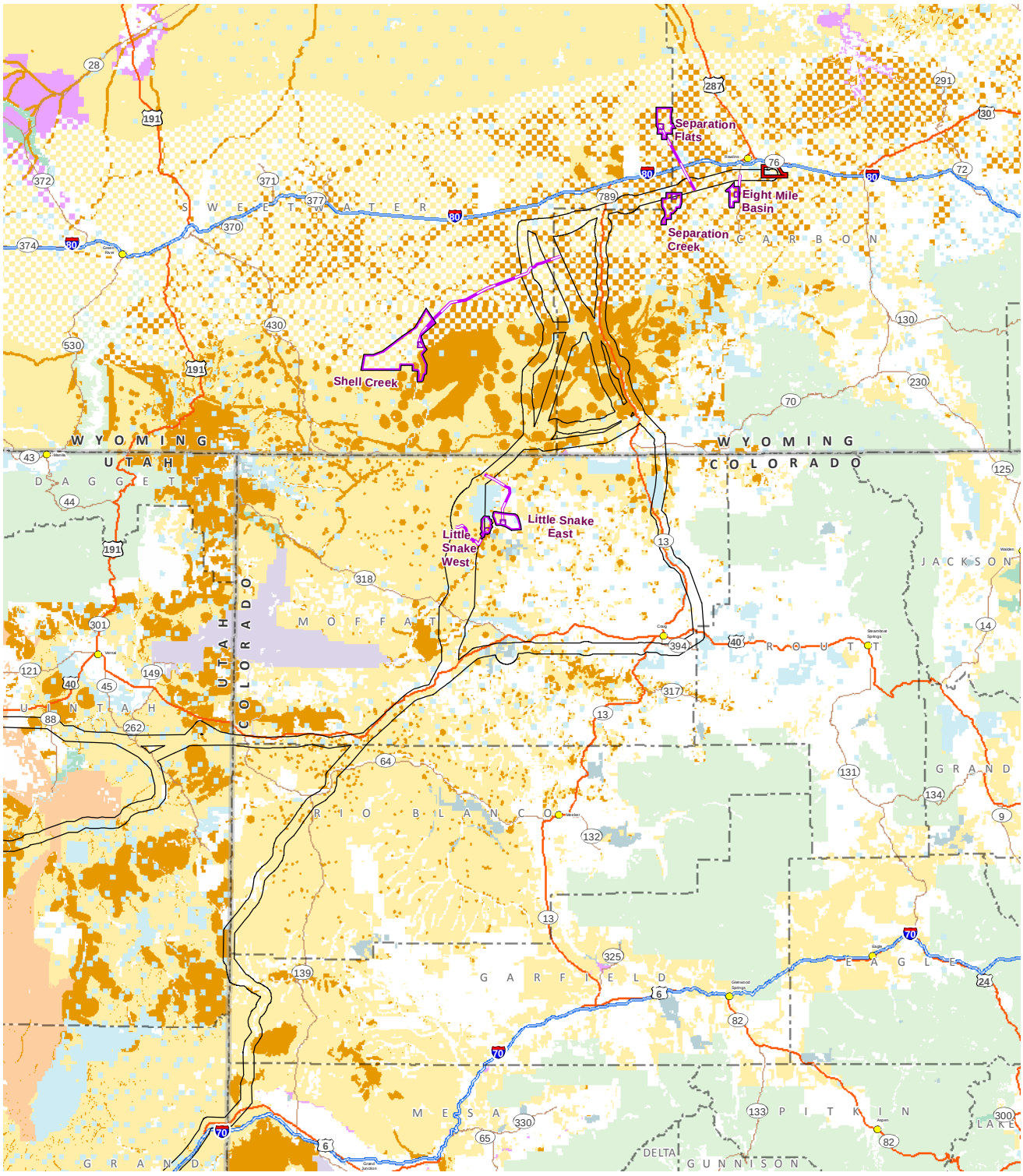
Several facilities would be required regardless of the action alternative selected. Terminals and ground electrode sites would be located at both the northern and southern ends of the Project. The following sections provide a summary of these facilities. A detailed description of these facilities is provided in the PDTR (**Appendix D**).

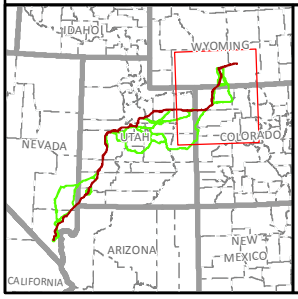
2.4.3.1 Northern and Southern Terminals

Northern and Southern terminals would be required for all transmission line action alternatives. The Northern Terminal would be located approximately 3 miles southwest of Sinclair, Wyoming; the Southern Terminal would be located at the Marketplace Hub in the Eldorado Valley, approximately 15 miles southwest of the metropolitan area of Boulder City, Nevada. Design Option 2 would require that the Southern Terminal be relocated to the IPP in Millard County near Delta, Utah. Design Option 3 would require an AC substation be constructed at the IPP site.

The terminal stations would include an AC/DC converter station and adjacent AC substation. The AC/DC converter station would include a 600-kV DC switchyard; AC/DC conversion equipment; transformers; and multiple equipment, control, maintenance, and administrative buildings.

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Land Jurisdiction

- NSU Restriction
- Bureau of Land Management
- Bureau of Reclamation
- Tribal/BIA
- DOD/USACE
- Department of Energy
- US Fish & Wildlife
- US Forest Service
- National Park Service
- State Land
- Private

- Project Corridor
- Terminal Siting Area
- Potential Ground Electrode Siting Area
- Potential Ground Electrode Site
- Potential Ground Electrode Overhead Electrical Line

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 2-12
Wyoming and Colorado (Region I)
No Surface Use

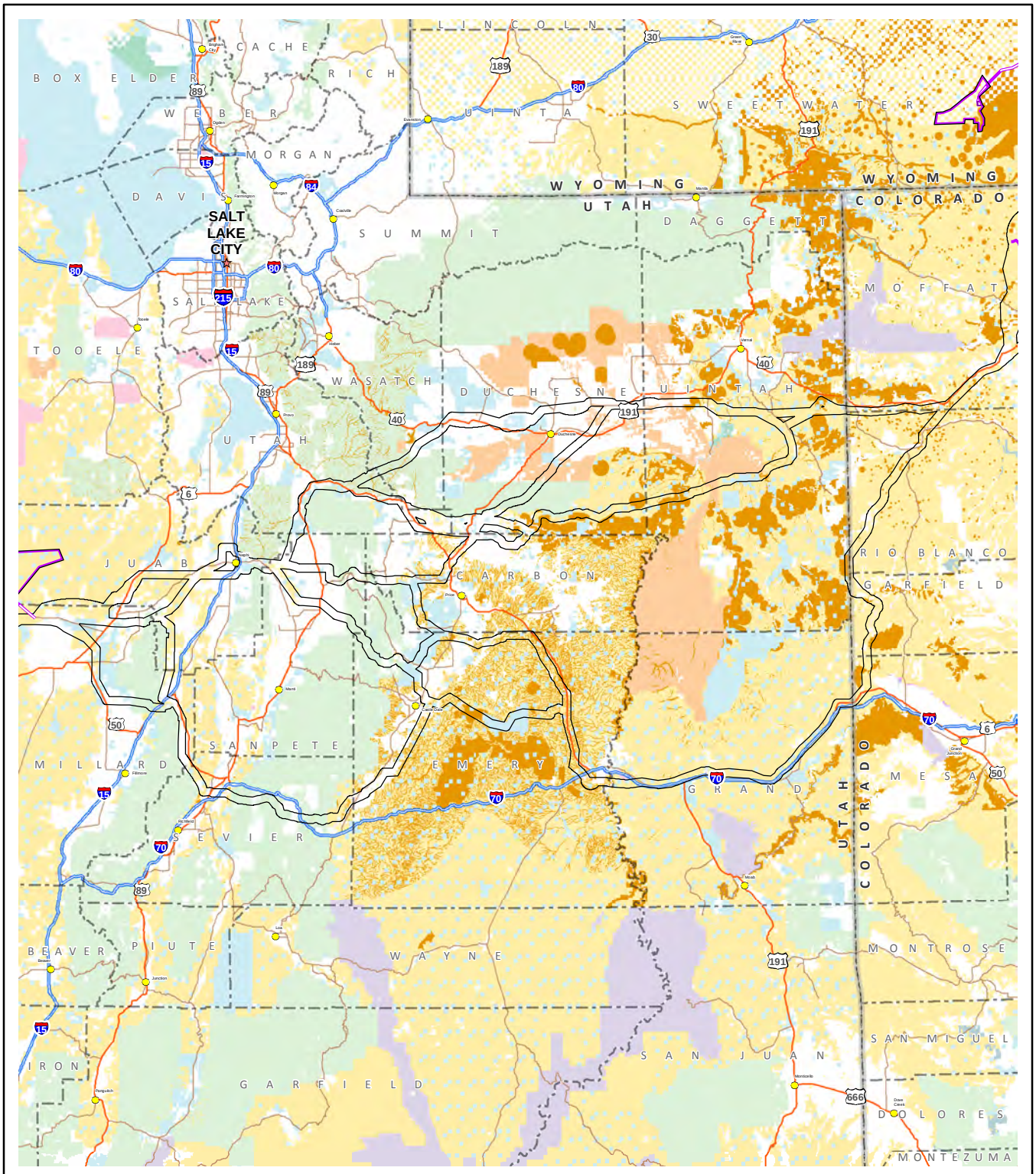
0 5 10 20 Miles
0 5 10 20 km
1:1,750,000

N

Western AREA POWER ADMINISTRATION

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NSU Restriction

Land Jurisdiction

- Bureau of Land Management
- Bureau of Reclamation
- Tribal/BIA
- DOD/USACE
- Department of Energy
- US Fish & Wildlife
- US Forest Service
- National Park Service
- State Land
- Private

- Project Corridor
- Potential Ground Electrode Siting Area
- Potential Ground Electrode Site
- Potential Ground Electrode Overhead Electrical Line

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 2-13
Eastern Utah (Region II)
No Surface Use

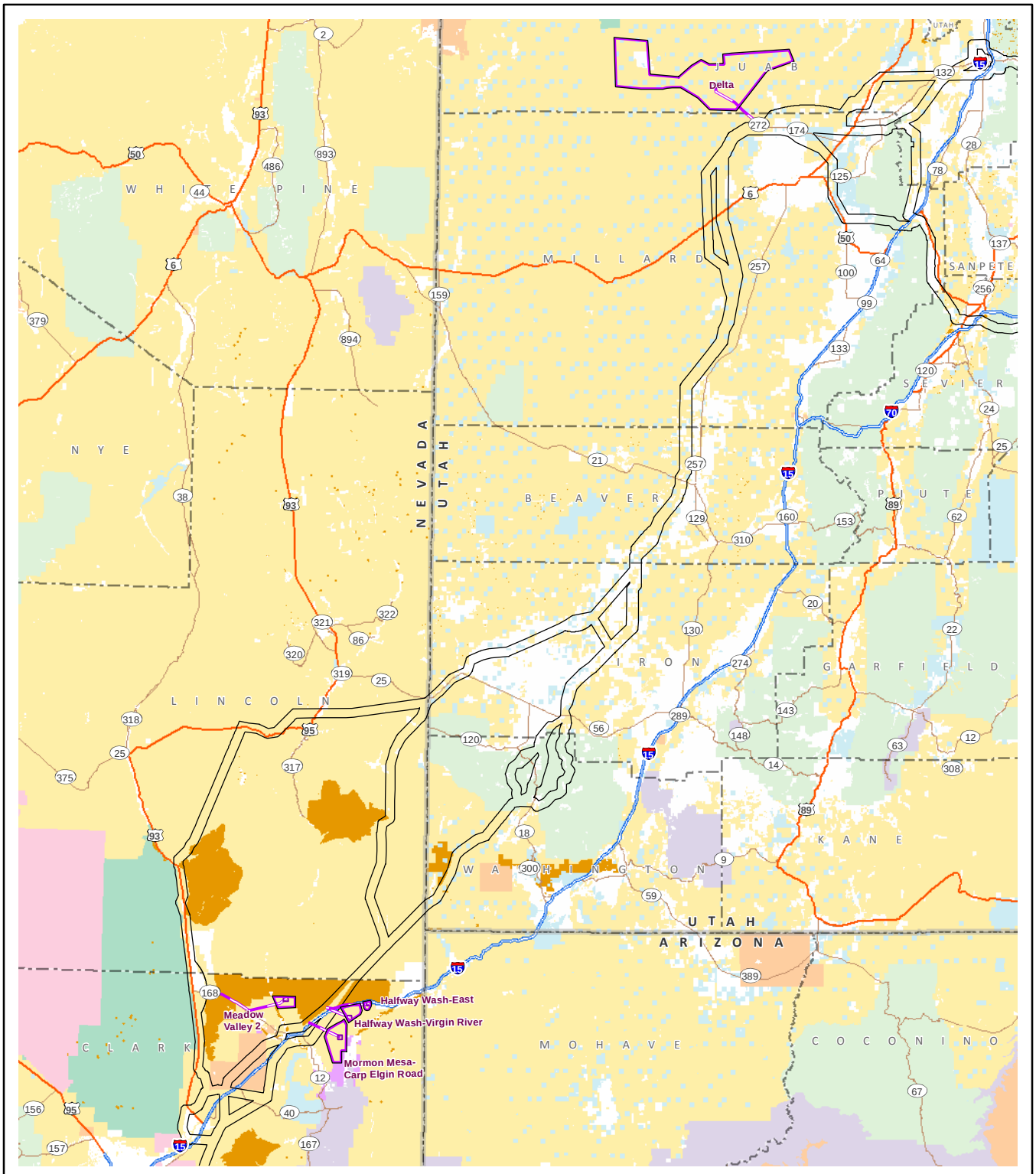
0 10 20 40 Miles
0 10 20 40 km
1:2,250,000

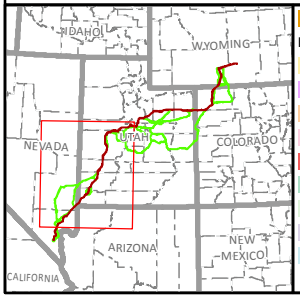
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Western AREA POWER ADMINISTRATION

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NSU Restriction

Land Jurisdiction

- Bureau of Land Management
- Bureau of Reclamation
- Tribal/BIA
- DOD/USACE
- Department of Energy
- US Fish & Wildlife
- US Forest Service
- National Park Service
- State Land
- Private

- Project Corridor
- Potential Ground Electrode Siting Area
- Potential Ground Electrode Site
- Potential Ground Electrode Overhead Electrical Line

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 2-14
Western Utah and Nevada (Region III)
No Surface Use

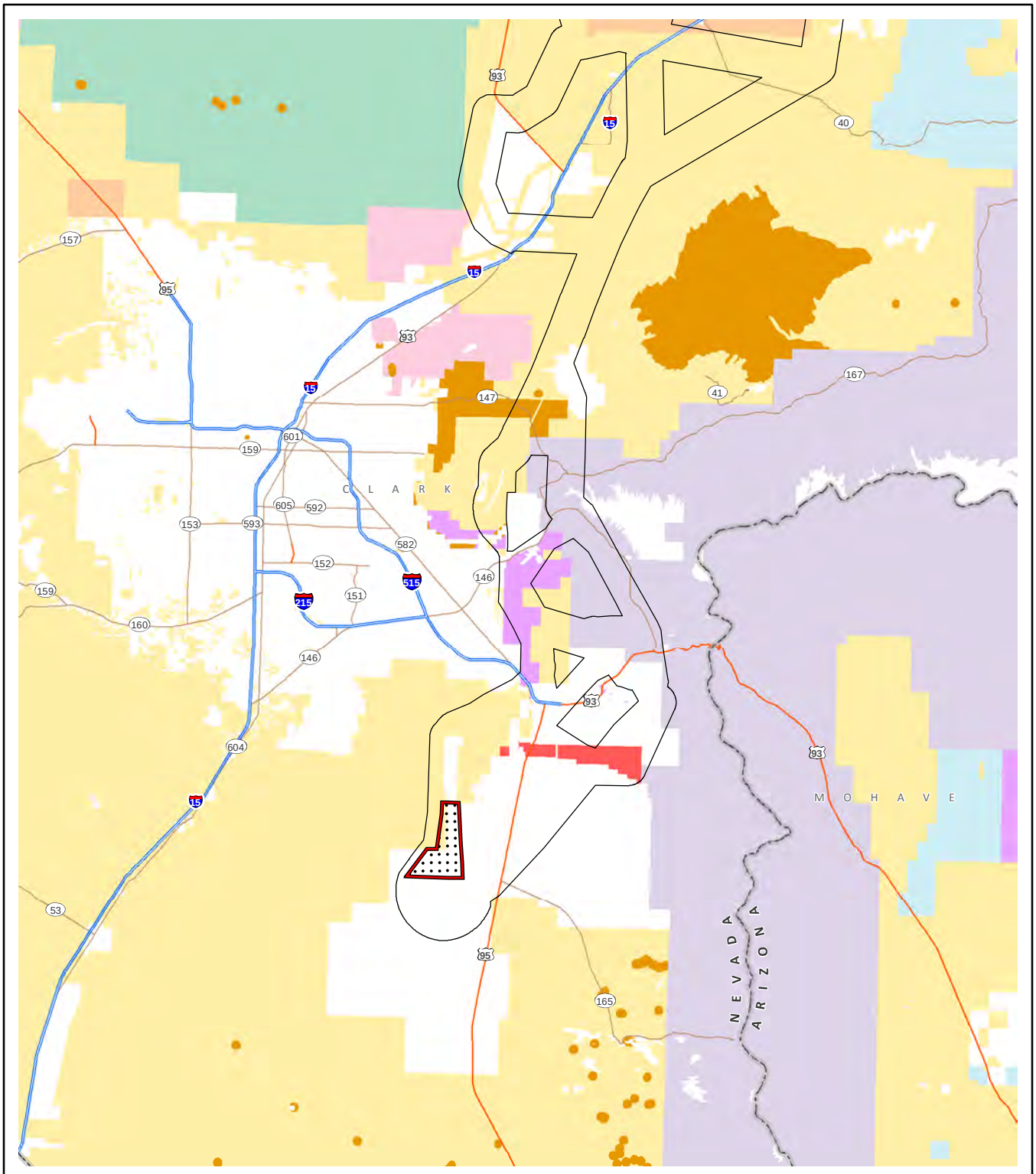
0 10 20 40 Miles
0 10 20 40 km
1:2,000,000

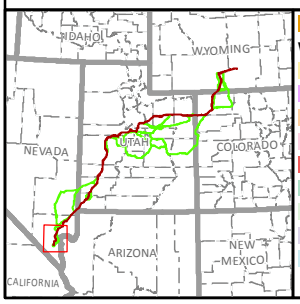
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Western AREA POWER ADMINISTRATION

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NSU Restriction
Project Corridor
WY Ownership
Terminal Siting Area
Bureau of Land Management
Bureau of Reclamation
Tribal/BIA
DOD/USACE
Department of Energy
US Fish & Wildlife
US Forest Service
National Park Service
State Land
Private

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 2-15
Las Vegas Area (Region IV)
No Surface Use

0 2.5 5 10 Miles
0 2.5 5 10 km
1:500,000

N

Western AREA POWER ADMINISTRATION

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Two buildings would house the AC/DC conversion equipment, each approximately 200 feet long by 80 feet wide and 60 to 80 feet high. Smaller buildings would house the control room, control and protection equipment, auxiliary equipment, and cooling equipment. The AC substation at the Northern Terminal would be a 500-/230-kV substation, and the AC substation at the Southern Terminal would be a 500-kV substation. The AC substations would include a switchyard, transformers, control equipment, and control buildings. Connections to the existing transmission infrastructure also would be constructed. **Table 2-1** summarizes the general terminal facility lengths and areas of disturbance.

Table 2-1 Terminal Facility Lengths and Areas of Disturbance

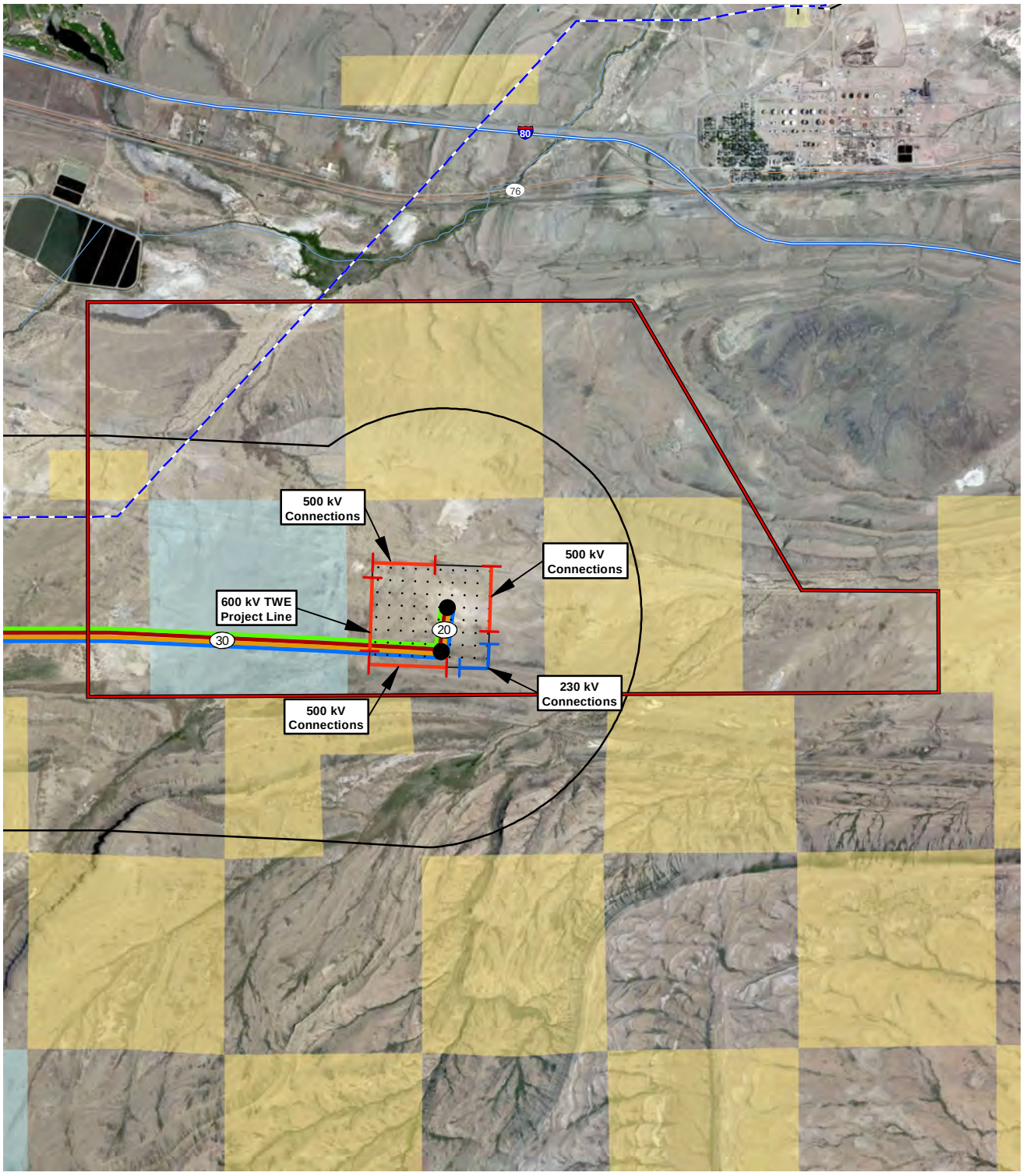
	Length (miles)		Construction Disturbance (acres)				Operation Disturbance (acres)			
Terminal	Inter-connection T-Lines	Access Roads	Converter, Substation, Switchyard	Inter-connection T-Lines	Access Roads	Total	Converter, Substation, Switchyard	Inter-connection T-Lines	Access Roads	Total
Northern	13	17	198	264	43	504	190	1	43	234
Southern and Southern Alternative	5	26	148	204	60	412	140	3	60	203
Southern near IPP (Design Option 2)	5	7	98	56	28	181	90	<1	28	118
Substation near IPP (Design Option 3)	5	7	83	56	23	161	75	<1	23	98
Series Compensation Station (Design Options)	N/A	N/A	18	N/A	5	23	10	N/A	5	15

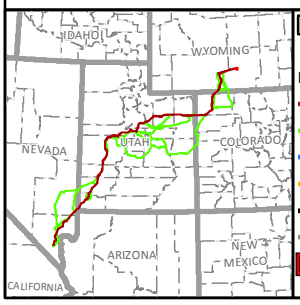
Northern Terminal

The Northern Terminal facilities would be located on private lands in Carbon County, Wyoming, approximately 3 miles southwest of the town of Sinclair, Wyoming (**Figure 2-16**). The Northern Terminal would connect to the existing Platte – Point of Rocks 230-kV line located within 1 mile of the terminal. If needed, the Northern Terminal also could connect to the Energy Gateway West and Energy Gateway South 500-kV transmission lines currently proposed by PacifiCorp. TransWest requested an interconnection with both projects from PacifiCorp in 2009. Based on the current alternative routes being analyzed in the respective NEPA processes for the Energy Gateway West and Energy Gateway South projects, it is reasonably foreseeable that the interconnections between these two projects and the proposed Project would be at the Northern Terminal. The Northern Terminal would require the following components:

- An AC/DC converter station (a 600-kV DC switchyard and a converter building containing electronics and control equipment) approximately 30 acres in size.
- A 500-/230-kV AC substation approximately 135 acres in size.
- A 230-kV AC substation approximately 25 acres in size.
- An electrical connection from the AC/DC converter station to the 600-kV DC transmission line connecting to the Southern Terminal. All facilities for this connection are incorporated into the 600-kV DC transmission line.
- Two electrical connections from each (four connections total) of the proposed single circuit Energy Gateway West and Energy Gateway South 500-kV transmission lines (if approved) to the 500-/230-kV substation. These connections would connect the Northern Terminal to both the Aeolus and Anticline substations via the Energy Gateway West and Energy Gateway South 500-kV transmission lines (if approved). These two connections may require 500-kV transmission facilities, approximately 4 miles total or less in length, to connect the 500-/230-kV substation to the route of the Energy Gateway South 500-kV transmission line (if approved).

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Project Corridor
Node
DEIS Alternative Routes
Applicant Proposed I-A
Alternative I-B
Alternative I-C
Agency Preferred I-D
Alternative Variation or Connector
Segment not in this Region
Terminal Siting Area

Proposed Terminal Site with Connection Types
Bureau of Land Management
State Land

Existing Transmission
345kV
500kV +/- DC
500kV
230 to 287kV
138 to 161kV
115kV
Below 100kV
Unknown Voltage

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 2-16
Northern Terminal Site

0 1,000 2,000 4,000 Feet
0 200 400 800 Meters
1:48,000

N

Western AREA POWER ADMINISTRATION

- Two electrical interconnections to the existing Platte – Point of Rocks 230-kV line, which would be rerouted into and out of the 230-kV substation. This 230-kV connection is assumed to require approximately 4 miles or less of double circuit 230-kV transmission line.
- Up to six electrical interconnections from proposed and planned generation facilities by 230-kV transmission lines.

The three major components of the Northern Terminal (AC/DC converter station, 500-/230-kV AC substation, and 230-kV AC substation) would be co-located and contiguous. Although these three components would be stand-alone facilities and could be located on separate parcels connected together by short transmission lines, it is common practice and preferable for the AC/DC converter station and 500-/230-kV AC substation(s) to be adjacent to each other. It also is preferable to locate the 230-kV AC substation next to the 500-kV AC substation. However, depending on the availability of space and other constraints in this area, these stand-alone facilities could be separated by a distance of up to 2 miles.

Southern Terminal

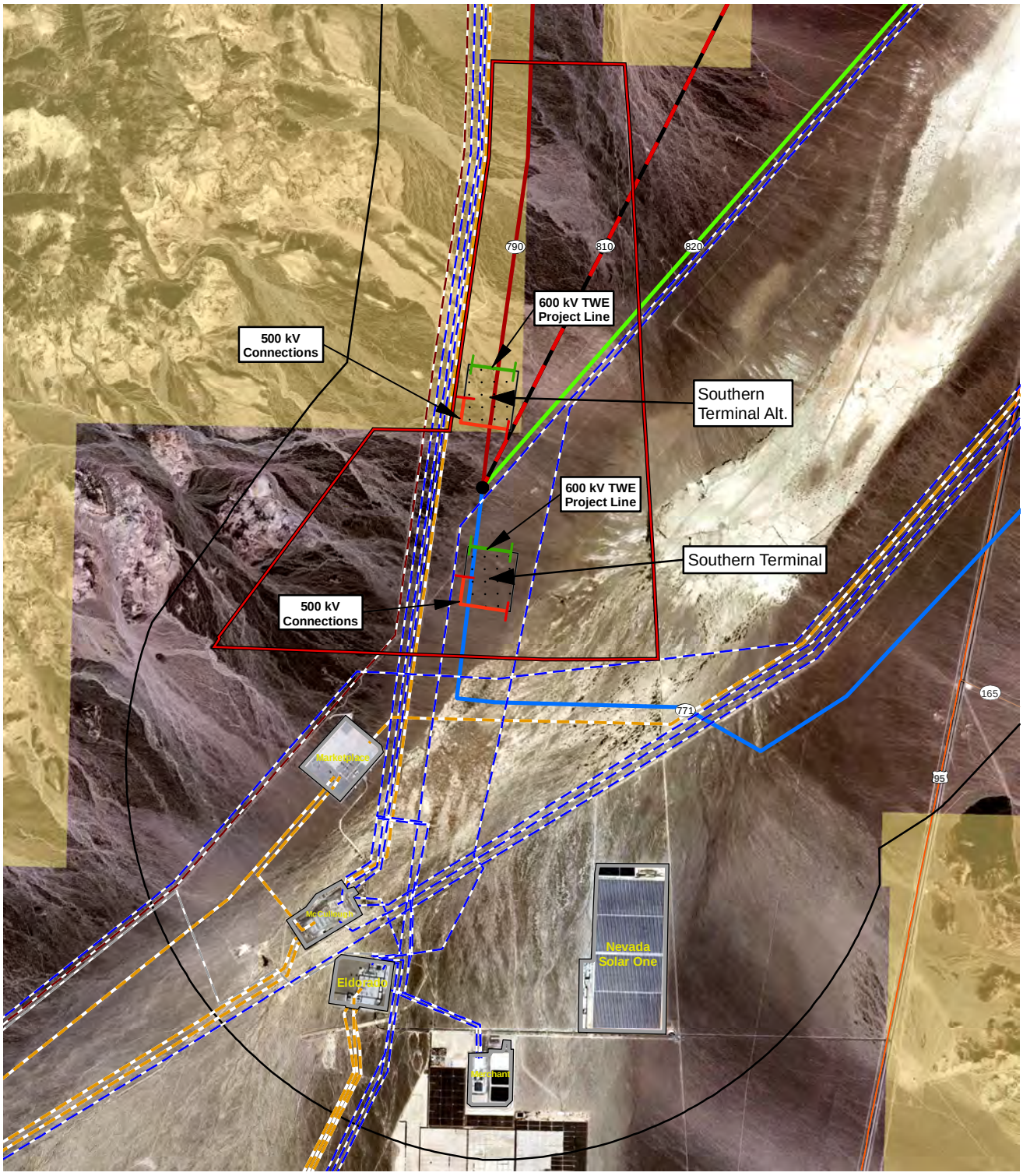
The Southern Terminal facilities would be located in the Eldorado Valley on private or public land, approximately 15 miles south of Boulder City, in Clark County, Nevada (**Figure 2-17**). Two alternative sites are being analyzed for the Southern Terminal in the Eldorado Valley; either would contain the same facilities. The Southern Terminal would connect to all four of the existing 500-kV substations (Eldorado, Marketplace, Mead, and McCullough) located at the Marketplace Hub.

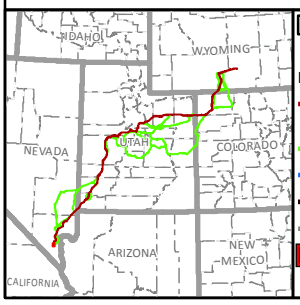
The Southern Terminal would require the following components:

- An AC/DC converter station (a 600-kV DC switchyard and a converter building containing power electronics and control equipment) approximately 30 acres in size.
- A 500-kV AC substation approximately 110 acres in size.
- An electrical connection from the AC/DC converter station to the 600-kV DC transmission line. All facilities for this connection would be incorporated into the 600-kV DC transmission line.
- Two electrical connections from the existing Mead – Marketplace 500-kV transmission line to the new 500-kV AC Substation. These connections would connect the Southern Terminal to both the Mead and Marketplace substations via the existing Mead – Marketplace 500-kV transmission line. These two connections may require 500-kV transmission facilities, assumed to total 4 miles or less in length, to connect the new 500-kV AC substation to the existing Mead – Marketplace 500-kV transmission line.
- Construction of 500-kV transmission line from the new 500-kV AC substation to each of the Eldorado and McCullough substations. These single circuit 500-kV transmission lines are each estimated to be 5 miles or less in length.
- Although not anticipated at this time, one or more of the existing 138-/230-kV lines within the Proposed Terminal Siting Area may need to be re-routed/re-configured to accommodate the Southern Terminal due to congestion within the area. If necessary, this reroute or reconfiguration of 138-/230-kV transmission line facilities is not anticipated to impact more than a total of 3 miles of existing lines.

The two major components of the Southern Terminal (AC/DC converter station and the 500-kV AC substation) would be co-located and contiguous. Although these two components would be stand-alone facilities and could be located on separate parcels connected together by short transmission lines, it is common practice and preferable for the AC/DC converter station and 500-kV AC substation to be adjacent to each other.

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Project Corridor
Node

DEIS Alternative Routes
- Applicant Proposed/ Agency Preferred IV-A
- Alternative IV-B
- Alternative IV-C
- Alternative Variation or Connector
- Segment not in this Region
- Terminal Siting Area

Proposed Terminal Site with Connection Types
Other Facilities
Bureau of Land Management

Existing Transmission
- 345kV
- 500kV +/- DC
- 500kV
- 230 to 287kV
- 138 to 161kV
- 115kV
- Below 100kV
- Unknown Voltage

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 2-17
Southern Terminal Site

0 1,000 2,000 4,000 Feet
0 200 400 800 Meters
1:64,000

N

Western AREA POWER ADMINISTRATION

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If Design Option 2 were implemented, the Northern Terminal would be constructed as in the proposed action. The Southern Terminal would be constructed near IPP instead of in Nevada (**Figure 2-2** and **Figure 2-18**). Facilities would be similar to those described above, and are as follows;

- An AC/DC converter station and an adjacent 500-/345-kV AC substation near the IPP in Millard County, Utah; and
- A double circuit 345-kV AC line (approximately 5 miles) between the new 500-/345-kV AC substation near IPP to the existing IPP 345-kV AC substation adjacent to the existing IPP AC/DC converter station.

If Design Option 3 were implemented, a substation would be constructed near IPP under phase one, and the Southern Terminal would be constructed in Nevada under phase two (**Figure 2-3** and **Figure 2-19**). The Northern Terminal would be constructed under phase two and configured as in the proposed action. Facilities would be similar to those described above, and are as follows;

- A 500-/345-kV AC substation near the IPP in Millard County, Utah; and
- A double circuit 345-kV AC line (approximately 5 miles) between the new 500-/345-kV AC substation near IPP to the existing IPP 345-kV AC substation adjacent to the existing IPP AC/DC converter station.

2.4.3.2 Ground Electrode Systems

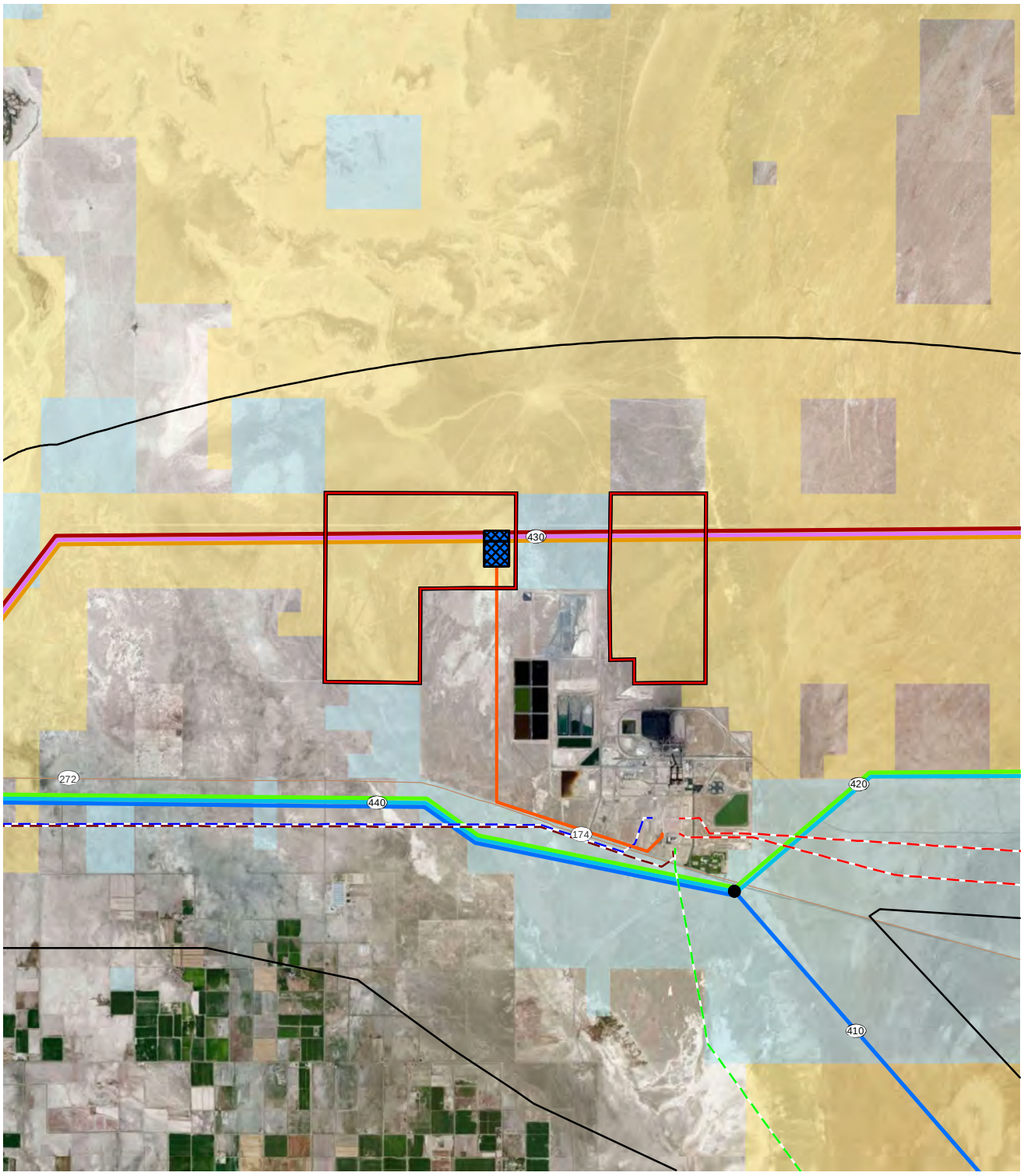
One ground electrode facility consisting of a small above-ground building and surrounding underground electrode bed wells (see **Figure 2-20** and additional description in **Appendix D**) would be required within approximately 100 miles of each of the Northern and Southern terminals. This would establish and maintain electrical current continuity during normal operations and during any unexpected outage of one of the two poles (or circuits) of the 600-kV DC terminal or converter station equipment. The specific location of the ground electrode systems would be identified during final engineering and design; however, general siting areas and conceptual alternative site locations have been identified in Regions I and III and have been analyzed in this EIS. Additionally, the lower voltage connector lines from the 600-kV DC transmission line to each of the conceptual ground electrode sites have been analyzed. The alternative route selected would influence which set of ground electrode location alternatives could be considered for use; therefore, the alternative ground electrode facilities are discussed in the following regional descriptions and depicted in the regional alternative figures.

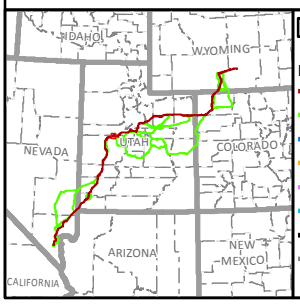
2.5 Alternative Transmission Line Routes and Ancillary Facilities

The Project has been split into four distinct regions, each of which would require independent alternatives decisions regarding transmission line routing based on region-specific topographical or resource constraints. The alternative transmission line routes are depicted by region in **Figure 2-21** through **Figure 2-24**. The alternatives within each of these regions can be combined to define a distinct end-to-end route from Wyoming to Nevada.

Each alternative route is further defined by a reference line. Transmission reference lines for each route have been considered as buildable locations within each corridor and represent the location of the transmission line centered within a nominal 250-foot-wide transmission line ROW. As representations of the likely location of the transmission line, reference lines provide a basis for quantifying and comparing the range and degree of impacts associated with the various alternatives. The impacts consider topographical constraints, existing transmission lines, and resource constraints within the 2-mile transmission line corridor. Ongoing refinements are being considered during the NEPA process, and are referred to as micro-siting options to the reference line. These micro-siting options represent adjustments that remain within the Project 2-mile transmission line corridor in areas requested by the agencies to minimize resource or siting constraints. Final transmission line

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Project Corridor
Node

DEIS Alternative Routes
- Applicant Proposed II-A
- Alternative II-B
- Alternative II-C
- Alternative II-D
- Alternative II-E
- Agency Preferred II-F
- Alternative Variation or Connector
- Segment not in this Region

- Terminal Siting Area
- Proposed Terminal Site
- 345kV Connection
- State Land
- Bureau of Land Management

Existing Transmission
- 345kV
- 500kV +/- DC
- 500kV
- 230 to 287kV
- 138 to 161kV
- 115kV
- Below 100kV
- Unknown Voltage

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 2-18
Design Option 2
Southern Terminal Area

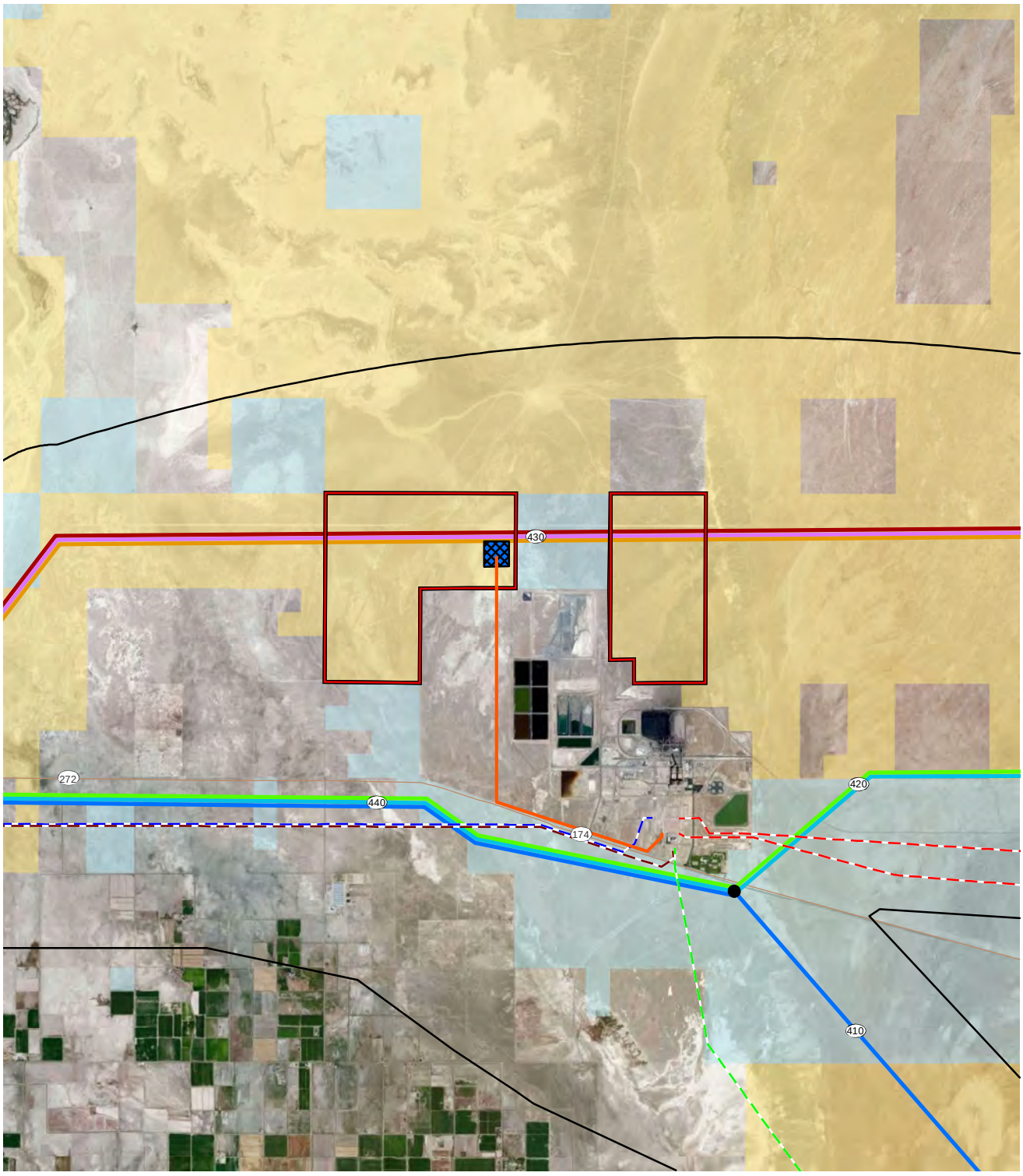
0 0.5 1 2 Miles
0 0.5 1 2 km
1:100,000

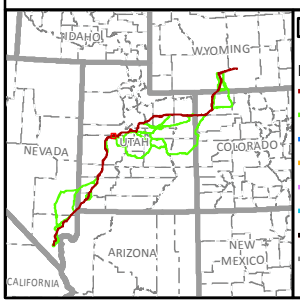
N

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Project Corridor
Node

DEIS Alternative Routes
- Applicant Proposed II-A
- Alternative II-B
- Alternative II-C
- Alternative II-D
- Alternative II-E
- Agency Preferred II-F
- Alternative Variation or Connector
- Segment not in this Region

- Substation Siting Area
- Proposed Substation Site
- 345kV Connection
- State Land
- Bureau of Land Management

Existing Transmission
- 345kV
- 500kV +/- DC
- 500kV
- 230 to 287kV
- 138 to 161kV
- 115kV
- Below 100kV
- Unknown Voltage

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 2-19
Design Option 3
Phase 1 Substation Area

0 0.5 1 2 Miles
0 0.5 1 2 km
1:100,000

N

Western AREA POWER ADMINISTRATION

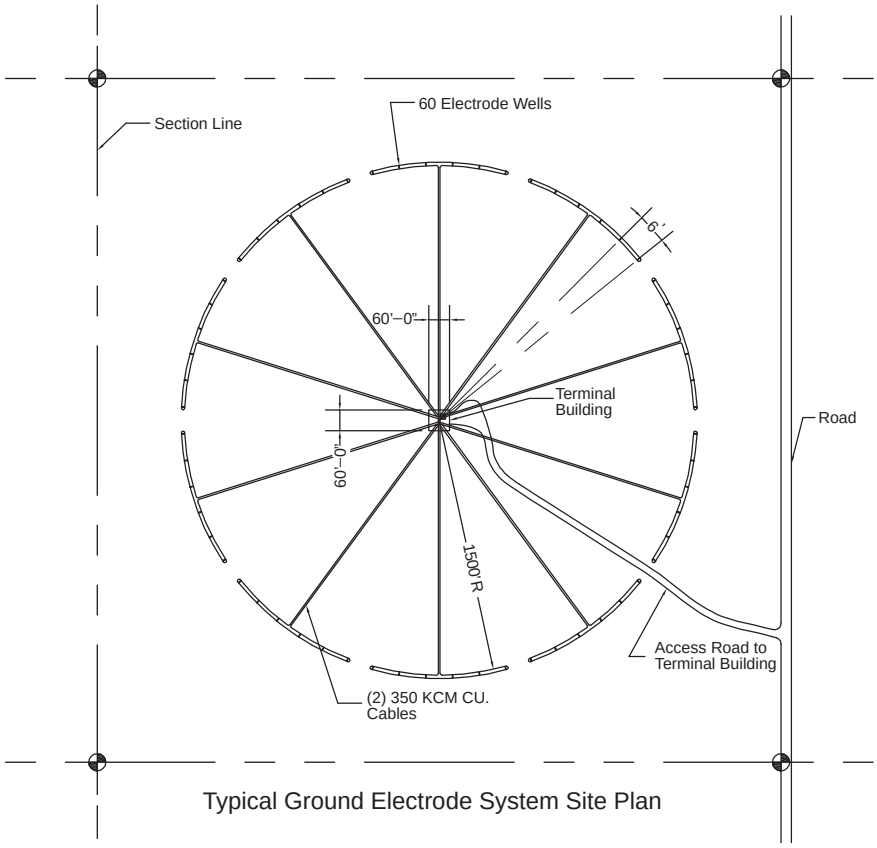
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A



Typical Above Ground Installation at the Ground Electrode Facility

B



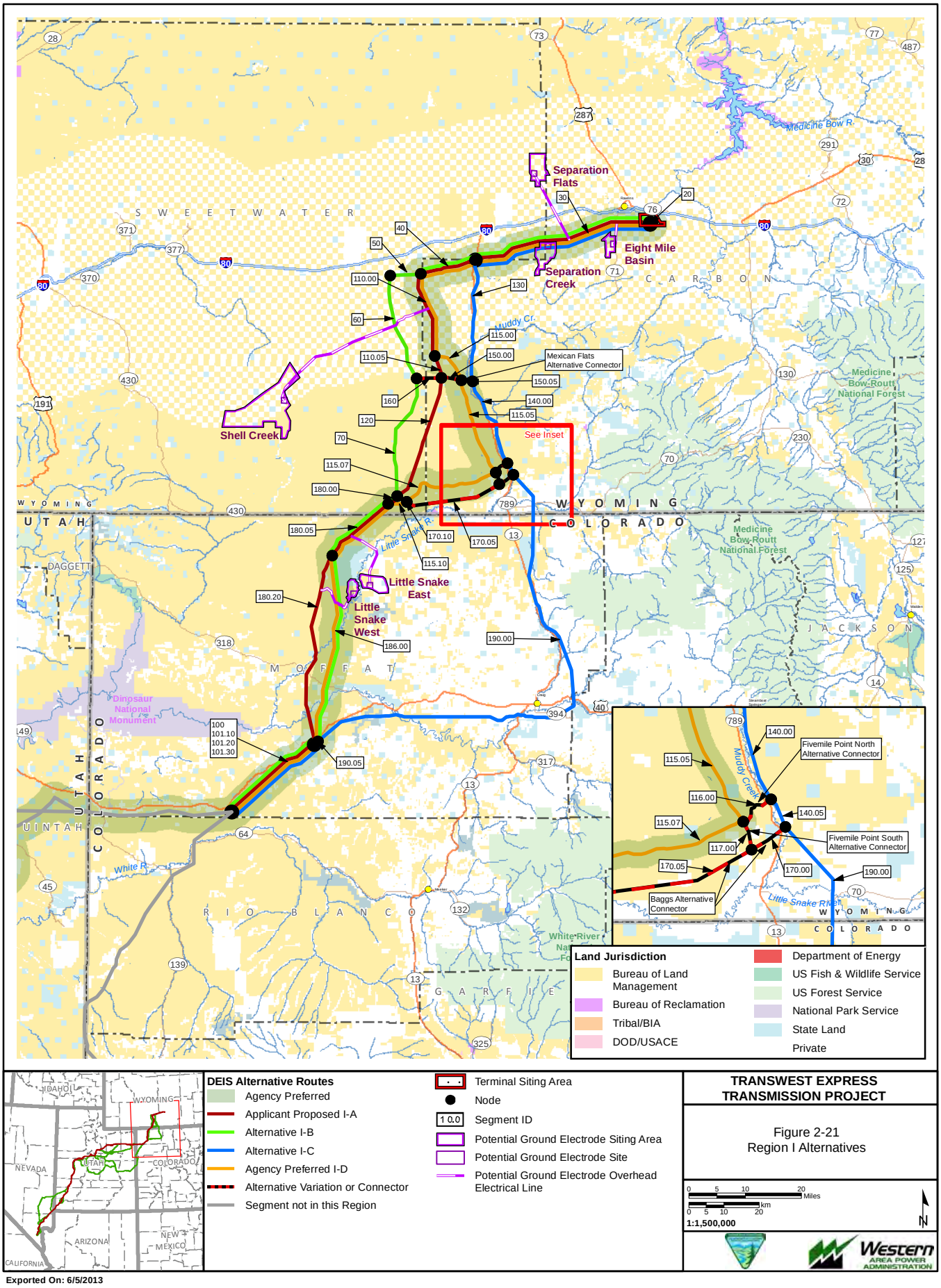
Typical Ground Electrode System Site Plan

Transwest Express Transmission Project

Figure 2-20
Typical Ground Electrode System Above Ground Installation and Site Plan

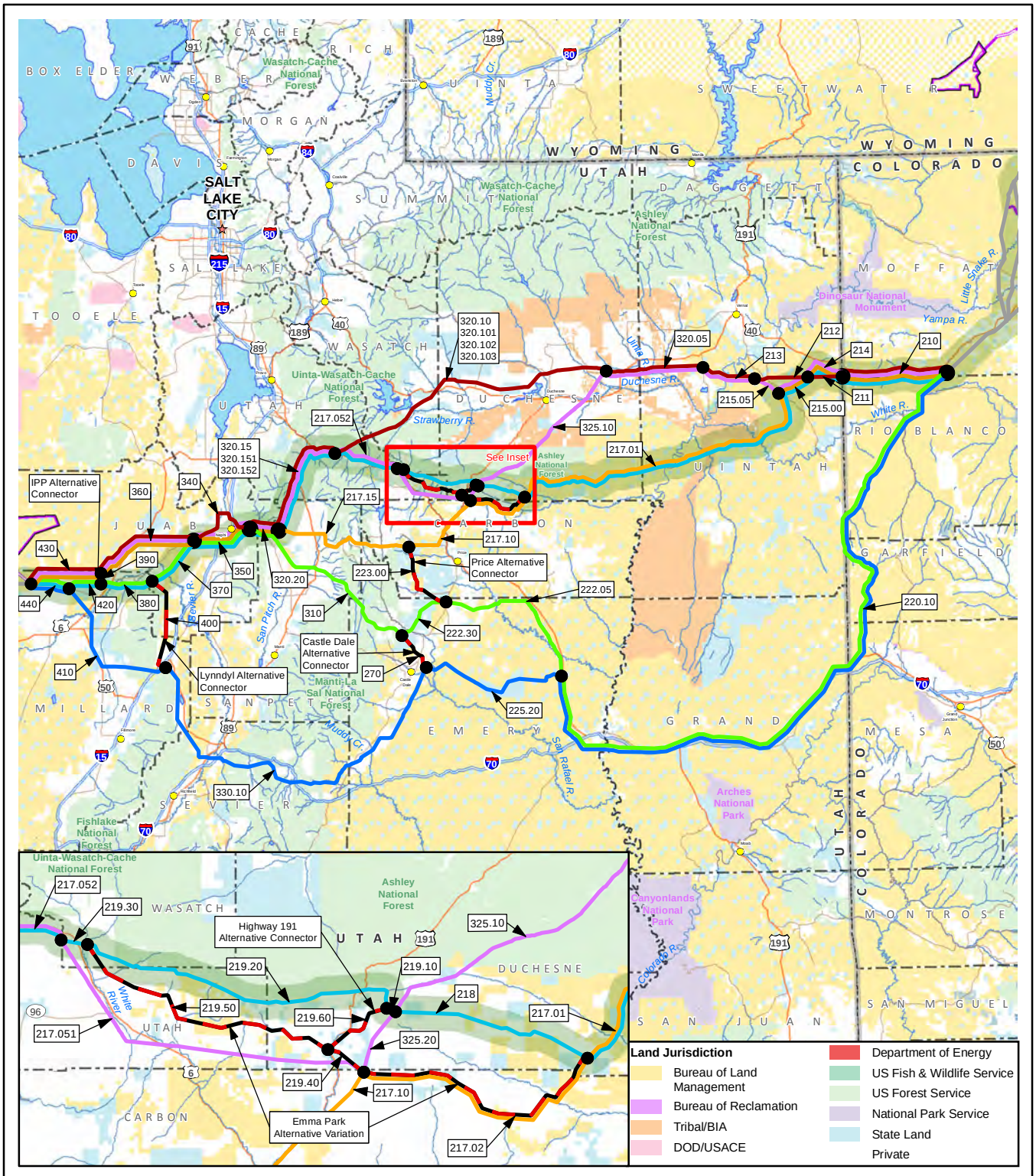
Source: TWE 2011

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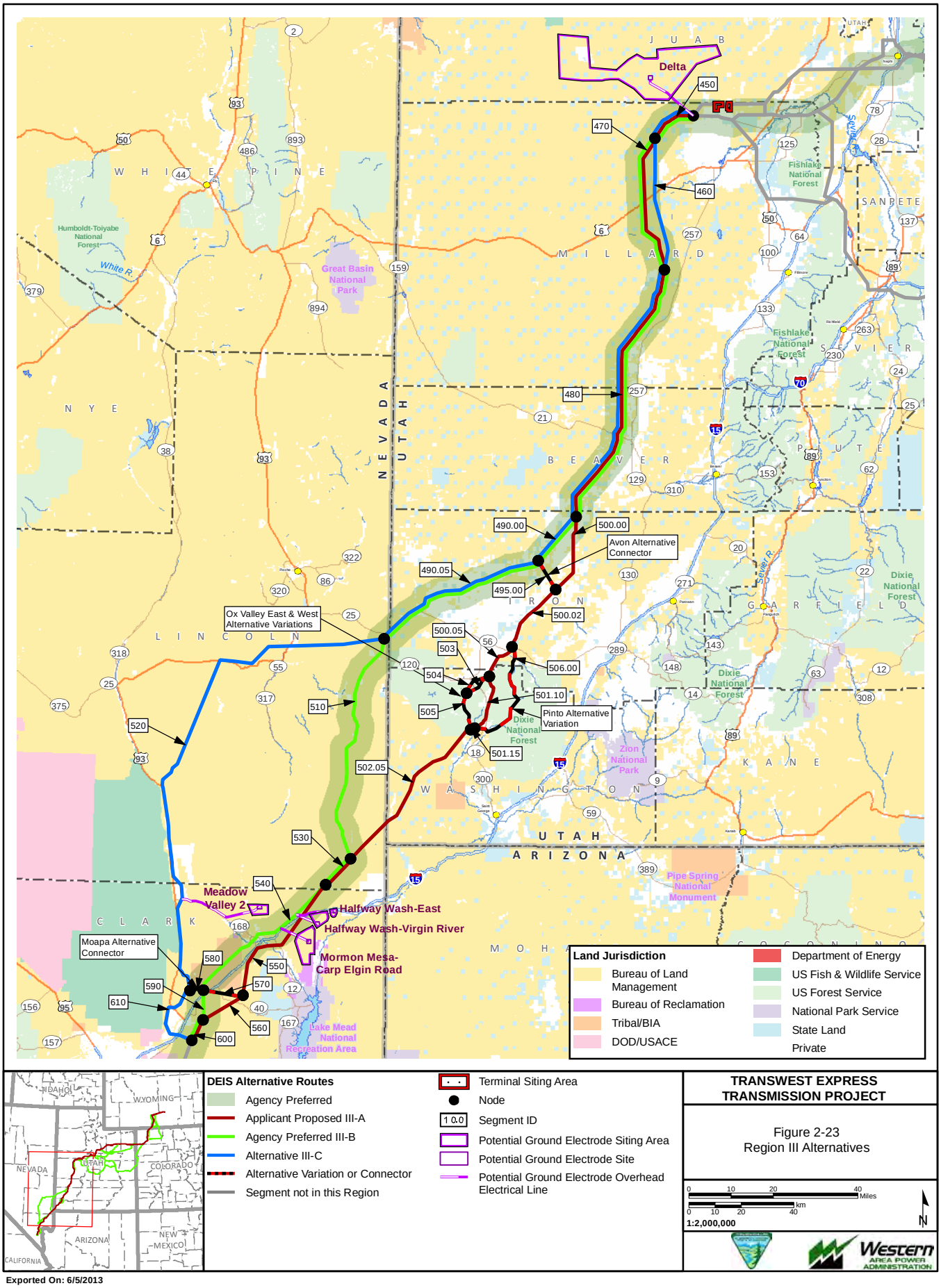


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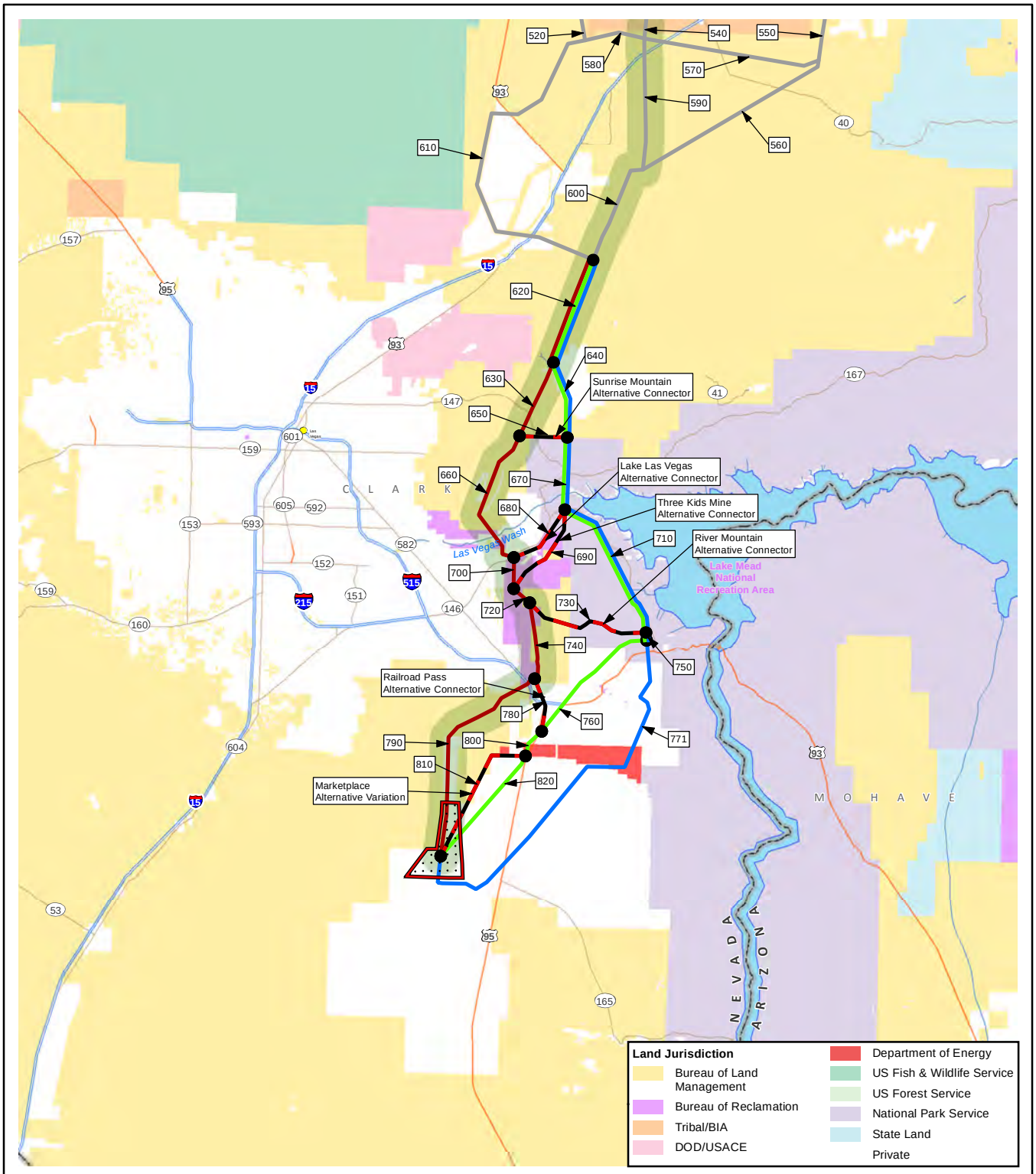
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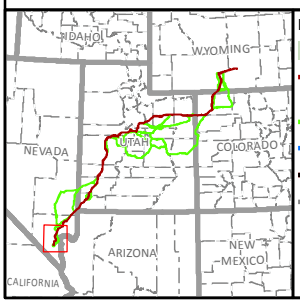


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Delta
Meadow Valley 2
Halfway Wash-East
Halfway Wash-Virgin River
Mormon Mesa-Carp Elgin Road
Moapa Alternative Connector
Ox Valley East & West Alternative Variations
Avon Alternative Connector
Pinto Alternative Variation
Fishlake National Forest
Dixie National Forest
Great Basin National Park
Zion National Park
Pipe Spring National Monument
Lake Mead National Recreation Area
Humboldt-Toiyabe National Forest
Land Jurisdiction
Bureau of Land Management
Bureau of Reclamation
Tribal/BIA
DOD/USACE
Department of Energy
US Fish & Wildlife Service
US Forest Service
National Park Service
State Land
Private
DEIS Alternative Routes
Agency Preferred
Applicant Proposed III-A
Agency Preferred III-B
Alternative III-C
Alternative Variation or Connector
Segment not in this Region
Terminal Siting Area
Node
Segment ID
Potential Ground Electrode Siting Area
Potential Ground Electrode Site
Potential Ground Electrode Overhead Electrical Line
TRANSWEST EXPRESS TRANSMISSION PROJECT
Figure 2-23
Region III Alternatives
1:2,000,000
Western AREA POWER ADMINISTRATION
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DEIS Alternative Routes

- Agency Preferred
- Applicant Proposed/ Agency Preferred IV-A
- Alternative IV-B
- Alternative IV-C
- Alternative Variation or Connector
- Segment not in this Region

- Terminal Siting Area
- Node
- 100 Segment ID

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 2-24
Region IV Alternatives

0 2.5 5 10 Miles
0 2.5 5 10 km
1:500,000

Western AREA POWER ADMINISTRATION

Exported On: 5/17/2013

alignments and 250-foot-wide transmission line ROW locations would be determined during final engineering and design and may vary from the reference lines presented in this document. However, any alignment changes must remain within the 2-mile transmission line corridor and comply with all avoidance, minimization, and mitigation requirements described in this EIS, pertinent BLM RMPs, and USFS LRMPs.

To facilitate alternatives discussion and impacts disclosure in this EIS, segments were defined between nodes or points where reference lines diverge and/or converge within a region. Each of these segments was given a unique identification number as listed in **Table 2-2**. The identification numbers generally were assigned beginning in the northeast and moving to the southwest. These segments were grouped within the regions to create alternative comparisons from the beginning point in each region to the ending point in the same region. Because there are locations in each region where multiple alternatives overlap, some segments are analyzed multiple times as part of each alternative (e.g., segments 20, 30, and 40 in Region I). Summaries of alternative transmission line routes, associated access road lengths, and disturbance areas are included in the regional descriptions below.

Table 2-2 Reference Line Segments Comprising Alternative Routes by Region

Region	Applicant Proposed Alternative A Segment IDs	Alternative B Segment IDs	Alternative C Segment IDs	Alternative D Segment IDs	Alternative E Segment IDs	Alternative F Segment IDs
I	I-A 20, 30, 40, 110.00, 110.05, 120, 180.00, 180.05, 180.20, 100	I-B 20, 30, 40, 50, 60, 70, 180.00, 180.05, 186, 190.05, 100	I-C 20, 30, 130, 140.00, 140.05, 190.00, 190.05, 100	I-D *Agency Preferred Alternative* 20, 30, 40, 110.00, 115.00, 115.05, 115.07, 115.10, 180.05, 186, 190.05, 100	Not Applicable in Region I	Not Applicable in Region I
II	II-A 210, 211, 212, 213, 320.05, 320.10, 320.15, 320.20, 340, 360, 430	II-B 220.10, 222.05, 222.3, 310, 350, 370, 380, 420, 440	II-C 220.10, 225.2, 330.10, 410, 440	II-D 210, 214, 215.00, 217.01, 217.02, 217.10, 217.15, 320.20, 350, 360, 430	II-E 210, 214, 215.00, 215.05, 213, 320.05, 325.1, 325.2, 217.051, 217.052, 320.15, 320.20, 350, 360, 430	II-F *Agency Preferred Alternative* 210, 214, 215.00, 217.01, 217.052, 218.00, 219.10, 219.20, 219.30, 320.15, 320.20, 350, 370, 380, 420, 440
III	III-A 450, 470, 480, 500.00, 500.02, 500.05, 501.10, 501.15, 502.05, 530, 550, 560, 600	III-B *Agency Preferred Alternative* 450, 460, 480, 490.00, 490.05, 510, 530, 540, 590, 600	III-C 450, 460, 480, 490.00, 490.05, 520, 610	Not Applicable in Region III	Not Applicable in Region III	Not Applicable in Region III
IV	IV-A *Agency Preferred Alternative* 620, 630, 660, 700, 720, 740, 790	IV-B 620, 640, 670, 710, 750, 760, 800, 820,	IV-C 620, 640, 670, 710, 750, 771	Not Applicable in Region IV	Not Applicable in Region IV	Not Applicable in Region IV

Also, individual impact descriptions or comparisons of shorter sections have been considered in locations where alternative variation possibilities are shorter in length than the entire region or where segments act as

alternative connectors. **Table 2-3** lists the alternative variations and micro-siting options that have been considered by region. Alternative variation impacts are described and directly compared to alternative routes that begin and end in the same locations as the variation. The segments that make up the alternative variation and those used to directly compare the variation to an alternative route are included in **Table 2-3**. **Table 2-4** lists the alternative connectors that have been considered by region. The direct comparison of impacts from alternative connectors in relation to segments of the alternative routes is not as simple. The ability to combine connectors with different segment routes allows for a large number of distinct alternative routes.

Table 2-3 Alternative Variations and Micro-siting Options Considered by Region

Region	Alternative Variation or Micro-siting Option		Comparison	Alternative(s) Necessary for Variation	
	Name	Segment IDs	Segment IDs	Beginning	Ending
I	Tuttle Easement Micro-siting Option 1	101.1	100.00, 186.00	I-D	I-D
I	Tuttle Easement Micro-siting Option 2	101.2	100.00, 186.00	I-D	I-D
I	Tuttle Easement Micro-siting Option 3	101.3	100.00, 186.00	I-D	I-D
II	Emma Park Alternative Variation	217.02, 219.40, 219.50	218.00, 219.10, 219.20, 219.30	II-F	II-F
II	Strawberry IRA 1 Micro-siting Option 1	320.101	320.10	II-A	II-A
II	Strawberry IRA 2 Micro-siting Option 2	320.102	320.10	II-A	II-A
II	Strawberry IRA 3 Micro-siting Option 3	320.103	320.10	II-A, II-E, II-F	II-A, II-E, II-F
II	Cedar Knoll IRA 1 Micro-siting Option 1	320.151	320.15	II-A, II-E, II-F	II-A, II-E, II-F
II	Cedar Knoll IRA 2 Micro-siting Option 2	320.152	320.15	II-A, II-E, II-F	II-A, II-E, II-F
III	Ox Valley East Alternative Variation	503, 505	501.10, 501.15	III-A	III-A
III	Ox Valley West Alternative Variation	504, 505	501.10, 501.15	III-A	III-A
III	Pinto Alternative Variation	506.00	500.05, 501.10	III-A	III-A
IV	Marketplace Alternative Variation	810	820	IV-B	IV-A, IV-B

Table 2-4 Alternative Connectors Considered by Region

Region	Alternative Connector		Alternative(s) Necessary for Connector	
	Name	Segment IDs	Beginning	Ending
I	Mexican Flats Alternative Connector	150.00, 150.05, 160	I-All	I-All
I	Baggs Alternative Connector	170.00, 170.05	I-C	I-A, I-B
I	Fivemile Point North Alternative Connector	116	I-D	I-C
I	Fivemile Point South Alternative Connector	117	I-D	Baggs Alternative Connector
II	Highway 191 Alternative Connector	219.60	II-F	Emma Park Alternative Variation
II	Castle Dale Alternative Connector	270	II-C	II-B
II	Price Alternative Connector	223.00	II-B	II-D
II	Lynndyl Alternative Connector	400	II-C	II-B
II	IPP East Alternative Connector	390	II-B, II-C	II-B, II-C
III	Avon Alternative Connector	495.00	III-B, III-C	III-A
III	Moapa Alternative Connector	570, 580	III-All	III-All

Table 2-4 Alternative Connectors Considered by Region

Region	Alternative Connector		Alternative(s) Necessary for Connector	
	Name	Segment IDs	Beginning	Ending
IV	Sunrise Mountain Alternative Connector	650	IV-B, IV-C	IV-A
IV	Lake Las Vegas Alternative Connector	680	IV-B, IV-C	IV-A
IV	Three Kids Mine Alternative Connector	690	IV-B, IV-C	IV-A
IV	River Mountains Alternative Connector	730	IV-B, IV-C	IV-A
IV	Railroad Pass Alternative Connector	780	IV-B	IV-A, IV-B

Note: The impacts of using connectors will be described; however, the impacts of the alternatives they connect are disclosed in the alternatives' respective discussions.

An analysis of all distinct alternative and connector potential route combinations would result in the detailed analysis of several route combinations with virtually identical impacts. Accordingly, Chapter 3.0 discloses the impacts of connectors independently, allowing the reader to determine potential additive impacts of the connectors across alternative combinations.

2.5.1 Alternative Transmission Line Routes and Ancillary Facilities by Region

The length and surface disturbance from the applicant-proposed and other alternatives are described in this section. This includes transmission line alternative routes, variations, connectors, and ground electrode systems. Facilities considered part of the construction disturbance for each alternative include access roads, structure erection sites, communication sites, line stringing and tensioning sites (both transmission and communication), and other temporary work areas (i.e., staging areas, concrete batch plants, storage yards, helicopter fly yards). Facilities considered part of operation and maintenance disturbance include access roads, structure foundation sites, and communication sites. These construction and operation areas generally would experience sub-grade disturbance to provide clear, flat work spaces. All construction disturbance not included in operation disturbance (e.g., stringing and tensioning sites, work areas, decrease in structures and communication sites) would be reclaimed after construction was completed. Areas within the ROW that are not included in the disturbance area for construction or operation facilities may experience vegetation clearing (e.g., mowing, woody vegetation clearing, overland travel) during construction. As such, these areas are reported as additional ROW vegetation clearing. Ground electrode systems would be necessary in Regions I and III. **Appendix D** contains additional information on the above facilities and their associated disturbances.

2.5.1.1 Region I: Sinclair, Wyoming to Northwest Colorado near Rangely, Colorado

Region I alternatives are depicted on **Figure 2-21**. Alternative I-D is the agency preferred alternative in Region I. The length of alternative routes and associated access roads in Region I are summarized in **Table 2-5** and the disturbance associated with construction and operation of each is summarized in **Table 2-6**. If Design Option 3 were implemented, the transmission lines in this region would be constructed with an AC configuration (three conductors and structures to support them) for AC operation during phase one of Project implementation (see **Figure 2-3**).

Table 2-5 Length of Alternative Routes and Associated Access Roads in Region I

Regional Alternative	Length (Miles)			
	I-A	I-B	I-C	I-D
600kV T-Line	155	159	186	171
Access Roads	227	223	269	242

Table 2-6 Transmission Line Alternative Route Areas of Disturbance in Region I

Facilities	Construction Disturbance (acres)				Operation Disturbance (acres)			
	Alt. I-A	Alt. I-B	Alt. I-C	Alt. I-D	Alt. I-A	Alt. I-B	Alt. I-C	Alt. I-D
Access Roads	512	481	601	515	512	481	601	515
Structures and Communication Sites	718	734	863	793	14	14	17	16
Stringing and Tensioning Sites	456	487	600	587	0	0	0	0
Work Areas[1]	371	381	447	411	0	0	0	0
Facilities Total	**2,057**	**2,083**	**2,511**	**2,306**	**526**	**495**	**618**	**531**
Additional ROW-vegetation clearing[2]	3,242	3,304	3,848	3,500	0	0	0	0

[1] Work areas include staging areas, concrete batch plants, storage yards, and helicopter fly yards.

[2] Additional ROW-vegetation clearing is the remainder of the area within the ROW that is not included in construction or operation facilities disturbance that may experience some degree of vegetation clearing (e.g., mowing, woody vegetation clearing, overland travel) during construction.

Alternative I-A (Applicant Proposed)

TransWest's proposed reference line would begin in Sinclair, Wyoming, and would travel west just south of the I-80 corridor to Wamsutter. At Wamsutter, it would turn south and generally follow the Carbon-Sweetwater county line along a corridor preferred by the Wyoming Governor's Office and Carbon and Sweetwater counties. It then would continue south-southwest across the Wyoming-Colorado state line and south along a corridor preferred by Moffat County where it would intersect with U.S. Highway 40 just west of Maybell, Colorado. The reference line generally would parallel U.S. Highway 40, turning west toward the Colorado-Utah border.

Alternative I-B

Alternative I-B was the TransWest original proposed action. It was subsequently withdrawn and replaced by a revised ROW application reflecting their current proposed action. It was retained as Alternative I-B because it would follow an existing utility corridor, thereby reducing the proliferation of new corridors. The alternative would be the same as Alternative I-A to Wamsutter, and then differ as Alternative I-B would continue west for several miles before turning south along the WWEC. Alternative I-B would follow the WWEC to near the Colorado state line, where it would converge with Alternative I-A for approximately 15 miles, then diverge to the south and parallel Alternative I-A to the east with an offset of approximately 5 miles. It then would intersect with U.S. Highway 40 and follow Alternative I-A to the end of Region I.

Alternative I-C

This alternative was developed to reduce the overall proliferation of utility corridors and associated impacts by following existing designated utility corridors. Alternative I-C would begin by following Alternative I-A to near Creston, Wyoming, where Alternative I-C would turn south and parallel Wyoming State Highway 789 toward Baggs, Wyoming. From there, Alternative I-C would continue south, deviating from Highway 789 to the east and passing east of Baggs. After crossing into Colorado, this alternative would parallel Colorado State Highway 13 into Craig, Colorado. Alternative I-C would pass east and south of Craig, turning to the west after crossing U.S. Highway 40, generally paralleling the highway and joining with Alternative I-A to the end of Region I.

Alternative I-D (Agency Preferred)

Alternative I-D was developed to reduce multiple resource concerns, including impacts to visual resources and greater sage-grouse. It would follow the route of Alternative I-A, going west from Sinclair, Wyoming (Carbon County, Wyoming), basically paralleling I-80 in the designated WWEC, until turning south near Wamsutter. It would follow Alternative I-A south for approximately 15 miles. Alternative I-D then would diverge to the east, where it generally would parallel Highway 789 at an offset distance of 2 to 5 miles to the west. Before reaching

the Baggs area, Alternative I-D would turn west and follow the Shell Creek Stock Trail road for approximately 20 miles, where it would cross into Sweetwater County and again join Alternative I-A while turning south into Colorado (Moffat County).

Tuttle Easement Micro-siting Options 1, 2, and 3

Three micro-siting options have been developed to address specific resource concerns in Region I (**Figure 2-25**). The Tuttle Easement micro-siting options 1, 2, and 3 address concerns related to the Tuttle Ranch Conservation Easement (see Section 3.14, Land Use). Tuttle Easement Micro-siting Option 1 would follow two existing transmission lines through the area (including the Tuttle Ranch Conservation Easement lands) with a 250-foot offset. Tuttle Easement Micro-siting Option 2 would avoid the Tuttle Ranch Conservation Easement and pass between where the easement and the NPS Dinosaur National Monument's Deerlodge Road intersects with U.S. Highway 40. Tuttle Easement Micro-siting Option 3 also would avoid the easement, but cross the NPS Deerlodge Road west of U.S. Highway 40. These micro-siting options are compared with the portion of Alternative I-D they might replace, but could be utilized with each of the alternatives in Region I. Because they are near each other and share a 2-mile transmission line corridor, resource impacts generally are similar to the other alternatives.

Region I Alternative Connectors

The Region I alternative connectors were developed to provide the flexibility to combine alternative segments to address resource conflicts. They are described below and depicted in **Figure 2-21**. The length of the alternative connectors and associated access roads along with construction and operation disturbance areas are summarized in **Table 2-7**.

Table 2-7 Alternative Connectors Areas of Disturbance in Region I

	Length (miles)		Construction Disturbance (acres)						Operation Disturbance (acres)		
Facilities	600-kV T-Line	Access Roads	Access Roads	Structures & Communication Sites	Stringing & Tensioning Sites	Work Areas[1]	Facilities Total	Additional ROW-Vegetation Clearing[2]	Access Roads	Structures & Communication Sites	Facilities Total
Mexican Flats	10	13	25	48	32	24	**129**	206	25	1	**26**
Baggs	22	31	68	104	68	54	**294**	464	68	2	**70**
Fivemile Point North	3	4	8	15	52	7	**82**	20	8	<1	**8**
Fivemile Point South	2	3	6	10	10	5	**31**	42	6	<1	**6**

[1] Work areas include staging areas, concrete batch plants, storage yards, and helicopter fly yards.

[2] Additional ROW-vegetation clearing is the remainder of the area within the ROW that is not included in construction or operation facilities disturbance that may experience some degree of vegetation clearing (e.g., mowing, woody vegetation clearing, overland travel) during construction.

Mexican Flats Alternative Connector (All Alternatives)

The Mexican Flats Alternative Connector could be used to join all Region I alternatives to any of the other alternatives. The connector would be located in an area where the three alternatives are closest to one another, just south of the BLM-private checkerboard ownership pattern in Wyoming.

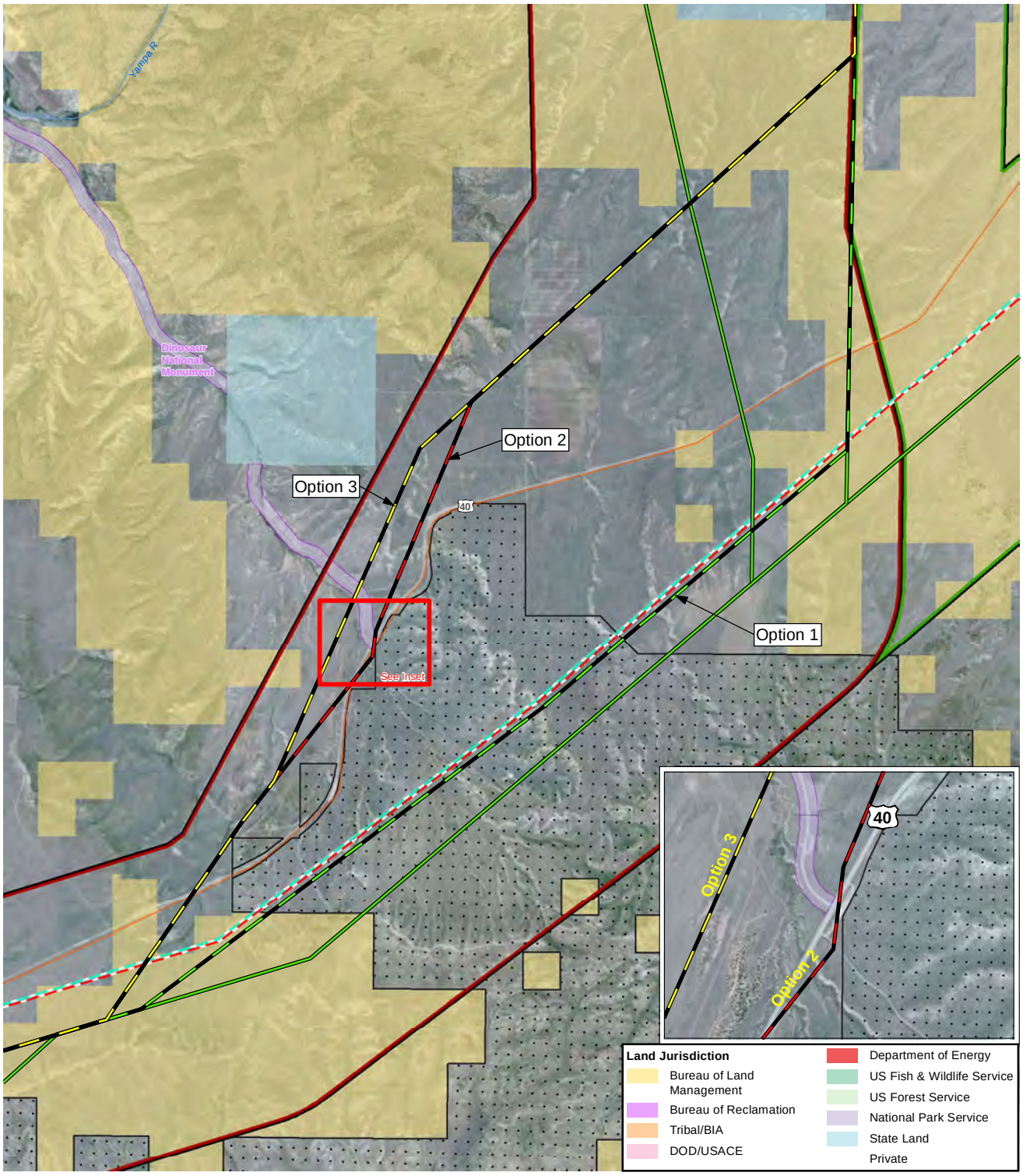
Baggs Alternative Connector (Alternative I-C only)

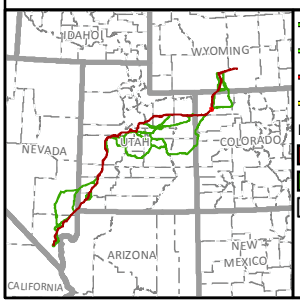
The Baggs Alternative Connector would connect Alternative I-C with Alternatives I-A and I-B between Baggs and the general location where Alternatives I-A and I-B cross the Wyoming-Colorado state line.

Fivemile Point North Alternative Connector (Alternatives I-C or I-D)

The Fivemile Point North Alternative Connector would connect Alternative I-D with Alternative I-C near Baggs.

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Reference Line
Tuttle Easement Micro-siting Option 1
Tuttle Easement Micro-siting Option 2
Tuttle Easement Micro-siting Option 3

Project Corridor
Applicant Proposed
Alternative
Tuttle Conservation Easement

Existing Transmission
345kV
138 to 161kV

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 2-25
Tuttle Easement Micro-siting
Options 1, 2, and 3

0 1,000 2,000 4,000 Feet
0 200 400 800 Meters
1:63,360

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Fivemile Point South Alternative Connector (Alternative I-D or Baggs Alternative Connector)

The Fivemile Point South Alternative Connector would connect Alternative I-D with the Baggs Alternative Connector near Baggs.

Region I Ground Electrode System Alternative Facilities

The ground electrode system alternative locations in Region I are depicted in **Figure 2-21**, and the lengths and disturbance areas are summarized in **Table 2-8**. These alternative locations are dependent on the alternative route selected, as noted in **Table 2-8** with the alternatives listed in parentheses.

Table 2-8 Ground Electrode System Alternative Facility Lengths and Areas of Disturbance in Region I

Northern Ground Electrode System Site Alternatives[1]	Length (miles)		Construction Disturbance (acres)				Operation Disturbance (acres)			
	34.5 kV AC Overhead Line	Access Road	Ground Electrode Sites	Over-head Lines	Access Roads	Total	Ground Electrode Sites	Over-head Lines	Access Roads	Total
Separation Flat (All Alternatives)	13	17	65	30	34	128	6	<1	34	39
Shell Creek (Alternatives I-A and I-D)	33	43	65	75	83	223	6	<1	83	89
Little Snake East (Alternatives I-A, I-B, and I-D)	9	12	65	20	24	108	6	<1	24	29
Little Snake West (Alternative I-A)	10	14	65	25	31	121	6	<1	31	37
Shell Creek (Alternative I-B)	26	34	65	59	65	189	6	<1	65	71
Little Snake West (Alternatives I-B and I-D)	5	7	65	12	15	93	6	<1	15	21
Separation Creek (All Alternatives)	14	20	65	30	43	138	6	<1	43	48
Eight Mile Basin (All Alternatives)	4	6	65	9	12	86	6	<1	12	18

[1] Note in parentheses indicates which alternatives in Region I would be necessary to utilize the ground electrode system site.

2.5.1.2 Region II: Northwest Colorado to IPP near Delta, Utah

Region II alternative reference lines are depicted in **Figure 2-22**. Alternative II-F is the agency preferred alternative in Region II. The length of alternative routes and associated access roads in Region II are summarized in **Table 2-9** and disturbance associated with construction and operation of each is summarized in **Table 2-10**. If Design Option 3 were implemented, the transmission lines in this region would be constructed with an AC configuration (three conductors and structures to support them) for AC operation during phase one Project implementation (see **Figure 2-3**).

Table 2-9 Length of Alternative Routes and Associated Access Roads in Region II

Facilities	Length (miles)					
	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
600-kV T-Line	257	345	364	262	266	267
Access Roads	463	580	556	474	471	526

Table 2-10 Transmission Line Alternative Route Areas of Disturbance in Region II

Facilities	Construction Disturbance (acres)						Operation Disturbance (acres)					
	Alt. II-A	Alt. II-B	Alt. II-C	Alt. II-D	Alt. II-E	Alt. II-F	Alt. II-A	Alt. II-B	Alt. II-C	Alt. II-D	Alt. II-E	Alt. II-F
Access Roads	1,154	1,404	1,274	1,198	1,170	1,366	1,154	1,404	1,274	1,198	1,170	1,366
Structures & Communication Sites	1,189	1,596	1,686	1,207	1,232	1,236	24	32	34	25	25	26
Stringing & Tensioning Sites	783	1,174	1,230	1,022	894	1,033	0	0	0	0	0	0
Work Areas[1]	617	828	874	628	639	641	0	0	0	0	0	0
Facilities Total	**3,743**	**5,002**	**5,064**	**4,055**	**3,935**	**4,276**	**1,178**	**1,436**	**1,308**	**1,223**	**1,195**	**1,392**
Additional ROW – vegetation clearing[2]	5,392	7,103	7,487	5,267	5,499	5,393	0	0	0	0	0	0

[1] Work areas include staging areas, concrete batch plants, storage yards, and helicopter fly yards.

[2] Additional ROW-vegetation clearing is the remainder of the area within the ROW that is not included in construction or operation facilities disturbance that may experience some degree of vegetation clearing (e.g., mowing, woody vegetation clearing, overland travel) during construction.

Alternative II-A (Applicant Proposed)

The TransWest proposed reference line would continue into Utah in a westerly direction, then deviate south from Highway 40 toward Roosevelt, Utah. From Roosevelt, it would pass north of Duchesne, again paralleling Highway 40 for several miles, then turn southwest toward Nephi, near U.S. Highways 6 and 89. The reference line would pass through Salt Creek Canyon then north around Nephi. It would continue west and then turn southwest following a path north of and adjacent to IPP. Portions of this corridor have been identified as preferred in a joint resolution by representatives of Juab and Millard counties.

Strawberry IRA Micro-siting Options 1, 2, and 3

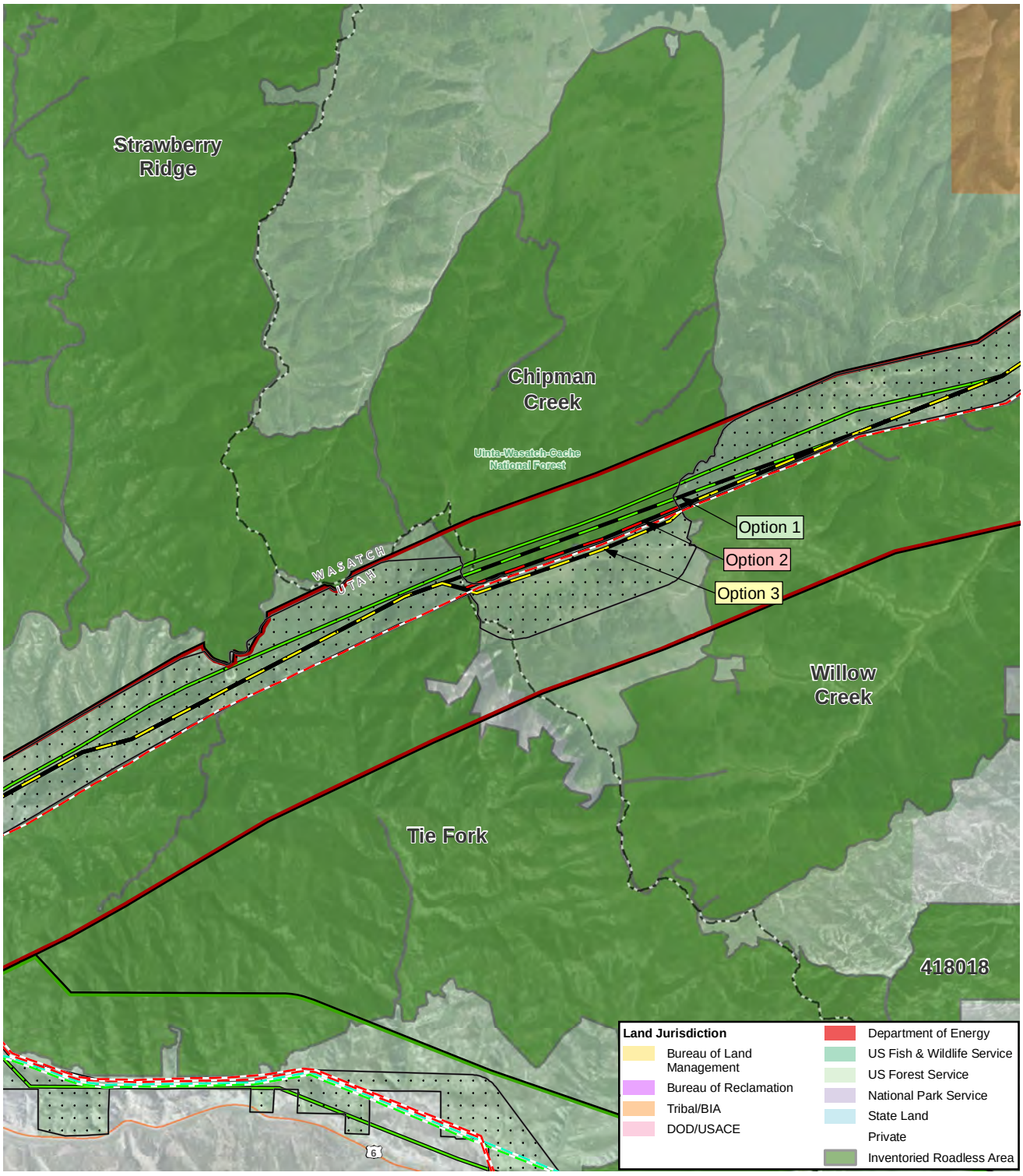
The Strawberry IRA micro-siting options have been developed to address concerns with construction in Uinta National Forest IRAs at a location the designated WWEC offsets from a continual corridor (**Figure 2-26**). Strawberry IRA Micro-siting Option 1 would be sited closer to the existing transmission line than Alternative II-A and still well within the IRA. Strawberry IRA Micro-siting Option 2 would be located with a 250-foot offset from the existing transmission line and within but on the edge of the IRA. Strawberry IRA Micro-siting Option 3 would cross the existing transmission line twice, remaining in the designated WWEC and avoiding the USFS IRA. These micro-siting options are compared with the portion of Alternative II-A they might replace.

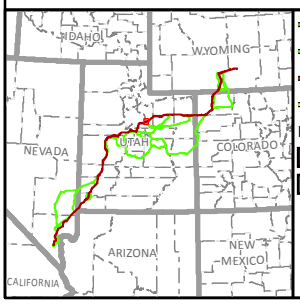
The Cedar Knoll IRA micro-siting options could be utilized under Alternative II-A as well. See Alternative II-F for a description of these options.

Alternative II-B

Alternative II-B was developed to address impacts to private lands and to generally follow established utility corridors. These corridors are designated for underground utilities only and use of the corridor for the transmission line would require a plan amendment. The route would travel southwest in Colorado from the beginning of Region II, cross the Yampa River, and pass east of Rangely, Colorado. It would continue southwest where it would cross the Colorado-Utah state line and turn generally south, crossing back into Colorado in the Baxter Pass area. At that location, it would intersect the Interstate 70 (I-70) corridor, turning in a southwesterly and westerly direction, paralleling I-70. After passing south of Green River, Utah, Alternative II-B would diverge from I-70 and turn to the north along U.S. Highway 191. This highway generally would be followed until just south of the Emery-Carbon county line, where Alternative II-B would turn west and

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Reference Line
Strawberry IRA Micro-siting Option 1
Strawberry IRA Micro-siting Option 2
Strawberry IRA Micro-siting Option 3

Project Corridor
Applicant Proposed
Alternative

Existing Transmission
345kV
WWEC Corridor

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 2-26
Strawberry IRA Micro-siting
Options 1, 2, and 3

0 0.5 1 2 Miles
0 0.5 1 2 km
1:100,000
N

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pass near the county line for approximately 25 miles. It generally would turn south, passing west of Huntington, Utah, before turning northwest passing northeast of Mount Pleasant, Utah. From there, it would pass through Salt Creek Canyon to Nephi, and then south around Nephi. It then would turn southwest and west adjacent to IPP, following a path south of Alternative II-A.

Alternative II-C

Alternative II-C also would decrease impacts to private lands and generally would follow established utility corridors as well as avoid USFS IRAs. Alternative II-C would follow Alternative II-B through Colorado, along I-70 into Utah, and north at Highway 191. Approximately 15 miles north on Highway 191, Alternative II-C would diverge from Alternative II-B and turn in a general westerly direction toward Castle Dale. Approximately 3 miles east of Castle Dale, this alternative would turn south and roughly parallel Utah State Highway 10 at a distance of approximately 3 miles to the east. The alternative would cross Highway 10 near the Emery-Sevier county line and turn west, again generally following the I-70 corridor into the Salina, Utah, area. Alternative II-C would pass south of Salina, turn north, and parallel U.S. Highway 50 toward Scipio, Utah. The alternative would turn west and pass Scipio on the south, then turn north, passing east of Delta, Utah, continuing into IPP.

Alternative II-D

This alternative was developed to avoid USFS IRAs and to provide additional northern route options to avoid impacts to historic trails and areas designated for special resource management along the southern routes (Alternatives II-B and II-C). It would begin along the same route as Alternative II-A. However, as it would enter Utah, it would diverge briefly to follow a designated utility corridor, causing it to zigzag once across Alternative II-A. It then would diverge to the south of the designated utility corridor and turn west-southwest. Alternative II-D would cross into Carbon County northwest of Price, and then turn southwest in the Emma Park area along Highway 191. It would follow this highway west of Helper, and then turn west toward Salt Creek Canyon where it would join and follow Alternatives II-B and II-E, then join and follow Alternative II-A into IPP.

Alternative II-E

Alternative II-E also was developed to provide additional northern route options to address the previously-mentioned resource impacts from the southern routes. This alternative would follow Alternative II-D into Utah and along the designated utility corridor, zigzagging across Alternative II-A. It then would rejoin Alternative II-A to continue east through Duchesne, Utah. Approximately 10 miles east of Duchesne, Alternative II-E would turn southwest and generally parallel Highway 191, offset by 1 to 6 miles. At the Utah-Carbon county line, this alternative would turn west through the Emma Park area, then northwest along U.S. Highway 6 until it would rejoin with Alternative II-A, following its siting to Salt Creek Canyon. At this canyon, Alternative II-E would begin to follow the alignment of Alternative II-B south of Nephi, then join and follow Alternative II-A adjacent and into IPP.

Micro-siting options have been developed in specific areas of this alternative to minimize impacts to USFS IRAs. See Alternative II-F for a description of these options.

Alternative II-F (Agency Preferred)

This alternative combines portions of other alternatives in the region and contains unique segments in the Emma Park area that together would minimize impacts to USFS IRAs, Tribal and private lands, greater sage-grouse habitat, and avoid impacts to NHTs. It would begin in southwest Moffat County (Colorado) by following Alternative II-A in designated WWEC and BLM utility corridors. As it enters Utah (Uintah County), it would separate from Alternative II-A to the northwest and follow the designated utility corridors, which then turn southwest and cross Alternative II-A. It then would diverge to the south off of the designated WWEC (still following the BLM-designated corridor) and turn west-southwest, crossing the Uintah and Ouray Indian Reservation. It then would cross into Duchesne County, where it would turn west-southwest out of the BLM utility corridor and generally follow the southern county line, crossing into Carbon County northwest of Price where it would turn west-northwest and follow Highway 6 to Thistle (Utah County) through a portion of designated WWEC and BLM utility corridors. It then would turn south, following Highway 89 for about 10 miles

before cutting south-southwest (Sanpete County) to Highway 132. At this highway, it would turn west into Nephi (Juab County) and follow a path south around the community, then turn southwest following a BLM-designated utility corridor that turns west into IPP north of Delta (Millard County), which is the end of the Project's Region II.

Cedar Knoll IRA Micro-sting Options 1 and 2

The Cedar Knoll IRA micro-siting options have been developed to address concerns with construction in USFS IRAs along the edges of the Manti-LaSal National Forest (**Figure 2-27**).Cedar Knoll IRA Micro-siting Option 1 would be co-located with a 250-foot offset from an existing transmission line, would avoid the Coal Hollow IRA, and would span a short corner of the Cedar Knoll IRA. Cedar Knoll IRA Micro-siting Option 2 also would be co-located with a 250-foot offset from an existing transmission line, would avoid the Coal Hollow IRA, and also would avoid the Cedar Knoll IRA by crossing the existing transmission line twice. These micro-siting options are compared with the portion of Alternative II-F they might replace, and also could be utilized with Alternatives II-A and II-E with the same results.

Region II Alternative Variation

Emma Park Alternative Variation

The Emma Park Alternative Variation would address potential impacts to the scenic and recreation issues along the Reservation Ridge Scenic Backway, while also considering BLM policy (IM 2012-043) regarding greater sage-grouse. This variation is compared to the portion of Alternative II-F it might replace in the Emma Park area north of Price, Utah (**Figure 2-22**), and the length and associated construction and operation disturbance are summarized in **Table 2-11**. It would deviate from Alternative II-F (and follow Alternative II-D) just north of the Duchesne-Carbon county line, then deviate from Alternative II-D at the intersection of Alternatives II-D and II-E where the Emma Park Alternative Variation would cross Emma Park and rejoin with Alternative II-F just east of Soldier Summit, Utah.

Table 2-11 Alternative Variation and Comparison Areas of Disturbance in Region II

	Length (miles)		Construction Disturbance (acres)						Operation Disturbance (acres)		
Facilities	600-kV T-Line	Access Road	Access Roads	Structures & Comm Sites	Stringing & Tensioning Sites	Work Areas	Facilities Total	Additional ROW-veg clearing	Access Roads	Structures & Comm Sites	Facilities Total
Emma Park	35	78	218	163	179	85	645	669	218	3	221
Alternative II-F Comparable	32	82	237	149	203	77	666	577	237	3	240

Region II Alternative Connectors

The alternative connectors analyzed in Region II are described below and depicted in **Figure 2-22**. The length of the alternative connectors and associated access roads along with construction and operation disturbance areas are summarized in **Table 2-12**.

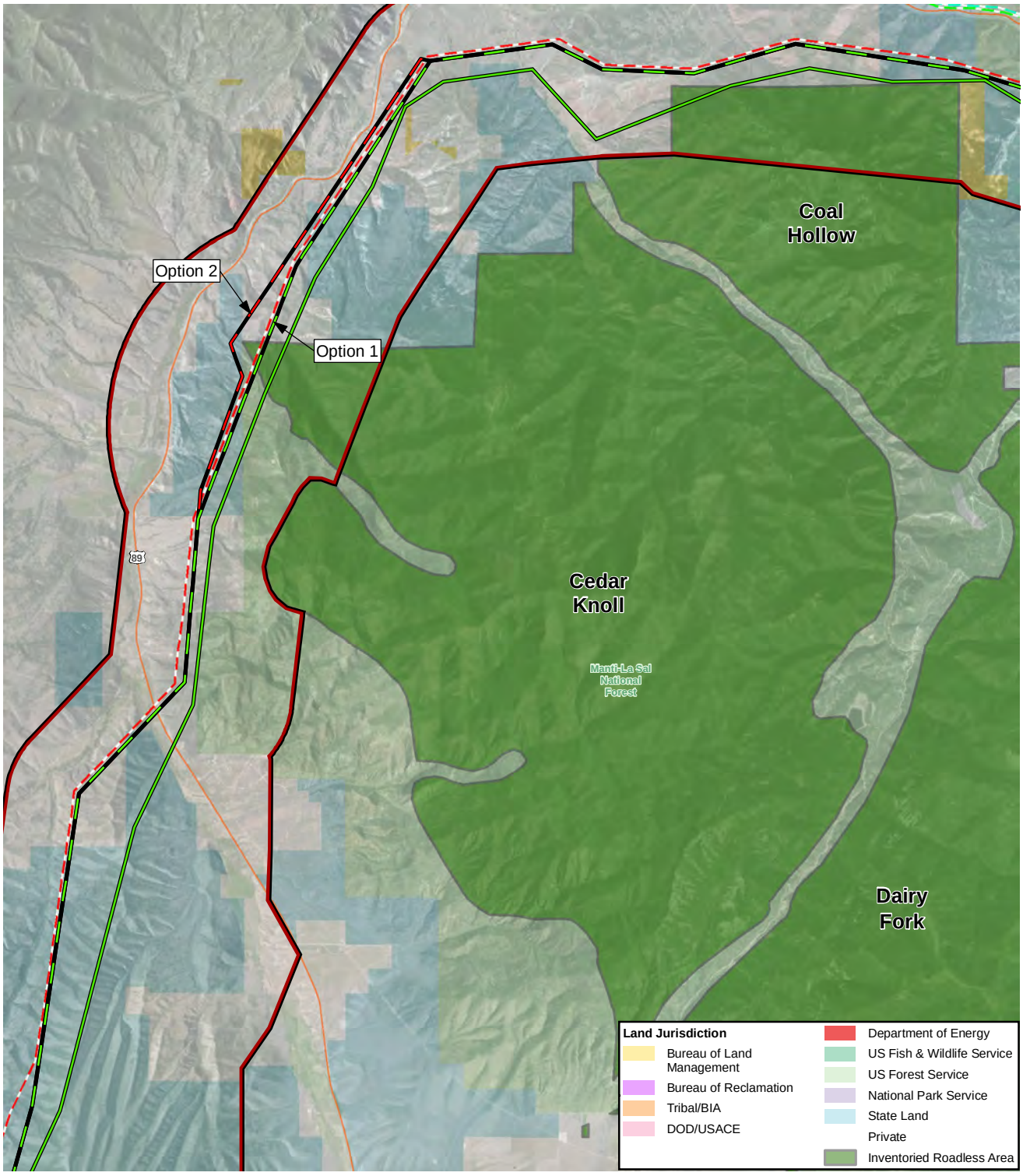
Highway 191 Alternative Connector (Alternative II-F and Emma Park Alternative Variation)

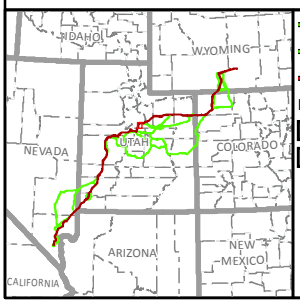
The Highway 191 Alternative Connector would connect Alternative II-F with the Emma Park Alternative Variation in a way that may consider a balance of resource concerns (i.e., biological, scenic, recreation, management areas).

Castle Dale Alternative Connector (Alternatives II-B and II-C)

The Castle Dale Alternative Connector would connect Alternative II-C near Castle Dale with Alternative II-B near Huntington. This connector also could be utilized to pass from Alternative II-B to Alternative II-C.

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Reference Line
Cedar Knoll IRA Micro-siting Option 1
Cedar Knoll IRA Micro-siting Option 2

Project Corridor
Applicant Proposed
Alternative

Existing Transmission
345kV

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 2-27
Cedar Knoll IRA Micro-siting
Options 1 and 2

0 0.5 1 2 Miles
0 0.5 1 2 km
1:100,000

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Table 2-12 Alternative Connectors Areas of Disturbance in Region II

Facilities	Length (miles)		Construction Disturbance (acres)						Operation Disturbance (acres)		
	600-kV T-Line	Access Road	Access Road	Structures & Comm Sites	Stringing & Tensioning	Work Areas[1]	Facilities Total	Additional ROW – Vegetation Clearing[2]	Access Road	Structures & Comm Sites	Facilities Total
Highway 191	5	13	37	22	49	11	**119**	61	37	1	**38**
Castle Dale	11	20	49	54	46	27	**176**	225	49	1	**50**
Price	18	31	79	85	72	44	**280**	369	79	2	**81**
Lynndyl	24	34	70	111	66	58	**305**	511	70	2	**72**
IPP East	3	3	7	12	11	6	**36**	50	7	0	**7**

[1] Work areas include staging areas, concrete batch plants, storage yards, and helicopter fly yards.

[2] Additional ROW-vegetation clearing is the remainder of the area within the ROW that is not included in construction or operation facilities disturbance that may experience some degree of vegetation clearing (e.g., mowing, woody vegetation clearing, overland travel) during construction.

Price Alternative Connector (Alternatives II-B and II-D)

The Price Alternative Connector would connect Alternative II-B north of Huntington along the Emery-Carbon county line with Alternative II-D west of Price. This connector potentially also could be utilized to pass from Alternative II-D to Alternative II-B.

Lynndyl Alternative Connector (Alternatives II-B and II-C)

The Lynndyl Alternative Connector would deviate from Alternative II-C just south of Scipio, turning north and joining with Alternative II-B between Nephi and IPP.

IPP East Alternative Connector (Alternatives II-A and II-B)

The IPP East Alternative Connector would connect Alternative II-A to Alternative II-B, allowing either of these to cross to the other and approach IPP from either the north or the south.

2.5.1.3 Region III: IPP to North Las Vegas, Nevada

Region III alternative reference lines are depicted in **Figure 2-23**. Alternative III-B is the agency preferred alternative in Region III. The length of alternative routes and associated access roads in Region III are summarized in **Table 2-13** and disturbance associated with construction and operation of each is summarized in **Table 2-14**. If Design Option 2 were implemented, the transmission lines in this region would be constructed and operated as an AC transmission line (three conductors and structures to support them) in this region (see **Figure 2-2**).

Table 2-13 Length of Alternative Routes and Associated Access Roads in Region III

Facilities	Length (miles)		
	Alternative III-A	Alternative III-B	Alternative III-C
600-kV T-Line	275	284	308
Access Roads	423	401	433

Table 2-14 Transmission Line Alternative Route Areas of Disturbance in Region III

Facilities	Construction Disturbance (acres)			Operation Disturbance (acres)		
	III-A	III-B	III-C	III-A	III-B	III-C
Access Roads	971	850	926	971	850	926
Structures & Comm Sites	1,269	1,313	1,424	25	25	27
Stringing & Tensioning Sites	740	747	836	0	0	0
Work Areas[1]	661	683	740	0	0	0
Facilities Total	**3,641**	**3,593**	**3,926**	**996**	**875**	**953**
Additional ROW-veg clearing[2]	5,852	6,056	6,589	0	0	0

[1] Work areas include staging areas, concrete batch plants, storage yards, and helicopter fly yards.

[2] Additional ROW-vegetation clearing is the remainder of the area within the ROW that is not included in construction or operation facilities disturbance that may experience some degree of vegetation clearing (e.g., mowing, woody vegetation clearing, overland travel) during construction.

Alternative III-A (Applicant Proposed)

The TransWest proposed reference line would leave IPP to the west and turn south toward Milford, Utah, following the WWEC. For the remainder of Utah, the reference line roughly would parallel Interstate 15 (I-15) approximately 20 miles west of the highway. The reference line would pass west of Milford, then generally trend south-southwest, passing east of Enterprise, Utah, and directly west of Central, Utah; exiting Utah just north of the southwest corner of the state. In Nevada, the line would cross I-15 west of Mesquite, Nevada, and remain on the south side of I-15 until reaching the North Las Vegas area northeast of Nellis Air Force Base.

Alternative III-A could incorporate the Mormon Mesa-Carp Elgin Road (Proposed Site), the Halfway Wash East (Alternative 1), Halfway Wash-Virgin River (Alternative 2), or Meadow Valley 2 (Alternative 3) locations for the ground electrode system.

Alternative III-B (Agency Preferred)

Alternative III-B was developed to decrease resource impacts in southwestern Utah (including potential impacts to the Mountain Meadows NHL and Site and IRAs in the Dixie National Forest). It would begin following Alternative III-A through Millard and Beaver counties. Near the Beaver-Iron county line, it would diverge toward the west. Alternative III-B would follow a west-southwest course, crossing into Lincoln County, Nevada, near Uvada, Utah, where it would turn to a general southerly direction, rejoining Alternative III-A to the northwest of Mesquite. It then would diverge to the west from Alternative III-A approximately 16 miles west of Mesquite, cross into Clark County, pass southeast of Moapa, Nevada, pass through the designated utility corridor on the Moapa Reservation, and rejoin Alternative III-A approximately 4 miles north of the end of Region III.

Alternative III-B could incorporate the Mormon Mesa-Carp Elgin Road (Proposed Site), the Halfway Wash East (Alternative 1), Halfway Wash-Virgin River (Alternative 2), or Meadow Valley 2 (Alternative 3) locations for the ground electrode system.

Alternative III-C

Alternative III-C also was developed to address the same resource impacts as Alternative III-B and to take advantage of an existing corridor with existing transmission line development, thereby potentially consolidating cumulative transmission line impacts. This alternative would follow Alternatives III-A and III-B before diverging from them shortly after traveling west out of IPP, where it would follow the existing IPP power line to the south for approximately 30 miles and then rejoin Alternative III-B to the Utah-Nevada state line. After passing into

Nevada at Uvada, Alternative III-C would turn west away from Alternative III-B, passing north of Caliente, Nevada; turning south approximately 15 miles west of Caliente. This alternative would follow that southern course, intersecting with U.S. Highway 93 and paralleling the highway for all but the last 15 miles into North Las Vegas. Alternative III-C would rejoin Alternative III-A northeast of Nellis Air Force Base at the end of Region III.

Alternative III-C could incorporate the Mormon Mesa-Carp Elgin Road (Proposed Site), the Halfway Wash East (Alternative 1), Halfway Wash-Virgin River (Alternative 2), or Meadow Valley 2 (Alternative 3) locations for the ground electrode system.

Region III Alternative Variations

The alternative variations analyzed in Region III are described below and depicted in **Figure 2-23**. The length of the alternative variations, associated access roads, and construction and operation disturbance areas along with those same statistics for the comparable portion of alternative routes are summarized in **Table 2-15**.

Table 2-15 Alternative Variation and Comparison Areas of Disturbance in Region III

Facilities	Length (miles)		Construction Disturbance (acres)						Operation Disturbance (acres)		
	600-kV T-Line	Access Road	Access Roads	Structures & Comm Sites	Stringing & Tensioning Sites	Work Areas[1]	Facilities Total	Additional ROW-veg clearing[2]	Access Roads	Structures & Comm Sites	Facilities Total
Ox Valley East	16	35	98	74	66	38	**276**	315	98	2	**100**
Alternative III-A Comparable	*15*	*34*	*94*	*67*	*57*	*34*	***252***	*285*	*94*	*1*	***95***
Ox Valley West	17	35	98	75	56	39	**268**	333	98	2	**100**
Alternative III-A Comparable	*15*	*34*	*94*	*67*	*57*	*34*	***252***	*285*	*94*	*1*	***95***
Pinto	29	46	108	136	134	71	**449**	572	108	3	**111**
Alternative III-A Comparable	*24*	*47*	*122*	*109*	*93*	*56*	***381***	*469*	*122*	*2*	***125***

[1] Work areas include staging areas, concrete batch plants, storage yards, and helicopter fly yards.
[2] Additional ROW-vegetation clearing is the remainder of the area within the ROW that is not included in construction or operation facilities disturbance that may experience some degree of vegetation clearing (e.g., mowing, woody vegetation clearing, overland travel) during construction.

Ox Valley East Alternative Variation (Alternative III-A)

The Ox Valley East Alternative Variation was developed to address potential impacts to the Mountain Meadows NHL resulting from Alternative III-A. It would deviate from Alternative III-A toward the west near Enterprise, Utah, then run south through Ox Valley, rejoining Alternative III-A just south of Central, Utah.

Ox Valley West Alternative Variation (Alternative III-A)

The Ox Valley West Alternative Variation also was developed to address potential impacts to the Mountain Meadows NHL. It would begin and end with the Ox Valley East route, but follow a route further west near Enterprise.

Pinto Alternative Variation (Alternative III-A)

The Pinto Alternative Variation also addresses potential impacts to the Mountain Meadows NHL, as well as USFS IRAs. This variation would deviate from Alternative III-A to the east where the routes cross Utah State Highway 56 west of Cedar City. This variation generally would travel south, near the Pinto Canyon Road and rejoin Alternative III-A just north of the Ox Valley variations near Central.

Region III Alternative Connectors

The alternative connectors analyzed in Region III are described below and depicted in **Figure 2-23**. The length of the alternative connectors and associated access roads along with construction and operation disturbance areas are summarized in **Table 2-16**.

Table 2-16 Alternative Connector Area of Disturbance in Region III

	Length (miles)		Construction Disturbance (acres)						Operation Disturbance (acres)		
Facilities	600-kV T-Line	Access Road	Access Roads	Structures & Comm Sites	Stringing & Tensioning Sites	Work Areas[1]	Facilities Total	Additional ROW-veg clearing[2]	Access Roads	Structures & Comm Sites	Facilities Total
Avon	8	10	20	37	28	19	**104**	164	20	1	**21**
Moapa	13	17	33	61	43	31	**168**	264	33	1	**34**

[1] Work areas include staging areas, concrete batch plants, storage yards, and helicopter fly yards.

[2] Additional ROW-vegetation clearing is the remainder of the area within the ROW that is not included in construction or operation facilities disturbance that may experience some degree of vegetation clearing (e.g., mowing, woody vegetation clearing, overland travel) during construction.

Avon Alternative Connector (Alternatives III-A, III-B, and III-C)

The Avon Alternative Connector would connect Alternatives III-B and III-C with Alternative III-A just south of the area where these routes diverge near Latimer. This connector also could be potentially utilized to pass from Alternative III-A to Alternatives III-B or III-C. The Avon connector was added to avoid potential impacts to greater sage-grouse

Moapa Alternative Connector (Alternatives III-A, III-B, and III-C)

The Moapa Alternative Connector would be located near Dry Lake, Nevada, and act as a connector between Alternatives III-A, III-B, and III-C.

Region III Ground Electrode System Alternative Facilities

The ground electrode system alternative locations in Region III are depicted in **Figure 2-23** and the lengths and disturbance areas are summarized in **Table 2-17**.

Table 2-17 Ground Electrode System Alternative Facility Lengths and Areas of Disturbance in Region III

	Length (miles)		Construction Disturbance (acres)				Operation Disturbance (acres)			
Southern Ground Electrode System Site Alternatives	34.5-kV AC Overhead Line	Access Road	Ground Electrode Sites	Over-head Lines	Access Roads	Total	Ground Electrode Sites	Over-head Lines	Access Roads	Total
Mormon Mesa-Carp Elgin Rd (Alternative III-A)	6	7	65	12	14	**91**	6	<1	14	**19**
Halfway Wash - Virgin River (Alternative III-A)	4	5	65	9	10	**84**	6	<1	10	**16**
Halfway Wash East (Alternative III-A)	8	10	65	18	20	**104**	6	<1	20	**26**
Mormon Mesa-Carp Elgin Rd (Alternative III-B)	8	10	65	18	20	**103**	6	<1	20	**26**
Halfway Wash - Virgin River (Alternative III-B)	6	7	65	13	14	**93**	6	<1	14	**20**
Halfway Wash East (Alternative III-B)	8	10	65	18	19	**102**	6	<1	19	**25**
Meadow Valley 2 (Alternative III-C)	22	29	65	49	60	**174**	6	<1	60	**66**
Delta (Design Option 2)	19	23	65	51	44	**160**	6	<1	44	**50**

2.5.1.4 Region IV: North Las Vegas to Marketplace Hub near Boulder City, Nevada

Region IV alternative reference lines are depicted in **Figure 2-24**. Alternative IV-A is the agency preferred alternative in Region IV. The length of alternative routes and associated access roads in Region IV are summarized in **Table 2-18**, and disturbance associated with construction and operation of each is summarized in **Table 2-19**. If Design Option 2 were implemented, the transmission line in this region would be constructed and operated as an AC transmission line (three conductors and structures to support them) (see **Figure 2-2**).

Table 2-18 Length of Alternative Routes and Associated Access Roads in Region IV

Facilities	Length (Miles)		
	IV-A	IV-B	IV-C
600kV T-Line	37	39	44
Access Roads	60	71	74

Table 2-19 Transmission Line Alternative Route Areas of Disturbance in Region IV

Facilities	Construction Disturbance (acres)			Operation Disturbance (acres)		
	IV-A	IV-B	IV-C	IV-A	IV-B	IV-C
Access Roads	144	176	177	144	176	177
Structures & Communication Sites	176	184	209	4	4	5
Stringing & Tensioning Sites	156	119	170	0	0	0
Work Areas[1]	90	94	107	0	0	0
Facilities Total	**566**	**573**	**663**	**148**	**180**	**182**
Additional ROW-veg clearing[2]	738	818	893	0	0	0

[1] Work areas include staging areas, concrete batch plants, storage yards, and helicopter fly yards.

[2] Additional ROW-vegetation clearing is the remainder of the area within the ROW that is not included in construction or operation facilities disturbance that may experience some degree of vegetation clearing (e.g., mowing, woody vegetation clearing, overland travel) during construction.

Alternative IV-A (Applicant Proposed and Agency Preferred)

The TransWest proposed action would follow a designated WWEC, pass North Las Vegas to the east, and cross the congressionally designated Sunrise Mountain ISA. Crossing the ISA may entail congressional legislation modifying the designation (see Section 3.15, Special Designations, for details). It would run between Whitney, Nevada, and the Lake Las Vegas development skirting the edge of Henderson, Nevada. It would then turn in a general southwest direction to the Marketplace endpoint.

Alternative IV-B

Alternative IV-B was developed to provide an alternative that does not require crossing the Sunrise Mountain ISA. It would follow the proposed alternative for approximately 7 miles, diverge to the southeast as it passed directly east of Nellis Air Force Base and travel south through the Lake Mead NRA, passing between the Lake Las Vegas development and Lake Mead. Along the south edge of Lake Las Vegas, it would turn southwest, north of Boulder City, Nevada, then turn west and join with Alternative IV-A west of Henderson to the Marketplace endpoint.

Alternative IV-C

Alternative IV-C also would provide an alternative that would not cross Sunrise Mountain ISA. In addition, it would decrease impacts to populated areas. This alternative would follow Alternative IV-B through the Lake Mead NRA and between the Lake Las Vegas development and Lake Mead to north of Boulder City. It would then continue south before it turned southwest around the southeast edge of Boulder City, and into the Marketplace endpoint.

Region IV Alternative Variation

Marketplace Variation (Alternative IV-B)

The alternative variation analyzed in Region IV is described below and depicted in **Figure 2-24**. The length of the alternative variation, associated access roads, and construction and operation disturbance areas along with those same statistics for a comparable portion of an alternative route are summarized in **Table 2-20**.

Table 2-20 Alternative Variation and Comparison Areas of Disturbance in Region IV

	Length (miles)		Construction Disturbance (acres)						Operation Disturbance (acres)		
Facilities	600-kV T-Line	Access Road	Access Roads	Structures & Comm Sites	Stringing & Tensioning Sites	Work Areas[1]	Facilities Total	Additional ROW-veg clearing[2]	Access Roads	Structures & Comm Sites	Facilities Total
Marketplace	8	10	20	37	33	19	**109**	155	20	1	**21**
Alternative IV-B Comparable	*7*	*9*	*18*	*33*	*14*	*17*	***82***	*154*	*18*	*1*	***19***

[1] Work areas include staging areas, concrete batch plants, storage yards, and helicopter fly yards.

[2] Additional ROW-vegetation clearing is the remainder of the area within the ROW that is not included in construction or operation facilities disturbance that may experience some degree of vegetation clearing (e.g., mowing, woody vegetation clearing, overland travel) during construction.

The Marketplace Alternative Variation would decrease impacts to private lands. It would diverge from Alternative IV-B toward the west near Boulder City, Nevada, and reconnect with the Alternatives IV-A and IV-B near the proposed Southern Terminal.

Region IV Alternative Connectors

The alternative connectors analyzed in Region IV are described below and depicted in **Figure 2-24**. The length of the alternative connectors and associated access roads along with construction and operation disturbance areas are summarized in **Table 2-21**.

Table 2-21 Alternative Connectors Areas of Disturbance in Region IV

	Length (miles)		Construction Disturbance (acres)						Operation Disturbance (acres)		
Facilities	600-kV T-Line	Access Road	Access Roads	Structures & Comm Sites	Stringing & Tensioning Sites	Work Areas[1]	Facilities Total	Additional ROW-veg clearing[2]	Access Roads	Structures & Comm Sites	Facilities Total
Sunrise Mountain	3	4	8	13	11	6	**38**	50	8	<1	**8**
Lake Las Vegas	4	7	19	18	8	9	**54**	86	19	<1	**19**
Three Kids Mine	5	12	33	25	22	13	**93**	106	33	1	**34**
River Mountain	7	19	56	32	37	17	**142**	132	56	1	**57**
Railroad Pass	3	6	14	14	23	7	**58**	48	14	<1	**14**

[1] Work areas include staging areas, concrete batch plants, storage yards, and helicopter fly yards.

[2] Additional ROW-vegetation clearing is the remainder of the area within the ROW that is not included in construction or operation facilities disturbance that may experience some degree of vegetation clearing (e.g., mowing, woody vegetation clearing, overland travel) during construction.

Sunrise Mountain Alternative Connector (Alternatives IV-A, IV-B, and IV-C)

The Sunrise Mountain Alternative Connector would pass between Alternative IV-B (and IV-C) and Alternative IV-A on the northern border of the Lake Mead NRA.

Lake Las Vegas Alternative Connector (Alternatives IV-A, IV-B, and IV-C)

The Lake Las Vegas Alternative Connector would connect Alternative IV-B (and IV-C) and Alternative IV-A just south of each alternative's crossing of Las Vegas Wash, and would be located south of Lake Las Vegas along Lake Mead Boulevard.

Three Kids Mine Alternative Connector (Alternatives IV-A, IV-B, and IV-C)

The Three Kids Mine Alternative Connector would connect Alternative IV-B (and IV-C) and Alternative IV-A just south of the Lake Las Vegas Alternative Connector, and would be located south of the Three Kids Mine.

River Mountains Alternative Connector (Alternatives IV-A, IV-B, and IV-C)

The River Mountains Alternative Connector variation would connect Alternative IV-B (and IV-C) and Alternative IV-A from the point where Alternatives IV-B and IV-C would deviate north of Boulder City, to the point where Alternative IV-A would turn southwest toward the Marketplace endpoint.

Railroad Pass Alternative Connector (Alternatives IV-A and IV-B)

The Railroad Pass Alternative Connector would connect Alternative IV-A with Alternative IV-B from the point where Alternative IV-A would turn southwest on the west side of Boulder City to a point directly south on Alternative IV-B.

2.6 No Action Alternative

Under the No Action Alternative, the BLM or USFS would not issue ROW grants or special use permits and the Project would not be constructed.

Under the No Action Alternative, Western would not provide funding to the Project.

2.7 Alternatives Considered but Eliminated From Detailed Analysis

Figure 2-5 depicts the corridors considered during the scoping period, those that were added as a result of scoping comments, and those that have been eliminated from further consideration in the EIS. The alternative corridor segments listed in **Table 2-22** were considered through the public scoping period, but have subsequently been eliminated from detailed analysis in this EIS by the lead agencies for the reasons noted. Evaluations of segments that were eliminated from further analysis and more detailed rationales for their removal are provided in **Appendix B**.

Table 2-22 Alternatives Considered but Eliminated From Detailed Analysis

Rationale for Elimination From Detailed Analysis
Western Wyoming: Rock Springs (Region I)
Provides no benefits beyond those provided by the existing range of alternatives; equal or greater impacts to alternatives being retained for detailed analysis: • Land Use: Crossing of ROW exclusion area (Red Creek ACEC). Not compliant with Wyoming Governor's EO 2011-5. • Visual Resources: Visibility from Dinosaur National Monument and Flaming Gorge National Scenic Byway. Crossed Green River in segment eligible for Wild-and-Scenic status.

Table 2-22 Alternatives Considered but Eliminated From Detailed Analysis

Rationale for Elimination From Detailed Analysis
Wyoming-Colorado: Craig, Meeker, Rifle, Parachute, Grand Junction, and connector to the west (Region I)
Provides no benefits beyond those provided by the existing range of alternatives; equal or greater impacts to alternatives being retained for detailed analysis: • Land commitment: Greater length, use of private lands. • Visual Resources: Overall visibility to the public in the Grand Valley. • Siting: Located near other transmission lines for entire length, requiring construction across steep side slope terrain in narrow valleys.
Emery County, Utah: multiple corridors near the San Rafael Swell (Region II)
Provides no benefits beyond those provided by the existing range of alternatives; equal or greater impacts to alternatives being retained for detailed analysis: • Cultural Resources: Old Spanish NHT impacts. • Visual Resources: Scenic quality and setting changes to historic sites.
Emery, Sanpete, and Juab counties Utah: two USFWS proposed re-routes (Region II)
Provides no benefits beyond those provided by the existing range of alternatives; equal or greater impacts to alternatives being retained for detailed analysis (**Figure 2-20**): • Land Use: Eastern reroute bisects IRAs for approximately 15 miles and western reroute deviates from designated utility corridor and crosses private lands, including center-pivot irrigated agricultural lands. • Visual Resources: Eastern reroute passes through relatively undisturbed areas noted for scenic quality. • Biological Resources: Stated intent was to avoid mapped greater sage-grouse habitat; however existing alternatives to the south avoid said habitat.
Far west corridor between Delta, Utah, and U.S. Highway 93 crossing, Nevada (Region III)
Provides no benefits beyond those provided by the existing range of alternatives; equal or greater impacts to alternatives being retained for detailed analysis: • Land commitment: Greater length relative to other corridors near I-15. • Visual Resources: Large section in western Utah where no other transmission lines or other utilities currently exist. • Visual Resources: Visibility from the Great Basin National Park.
West side of Las Vegas (Region IV)
Provides no benefits beyond those provided by the existing range of alternatives; equal or greater impacts to alternatives being retained for detailed analysis: • Land Use: No available buffer to avoid both residential lands and Red Rocks National Conservation Area (NCA).

During scoping, numerous questions were raised regarding the ability to route all or portions of the transmission line underground. Underground cable systems have been considered and evaluated for the Project. To date, underground cable technology is not commercially available at the very high voltage and capacity levels (i.e., 600-kV and 3,000-MW) required to meet the proponent's objectives. The technology is not presently available, nor is it reasonably foreseeable that it would become available within the time frame for the construction of the Project. While there are theoretical and laboratory experiments in place that could conceivably be applied to the voltage and capacity levels of the proposed Project, there are no AC or DC underground installations worldwide above 500 kV or 2,000 MW either in-service or planned to be in-service in the next decade (TWE 2011). Therefore, undergrounding all or portions of the Project was not considered a viable alternative and has been eliminated from further analysis (**Appendix D**).

2.8 Comparison of Alternatives

2.8.1 Agency Preferred Alternative

The alternative preferred by the BLM within each project region was identified with input from USFS and other cooperating agencies using criteria linked to CEQ criteria for determining significant impacts. These criteria were broadened and refined based on input from the Project's cooperating agencies regarding other key resource concerns as follows:

1. Maximizes the use of appropriate (e.g., non-underground-only) existing designated utility corridors by locating within or paralleling areas of existing utility ROWs.
2. Minimizes the need for plan amendments through conformance to land use plans.
3. Avoids or minimizes resource impacts that are regulated by law (ESA, CWA, Clean Air Act [CAA], NHPA, Wilderness, WSAs, ISAs, IRAs, etc.), after consideration of project design features and agency BMPs. This includes impacts to greater sage-grouse.
4. Avoids or minimizes proximity to private residences and residential areas, thereby addressing concerns with public health and safety, aesthetics, visual effects, and others.
5. Avoids or minimizes resource impacts that demonstrate potentially unavoidable adverse impacts (residual impacts) after consideration of project design features and agency BMPs, even though they may not be specifically regulated by law.
6. Minimizes use of private lands, assuming natural resource impacts are more or less similar.
7. If multiple alternatives meet the preceding criteria, the agency preferred alternative would be the alternative that minimizes construction, operation, and maintenance expense and/or time.

Although these criteria have guided the agency preferred alternative selection process, trade-offs between items on the list occur. Parameters were established to define priorities to determine which alternatives best fulfill the criteria. These parameters are listed below and reflected in the summary tables that follow with the corresponding number/letter.

1. Existing designated utility corridors
    a. Distance within designated utility corridor (by BLM, USFS, and total)
2. Land use plan conformance
    a. Location and reason for plan amendment (by BLM, USFS, and total)
3. Resource impacts regulated by law
    a. Greater sage-grouse: amount of core habitat crossed and active leks within 4 miles
    b. Special status raptors: number of nests within 1 mile
    c. Canada Lynx: amount of habitat crossed
    d. USFWS critical desert tortoise: amount of habitat crossed
    e. Utah prairie dog: amount of habitat crossed
4. Public health and safety concerns
    a. Number of residences within 500 feet
    b. Adjacent communities within project corridor

5. Resource impacts not regulated by law
    a. Wildlife: amount of habitat crossed (by BLM, USFS, and total)
    b. Number of raptor nests within 1 mile
    c. Listing of areas of visual and recreation importance: adjacent areas of higher viewer sensitivity and large undeveloped landscapes crossed
    d. Historic Trails: count crossed and amount within 2 miles of trails
    e. LWCs and IRAs: amount crossed and context of crossing
    f. Greenfield construction: amount crossed
6. Minimal use of private lands
    a. Jurisdiction: amount crossed (by BLM, USFS, private)
7. Expense
    a. Total miles: more miles equate to more expense
    b. Miles of helicopter only construction areas crossed (based on ground constraints)

2.8.2 Summary of Impacts by Region and Alternative

A summary of impacts to the Project's action alternatives as described in Chapter 3.0 is provided by Project region in **Tables 2-23** through **2-26**. The alternative segments comprising the agency preferred alternative are highlighted in gray to facilitate comparison with the other action alternative segments. **Table 2-27** compares the applicant proposed route with the agency preferred route on a Project-wide basis (sum of impact parameters across the four Project regions).

Table 2-23 Summary of Impacts for Region I

Resource	Resource Topic	Alternative I-A	Alternative I-B	Alternative I-C	Alternative I-D
Region I					
Climate and Air					
	Fugitive Dust Emissions (particulate matter[PM] with an aerodynamic diameter of 10 microns or less [PM_{10}])	119.2 tons	121.2 tons	143.1 tons	130.6 tons
Geology					
	Geologic Hazards Risk	No faults, low landslide, low subsidence.	Same as Alternative I-A	Same as Alternative I-A except for historic coal mining areas posing increased risk of subsidence.	Same as Alternative I-A
	Mineral Resource Access	7 oil and gas fields crossed.	12 oil and gas fields crossed.	8 oil and gas fields crossed. No potential coal lease tracts are crossed.	7 oil and gas fields crossed.
	Paleontological Resources Loss	92 miles Potential Fossil Yield Classification (PFYC) Class 5.	111 miles PFYC Class 5.	74 miles PFYC Class 5.	123 miles PFYC Class 5.
Soils					
	Soils – Wind Erodible	231 acres	239 acres	270 acres	238 acres
	Soils – Water Erodible	259 acres	271 acres	301 acres	269 acres
	Soils – Compaction Prone	579 acres	525 acres	947 acres	706 acres
	Soils – limited revegetation potential (LRP)	741 acres	786 acres	558 acres	913 acres
	Soils – Prime Farmland	129 acres	136 acres	293 acres	136 acres
Water					
	Erosion and Sedimentation Direct Effects from Crossings	Two perennial stream crossings	Two perennial stream crossings	19 perennial stream crossings	Four perennial stream crossings
	Impaired Stream Effects from Crossings	Two impaired streams crossed	Two impaired stream crossed	Three impaired stream crossed (seven crossings)	Two impaired stream crossed
	Effects to Water Users from Construction Water Use	116 acre-feet required	119 acre-feet required	139 acre-feet required	128 acre-feet required
	Maximum Road Density Change in Watershed (Hydrographic Unit Code [HUC]10, 300-foot or 100-foot perennial buffer area)	0.10 mile/$mile^2$ (multiple watersheds)	0.10 mile/$mile^2$ (Wolf Creek Watershed)	0.40 mile/$mile^2$ (300 foot: Fourmile Creek Watershed)	0.10 mile/$mile^2$ (multiple watersheds)

Table 2-23 Summary of Impacts for Region I

Resource	Resource Topic	Alternative I-A	Alternative I-B	Alternative I-C	Alternative I-D
Vegetation					
	Vegetation clearing of woody vegetation over 6 feet in height	1 acre of conifer forest, 43 acres of pinyon-juniper, 28 acres of woody riparian and wetlands	1 acres of conifer forest, 45 acres of pinyon-juniper, and 29 acres of woody riparian and wetlands	1 acre of conifer forest, 46 acres of pinyon-juniper, and 23 acres of woody riparian and wetlands	1 acre of conifer forest, 45 acres of pinyon-juniper, and 24 acres of woody riparian and wetlands
Vegetation (Continued)	Wetlands and Riparian Areas impacted by Facilities Construction (acres)	21 acres of greasewood flat, 23 acres of herbaceous wetlands, 16 acres of woody riparian and wetlands	78 acres of greasewood flat, 15 acres of herbaceous wetlands and 17 acres of woody riparian and wetlands	31 acres of greasewood flat, 7 acres of herbaceous wetlands and 19 acres of woody riparian and wetlands	41 acres of greasewood flat, 29 acres of herbaceous wetlands and 15 acres of woody riparian and wetlands
	Wetlands and Riparian Areas impacted by Operations (acres)	6 acres of greasewood flat, 5 acres of herbaceous wetlands, 4 acres of woody riparian and wetlands	17 acres of greasewood flat, 3 acres of herbaceous wetlands and 4 acres of woody riparian and wetlands	8 acres of greasewood flat, 2 acres of herbaceous wetlands, and 5 acres of woody riparian and wetlands	9 acres of greasewood flat, 6 acres of herbaceous wetlands and 3 acres of woody riparian and wetlands
	USFS Management Indicator Species (MIS) Species	Alternative does not cross USFS lands	Alternative does not cross USFS lands	Alternative does not cross USFS lands	Alternative does not cross USFS lands
Special Status Plants					
	Number of USFWS species with known occurrences impacted	0	0	0	0
	Number of USFWS species with potential habitat impacted	1	1	1	1
	Number of BLM sensitive species with known occurrences impacted	3	3	3	3
	Number of BLM sensitive species with potential habitat impacted	22	22	20	22
Wildlife					
(5.a)	Pronghorn crucial winter range (acres) construction/operation	292/80	285/72	767/172	440/102
	Mule deer crucial winter range (acres) construction/operation	319/88	280/69	1,162/280	450/99
	Elk crucial winter range (acres) construction/operation	309/83	401/101	1,342/347	401/101

Table 2-23 Summary of Impacts for Region I

Resource	Resource Topic	Alternative I-A	Alternative I-B	Alternative I-C	Alternative I-D
Wildlife (Continued)	Small game, nongame habitat (acres) construction/operation	5,159/512	5,252/482	6,188/599	5,644/516
	Waterfowl habitat (acres) construction/operation	110/9	90/8	59/7	120/10
(5.b)	Number of raptor nests within 1 mile of the reference line	60	96	149	94
	Number of Important Bird Areas (IBAs) crossed by the 2-mile transmission line corridor	9,708	Powder Rim (9,456 acres)	Muddy Creek Wetlands (2,023 acres)	Powder Rim (11,988 acres) Muddy Creek Wetlands (3,131 acres)
Special Status Wildlife					
	Impacted potential black-footed ferret habitat (acres) construction/operation	150/42	232/55	79/22	180/46
(3.a)	Impacted greater sage-grouse habitat (acres) construction/operation	1,034/280	991/251	1,611/415	991/251
(3.a)	Total number of occupied leks within 4 miles of reference line	41	40	59	47
	Impacted western yellow-billed cuckoo potential habitat (acres) construction/operation	43/4	46/4	41/5	39/3
(3.b)	Number of special status raptor nests within 1 mile of reference line	187	225	330	208
Aquatic Biological Resources					
	Effects on aquatic habitat and species from potential direct and indirect disturbance or water quality changes	2 perennial streams crossed by the 250-foot-wide transmission line ROW; 2 game fish streams crossed by the 250-foot-wide transmission line ROW	2 perennial streams crossed by 250-foot-wide transmission line ROW; 2 game fish streams crossed by the 250-foot-wide transmission line ROW	18 perennial streams crossed by 250-foot-wide transmission line ROW; 6 game fish streams crossed by the 250-foot-wide transmission line ROW	2 perennial streams crossed by 250-foot-wide transmission line ROW; 2 game fish streams crossed by the 250-foot-wide transmission line ROW
	Potential aquatic habitat alteration or loss ($feet^2$)	0	0	3,600	0
	Potential amphibian mortalities from vehicle traffic	155 ROW miles	159 ROW miles	186 ROW miles	171 ROW miles

Table 2-23 Summary of Impacts for Region I

Resource	Resource Topic	Alternative I-A	Alternative I-B	Alternative I-C	Alternative I-D
Special Status Aquatic Resources					
	Effects on habitat and special status species from potential direct disturbance or water quality changes	2 perennial streams with special status aquatic species crossed by 250-foot ROW	2 perennial streams with special status aquatic species crossed by 250-foot ROW	7 perennial streams with special status aquatic species crossed by 250-foot ROW	2 perennial streams with special status aquatic species crossed by 250-foot ROW
		2 streams with federally listed or petitioned aquatic species	2 streams with federally listed or petitioned aquatic species	1 stream with federally listed or petitioned aquatic species	2 streams with federally listed or petitioned aquatic species
	Number of special status aquatic species with potential habitat alteration or loss	0	0	5	0
	Number of watersheds supporting special status aquatic species with increased road densities	2	2	7	2
	Potential direct disturbance on critical habitat for federally listed species	1 acre	1 acre	3 acres	1 acre
Cultural Resources					
	NRHP-listed Sites	0	0	0	0
	NRHP-eligible Sites	19	19	24	19
	Unevaluated Sites	9	8	14	11
	Potential traditional cultural properties (TCPs)	0	1	0	1
	Trail Crossings	Cherokee Trail (1) (contributing)	Cherokee Trail (1) (contributing)	Cherokee Trail (1) (contributing)	Cherokee Trail (3) (non-contributing)
		Overland Trail (1) (contributing)	Overland Trail (1) (contributing)	Overland Trail (1) (contributing)	Overland Trail (1) (contributing)
		Rawlins to Baggs Road (1) (unknown if contributing)	Rawlins to Baggs Road (1) (unknown if contributing)	Rawlins to Baggs Road (3) (1 contributing, 2 unknown)	Rawlins to Baggs Road (1) (unknown if contributing)
	Average Inventory Coverage	14%	9%	9%	35%
	Site Density (sites per 100 acres inventoried)	3	5	4	4.7
	Overall Trail/Road Visibility (within 5-mile viewshed)	92 miles (including the Lincoln Highway)	83 miles (including the Lincoln Highway)	99 miles (including the Lincoln Highway)	101 miles (including the Lincoln Highway)

Table 2-23 Summary of Impacts for Region I

Resource	Resource Topic	Alternative I-A	Alternative I-B	Alternative I-C	Alternative I-D
Visual Resources					
	High Sensitivity Viewers (miles)				
	0–0.5 miles	13	13	73	20
	0.5–2.5 miles	73	64	87	105
	2.5–5 miles	48	57	24	41
	>5 miles	20	25	1	6
	Moderate Sensitivity Viewers (miles)				
	0–0.5 miles	10	15	67	13
	0.5–2.5 miles	53	54	96	68
	2.5–5 miles	44	51	23	62
	>5 miles	47	39	--	29
	Scenic Quality (miles)				
	A	<1	1	<1	1
	B	61	60	94	76
	C	93	98	91	95
	BLM Visual Resource Inventory (VRI) Classifications (miles)				
	Class II	28	40	28	32
	Class III	41	22	60	39
	Class IV	85	97	97	101
	BLM Visual Resource Management (VRM) Classifications (miles)				
	Class II	--	--	--	--
	Class III	72	88	38	85
	Class IV	43	25	45	44
	USFS Scenic Integrity Objective (SIO)/Visual Quality Objective (VQO) Classifications (miles)				
	High Retention	--	--	--	--
	Moderate Partial Retention	--	--	--	--
	Low Modification	--	--	--	--

Table 2-23 Summary of Impacts for Region I

Resource	Resource Topic	Alternative I-A	Alternative I-B	Alternative I-C	Alternative I-D
Visual Resources	Residual Impacts Landscape Scenery (miles)				
(Continued)	High	58	57	52	59
(5.c)	Moderate	53	51	59	62
	Low	44	51	75	51
	Residual Impacts High Sensitivity Viewers (miles)				
	High	7	7	28	10
(5.c)	Moderate	96	93	117	120
	Low	51	60	41	42
	Residual Impacts Moderate Sensitivity Viewers (miles)				
	High	8	12	31	11
	Moderate	38	38	81	38
	Low	109	109	74	122
	BLM VRM USFS SIO/VQO Compliance/Consistency (miles) Before Mitigation				
	Compliant	110	105	82	115
	Non-compliant	5	8	<1	14
	NA	40	46	104	43
	BLM VRM USFS SIO/VQO Compliance/Consistency (miles) After Mitigation				
	Compliant	110	105	82	115
	Non-compliant	5	8	<1	14
	NA	40	46	104	43
Recreation					
	Recreation Area/Site in Region I	250-foot ROW Acres (% of total area)	250-foot ROW Acres (% of total area)	250-foot ROW Acres (% of total area)	250-foot ROW Acres (% of total area)
		2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)
	Rawlins FO				
	BLM dispersed undesignated	1,764 (0.05%)	1,847 (0.08%)	1,350 (0.04%)	2,297 (0.06%)
	recreation areas	78,251 (2.2%)	76,336 (2.2%)	58,224 (1.7%)	94,929 (2.7%)

Table 2-23 Summary of Impacts for Region I

Resource	Resource Topic	Alternative I-A	Alternative I-B	Alternative I-C	Alternative I-D
Recreation (Continued)	Continental Divide National Scenic Trail (CDNST) Special Recreation Management Area (SRMA)	1 mile/5 acres (0.8%)	1 mile/5 acres (0.8%)	1 mile/5 acres (0.8%)	1 mile/5 acres (0.8%)
		191 (31.8%)	191 (31.8%)	191 (31.8%)	191 (31.8%)
	Adobe Town Dispersed Recreation Use Area (DRUA)	N/A	101 (0.4%)	N/A	N/A
			4,420 (1.8%)		
	Little Snake FO				
	BLM dispersed undesignated recreation areas	1,328 (0.1%)	1,217 (0.09%)	770 (0.06%)	1,217 (0.09%)
		51,779 (4.1%)	63,149 (5.0%)	28,639 (2.3%)	63,149 (5.0%)
	South Sand Wash SRMA	N/A	N/A	N/A	N/A
	Juniper Mountain SRMA	N/A	N/A	40 (2.2%)	N/A
				1,437 (80.7%)	
	Serviceberry SRMA	N/A	N/A	0	N/A
				1,462 (11.8%)	
	Little Yampa Canyon SRMA	N/A	N/A	0	N/A
				<1 (0%)	
	BLM White River FO				
	Dispersed, undesignated recreation areas	373 (0.03%)	373 (0.03%)	373 (0.03%)	373 (0.03%)
		13,799 (0.9%)	13,799 (0.9%)	13,799 (0.9%)	13,799 (0.9%)
	Other Federal Recreation Areas				
	Dinosaur National Monument	N/A	N/A	N/A	0
					16 (<0.01%)
	State Recreation Areas				
	Wyoming				
	Red Rim-Daley Wildlife Habitat Management Area (WHMA)	58 (0.2%)	58 (0.2%)	58 (0.2%)	58 (0.2%)
		2,847 (11.3%)	2,847 (11.3%)	2,847 (11.3%)	2,847 (11.3%)
	Upper Muddy Creek Watershed/Grizzly WHMA	N/A	N/A	19 (0.3%)	N/A
				1,015 (1.7%)	

Table 2-23 Summary of Impacts for Region I

Resource	Resource Topic	Alternative I-A	Alternative I-B	Alternative I-C	Alternative I-D
Recreation	Colorado				
(Continued)	Yampa River State Wildlife Area	N/A	N/A	0	N/A
	(SWA)			199 (23.1%)	
	Bitter Brush SWA	N/A	N/A	107 (1.3%)	N/A
				4,921 (61.1%)	
	Raftopolous Hunting Lease	0	N/A	N/A	N/A
		617 (5.4%)			
	Yampa River State Park	1 river crossing; 1 access point	1 river crossing; 0 access points	3 river crossings; 4 access points	1 river crossing 0 access points
	Local Recreation Areas				
	Juniper Hot Springs	N/A	N/A	0	N/A
				Entire Site	
Land Use and Planning					
(6.a)	Federal and State lands and	155 miles total: 74% located on BLM lands; 1% on state lands.	159 miles total: 71% locate don BLM lands; 3% on state lands.	186 miles total: 44 % located on BLM -managed lands; 9% on state lands	171 miles total: 74% located on BLM -managed lands; 3% on state lands.
(1.a)	Use of Designated Utility Corridors	7 miles in BLM RMP utility corridors and 4 miles in WWEC.	18 miles in BLM RMP utility corridors and 37 miles in WWEC.	60 miles in BLM RMP utility corridors and 38 miles in WWEC.	7 miles in BLM RMP utility corridors and 54 miles in WWEC.
	Avoidance/Exclusion areas crossed by reference line	Designated avoidance areas are crossed by the reference line for 1 mile in the Rawlins FO around the Overland Trail and Cherokee Trail areas. No exclusion areas	Same as Alternative I-A.	Designated avoidance areas are crossed by the reference line for 1 mile in the Rawlins FO around the Overland Trail and Cherokee Trail areas and 1 mile of Juniper Mountain.	Designated avoidance areas are crossed by the reference line for 3 miles in the Rawlins FO around the Overland Trail and Cherokee Trail areas.
(6.a)	Private Lands and Zoning	38 miles (25%) located on private land.	41 miles (26%) located on private land. 47 commercial/industrial structures and three outbuildings within 500 feet of the proposed reference line.	86 miles (47%) located on private land. 9 residences and 24 commercial structures within 500 feet of the proposed reference line.	39 miles (23%) would be located on private land. 34 commercial/industrial structures within 500 feet of the proposed reference line.

Table 2-23 Summary of Impacts for Region I

Resource	Resource Topic	Alternative I-A	Alternative I-B	Alternative I-C	Alternative I-D
Land Use and Planning (Continued)		45 commercial/industrial structures within 500 feet of the proposed reference line.	No communities within the 2-mile transmission line corridor.	1 community within the 2-mile transmission line corridor, no identified incompatible land uses within those communities.	No communities within the 2-mile transmission line corridor.
		No communities within the 2-mile transmission line corridor.			
(5.f)	Greenfield	93 miles (60%)	91 miles (57%)	88 miles (47%)	109 miles (64%)
	Agriculture	19 acres of initial clearing, 14 acres of construction disturbance, and four acres of permanent removal of croplands.	27 acres of initial clearing, 18 acres of construction disturbance, and 5 acres of permanent removal of croplands.	357 acres of initial clearing, 255 acres of construction disturbance, and 68 acres of permanent removal of croplands.	27 acres of initial clearing, 18 acres of construction disturbance, and five acres of permanent removal of croplands.
	Livestock Grazing	Construction impacts 5,159 acres (258 animal unit months [AUMs]); Operation impacts 501 acres (25 AUMs)	Construction impacts 5,268 acres (263 AUMs); Operation impacts 477 acres (24 AUMs)	Construction impacts 4,949 acres (247 AUMs); Operation impacts 452 acres (23 AUMs)	Construction impacts 5,655 acres (263 AUMs); Operation impacts 505 acres (25 AUMs)
Special Designation Areas					
	Rawlins FO	Approximately 0.2 mile of reference line (5 acres of 250-foot-wide transmission line ROW) would be located within the CDNST SRMA. This is less than 1 percent of the SRMA. The 2-mile transmission line corridor encompasses 181 acres of the CDNST SRMA, 68 percent of the SRMA.	Same as Alternative I-A	Same as Alternative I-A	Same as Alternative I-A
	NPS	16 acres of entrance road to Dinosaur National Monument within 2-mile corridor; presence of construction equipment, personnel, or traffic could reduce the quality of site visitation during construction.	Same as Alternative I-A	Same as Alternative I-A	Same as Alternative I-A

Table 2-23 Summary of Impacts for Region I

Resource	Resource Topic	Alternative I-A	Alternative I-B	Alternative I-C	Alternative I-D
Special Designation Areas (Continued)		1 segment of the CDNST would be crossed. 4 acres within the 250-foot ROW and 179 acres with the 2-mile corridor. Impacts to the trail itself would be minimized by the placement of the transmission line ROW within a designated overhead utility corridor; towers would be placed to avoid surface disturbance near the actual trail.	Same as Alternative I-A	Same as Alternative I-A	Same as Alternative I-A
(5.d)	NHTs	1 contributing segment of the Overland Trail Crossed. Visible along 9 miles of trail, 5 of which are contributing.	1 contributing segment of the Overland Trail Crossed. Visible along 10 miles of trail, 4 of which are contributing.	1 contributing segment of the Overland Trail Crossed. Visible along 7 miles of trail, 6 of which are contributing.	1 contributing segment of the Overland Trail Crossed. Visible along 9 miles of trail, 4 of which are contributing.
		1 contributing segment of the Cherokee Trail Crossed. Visible along 24 miles of trail, 10 of which are contributing.	1 contributing segment of the Cherokee Trail Crossed. Visible along 9 miles of trail, 4 of which are contributing	1 contributing segment of the Cherokee Trail Crossed. Visible along 11 miles of trail, 4 of which are contributing	1 contributing segment of the Cherokee Trail Crossed. Visible along 28 miles of trail, 10 of which are contributing
Transportation					
	Total Miles of New Permanent Access Roads	227 miles	223 miles	269 miles	242 miles
	(Beneficial effect is highest for the highest number of miles)				
	Total Miles of Steep and Mountainous Terrain	66	39	67	41
	Road Crossings	4	4	5	4
	Railroad Crossings	0	0	3	0
	Center Line Passing Through Public Land (miles)	117	118	100	133

Table 2-23 Summary of Impacts for Region I

Resource	Resource Topic	Alternative I-A	Alternative I-B	Alternative I-C	Alternative I-D
Transportation (Continued)	Center Line Passing Through Private Land (miles)	38	41	86	39
	Number of Airports within 5 Miles	2	2	6	2
	Military Operations Areas (MOAs) within 20 Miles	0	0	0	0
	MOAs with 250-foot-wide Transmission Line ROW Overlap	0	0	0	0
Socioeconomics					
	Short-term Socioeconomic effects	Temporary increases in local employment, demand on temporary housing, and public facilities and services.	Comparable to Alternative I-A.	Comparable to Alternative I-A.	Comparable to Alternative I-A.
		Temporary increases in sales, use and lodging taxes.	Slightly higher economic effects due to increased length and cost of power line.	Up to 20% higher economic effects due to increased length and cost of power line.	Up to 15% higher economic effects due to increased length and cost of power line.
		Effects concentrated in the Rawlins area, due to development of the northern terminal, ground electrode and the transmission line. Effects associated with terminal would be of longer duration	Essentially the same as Alternative I-A	Effects more focused in Colorado (Craig area) and some impact shifting in Wyoming (from Wamsutter to Baggs and Dixon) than under Alternative I-A	Comparable to Alternative I-A, with some shifts in Wyoming, from Wamsutter to Baggs and Dixon.
		Effects to agriculture primarily associated with limited temporary reductions of grazing on public lands.	Comparable to Alternative I-A	Less effect on livestock grazing on public lands, higher potential effects on irrigated farming and ranching.	Comparable to Alternative I-A
	Long-term socioeconomic effects	Little long-term effects on employment, population, housing need or public services.	Essentially the same as Alternative I-A	Essentially the same as Alternative I-A, with some geographic redistribution between Colorado and Wyoming.	Essentially the same as Alternative I-A

Table 2-23 Summary of Impacts for Region I

Resource	Resource Topic	Alternative I-A	Alternative I-B	Alternative I-C	Alternative I-D
Socioeconomics (Continued)		Substantial ad valorem taxes paid; primarily to Carbon County and Carbon County School District #1 (WY), with lesser revenues to Sweetwater (WY), Moffat County (CO), and other taxing jurisdictions.	Essentially the same as Alternative I-A	Essentially the same as Alternative I-A	Essentially the same as Alternative I-A
		Limited effects on property values, social values, and limited conflicts with outdoor recreation. Limited private land and existing energy resource development in proximity to much of the ROW.	Comparable to Alternative I-A	Higher potential social effects due to proximity to private lands and visibility from highways.	Comparable to Alternative I-A
		Federal government and other lessors gain ROW rental/lease income.	Essentially the same as Alternative I-A	Slightly higher than Alt. I-A due to increased length of the ROW.	Slightly higher than Alt. I-A due to increased length of the ROW.
		No Environmental Justice concerns, although facilities are located near the Wyoming State Penitentiary.	Same as Alternative I-A	Same as Alternative I-A	Same as Alternative I-A
Health and Safety					
	Serious injuries to workers and the public at-large	Workers during construction and operation may be injured by heavy equipment, working at heights, working in the vicinity of high voltage equipment, as well as from typical hazards found on a construction site. The workers and the public may be injured by fire as well as downed power lines.	Same as Alternative I-A	Same as Alternative I-A	Same as Alternative I-A

Table 2-23 Summary of Impacts for Region I

Resource	Resource Topic	Alternative I-A	Alternative I-B	Alternative I-C	Alternative I-D
Health and Safety (Continued)	Adverse health impacts from electric and magnetic fields (EMF), stray voltage, and induced voltage associated with transmission lines.	Three outbuildings and 11 commercial/industrial structures would be within 200 feet of the reference line, resulting in potential impacts from EMF, stray voltage, and induced voltage.	Seven outbuildings and 9 commercial/industrial structures would be within 200 feet of the reference line, resulting in the potential for slightly greater impacts from EMF, stray voltage, and induced current than Alternative I-A.	Eleven outbuildings and 24 commercial/ industrial structures would be within 200 feet of the reference line, resulting in the potential for greater impacts from EMF, stray voltage, and induced current than Alternative I-A.	Three outbuildings and 39 commercial/industrial structures would be within 200 feet of the reference line, resulting in the potential for greater impacts from EMF, stray voltage, and induced current than Alternative I-A.
(4.a) (4.b)	Noise impacts to nearby communities and residences	There would be no communities within the 2-mile transmission line corridor and no residential structures within 500 or 200 feet of the reference line, resulting in negligible impacts from noise with this alternative.	There would be no communities within the 2-mile transmission line corridor and no residential structures within 500 or 200 feet of the reference line, resulting in impacts from noise that are similar to Alternative I-A.	There would be one community within the 2-mile transmission line corridor and nine residential structures within 500 feet of the reference line, resulting in impacts from noise that are greater than Alternative I-A.	There would be no communities within the 2-mile transmission line corridor and no residential structures within 500 or 200 feet of the reference line, resulting in impacts from noise that are similar to Alternative I-A.
Wild Horses					
	Temporary and permanent loss of forage areas	407 acres of 250-foot-wide transmission line ROW within the Adobe Town Herd Management Area (HMA) (0.1% of the HMA). 174 acres of temporary disturbance, 47 acres permanent. 244 acres of 250-foot-wide transmission line ROW within the Sand Wash Basin HMA (0.1% of the HMA). 110 acres of temporary disturbance, 30 acres permanent.	499 acres of 250-foot-wide transmission line ROW within the Adobe Town HMA (0.1% of the HMA). 218 acres of temporary disturbance, 48 acres permanent. No acres of 250-foot-wide transmission line ROW within the Sand Wash Basin HMA. 2 acres of temporary disturbance, 1 acre permanent.	N/A	36 acres of 250-foot-wide transmission line ROW within the Adobe Town HMA (<0.1% of the HMA). 26 acres of temporary disturbance, 5 acres permanent. No acres of 250-foot-wide transmission line ROW within the Sand Wash Basin HMA. 2 acres of temporary disturbance, 1 acre permanent.

Table 2-23 Summary of Impacts for Region I

Resource	Resource Topic	Alternative I-A	Alternative I-B	Alternative I-C	Alternative I-D
Wild Horses (Continued)	Temporary construction noise and human activity	17,248 acres of 2-mile transmission line corridor within the Adobe Town HMA (3.6% of HMA). 8,163 acres of 2-mile transmission line corridor within the Sand Wash Basin HMA (5.2% of the HMA).	20,948 acres of 2-mile transmission line corridor within the Adobe Town HMA (4.4% of HMA). 695 acres of 2-mile transmission line corridor within the Sand Wash Basin HMA (0.4% of the HMA).	N/A	4,038 acres of 2-mile transmission line corridor within the Adobe Town HMA (0.9% of HMA). 695 acres of 2-mile transmission line corridor within the Sand Wash Basin HMA (0.4% of the HMA).
	Presence of transmission line within HMAs/herd areas (HAs) restrict helicopter use during wild horse gathers	13 miles of transmission line within the Adobe Town HMA. 8 miles of transmission line within the Sand Wash Basin HMA.	17 miles of transmission line within the Adobe Town HMA. No miles of transmission line within the Sand Wash Basin HMA.	N/A	One mile of transmission line within the Adobe Town HMA. No miles of transmission line within the Sand Wash Basin HMA.
Lands with Wilderness Characteristics (LWC)					
(5.e)	Number of LWC Units Affected	8	9	2	8
(5.e)	Number (acres) of LWC Units Eliminated	1 (5,356)	2 (11,699)	0	2 (11,699)
(5.e)	Number (acres) of LWC Units Remaining	7 (46,188)	7 (50,202)	2 (20,412)	6 (44,108)
(5.e)	Number (acres) of Unit Portions Eliminated	7 (6,693)	8 (8,211)	2 (3,676)	7 (8,200)
Plan Amendments					
(2.a)	Location, length, and reason for plan amendment	RFO (58 miles)—expand existing and designate new utility corridor LSFO (42 miles)—new utility corridor	RFO (61 miles)—expand existing and convert/expand underground-only ROW LSFO (37 miles)—new utility corridor	RFO (27 miles)—expand existing utility corridors	RFO (76 miles)—expand existing and designate new utility corridor LSFO (37 miles)—new utility corridor

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Region II							
Climate and Air Quality							
	Fugitive Dust Emissions (PM_{10})	205.6 tons	272.4 tons	282.4 tons	210.2 tons	212.9 tons	211.0 tons
Geology							
	Geologic Hazards Risk	Three active faults crossed. Moderate risk for ground motion. Moderate to high risk for landslide impacts. Low to moderate risk for ground subsidence.	Four active faults crossed. Same as Alternative II-A, except increased risk for subsidence due to active and historic underground coal mining.	Five active faults crossed. Same as Alternative II-A.	Two active faults crossed. Moderate risk for ground motion. Moderate to high risk for landslide impacts. Increased risk for subsidence due to historic coal mining.	Two active faults crossed. Moderate risk for ground motion. Moderate to high risk for landslide impacts.	Same as Alternative II-D.
		6 oil and gas fields crossed. Encroaches on propose coal mine permit area, Deserado Mine.	15 oil and gas fields crossed. Approximately 15.0 miles of active coal mine permit areas.	15 oil and gas fields crossed. Approximately 3.0 miles of active coal mine permit areas.	5 oil and gas fields crossed. Approximately 5 miles of active coal mine permit areas.	5 oil and gas fields crossed. Encroaches on proposed coal mine permit area, Deserado Mine.	7 oil and gas fields crossed. Encroaches on proposed coal mine permit area, Deserado Mine.
	Paleontological Resources Loss	120 miles PFYC Class 5.	74 miles PFYC Class 5.	77 miles PFYC Class 5.	129 miles PFYC Class 5.	113 miles PFYC Class 5.	156 miles PFYC Class 5.
Soils							
	Soils – Wind Erodible	247 acres	152 acres	167 acres	280 acres	247 acres	210 acres
	Soils – Water Erodible	194 acres	580 acres	612 acres	252 acres	246 acres	257 acres
	Soils – Compaction Prone	1,214 acres	2,013 acres	1,929 acres	1,317 acres	1,137 acres	1,361 acres
	Soils – LRP	1,092 acres	1,921 acres	2,351 acres	1,018 acres	1,045 acres	1,247 acres
	Soils – Prime Farmland	347 acres	413 acres	484 acres	279 acres	278 acres	178 acres
Water							
	Erosion and Sedimentation Direct Effects from Crossings	19 perennial stream crossings	26 perennial stream crossings	24 perennial stream crossings	17 perennial stream crossings	40 perennial stream crossings	27 perennial stream crossings
	Impaired Stream Effects from Crossings	Four impaired streams crossed	Three impaired stream crossed (39 crossings)	Five impaired streams crossed (41 crossings)	One impaired stream crossed	Five impaired streams crossed (23 crossings)	Three impaired streams crossed (7 crossings)

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Water (Continued)	Effects to Water Users from Construction Water Use	192 acre-feet required	258 acre-feet required	272 acre-feet required	195 acre-feet required	199 acre-feet required	199 acre-feet required
	Maximum Road Density Change in Watershed (HUC10, 300-foot or 100-foot perennial buffer area)	0.5 mile/mile^2 (300 feet: Currant Creek Watershed) (0.27 mile/mile^2 (100 feet: Soldier Creek Watershed)	1.33 mile/mile^2 (100 feet: West Salt Creek Watershed)	1.33 mile/mile^2 (100 feet: West Salt Creek Watershed)	0.67 mile/mile^2 (300 feet: Coyote Wash Watershed)	3.74 mile/mile^2 (300 feet: Antelope Creek Watershed)	0.67mile/mile^2 (300 feet: Coyote Wash Watershed)
Vegetation							
	Vegetation clearing of woody vegetation over 6 feet in height	165 acres of aspen forest and woodland, 68 acres of conifer forest, 29 acres of deciduous forest, 732 acres of pinyon-juniper, and 53 acres of woody riparian and wetlands	149 acres of aspen forest and woodland, 150 acres of conifer forest, 956 acres of pinyon-juniper, and 36 acres of woody riparian and wetlands	49 acres of aspen forest and woodland, 34 acres of conifer forest, 1,026 acres of pinyon-juniper, and 30 acres of woody riparian and wetlands	270 acres of aspen forest and woodland, 124 acres of conifer forest, 727 acres of pinyon-juniper, and 15 acres of woody riparian and wetlands	65 acres of aspen forest and woodland, 82 acres of conifer forest, 4 acres of deciduous forest, 894 acres of pinyon-juniper, and 34 acres of woody riparian and wetlands	162 acres of aspen forest and woodland, 191 acres of conifer forest, 4 acres of deciduous forest, 865 acres of pinyon-juniper, and 15 acres of woody riparian and wetlands
	Wetlands and Riparian Areas impacted by Facilities Construction (acres)	152 acres of greasewood flat, 12 acres of herbaceous wetlands, and 38 acres of woody riparian and wetlands	506 acres of greasewood flat, 8 acres of herbaceous wetlands and 27 acres of woody riparian and wetlands	538 acres of greasewood flat, 6 acres of herbaceous wetlands and 26 acres of woody riparian and wetlands	215 acres of greasewood flat, 15 acres of herbaceous wetlands and 12 acres of woody riparian and wetlands	176 acres of greasewood flat, 35 acres of herbaceous wetlands, and 28 acres of woody riparian and wetlands	212 acres of greasewood flat, 16 acres of herbaceous wetlands, and 16 acres of woody riparian and wetlands
	Wetlands and Riparian Areas impacted by Operations (acres)	36 acres of greasewood flat, 3 acres of herbaceous wetlands, and 11 acres of woody riparian and wetlands	119 acres of greasewood flat, 2 acres of herbaceous wetlands and 7 acres of woody riparian and wetlands	129 acres of greasewood flat, 2 acres of herbaceous wetlands and 8 acres of woody riparian and wetlands	53 acres of greasewood flat, 4 acres of herbaceous wetlands and 4 acres of woody riparian and wetlands	41 acres of greasewood flat, 8 acres of herbaceous wetlands and 9 acres of woody riparian and wetlands	54 acres of greasewood flat, 1 acre of herbaceous wetlands, and 7 acres of woody riparian and wetlands
	USFS MIS Species	Alternative does not cross USFS Fishlake National Forest	Based on elevation, there is no potential habitat for this species within the USFS Fishlake National Forest.	Potential habitat would be possible based on substrate, elevation, and vegetation parameters. The population has historically been found to be stable and viable across the USFS Fishlake National Forest.	Alternative does not cross USFS Fishlake National Forest.	Alternative does not cross USFS Fishlake National Forest.	Based on elevation, there is no potential habitat for this species within the USFS Fishlake National Forest.

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Special Status Plants							
	Number of USFWS species with known occurrences impacted	2	1	2	3	4	5
	Number of USFWS species with potential habitat impacted	6	8	9	6	5	8
	Number of BLM sensitive species with known occurrences impacted	6	12	17	9	11	10
	Number of BLM sensitive species with potential habitat impacted	29	36	43	32	32	34
	Number of USFS sensitive species with known occurrences impacted	0	1	2	2	2	2
	Number of USFS sensitive species with potential habitat impacted	3	7	7	7	6	9
Wildlife							
(5.a)	Pronghorn crucial winter range (acres) Construction/operation	731/219	1,274/303	1,086/264	1,275/354	768/192	1,047/284
	Mule deer crucial winter range (acres) construction/operation	1,041/362	836/275	943/254	823/265	1,072/371	803/282
	Elk crucial winter range (acres) construction/operation	1,102/408	927/283	979/273	808/279	1,565/591	937/573
	Moose occupied habitat (acres) construction/operation	222/72	311/125	0/0	790/256	432/143	710/255

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Wildlife (Continued)	Rocky Mountain or desert bighorn sheep (acres) construction/operation	RMBS 14/6	DBS 23/5	DBS 26/6	RMBS 151/45	RMBS 3/2	RMBS 147/41
	Small game, nongame habitat (acres) construction/operation	8,613/1,110	11,436/1,350	12,093/1,252	8,876/1,166	8,846/1,125	9,169/1,327
	Waterfowl habitat (acres) construction/operation	131/17	94/11	96/12	64/9	157/18	54/10
(5.b)	Number of raptor nests within 1 mile of the reference line	99	107	99	139	101	117
	Number of IBAs crossed by the 2-mile transmission line corridor	Upper Strawberry Watershed (UT12) (1,399 acres)	0	0	0	0	0
	Number of MIS species whose habitat is crossed by alternative[2]	1	9	8	2	3	10
Special Status Wildlife							
	Impacted black-footed ferret habitat (acres) construction/operation	217/53	67/15	122/27	201/51	254/63	201/51
(3.a)	Impacted greater sage-grouse habitat (acres) construction/operation	2,664/747	750/248	195/49	2,385/659	2,924/744	1,432/388
	Number of occupied leks within 4 miles of reference line	7	0	0	10	10	15
	Impacted western yellow-billed cuckoo potential habitat (acres) construction/operation	90/12	63/7	56/8	26/4	62/9	32/7

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Special Status Wildlife (Continued) (3.c)	Impacted Canada lynx potential habitat (acres) construction/operation	120/20	287/54	63/9	243/43	158/26	418/91
(3.e)	Impacted Utah prairie dog potential habitat (acres) construction/operation	0/0	Same as Alternative II-A	179/33	Same as Alternative II-A	Same as Alternative II-A	Same as Alternative II-A
(3.b)	Number of special status raptor nests within 1 mile of the reference line[2]	129	154	124	250	156	200
Aquatic Biological Resources							
	Effects on aquatic habitat and species from potential direct and indirect disturbance or water quality changes	26 perennial streams crossed by 250-foot-wide transmission line ROW; 14 game fish streams crossed by the 250-foot-wide ROW	27 perennial streams crossed by 250-foot-wide transmission line ROW; 11 game fish streams crossed by the 250-foot-wide transmission line ROW	29 perennial streams crossed by 250-foot-wide transmission line ROW; 13 game fish streams crossed by the 250-foot-wide transmission line ROW	26 perennial streams crossed by 250-foot-wide transmission line ROW; 17 game fish streams crossed by the 250-foot-wide transmission line ROW	39 perennial streams crossed by 250-foot-wide transmission line ROW; 13 game fish streams crossed by the 250-foot-wide transmission line ROW	30 perennial streams crossed by 250-foot-wide transmission line ROW; 12 game fish streams crossed by the 250-foot-wide transmission line ROW
	Potential aquatic habitat alteration or loss (feet[2])	10,000	19,600	22,000	7,200	17,600	7,200
	Potential amphibian mortalities from vehicle traffic	257 ROW miles	345 ROW miles	365 ROW miles	262 ROW miles	266 ROW miles	267 ROW miles
Special Status Aquatic Resources							
	Effects on habitat and special status species from potential direct disturbance or water quality changes	12 perennial streams with special status aquatic species crossed by 250-foot ROW	8 perennial streams with special status aquatic species crossed by 250-foot ROW	11 perennial streams with special status aquatic species crossed by 250-foot ROW	7 perennial streams with special status aquatic species crossed by 250-foot ROW	13 perennial streams with special status aquatic species crossed by 250-foot ROW	11 perennial streams with special status aquatic species crossed by 250-foot ROW
		1 stream with federally listed or petitioned aquatic species	2 streams with federally listed or petitioned aquatic species	2 streams with federally listed or petitioned aquatic species	2 streams with federally listed or petitioned aquatic species	1 stream with federally listed or petitioned aquatic species	2 streams with federally listed or petitioned aquatic species

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
SS Aquatic Resources (Continued)	Number of special status aquatic species with potential habitat alteration or loss	12	7	5	5	7	5
	Number of watersheds supporting special status aquatic species with increased road densities	13	9	10	8	12	11
	Potential direct disturbance on critical habitat for federally listed species[1]	4 acres	7 acres	7 acres	7 acres	4 acres	7 acres
Cultural Resources							
	NRHP-listed Sites	0	1	1	0	0	0
	NRHP-eligible Sites	13	48	45	26	17	20
	Unevaluated Sites	0	17	24	3	0	3
	Potential TCPs	1	8	10	4	1	4
	Trail Crossings	Old Spanish Trail (0)	Old Spanish Trail (4) (1 NHT II, 1 NHT III, 2 NHT V)	Old Spanish Trail (9) (1 NHT II, 1 NHT III, 3 NHT IV, 4 not categorized)	Old Spanish Trail (0)	Old Spanish Trail (0)	Old Spanish Trail (0)
	Average Inventory Coverage	20%	19%	23%	19%	18%	22.4%
	Site Density (sites per 100 acres inventoried)	0.12	0.25	0.5	0.1	0.67	0.09
	Overall Trail Visibility (within 5-mile viewshed)	0 miles	58 miles	107 miles	0 miles	0 miles	0 miles
Visual Resources							
	High Sensitivity Viewers						
	0–0.5 miles	78	94	90	50	84	74
	0.5–2.5 miles	127	196	214	116	125	128
	2.5–5 miles	35	38	48	50	35	31
	>5 miles	18	15	10	45	22	34

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Visual	Moderate Sensitivity Viewers						
Resources	0–0.5 miles	72	169	206	72	71	88
(Continued)	0.5–2.5 miles	132	145	141	104	118	103
	2.5–5 miles	44	29	15	47	50	33
	>5 miles	9	--	--	39	27	42
	Scenic Quality (miles)						
	A	<1	1	2	25	10	44
	B	139	131	124	98	135	102
	C	118	213	237	139	121	119
	BLM VRI Classifications (miles)						
	Class II	9	19	22	40	31	66
	Class III	33	49	64	62	45	23
	Class IV	111	243	242	138	113	138
	BLM VRM Classifications (miles)						
	Class II	--	5	5	2	--	2
	Class III	48	135	159	50	44	39
	Class IV	51	66	55	94	56	83
	USFS SIO/VQO Classifications (miles)						
	High Retention	<1	3	9	<1	<1	4
	Moderate Partial Retention	21	18	20	8	23	14
	Low Modification	--	--	--	--	--	--
	Residual Impacts Landscape Scenery (miles)						
	High	97	96	84	103	108	127
(5.c)	Moderate	78	133	143	98	98	68
	Low	82	115	137	61	60	70
	Residual Impacts High Sensitivity Viewers (miles)						
	High	61	42	3	46	67	71
(5.c)	Moderate	117	234	247	142	138	123
	Low	80	66	81	73	62	73

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Visual	Residual Impacts Moderate Sensitivity Viewers (miles)						
Resources	High	55	83	111	49	49	61
(Continued)	Moderate	93	182	184	101	100	105
	Low	109	78	68	111	117	101
	BLM VRM USFS SIO/VQO Compliance/Consistency (miles) Before Mitigation						
	Compliant	116	176	182	143	122	130
	Non-compliant	4	51	66	11	2	12
	NA	137	118	117	108	143	125
	BLM VRM USFS SIO/VQO Compliance/Consistency (miles) After Mitigation						
	Compliant	117	214	217	146	122	133
	Non-compliant	3	13	31	8	1	8
	NA	137	118	117	108	143	25
Recreation							
	Recreation Area/Site in Region II	250-foot-wide ROW Acres (% of total area)	250-foot-wide ROW Acres (% of total area)	250-foot-wide ROW Acres (% of total area)	250-foot-wide ROW Acres (% of total area)	250-foot-wide ROW Acres (% of total area)	250-foot-wide ROW Acres (% of total area)
		2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)
	BLM White River FO						
	Dispersed, undesignated	587 (0.04%)	1,389 (<0.1%)	1,389 (<0.1%)	587 (0.04%)	587 (0.04%)	587 (0.04%)
	recreation areas	22,827 (1.6%)	57,802 (4.0%)	57,802 (4.0%)	22,908 (1.6%)	22,908 (1.6%)	22,908 (1.6%)
	BLM Grand Junction FO						
	Dispersed, undesignated	N/A	600 (0.05%)	600 (0.05%)	N/A	N/A	N/A
	recreation areas		32,592 (2.5%)	32,592 (2.5%)			
	BLM Moab FO						
	Dispersed, undesignated	N/A	1,806 (0.2%)	1,806 (0.2%)	N/A	N/A	N/A
	recreation areas		69,181 (5.8%)	69,181 (5.8%)			
	Labyrinth Canyon/Gemini	N/A	75 (0.02%)	75 (0.02%)	N/A	N/A	N/A
	Bridges SRMA		4,087 (1.4%)	4,087 (1.4%)			
	Utah Rims SRMA	N/A	0	0	N/A	N/A	N/A
			925 (6.0%)	925 (6.0%)			

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Recreation	BLM Vernal FO						
(Continued)	Dispersed, undesignated	1,113 (0.07%)	168 (0.01%)	168 (0.01%)	2,337 (0.2%)	1,133 (0.07%)	2,494 (0.2%)
	recreation areas	38,850 (2.5%)	5,151 (0.3%)	5,151 (0.3%)	89,284 (5.7%)	42,226 (2.7%)	92,872 (6%)
	Fantasy Canyon SRMA	N/A	N/A	N/A	0	N/A	0
					54 (78.3%)		54 (78.3%)
	Nine Mile Canyon SRMA	N/A	N/A	N/A	0	N/A	0
					1,456 (3.3%)		1,453 (3.3%)
	BLM Price FO						
	Dispersed, undesignated	N/A	1,684 (0.1%)	1,709 (0.1%)	186 (0.01%)	5 (0%)	N/A
	recreation areas		68,221 (5%)	68,157 (5%)	10,385 (0.8%)	66 (0.03%)	
	Labyrinth Canyon SRMA	N/A	3 (0.02%)	3 (0.02%)	N/A	N/A	N/A
			154 (0.4%)	154 (0.4%)			
	San Rafael Swell SRMA	N/A	N/A	180 (0.02%)	N/A	N/A	N/A
				10,589 (1.1%)			
	BLM Richfield FO						
	Dispersed, undesignated recreation areas	38 (0%)	140 (0.01%)	436 (0.03%)	41 (0%)	38 (0%)	38 (0%)
		1,378 (0.1%)	5,821 (0.5%)	16,284 (1.3%)	1,574 (0.1%)	1,378 (0.1%)	1,378 (0.1%)
	BLM Salt Lake FO						
	Dispersed, undesignated recreation areas	3 (0%)	N/A	N/A	N/A	5 (0%)	108 (0%)
		323 (0.02%)				1,675 (0.05%)	2,489 (0.08%)
	BLM Fillmore FO						
	Dispersed, undesignated recreation areas	1,257 (0.03%)	504 (0.01%)	523 (0.01%)	1,261 (0.03%)	1,261 (0.03%)	524 (0.01%)
		49,166 (1.1%)	21,815 (0.5%)	18,657 (0.4%)	48,833 (1.1%)	48,833 (1.1%)	22,245 (0.5%)
	Little Sahara Recreation	183 (0.3%)	N/A	N/A	183 (0.3%)	183 (0.3%)	N/A
	Area (RA)	5,974 (10%)			5,974 (10%)	5,974 (10%)	

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Recreation	USFS Recreation Areas						
(Continued)	Recreation Area	250-foot-wide ROW Acres (% of total area)	250-foot-wide ROW Acres (% of total area)	250-foot-wide ROW Acres (% of total area)	250-foot-wide ROW Acres (% of total area)	250-foot-wide ROW Acres (% of total area)	250-foot-wide ROW Acres (% of total area)
	ROS	2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)
	Ashley National Forest						
	Rural	N/A	N/A	N/A	N/A	N/A	N/A
	Roaded Modified	N/A	N/A	N/A	N/A	N/A	N/A
	Roaded Natural	N/A	N/A	N/A	10 (<0.01%)	300 (0.07%)	40 (<0.01%)
					884 (0.2%)	7,863 (1.7%)	2,118 (0.5%)
	Semi-Primitive Motorized	N/A	N/A	N/A	1 (0%)	0	1 (0%)
					2,629 (0.9%)	1,822 (0.6%)	2,629 (0.9%)
	SPM Within IRA	N/A	N/A	N/A	*0*	*0*	*1*
					2,263 (0.9%)	*1,822 (0.6%)*	*2,623 (0.9%)*
	Remainder in SPM ROS	N/A	N/A	N/A	*0*	*0*	*0*
					6 (<0.01%)	*0*	*6*
	Semi-Primitive Non-	*N/A*	*N/A*	*N/A*	0	0	0 (<0.01%)
	motorized				630 (0.2%)	5,802 (1.6%)	*649 (0.2%)*
	SPNM Within IRA	*N/A*	*N/A*	*N/A*	*0*	*0*	*0*
					630 (0.2%)	*5,784 (1.5%)*	*649 (0.2%)*
	Remainder in SPNM ROS	*N/A*	*N/A*	*N/A*	*N/A*	*0*	N/A
						18 (<0.01%)	
	Primitive	N/A	N/A	N/A	N/A	N/A	N/A
	Unknown/Private	N/A	N/A	N/A	N/A	N/A	N/A
	Total	NA	NA	NA	11	300	41
					4,143	15,487	5,396
	Uinta National Forest						
	Rural	0	N/A	N/A	N/A	N/A	N/A
		23 (1.4%)					

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Recreation (Continued)	Roaded Modified	160 (0.2%)	N/A	N/A	0	242 (0.3%)	242 (0.3%)
		4,475 (5.3%)			31 (0.04%)	4,929 (5.8%)	4,929 (5.8%)
	Roaded Natural	286 (0.1%)	N/A	N/A	0	0	31 (0.01%)
		7,904 (2.9%)			17 (0.01%)	648 (0.2%)	1,104 (0.4%)
	Semi-Primitive Motorized	97 (<0.1%)	N/A	N/A	N/A	0	17 (<0.01%)
		11,800 (3.3%)				4,752 (1.3%)	4,988 (1.4%)
	SPM Within IRA	*0*	*N/A*	*N/A*	*N/A*	*0*	*17 (<0.01%)*
		10,102 (2.8%)				*3,581 (1%)*	*3,816 (1.1%)*
	Remainder in SPM ROS	*97 (<0.1%)*	*N/A*	*N/A*	*N/A*	*0*	*0*
		1,698 (0.5%)				*1,172 (0.3%)*	*1,172 (0.3%)*
	Semi-Primitive Non-motorized	N/A	N/A	N/A	N/A	N/A	N/A
	Primitive	<1	N/A	N/A	N/A	N/A	N/A
	Unknown/Private	2 (<0.01%)	N/A	N/A	N/A	0	0
		11 (<0.01%)				20 (<0.02%)	20 (<0.02%)
	Total	545	NA	NA	0	242	290
		24,213			48	10,349	11,021
	Manti-La Sal National Forest						
	Rural	N/A	N/A	N/A	0	N/A	N/A
					16 (2.0%)		
	Roaded Modified	N/A	N/A	N/A	N/A	N/A	N/A
	Roaded Natural	26 (0.01%)	392 (<0.1%)	N/A	173 (0.03%)	31 (0.01%)	31 (0.01%)
		685 (0.1%)	14,379 (2.9%)		7,183 (1.4%)	1,266 (0.3%)	1,266 (0.3%)
	Semi-Primitive Motorized	52 (0.01%)	144 (0.02%)	N/A	77 (0.01%)	52 (0.01%)	52 (0.01%)
		3,592 (0.5%)	7,555 (1.0%)		3,729 (0.5%)	3,592 (0.5%)	3,592 (0.5%)
	SPM Within IRA	*26 (<0.01%)*	*<1 (<0.01%)*	*N/A*	*0*	*26 (<0.01%)*	*26 (<0.01%)*
		2,156 (0.3%)	*3,121 (0.4%)*		*574 (0.1%)*	*2,156 (0.3%)*	*2,156 (0.3%)*
	Remainder in SPM ROS	*26 (<0.01%)*	*144 (0.02%)*	*N/A*	*77 (0.1%)*	*27 (<0.01%)*	*26 (<0.01%)*
		1,436 (0.2%)	*4,439 (0.6%)*		*3,153 (0.4%)*	*1,436 (0.2%)*	*1,436 (0.2%)*

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Recreation (Continued)	Semi-Primitive Non-motorized	N/A	0	N/A	0	N/A	N/A
			10 (0.01%)		10 (0.01%)		
	SPNM Within IRA	*N/A*	*0*	*N/A*	*N/A*	*N/A*	*N/A*
			10 (0.01%)				
	Remainder in SPNM ROS	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
	Primitive	N/A	N/A	N/A	N/A	N/A	N/A
	Unknown/Private	N/A	N/A	N/A	<1 (0.01%)	N/A	N/A
					119 (0.2%)		
	Total	78	536	NA	250	83	83
		4,277	21,944		11,055	4,858	4,858
	Fishlake National Forest						
	Rural	N/A	N/A	N/A	N/A	N/A	N/A
	Roaded Modified	N/A	N/A	N/A	N/A	N/A	N/A
	Roaded Natural	N/A	116 (0.02%)	476 (0.1%)	N/A	N/A	116 (0.2%)
			2,595 (0.5%)	21,822 (4.2%)			2,595 (0.5%)
	Semi-Primitive Motorized	N/A	0	394 (0.04%)	N/A	N/A	0
			1,534 (0.1%)	18,887 (1.8%)			1,534 (0.1%)
	Within IRA	*N/A*	*0*	*0*	*N/A*	*N/A*	*0*
			0	*1,151 (0.1%)*			*0*
	Remainder in SPM ROS	*N/A*	*0*	*400 (0.4%)*	*N/A*	*N/A*	*0*
			1,534 (0.1%)	*17,736 (1.7%)*			*1,534 (0.1%)*
	Semi-Primitive Non-motorized	N/A	N/A	0	*N/A*	*N/A*	*N/A*
				111 (0.06%)			
	SPNM Within IRA	N/A	N/A	0	*N/A*	*N/A*	*N/A*
				89 (0.05%)			
	Remainder in SPNM ROS	N/A	N/A	22 (0.01%)	*N/A*	*N/A*	*N/A*
	Primitive	N/A	N/A	N/A	N/A	N/A	N/A
	Unknown/Private	N/A	N/A	<1 (0.01%)	N/A	N/A	N/A
				5 (0.02%)			

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Recreation	Other Federal Recreation Areas						
(Continued)	Dinosaur National	0	N/A	N/A	0	0	0
	Monument	3 (<0.01%)			3 (<0.01%)	3 (<0.01%)	3 (<0.01%)
	Total	NA	116	876	NA	NA	116
			4,129	40,825			4,129
	State Recreation Areas						
	Recreation Area	250-foot-wide ROW Acres (% of total area)	250-foot-wide ROW Acres (% of total area)	250-foot-wide ROW Acres (% of total area)	250-foot-wide ROW Acres (% of total area)	250-foot-wide ROW Acres (% of total area)	250-foot-wide ROW Acres (% of total area)
		2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)	2-mile Corridor Acres (% of total area)
	Emery Farm Castle Dale	N/A	N/A	0	N/A	N/A	N/A
	WMA			<1 (1%)			
	Currant Creek/Wildcat WMA	152 (0.73%)	N/A	N/A	N/A	N/A	N/A
		2,284 (10.7%)					
	Nephi WMA-Nephi Unit	0	N/A	N/A	N/A	N/A	N/A
		152 (100%)					
	Fillmore WMA	N/A	N/A	0	N/A	N/A	N/A
				221 (1.7%)			
	Gordon Creek WMA	N/A	N/A	N/A	155 (0.7%)	N/A	N/A
					5,315 (23.4%)		
	Indian Canyon WMA-	N/A	N/A	N/A	N/A	46 (0.6%)	N/A
	Cottonwood Canyon Unit					1,668 (22%)	
	North Nebo WMA/Fountain	N/A	41 (1.8%)	N/A	N/A	N/A	N/A
	Green		1,347 (58%)				
	North Nebo WMA—Spencer	111 (1.7%)	N/A	N/A	N/A	111 (1.7%)	111 (1.7%)
	Fork Unit	6,265 (96.4%)				6,265 (96.4%)	6,265 (96.4%)
	Northwest Manti WMA—	71 (1.9%)	N/A	N/A	N/A	71 (1.9%)	71 (1.9%)
	Birdseye Lake Fork Unit	2,695 (71.9%)				2,695 (71.9%)	2,695 (71.9%)
	Northwest Manti WMA —	53 (1.1%)	N/A	N/A	N/A	52 (1.1%)	52 (1%)
	Dairy Fork Unit	663 (13.3%)				1,600 (32.2%)	1,600 (32.2%)

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Recreation (Continued)	Northwest Manti WMA— Hilltop Conservation Easement	N/A	N/A	N/A	17 (1.6%) 696 (64.8%)	N/A	N/A
	Northwest Manti WMA— Lasson Draw	0 (0%) 16 (0.7%)	N/A	N/A	N/A	0 (0%) 16 (0.7%)	0 16 (0.7%)
	Northwest Manti WMA— Starvation Unit					24 (0.4%) 976 (16.9%)	24 (0.4%) 976 (16.9)
	Strawberry River WMA	5 (0.2%) 454 (14.8%)	N/A	N/A	N/A	N/A	N/A
	South Nebo WMA — Triangle Ranch Unit	29 (1%) 1,855 (37.7%)	42 (0.9%) 2,734 (55.6%)	N/A	61 (1.2%) 3,584 (72.9%)	61 (1.2%) 3,584 (72.9%)	61 (1.2%) 3,589 (72.9%)
	Tabby Mountain WMA— Rabbit Gulch Unit	111 (1.2%) 8,088 (89.4%)	N/A	N/A	N/A	N/A	N/A
	Tabby Mountain WMA— Tabby Mountain Unit	53 (0.1%) 839 (2%)	N/A	N/A	N/A	N/A	N/A
	Starvation State Park	0 acres 459 acres (6%)	N/A	N/A	N/A	N/A	N/A
	CWMUs:						
	Double R Ranch	41/2,465 (39%)	N/A	N/A	N/A	N/A	N/A
	Crab Creek	0/211 (2%)	N/A	N/A	N/A	0/211 (2%)	0/211 (2%)
	Bear Mountain	N/A	82/4,515 (56%)	N/A	N/A	N/A	N/A
	Castle Valley Outdoors	N/A	N/A	178/6,067 (57%)	N/A	N/A	N/A
	Johnson Mountain Ranch	N/A	N/A	61/2,317 (17%)	N/A	N/A	N/A
	Oak Ranch	N/A	N/A	0/192 (4%)	N/A	N/A	N/A
	Old Woman Plateau	N/A	N/A	8/123 (2%)	N/A	N/A	N/A
	Round Valley	N/A	N/A	152/4,683 (59%)	N/A	N/A	N/A
	Minnie Maud Ridge	N/A	N/A	N/A	355/10,025 (63%)	26/1,096 (7%)	0/130 (4%)
	Emma Park	N/A	N/A	N/A	0/227 (1%)	232/7,267 (32%)	95/2,684 (12%)
	Antelope Creek	N/A	N/A	N/A	N/A	129/5,817 (18%)	N/A
	Scofield Canyons	N/A	N/A	N/A	N/A	0/556 (4%)	0/556 (4%)

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Recreation (Continued)	Soldier Summit	N/A	N/A	N/A	N/A	263/9,969 (38%)	193/5,477 (21%)
	Local Recreation Areas						
	Big Mountain Campground	0	N/A	N/A	0	0	0
		15 (100%)			15 (100%)	15 (100%)	15 (100%)
	Bottle Hollow Reservoir	0	N/A	N/A	N/A	0	N/A
		101 (24%)				101 (24%)	
	Brough Reservoir	0	N/A	N/A	N/A	N/A	N/A
		<1					
	Cedar Ridges Golf Course	N/A	0	0	N/A	N/A	N/A
			Entire site	Entire site			
	Bear Creek Campground	N/A	0	N/A	N/A	N/A	N/A
			18 (100%)				
	Camp Timberlane	N/A	N/A	N/A	N/A	37 (5.1%)	31 (4.3%)
						381 (53%)	337 (47%)
	Scenic Byways and Backways						
	Recreation Area	250-foot-wide ROW (crossings)	250-foot-wide ROW (crossings)	250-foot-wide ROW (crossings)	250-foot-wide ROW (crossings)	250-foot-wide ROW (crossings)	250-foot-wide ROW (crossings)
		2-mile Corridor (miles)	2-mile Corridor (miles)	2-mile Corridor (miles)	2-mile Corridor (miles)	2-mile Corridor (miles)	2-mile Corridor (miles)
	Dinosaur Diamond	2 crossings	3 crossings	3 crossings	2 crossings	4 crossings	2 crossings
	Prehistoric Byway	5 miles	88 miles	76 miles	13 miles**	10 miles**	5 miles
	White River/Strawberry	1 crossing	N/A	N/A	N/A	N/A	N/A
	Road Scenic Backway	3 miles					
	Nebo Loop Scenic Byway	0 crossings	N/A	N/A	0 crossings	0 crossings	0 crossings
		<1 mile			<1 mile	<1 mile	<1 mile
	Energy Loop: Huntington/	N/A	1 crossing	N/A	7 crossings	1 crossing	N/A
	Eccles Canyons National Scenic Byway		4 miles		17 miles	<2 miles	
	Skyline Drive Scenic	N/A	1 crossing	N/A	1 crossing	0 crossings	0 crossings
	Backway		3 miles		4 miles	<1 mile	<1 mile
	Wedge Overlook/Buckhorn	N/A	N/A	5 crossings	N/A	N/A	N/A

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Recreation	Drive Scenic Backway			9 miles			
(Continued)	Gooseberry/Fremont Road	N/A	N/A	1 crossing	N/A	N/A	N/A
	Scenic Backway			2 miles			
	Indian Canyon Scenic	N/A	N/A	N/A	1 crossing	1 crossing	1 crossing
	Byway				7 miles**	<2 miles**	3 miles**
	Nine Mile Canyon Scenic	N/A	N/A	N/A	1 crossing	N/A	1 crossing
	Backway				2 miles		2 miles
	Reservation Ridge Scenic	N/A	N/A	N/A	N/A	N/A	6 crossings
	Backway						13 miles
	** Indian Canyon Scenic Byway shares the same route with Dinosaur Diamond Prehistoric Byway in this portion of the Byway; therefore, the acreage identified under the Indian Canyon route is also included in the Dinosaur Diamond route.						
Land Use and Planning							
(1.a) (6.a)	Federal and State lands and Use of Designated Utility Corridors	257 miles total: 47% located on BLM or USFS-managed lands; 11% located on state lands. 39 miles in BLM RMP corridors, and 56 miles in WWEC.	345 miles total; 67% located on BLM or USFS-managed lands; 11% located on state lands. 130 miles in BLM RMP corridors, and 38 miles in WWEC.	365 miles total: 68% located on BLM or USFS-managed lands; 11% located on state lands. 122 miles in BLM RMP corridors, and 17 miles in WWEC.	262 miles total: 59% located on BLM or USFS-managed lands, 1% on tribal lands and 13% on state lands.	266 mile total: 46% located on BLM or USFS-managed lands; 11 on state lands and 3% on tribal lands.	267 miles total; 53% on BLM/USFS lands; 16% state lands and 1% on Tribal lands
		26 miles RMP corridor; 56 miles WWEC.	142 miles RMP corridor; 34 miles WWEC.	149 miles RMP corridor; 16 miles WWEC	73 miles in BLM RMP corridors, and 49 miles in WWEC.	39 miles in BLM RMP corridors, and 66 miles in WWEC.	69 miles RMP corridor; 30 miles WWEC.
	Avoidance/Exclusion areas crossed by reference line	ROW would cross the Sand Wash/Sink Draw CWMU, a ROW exclusion area. 7 miles of exclusion areas.	Designated avoidance areas crossed for <1 miles; designated exclusion areas crossed for 1 mile (Demaree WSA)	Same as Alternative II-B	6 miles; would cross the Gordon Creek WMA, an exclusion area for overhead power lines.	None	11 miles; no exclusion area

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Land Use (Continued) (6.a)	Private Lands and Zoning	109 miles (42 %) located on private land.	76 miles (22%) located on private land. 5 residences and 19 commercial building within 500 feet of the reference line.	77 miles (21%) located on private land. 4 residences and 14 commercial building within 500 feet of the reference line.	71 miles (27%) located on private lands. 6 residences and 1 commercial building within 500 feet of the reference line.	106 miles (40%) located on private lands	79 miles (30%) on private land
		9 communities within the 2 mile transmission line corridor; no identified incompatible land uses within these communities. 11 parks (9 wildlife management areas and one state park and one BLM recreation area), one cemetery, one school, and one church within the 2 mile transmission line corridor; 53 residences and 31 commercial building within 500 feet of the reference line.	11 communities within the 2 mile transmission line corridor; no identified incompatible land uses within these communities. Two wildlife management areas and two cemeteries within the 2-mile transmission line corridor.	11 communities within the 2 mile transmission line corridor; no identified incompatible land uses within these communities. Two wildlife management areas and 1 cemetery within the 2-mile transmission line corridor.	10 communities within the 2 mile transmission line corridor; no identified incompatible land uses within these communities. 3 wildlife management areas, two cemeteries, one church, and two schools within the 2-mile transmission line corridor; one WMA is a ROW exclusion area for overhead power lines.	15 communities within the 2-mile transmission line corridor in region, no identified incompatible land uses within these communities. One local park, seven WMAs, three cemeteries, one school, and two churches within the 2-mile transmission line corridor; 35 residences and 20 commercial building within 500 feet of the reference line.	10 communities within 2 miles; 13 residences within 500 feet.
	Agriculture	452 acres of initial clearing, 328 acres of construction disturbance, and 93 acres of permanent removal of croplands. Three center pivots crossed by the 250-foot-wide ROW.	169 acres of initial clearing, 139 acres of construction disturbance, and 51 acres of permanent removal of croplands.	238 acres of initial clearing, 177 acres of construction disturbance, and 50 acres of permanent removal of croplands. Five center pivots crossed by the 250-foot-wide ROW.	82 acres of initial clearing, 72 acres of construction disturbance, and 29 acres of permanent removal of croplands.	285 acres of initial clearing, 216 acres of construction disturbance, and 66 acres of permanent removal of croplands. Two center pivots crossed by the 250-foot-wide ROW.	104 acres of clearing; 82 acres of construction disturbance; 32 acres of permanent removal.
	Livestock Grazing	Construction impacts 1,728 acres (86 AUMs); Operation impacts 449 acres (25 AUMs)	Construction impacts 4,018 acres (201 AUMs); Operation impacts 1,103 acres (55 AUMs)	Construction impacts 4,229 acres (211 AUMs); Operation impacts 1,086 acres (54 AUMs)	Construction impacts 2,922 acres (146 AUMs); Operation impacts 819 acres (41 AUMs)	Construction impacts 1,804 acres (90 AUMs); Operation impacts 493 acres (25 AUMs)	Construction impacts 2,800 acres (140 AUMs); Operation impacts 834 acres (42 AUMs)

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Land Use (Continued) (6.a)	USFS land Management	Within the Uinta NF, the reference line, the 250-foot-wide ROW, and the 2-mile transmission corridor would pass through areas managed for aquatic and terrestrial resources (9 miles), dispersed recreation (5 miles) areas; forested area vegetation (2 miles); non forested ecosystems (3miles) and utility corridor/ communication sites(less than 1 mile). With the exception of portions of the Strawberry Management Area within 300 yards of greater sage-grouse foraging areas, development of a transmission line would in generally be compatible with area management. Application of mitigation LU-1 would eliminate impacts to this management area. Within the Manti-La Sal NF, the reference line, the 250-foot-wide ROW, and the 2-mile transmission corridor would fall within areas managed for General Big Game Winter Range (2 miles) , and Key Big Game Winter Range (less than 1	Within the Manti-La Sal NF, the reference line, the 250-foot-wide ROW, and the 2-mile transmission corridor would pass through areas managed for general big game winter range (1 mile), mineral development (1 mile), forage production areas (16 miles), and designated utilities corridors and developed recreation site management areas (less than one mile). Development of a transmission line would be fully compatible within areas managed as utility corridors, and generally compatible with management goals for minerals management, range forage production areas, and motorized recreation areas, provided that access to resources is not restricted. Compatibility with Big Game Winter Range would be the same as under Alternative II-A.	Within the Fishlake NF, the reference line, the 250-foot-wide ROW, and the 2-mile transmission corridor would pass through areas managed for management indicator species (MIS; 13 miles); livestock grazing (10 miles); improved watershed condition (4 miles), big game winter range (2 miles), and rural and roaded-natural recreation opportunities (2 miles). Development of a transmission line would be generally compatible with management goals for these areas, provided that access to resources not restricted, and vegetation densities are maintained and short-term or temporary roads are obliterated within one season of use in MIS and big game winter range MAs. Construction activities would have temporary impacts to the recreation opportunities in some areas of the 2b Roaded Natural Recreation management areas through visual and noise	Within the Manti-La Sal NF, the 250-foot-wide ROW, and the 2-mile transmission corridor would pass through Developed Recreation Sites (specifically, the Flat Canyon and Gooseberry Campgrounds); Special Land Designation (the Mammoth Guard Station); Research, Protection, and Interpretation of Lands and Resource; and Undeveloped Motorized Recreation Sites management areas. Construction of a transmission line would not be compatible with the management goals of developed recreation management areas, which restrict non-recreation noise to 30 decibels or less. Construction of a transmission line would generally be compatible with the other management areas, provided it does not inhibit attainment of objectives for the area.	Within the Manti-La Sal, impacts to management units and consistency with applicable standards and guidelines would be the similar to Alternative II-A, but would slightly more Manti-La Sal NF acreage within the general big game winter range and range forage production areas within the 2-mile transmission line corridor. Within the Uinta NFs, impacts to management units and consistency with applicable standards and guidelines would be the similar to Alternative II-A, but would include slightly less mileage within areas managed for aquatic/terrestrial resources and dispersed recreation. Within the Ashley NF, the reference line, the 250-foot-wide ROW, and the 2-mile transmission corridor would pass through approximately nine miles of areas with a low management emphasis (N)	Approximately 15 miles of the 250-foot-wide transmission line ROW would be within national forest system lands with special management prescriptions within the Fishlake, Uinta, and Manti-La Sal NFs. Consistency with applicable standards and guidelines within the Uinta and Manti-La Sal NFs would be the same as under Alternative ll-D. Consistency with applicable standards and guidelines within the Fishlake NF would be the same as under Alternative ll-B. Consistency with applicable standards and guidelines within the Ashley NF would be similar that described under Alternative II-D and II-E.

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
		mile). Development of a transmission line would generally be compatible with area management, provided vegetation densities are maintained and short term or temporary roads are reclaimed, construction occurs outside of the critical season, and there is no long term degradation of habitat..	Construction of a transmission line would not be compatible with the management goals of developed recreation management areas (specifically the Indian Creek Campground), which restrict non-recreation noise to 30 decibels or less. Within the Fishlake NF, 4 miles of the reference line, the 250-foot-wide ROW, and the 2-mile transmission corridor would be within areas managed for livestock grazing. Development of a transmission line would generally be compatible with Standard and Guidelines for this area.	disturbances, traffic delays, or trail access restrictions. The 2-mile transmission line corridor would also encompass acreage within Semi-Primitive Non-Motorized Recreation Fish Habitat Improvement management areas. Development of access roads or other construction support areas would generally be compatible with Standard and Guidelines for these areas provided that riparian areas are avoided and roads are closed to motorized public access.	Within the Ashley NF, portions of the 2-mile transmission line corridor (and a very small portion of the 250- foot-wide transmission line ROW) would fall within areas managed for livestock grazing and wildlife habitat. Development of a transmission line would be compatible with the management goals, provided that key stress seasons are avoided, short term or temporary roads are reclaimed and riparian areas are protected within wildlife habitat areas.	and one mile of area managed for dispersed roaded recreation (F). Development of a transmission line within these areas would generally be compatible with management goals.	
(5.f)	Greenfield	32 miles (12%)	156 miles (45%)	156 miles (43%)	151 miles (58%)	45 miles (17%)	121 miles (45%)

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Special Designation Areas							
	White River FO	No impacts	0 miles and >1 acre of ROW within Oil Spring Mountain WSA/ACEC, located within a designated underground utility corridor outside the WSA/ACEC but extending partially within the WSA. 7% of the WSA/ACEC (1,241 acres) within 2-mile corridor. Impacts to ACEC's R&I values (spruce-fir and biologically diverse plant communities, BLM sensitive species, and remnant vegetation associations) from habitat removal. Development of transmission line, roads or use of motorized vehicles would not be compatible with WSA designation. Visual impacts to the WSA from operation of the line; temporary impacts to wilderness quality in the areas closest to the ROW from noise and activity.	Impacts to Oil Spring Mountain WSA same as under Alternative II-B.	No impacts	No impacts	No impacts

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Special Designation Areas (Continued)			0 mile ROW within the White River ACEC; 143 acres (15% of ACEC) within 2-mile corridor. The ACEC is a ROW avoidance area; road construction would have potential to impact the riparian areas and bald eagle roost R&I values. Construction would be contingent upon avoidance of cottonwood communities, maintenance of utility as bald eagle habitat and properly functioning riparian community.	Impacts to White River Riparian ACEC same as under Alternative II-B.			
	Grand Junction FO	No impacts	1 mile and 15 acres of ROW within Demaree WSA; 9% of WSA (1,812 acres) within 2-mile corridor, Development of transmission line, roads or use of motorized vehicles would not be compatible with area management; wilderness quality in the areas closest to the ROW could be temporarily reduced during construction from noise and activity.	Impacts to Demaree WSA same as same as under Alternative II-B.	No impacts	No impacts	No impacts

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Special Designation Areas (Continued)			0 mile ROW within the Badger Wash ACEC; 310 acres (20% of ACEC) within 2-mile corridor. This area is not within a designated utility corridor. Surface disturbance would impact sensitive plant communities and hydrologic research R&I values in these areas.	Same as Alternative II-B.			
			0 mile ROW and 2% of McInnis Canyon NCA (1,925 acres) within 2 mile corridor, entirely within designated utility corridor. Road development of roads consistent with area management, subject to agency constraints and BMPs.	Impacts Badger Wash ACEC same as under Alternative II-B.			
				Impacts to McInnis Canyon NCA same as under Alternative II-B.			

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Special Designation Areas (Continued)	Vernal FO	No impacts	No impacts	No impacts	1 mile ROW crossing Green River WSR-suitable area. 1,447 acres (12% of suitable area) within 2 mile corridor Crossing is within designated corridor but would not be in conformance with VRM II area or consistent with criteria for 'scenic" designation.	No Impacts	Impacts would be the same as those for Alternative II-D.
					1 mile of ROW within Lower Green River ACEC, a ROW avoidance area. 1,239 acres (15% of ACEC) within 2-mile corridor .Impacts from surface disturbance and vegetation removal would affect special status species habitat and scenic R&I values. Would not be in conformance with VRM management in VRM II area.		Impacts would be the same as those for Alternative II-D.

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Special Designation Areas (Continued)					489 acres of Lear Canyon ACEC (35% of the ACEC) within 2-mile corridor. The ACEC is a ROW avoidance area for protection of surface disturbance from road construction would affect R&I values of relict vegetation and conflict with management that closes the ACEC to motorized travel.		Impacts would be the same as those for Alternative II-D.
					1,453 acres of Nine Mile Canyon ACEC (2% of the ACEC) within 2-mile corridor, above the rim of the canyon but with potential for impacts to the R&I cultural resources and special status species values.		Impacts would be the same as those for Alternative II-D.
	Price FO	No impacts	No impacts	0 miles ROW within the San Rafael Canyon ACEC; 8% of the ACEC (1,192 acres) within the 2-mile corridor. The ACEC is a ROW avoidance area; development of roads would reduce the scenic qualities for which the ACEC was designated.	No impacts	No impacts	No impacts

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Special Designation Areas (Continued)				0 miles ROW within the Rock Art ACEC; 123 acres of the Dry Wash unit would be within the 2-mile corridor. The ACEC is a ROW avoidance area; the 2-mile corridor would not be located within a designated utility corridor. Development of roads would not be in conformance with area management objectives and could result in destruction of cultural resources as well as increased vandalism due to increased access.			
(5.e)	Uinta National Forest	2 miles of ROW within Chipman Creek IRA. Route located on IRAs' edge (paralleling existing transmission line), leaving most of the IRA unfragmented; however proposed route would widen the existing designated corridor between six, mostly unfragmented, IRAs. All ROW areas within IRA within roaded natural and roaded modified ROS. Impacts to IRA during operations from vegetation maintenance within ROW.	No impacts	No impacts	0 miles of ROW; 2-mile transmission line corridor would encompass portions of 2 IRAs. TWE would eliminate roads in these areas.	0 miles of ROW; 2-mile transmission line corridor would encompass portions of five IRAs. TWE would eliminate roads in these areas.	0 miles of ROW; 2-mile transmission line corridor would encompass portions of 6 IRAs. TWE would eliminate roads in those areas.

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Special Designation Areas (Continued)		The 2-mile transmission line would cross 7 additional IRAs (11,747 acres); TWE would eliminate roads in these areas.					
(5.e)	Manti-La Sal National Forest	1 mile of 250-foot ROW within the Coal Hollow IRA and 1 mile of ROW within Cedar Knoll IRA. Route located on IRAs' edge (paralleling existing transmission line), leaving most of the IRAs unfragmented. 25 acres of ROW within semi-primitive motorized ROS; TWE commitment to use of 100 foot ROW would reduce surface disturbance impacts. Impacts to IRAs during operations from vegetation maintenance within ROW.	0 miles of ROW.	No impacts	0 miles of ROW; 2-mile transmission line corridor would encompass portions of 3 IRAs. TWE would eliminate roads in these areas.	2 miles of ROW within 3 IRAs. Impacts same as under Alternative II-A.	Impacts would be the same as those for Alternative II-E.
		The 2-mile transmission line would cross one additional IRAs (2,437 acres); TWE would eliminate roads in these areas.	The 2-mile transmission line corridor would encompass portions of three IRAs; TWE would eliminate roads in these areas.				
(5.e)	Fishlake National Forest		0 miles of ROW. The 2-mile transmission line corridor would encompass portions of one IRA; TWE would eliminate roads in these areas.	0 miles of ROW. The 2-mile transmission line corridor would encompass 1,257 acres IRA.	No impacts	No impacts	Impacts would be the same as those for Alternative II-B.

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Special Designation Areas (Continued) (5.e)	Ashley National Forest	No impacts	No impacts	No impacts	1 mile and 11 acres of ROW along southern edge of IRA 401009, leaving the majority of the IRA unfragmented. One acre within Semi-Primitive Motorized ROS; TWE commitment to use of 100 foot ROW would reduce or eliminate surface disturbance impacts in this portion of the ROW. TWE would eliminate roads in IRAs.	3 miles of ROW within IRA 401010. Would parallel an existing transmission line and road, widening the disturbance area that bisects one large, mostly unfragmented, habitat area. Separation distances from existing transmission line could result in ROW being located on steeper side slopes, resulting in additional erosion and sedimentation to Sowers Creek, an impaired stream. TWE commitment to use of 100 foot ROW would reduce surface disturbance impacts. Impacts to IRAs during operations from vegetation maintenance within ROW. TWE would eliminate roads in IRAs. Acreage fully within roaded natural ROS areas. The 2-mile transmission line would cross 1 additional IRA.	1 mile and 11 acres of ROW along southern edge of IRA 401009, leaving the majority of the IRA unfragmented. The 2-mile transmission line would cross 3 additional IRAs.
	Other Federally managed areas	No impacts	No impacts	No impacts	3 acres Dinosaur NM within 2-mile corridor.	Impacts to Dinosaur NM same as Alternative II-D.	Impacts would be the same as those for Alternative II-D.

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Special Designation Areas (Continued) (5.d)	NHTs	No Impacts	4 segments of the Old Spanish NHT crossed; 1 segment NHT II, 1 segment NHT III, 2 segments NHT V. Visible along 58 miles of trail, of which 7 miles are NHT II, 6 miles are NHT III, 27 miles are NHT IV, and 18 miles are NHT V	9 segments of the Old Spanish NHT crossed; 1 segment NHT II, 1 segment NHT III, 3 segments NHT V, 4 segments not categorized. Visible along 107 miles of trail, of which 17 miles are NHT II, 8 miles are NHT III, 31 miles are NHT IV, and 27 miles are NHT V; and 24 miles are not categorized	No Impacts	No Impacts	No Impacts
Transportation							
	Total Miles of New Permanent Access Roads	464	580	557	480	479	514
	Total Miles of Steep and Mountainous Terrain	239	270	192	281	259	313
	Road Crossings	21	16	19	16	17	16
	Number of Railroad Crossings	4	21	10	8	8	11
	Center Line Passing Through Public Land (miles)	148	270	287	191	160	182
	Center Line Passing Through Private Land (miles)	109	76	77	71	106	89
	Number of Airports within 5 miles	6	9	7	2	3	3
	Military Operations Areas (MOAs) within 20 Miles	1 – Hill AFB Sevier	1– Hill AFB Sevier Utah Launch Complex	1– Hill AFB Sevier Utah Launch Complex	1 – Hill AFB Sevier	1 – Hill AFB Sevier	1 – Hill AFB Sevier
	Military Operations Areas (MOAs) with 250-foot-Wide Transmission ROW Overlap	1 – Hill AFB Sevier	2 - Utah Launch Complex Hill AFB Sevier	2 - Utah Launch Complex Hill AFB Sevier	1 – Hill AFB Sevier	1 – Hill AFB Sevier	1 – Hill AFB Sevier

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Socioeconomics							
	Short-term socioeconomic effects	Temporary effects similar in nature to those associated with transmission line construction for Alternative I-A; mostly transient as construction progresses along the corridor. No effects related to terminal construction, unlike for Alternative I-A.	Total economic effects up to 30% higher than those in Alternative II-A due to the increased length and cost of the power line.	Total economic effects up to 30% higher than those in Alternative II-A due to the increased length and cost of the power line.	Similar to Alt. II-A, but would affect different communities in central Utah.	Similar to Alt. II-A, but would affect different communities in central Utah.	Similar to Alt. II-A, but would affect different communities in central Utah.
		Temporary increases in sales, use and lodging taxes, but lower tax revenues than for Alternative I-A because no terminal located in Region II.	Higher than in Alternative II-A, with relatively more effect in Colorado.	Higher than in Alternative II-A, with relatively more effect in Colorado.	Comparable to Alternative II-A.	Slightly higher than Alternative II-A	Slightly higher than Alternative II-A
		Temporary housing availability may be limited in northeastern Utah due to competing demands. Some areas in central with limited supply.	Temporary housing availability limited in northeastern and central Utah.	Temporary housing availability limited in northeastern and central Utah. Commuting may be easier due to highway access.	Comparable to Alternative II-A.	Comparable to Alternative II-A.	Comparable to Alternative II-A.
		Potential effects to agriculture could include temporary reductions of grazing on public lands and very minor effects on private farm lands.	More effects on livestock grazing and lesser effects on private farm lands.	More effects on livestock grazing and lesser effects on private farm lands.	More effects on livestock grazing (but less than II-B and II-C) and lesser effects on private farm lands (but more than II-B and II-C).	More effects on livestock grazing (but less than II-B and II-C) and lesser effects on private farm lands (but more than II-B and II-C).	
	Long-term socioeconomic effects	Long-term effects similar to those for Alternative I-A.	Generally the same as, but higher tax revenues than Alternative II-A.	Generally the same as, but higher tax revenues than Alternative II-A.	Comparable to Alternative II-A.	Comparable to Alternative II-A.	Comparable to Alternative II-A.

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Socio-economics (Continued)		Substantial ad valorem taxes paid, but no taxes on terminals or ground electrodes.	Relatively more revenue would accrue to Colorado jurisdictions than under Alternative II-A.	Relatively more revenue would accrue to Colorado jurisdictions than under Alternative II-A.	Comparable to Alternative II-A.	Comparable to Alternative II-A.	Comparable to Alternative II-A.
		Tax and business revenues accrue primarily in Utah.	Relatively more revenue would accrue to Colorado jurisdictions than under Alternative II-A.	Relatively more revenue would accrue to Colorado jurisdictions than under Alternative II-A.	Comparable to Alternative II-A.	Comparable to Alternative II-A.	Comparable to Alternative II-A.
		Federal government and other lessors receive rental/ lease income on ROW.	Higher than Alternative II-A due to increased length of the ROW.	Higher than Alternative II-A due to increased length of the ROW.	Essentially the same as Alternative II-A.	Essentially the same as Alternative II-A.	Essentially the same as Alternative II-A.
		Alternative crosses area near the Uintah & Ouray Reservation, but would not result in effects warranting detailed consideration under Environmental Justice.	Avoids the Uintah and Ouray Reservation. No effects warranting further consideration under Environmental Justice.	Avoids the Uintah and Ouray Reservation. No effects warranting further consideration under Environmental Justice.	Avoids much of the Uintah and Ouray Reservation. No effects warranting further consideration under Environmental Justice.	Essentially the same as Alternative II-A.	Avoids much of the Uintah and Ouray Reservation. No effects warranting further consideration under Environmental Justice.
Health and Safety							
	Serious injuries to workers and the public at-large	Workers during construction and operation may be injured by heavy equipment, working at heights, working in the vicinity of high voltage equipment, as well as from typical hazards found on a construction site. Sand dunes within this alternative also may affect the safety of workers and the public during construction and operation. The workers and the public may be injured by fire as well as downed power lines.	Same as Alternative II-A except that safety issues related to sand dunes would not result from this alternative.	Same as Alternative II-A except that safety issues related to sand dunes would not result from this alternative.	Same as Alternative II-A.	Same as Alternative II-A.	Same as Alternative II-A.

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Health and Safety (Continued)	Adverse health impacts from EMF, stray voltage, and induced voltage associated with transmission lines.	One outbuilding, four commercial/industrial structures, and four residential structures would be within 200 feet of the reference line, resulting in potential impacts from EMF, stray voltage, and induced voltage.	One outbuilding, five commercial/industrial structures, and three residential structures would be within 200 feet of the reference line, resulting in the potential for impacts from EMF, stray voltage, and induced current that would be similar to slightly less than Alternative II-A.	Three outbuildings, four commercial/industrial structures, and one residential structure would be within 200 feet of the reference line, resulting in the potential for impacts from EMF, stray voltage, and induced current that would be slightly less than Alternative II-A.	There would be no structures within 200 feet of the reference line, resulting in the potential for impacts from EMF, stray voltage, and induced current that would be less than Alternative II-A.	One outbuildings and five residential structures would be within 200 feet of the reference line, resulting in the potential for impacts from EMF, stray voltage, and induced current that would be similar to slightly less than Alternative II-A.	Four outbuildings would be located within 200 feet of the reference line, resulting in potential for impacts from EMF, stray voltage, and induced current that would be less than Alternative II-A.
(4.a) (4.b)	Noise impacts to nearby communities and residences.	There would be 9 communities within the 2-mile transmission line corridor; 53 residential structures within 500 feet of the reference line, and four residential structures within 200 feet of the reference line, resulting in potential impacts from noise with this alternative.	There would be 11 communities within the 2-mile transmission line corridor; five residential structures within 500 feet of the reference line, and three residential structures 200 feet of the reference line, resulting in impacts from noise that would be less than Alternative II-A.	There would be 11 communities within the 2-mile transmission line corridor; four residential structures within 500 feet of the reference line, and one residential structure 200 feet of the reference line, resulting in impacts from noise that would be similar to less than Alternative II-A.	There would be 1 communities within the 2-mile transmission line corridor; six residential structures within 500 feet of the reference line resulting in impacts from noise that would be less than Alternative II-A.	There would be 16 communities within the 2-mile transmission line corridor; 35 residential structures within 500 feet of the reference line, and five residential structures 200 feet of the reference line, resulting in impacts from noise that would be similar to less than Alternative II-A.	There would be 10 communities within the 2-mile transmission line corridor and 13 residential structures within 500 feet of the reference line, resulting in impacts from noise that would be less than Alternative II-A.

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Wild Horses							
	Temporary and permanent loss of forage areas	N/A	31 acres of 250-foot-wide ROW within the Piceance-East Douglas Creek HMA (<0.02% of the HMA). <1 acres of temporary and permanent disturbance. 218 acres of 250-foot-wide ROW within the North Douglas HA (0.3% of the HMA). 91 acres of temporary disturbance, 23 acre permanent. 390 acres of 250-foot-wide ROW within the West Douglas HA (<0.3% of the HMA). 192 acres of temporary disturbance, 49 acre permanent.	Same as Alternative II-B.	No acres of 250-foot-wide ROW within the Hill Creek HMA. One acre of temporary disturbance, no permanent disturbance.	N/A	Same as Alternative II-D.
	Temporary construction noise and human activity	N/A	1,049 acres of 2-mile transmission line corridor within the Piceance-East Douglas Creek HMA (0.6% of HMA). 5,902 acres of 2-mile transmission line corridor within the North Douglas HA (7.7% of HA). 13,966 acres of 2-mile transmission line corridor within the West Douglas HA (11% of HA).	Same as Alternative II-B.	123 acres of 2-mile transmission line corridor within the Hill Creek HMA (0.1% of HMA).	N/A	Same as Alternative II-D.

Table 2-24 Summary of Impacts for Region II

Resource	Resource Topic	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Wild Horses (Continued)	Presence of transmission line within HMAs / HAs restrict helicopter use during wild horse gathers	N/A	One mile of transmission line within the Piceance-East Douglas Creek HMA. 7 miles of transmission line within the within the North Douglas HA 13 miles of transmission line within the within the West Douglas HA	Same as Alternative II-B.	No miles of transmission line within the Hill Creek HMA.	N/A	Same as Alternative II-D.
Lands with Wilderness Characteristics							
(5.e)	Number of LWC Units Affected	2	8	8	4	2	5
(5.e)	Number (acres) of LWC Units Eliminated	0	1 (5,304)	1 (5,304)	0	0	0
(5.e)	Number (acres) of LWC Units Remaining	3 (39,962)	8 (180,209)	8 (121,843)	5 (224,448)	3 (39,962)	6 (234,250)
(5.e)	Number (acres) of Unit Portions Eliminated	2 (323)	12 (2,841)	11 (7,550)	9 (857)	2 (323)	12 (1,286)
Plan Amendments							
(2.a)	Location, length, and reason for plan amendment	VFO (19 miles)—New utility corridor	WRFO (38 miles)—Convert/expand underground only corridor VFO (6 miles)—New utility corridor PFO (14 miles)—Designate new utility corridor	WRFO (38 miles)—Convert/expand underground only corridor VFO (6 miles)—New utility corridor PFO (10 miles)—Designate new utility corridor Fishlake National Forest (22 miles) — Expand existing corridor	VFO (17 miles)—New utility corridor	VFO (6 miles)—New utility corridor	VFO (22 miles)—New utility corridor SLFO (3 miles)—New utility corridor

[1] Number does not include MIS that are otherwise classified as special status.

[2] Number includes nests for which the species is not known.

Table 2-25 Summary of Impacts for Region III

Resource	Resource Topic	Alternative III-A	Alternative III-B	Alternative III-C
Region III				
Climate and Air				
	Fugitive Dust Emissions (PM_{10})	119.4 tons	117.1 tons	128.7 tons
Geology				
	Geologic Hazards Risk	Two active faults, slight landslide, slight subsidence. Low risk for ground motion.	One active fault, slight landslide, moderate subsidence. Low risk for ground motion.	One active fault, slight landslide, moderate subsidence. Moderate risk of ground motion.
	Mineral Resource Access	No oil and gas or coal mining. Potential conflict with active mining areas near Milford, Utah.	Same as Alternative III-A.	Same as Alternative III-A.
	Paleontological Resources Loss	4 miles PFYC Class 5.	1 mile PFYC Class 5.	1 mile PFYC Class 5.
Soils				
	Soils – Wind Erodible	114 acres	140 acres	105 acres
	Soils – Water Erodible	77 acres	36 acres	62 acres
	Soils-Compaction Prone	864 acres	1,106 acres	1,039 acres
	Soils-LRP	1,586 acres	1,453 acres	1,579 acres
	Soils- Prime Farmland	132 acres	113 acres	286 acres
Water				
	Erosion and Sedimentation Direct Effects from Crossings	Three perennial stream crossings	Five perennial stream crossings	No perennial stream crossings
	Impaired Stream Effects from Crossings	Two impaired stream crossed	One impaired stream crossed	No impaired streams crossed
	Effects to Water Users from Construction Water Use	206 acre-feet required	212 acre-feet required	230 acre-feet required
	Maximum Road Density Change in Watershed (HUC10, 300-foot, or 100-foot perennial buffer area)	1.61 mile/mile^2 (100 feet: the Big Wash-Beaver River Watershed)	1.61mile/mile^2 (100 feet: the Big Wash-Beaver Watershed)	1.61 mile/mile^2 (100 feet: the Big Wash-Beaver River Watershed)
Vegetation				
	Vegetation clearing of woody vegetation over 6 feet in height	276 acres of pinyon-juniper, and 12 acres of woody riparian and wetlands	331 acres of pinyon-juniper and 53 acres of woody riparian and wetlands	337 acres of pinyon-juniper and 12 acres of woody riparian and wetlands

Table 2-25 Summary of Impacts for Region III

Resource	Resource Topic	Alternative III-A	Alternative III-B	Alternative III-C
Vegetation (Continued)	Wetlands and Riparian Areas impacted by Facilities Construction (acres)	210 acres of greasewood flats, 46 acres of herbaceous wetlands, 41 acres of riparian, and 9 acres of woody riparian and wetlands	229 acres of greasewood flat, 55 acres of herbaceous wetlands, 50 acres of riparian, and 28 acres of woody riparian and wetlands	287 acres of greasewood flat, 75 acres of herbaceous wetlands, 11 acres of riparian, and 7 acres of woody riparian and wetlands
	Wetlands and Riparian Areas impacted by Operations (acres)	48 acres of greasewood flats, 10 acres of herbaceous wetlands, 13 acres of riparian, and 3 acres of woody riparian and wetlands	51 acres of greasewood flat, 12 acres of herbaceous wetlands, 11 acres of riparian, and 6 acres of woody riparian and wetlands	70 acres of greasewood flat, 19 acres of herbaceous wetlands, 3 acres of riparian, and 2 acres of woody riparian and wetlands
	USFS MIS Species	NA	NA	NA
Special Status Plants				
	Number of USFWS species with known occurrences impacted	1	1	1
	Number of USFWS species with potential habitat impacted	3	2	2
	Number of BLM Sensitive species with known occurrences impacted	9	9	7
	Number of BLM Sensitive species with potential habitat impacted	31	38	38
	Number of USFS Sensitive species with known occurrences impacted	1	0	0
	Number of USFS Sensitive species with potential habitat impacted	2	0	0
	Number of Nevada state listed species with known occurrences impacted	3	3	1
	Number of Nevada state listed species with potential habitat impacted	4	6	6
Wildlife				
(5.a)	Pronghorn crucial winter range (acres) construction/operation	1,627/378	1,897/433	1,868/439
	Mule deer crucial winter range (acres) construction/operation	185/51	0/0	0/0

Table 2-25 Summary of Impacts for Region III

Resource	Resource Topic	Alternative III-A	Alternative III-B	Alternative III-C
Wildlife (Continued)	Desert bighorn sheep occupied range – Nevada (acres)	106/33	140/40	106/30
	Small game, nongame habitat (acres) construction/operation	9,320/979	9,502/862	10,318/940
	Waterfowl habitat (acres) construction/operation	249/26	360/30	239/23
(5.b)	Number of raptor nests within 1 mile of the reference line	254	129	199
	IBAs crossed by the 2-mile transmission line corridor	0	Same as Alternative III-A	Pahranagat Valley Complex (188 acres)
	Number of MIS species whose habitat is crossed by alternative[2]	2	Same as Alternative III-A	Same as Alternative III-A
Special Status Wildlife				
(3.d)	Impacted desert tortoise potential habitat (acres) construction/operation	993/299	1,081/279	985/242
(3.a)	Impacted greater sage-grouse habitat (acres) construction/operation	346/73	0/0	Same as Alternative III-B
	Number of active leks within 4 miles of reference line in Utah	1	0	0
(3.e)	Impacted Utah prairie dog potential habitat (acres) construction/operation	77/31	86/36	101/44
	Impacted California condor potential habitat (acres) construction/operation	4,810/525	4,308/401	4,624/426
	Impacted Yuma clapper rail potential habitat (acres) construction/operation	22/3	81/6	19/2
	Impacted western yellow-billed cuckoo potential habitat (acres) construction/operation	22/3	81/6	19/2
	Impacted southwestern willow flycatcher potential habitat (acres) construction/operation	22/3	81/6	19/2

Table 2-25 Summary of Impacts for Region III

Resource	Resource Topic	Alternative III-A	Alternative III-B	Alternative III-C
Special Status Wildlife (Continued) (3.b)	Number of special status raptor nests within 1 mile of the reference line[1]	208	119	125
Aquatic Biological Resources				
	Effects on aquatic habitat and species from potential direct and indirect disturbance or water quality changes	4 perennial streams crossed by 250-foot-wide ROW; no game fish streams crossed by the 250-foot-wide ROW	3 perennial streams crossed by 250-foot-wide ROW; 2 game fish streams crossed by the 250-foot-wide ROW	1 perennial stream crossed by 250-foot-wide ROW; 1 game fish stream crossed by the 250-foot-wide ROW
	Potential aquatic habitat alteration or loss (feet^2)	1,600	1,200	400
	Potential amphibian mortalities from vehicle traffic	275 ROW miles	282 ROW miles	309 ROW miles
Special Status Aquatic Resources				
	Effects on habitat and special status species from potential direct disturbance or water quality changes	4 perennial streams with special status aquatic species crossed by 250-foot ROW	3 perennial streams with special status aquatic species crossed by 250-foot ROW	1 perennial stream with special status aquatic species crossed by 250-foot ROW
		One stream with one species under review for federal listing	One stream with one species under review for federal listing	No streams with federally listed or petitioned aquatic species
	Number of special status aquatic species with potential habitat alteration or loss	9	4	3
	Number of watersheds supporting special status aquatic species with increased road densities	1	2	0
	Potential direct disturbance on critical habitat for federally listed species	None	None	None
Cultural Resources				
	NRHP-listed Sites	0	1	1
	NRHP-eligible Sites	23	15	29
	Unevaluated Sites	11	14	11
	Potential TCPs	3	11	5
	Trail Crossings	Old Spanish Trail (3) (1 NHT-I, 2 not categorized)	Old Spanish Trail (0)	Old Spanish Trail (0)

Table 2-25 Summary of Impacts for Region III

Resource	Resource Topic	Alternative III-A	Alternative III-B	Alternative III-C
Cultural Resources (Continued)	Mountain Meadows NHL and Site (distance from alternative)	0.1 mile	31 miles	28 miles
	Average Inventory Coverage	20%	23%	20%
	Site Density (sites per 100 acres inventoried)	0.022	1.7	0.01
	Overall Trail Visibility (within 5-mile viewshed)	23 miles	6.2 miles	0 miles
Visual Resources				
	High Sensitivity Viewers			
	0–0.5 miles	32	22	51
	0.5–2.5 miles	82	99	106
	2.5–5 miles	69	105	83
	>5 miles	93	58	68
	Moderate Sensitivity Viewers			
	0–0.5 miles	52	84	110
	0.5–2.5 miles	93	92	81
	2.5–5 miles	72	48	72
	>5 miles	59	61	46
	Scenic Quality (miles)			
	A	1	13	11
	B	100	85	96
	C	174	187	202
	BLM VRI Classifications (miles)			
	Class II	17	26	28
	Class III	90	75	66
	Class IV	150	169	209
	BLM VRM Classifications (miles)			
	Class II	3	3	--
	Class III	73	64	92
	Class IV	132	144	146

Table 2-25 Summary of Impacts for Region III

Resource	Resource Topic	Alternative III-A	Alternative III-B	Alternative III-C
Visual Resources	USFS SIO/VQO Classifications (miles)			
(Continued)	High Retention	1	--	--
	Moderate Partial Retention	16	--	--
	Low Modification	--	--	--
	Residual Impacts Landscape Scenery (miles)			
	High	60	59	82
(5.c)	Moderate	60	100	111
	Low	155	126	116
	Residual Impacts High Sensitivity Viewers (miles)			
	High	23	14	42
(5.c)	Moderate	70	116	131
	Low	182	154	135
	Residual Impacts Moderate Sensitivity Viewers (miles)			
	High	25	55	89
	Moderate	73	67	64
	Low	178	163	155
	BLM VRM USFS SIO/VQO Compliance/Consistency (miles) Before Mitigation			
	Compliant	219	210	229
	Non-compliant	7	1	8
	NA	50	73	71
	BLM VRM USFS SIO/VQO Compliance/Consistency (miles) After Mitigation			
	Compliant	220	210	229
	Non-compliant	6	1	8
	NA	50	73	71
Recreation				
	Recreation Area/Site in Region III	250-foot-wide ROW Acres (% of Total Area)	250-foot-wide ROW Acres (% of Total Area)	250-foot-wide ROW Acres (% of Total Area)
		2-mile Corridor Acres (% of Total Area)	2-mile Corridor Acres (% of Total Area)	2-mile Corridor Acres (% of Total Area)

Table 2-25 Summary of Impacts for Region III

Resource	Resource Topic	Alternative III-A	Alternative III-B	Alternative III-C
Recreation	BLM Fillmore FO			
(Continued)	Dispersed, undesignated recreation	2,126 (0.05%)	2,096 (0.05%)	2,091 (0.05%)
	areas	96,673 (2.2%)	101,464 (2.3%)	101,450 (2.3%)
	BLM Cedar City FO			
	Dispersed, undesignated recreation	1,256 (0.06%)	1,122 (0.05%)	1,122 (0.05%)
	areas	57,249 (2.7%)	53,732 (2.6%)	53,616 (2.5%)
	BLM St. George FO			
	Dispersed, undesignated recreation	747 (0.2%)	N/A	N/A
	areas	32,409 (6.4%)		
	BLM Caliente FO			
	Dispersed, undesignated recreation	651 (0.02%)	2,032 (0.06%)	2,739 (0.08%)
	areas	25,917 (0.7%)	81,729 (2.3%)	114,595 (3.2%)
	Chief Mountain SRMA	N/A	N/A	488 (0.4%)
				18,618 (2%)
	North Delamar SRMA	N/A	N/A	0
				<1
	BLM Las Vegas FO			
	Dispersed, undesignated recreation	1,518 (0.08%)	1,123 (0.06%)	1,237 (0.07%)
	areas	57,488 (3.1%)	38,488 (2.1%)	44,147 (2.4%)
	Muddy Mountains SRMA	72 (0.1%)	N/A	N/A
		4,202 (3.4%)		
	Nellis Dunes SRMA	N/A	N/A	0
				142 (1%)
	Dixie National Forest			
	Rural	N/A	N/A	N/A
	Roaded Modified	N/A	N/A	N/A
	Roaded Natural	184 (0.3%)	N/A	N/A
		4,396 (8.0%)		

Table 2-25 Summary of Impacts for Region III

Resource	Resource Topic	Alternative III-A	Alternative III-B	Alternative III-C
Recreation (Continued)	Semi-Primitive Motorized	332 (0.3%)	N/A	N/A
		9,076 (7.8%)		
	SPM Within IRA	*19 (0.02%)*	*N/A*	*N/A*
		3,826 (3.3%)		
	Remainder in SPM ROS	*313 (0.3%)*	*N/A*	*N/A*
		5,250 (4.5%)		
	Semi-primitive Non-Motorized	15 (<0.01%)	N/A	N/A
		10,331 (4.6%)		
	SPNM Within IRA	*5 (<0.01%)*	*N/A*	*N/A*
		9,717 (4.3%)		
	Remainder in SPNM ROS	*10 (<0.01%)*	*N/A*	*N/A*
		614 (0.3%)		
	Private/Other	1 (<0.01%)	N/A	N/A
		20 (<0.01%)		
	Total	531 acres	N/A	N/A
		23,803 acres		
	State Recreation Areas			
	Zane CWMU	N/A	195/5,468 (55%)	195/5,468 (55%)
	Scenic Byways and Backways			
	Rainbow Canyon Backcountry Byway	N/A	2 crossings	1 crossing
			5 miles	5 miles
	Highway 93 Scenic Byway	N/A	N/A	2 crossings
				15 miles
	Bitter Springs Backcountry Byway	1 crossing	N/A	N/A
		2 miles		
	Local Recreation Areas			
	Newcastle Reservoir	0	N/A	N/A
		40 (26%)		

Table 2-25 Summary of Impacts for Region III

Resource	Resource Topic	Alternative III-A	Alternative III-B	Alternative III-C
Recreation (Continued)	Scenic Byways and Backways	None	2 crossings of the Rainbow Canyon Backcountry Byway; 5 miles within the 2-mile corridor.	1 crossing of the Rainbow Canyon Backcountry Byway; 5 miles within the 2-mile corridor.
				1 crossing of the Highway 93 Scenic Byway; 15 miles within the 2-mile corridor.
Land Use and Planning				
(1.a) (6.a)	Federal, State and Tribal lands and Use of Designated Utility Corridors	275 miles total: 81% located on BLM or USFS-managed lands; 5% would be located on state lands. 64% of the route would be within a designated RMP or WWEC (65 miles and 146 miles, respectively).	282 miles total: 75% located on BLM- managed lands; 3% on state lands and 5% be on tribal lands.	309 miles total; 77% located on BLM-managed lands; 3% located on state lands. 64 miles in BLM RMP corridors and 45 miles in WWEC.
			101 miles in BLM RMP corridors and 47 miles in WWEC.	
	Avoidance/Exclusion areas crossed by reference line	None	None	1 mile within avoidance area (Coyote Springs Valley ACEC) and 9 miles within Kane Springs ACEC.
(6.a)	Private Lands and Zoning	38 miles (14%) located on private lands; 9 residences, 7 commercial/industrial structures, one agricultural structure, and 11 outbuildings within 500 feet of the proposed reference line.	48 miles (17%) located on private land. 2 residences, and 6commercial/ industrial structure within 500 feet of reference line. There would be 8 communities and one park and one school within the 2-mile transmission line corridor. There are no identified incompatible designated land uses within the communities.	61 miles (20%) located on private land.
		There would be one community within the 2-mile transmission line corridor; no identified incompatible designated land uses within the community. One cemetery within the 2-mile transmission line corridor.		2 residences, 7 commercial/industrial structures within 500 feet of the reference line.
				There would be 9 communities and 1 park and 1 school within the 2-mile transmission line corridor. There are no identified incompatible designated land uses within the communities.
	Agriculture	No impacts	14 acres of initial clearing, nine acres of construction disturbance, and two acres of permanent removal of croplands.	Four acres of initial clearing, three acres of construction disturbance, and less than one acre of permanent removal of croplands.

Table 2-25 Summary of Impacts for Region III

Resource	Resource Topic	Alternative III-A	Alternative III-B	Alternative III-C
Land Use (Continued)	Livestock Grazing	Construction impacts 9,304 acres (465 AUMs); Operation impacts 966 acres (48 AUMs)	Construction impacts 8,522 acres (426 AUMs); Operation impacts 791 acres (40 AUMs)	Construction impacts 9,438 acres (472 AUMs); Operation impacts 857 acres (43 AUMs)
	USFS land Management	16 miles of ROW within Dixie NF areas specifically managed for roaded natural recreation, big-game winter range, and livestock grazing. A portion would also cross areas without special management prescriptions. Development of a transmission line would generally be compatible with the management prescriptions for these areas; however, timing restrictions would applied within big-game winter range management areas for protection of wildlife resources and temporary roads would be need to reclaimed within one season after intended use.	No impacts	No impacts
(5.f)	Greenfield	73 miles (26%)	140 miles (49%)	96 miles (31%)
Special Designation Areas				
	St. George FO	9 miles of ROW within Beaver Dam Slope ACEC; 25 % of the ACEC (12,347 acres) within the 2-mile corridor, and partially outside of the designated utility corridor. 4,253 acres within ACEC ROW avoidance areas and an additional 2,520 acres in ROW avoidance areas common to both the ACEC and the Beaver Dam Wash NCA. Development of a transmission line or associated roads would not be in conformance with area management outside designated corridors, including a specification of 40 acres of surface disturbance life of project. Impacts to desert tortoise and desert tortoise (and other special status species) habitat during construction from surface disturbance and construction activity.	No impacts	No impacts

Table 2-25 Summary of Impacts for Region III

Resource	Resource Topic	Alternative III-A	Alternative III-B	Alternative III-C
Special Designations (Continued)		4 miles of ROW within Beaver Dam Wash NCA.12% of the NCA (7,571 acres) within the 2-mile corridor, and partially outside of the designated utility corridor; 1,452 acres would be located in NCA-only ROW avoidance areas in addition to shared NCA/ACEC ROW avoidance areas .Impacts to desert tortoise similar to those identified under Beaver Dam Slope ACEC.		
	Caliente FO	10 miles of ROW within Mormon Mesa ACEC; almost all within designated utility corridor.	Impacts to Mormon Mesa ACEC same as Alternative III-A except that 9 miles of ROW within the ACEC.	10 miles of ROW within Kane Springs ACEC; 9.1 miles would be outside of the designated utility corridor. The ACEC is a ROW exclusion area for protection of desert tortoise.
		28 percent of the ACEC (10,615 acres) within 2-mile corridor; 6,555 acres of which in ROW exclusion areas. Development of a transmission line or associated roads would not be in conformance with area management; impacts to desert tortoise R&I values as described above.		28% of the ACEC (6,340 acres) within 2-mile corridor; 5,298 acres in ROW avoidance areas, with corresponding impacts to desert tortoise habitat.
			6% (545 acres) of the Clover Wilderness Area (WA) within 2 -mile corridor. This is a ROW exclusion area; development of roads or use of motorized vehicles would not be compatible with area management; wilderness quality in the areas closest to the 250-foot-wide transmission line ROW could be temporarily reduced during construction from noise and activity.	

Table 2-25 Summary of Impacts for Region III

Resource	Resource Topic	Alternative III-A	Alternative III-B	Alternative III-C
Special Designations (Continued)				2,697 acres of the 2-mile within the Delamar Mountain Wilderness; 346 acres within the Arrow Canyon Wilderness, both of which are ROW exclusion areas. Development of roads or use of motorized vehicles would not be compatible with area management; wilderness quality in the areas closest to the 250-foot-wide transmission line ROW could be temporarily reduced during construction from noise and activity.
	Las Vegas FO	8 miles of ROW within Mormon Mesa ACEC; all within designated utility corridor. 4% of the ACEC (6,550 acres) within 2-mile corridor; 4,555 acres in ROW exclusion areas. Development of a transmission line or associated roads would not be in conformance with area management; impacts to desert tortoise R&I values as described above. One crossing of Muddy River WSR.	Impacts to Mormon Mesa ACEC same as Alternative III-A except 15 miles would cross the Vegas FO ACEC and 8% of ACEC (12,580 acres) within 2-mile corridor, 6,663 acres of which would be within ROW avoidance areas. One crossing of Muddy River and Meadow Valley Wash WSRs.	19 miles of ROW within Coyote Springs Valley ACEC; one mile of which is outside the designated corridor. The ACEC is a ROW avoidance area for protection of desert tortoise. 32% of the ACEC (24,237 acres) within 2-mile corridor; 5,928 acres in ROW avoidance areas, with corresponding impacts to desert tortoise habitat.
(5.e)	Dixie NF	2 miles of ROW within Atchinson IRA. Route partially within a designated WWEC and located on the IRAs' edge leaving most of the IRA unfragmented. Within the IRA, the ROW would be in some areas designated as semi-primitive motorized and non-motorized ROS; use of 100 foot ROW would reduce surface disturbance impacts. Impacts to IRAs during operations from vegetation maintenance within ROW.	No impacts	No impact
(5.e)		The 2-mile transmission line corridor for Alternative III-A would encompass portions of four additional IRAs; TWE would eliminate roads in these areas.		

Table 2-25 Summary of Impacts for Region III

Resource	Resource Topic	Alternative III-A	Alternative III-B	Alternative III-C
Special Designations (Continued)	USFWS Desert National Wildlife Refuge (NWR)	No impacts	No impacts	1 mile of ROW within Desert NWR; almost all within designated utility corridor. 1% of the Refuge (16,524 acres) within 2-mile corridor. Surface disturbance, noise and activity that would impact Refuge values (protection, enhancement, and maintenance of desert bighorn sheep) in this area. 170 acres of the Pahranagat NWR also would be within 2-mile corridor. Road construction in this area would remove habitat for migratory birds.
(5.d)	NHTs	3 segments of the Old Spanish NHT crossed; 1 NHT-1, 2 unrated. Visible along 10 miles of the trail ,of which - 8 miles are NHT-I, 1.9 miles are NHT-II, and 0.1 mile of NHT-IV.	No segments of the Old Spanish NHT crossed. Visible along 6.2 miles of the trail, of which 5 miles are NHT-I, 1 mile are NHT-II, and 0.1 mile is NHT-IV.	No Impacts
Transportation				
	Total Miles of New Permanent Access Roads	423	401	433
	Total Miles of Steep and Mountainous Terrain	185	79	99
	Road Crossings	12	8	10
	Railroad Crossings	4	10	11
	Center Line Passing Through Public Land (miles)	237	234	247
	Center Line Passing Through Private Land (miles)	38	48	61
	Number of Airports within 5 miles	1	2	2
	MOAs within 20 Miles	4	4	4
		Hill AFB Sevier MOA; Wendover MOA	Hill AFB Sevier (MOA); Wendover MOA	Hill AFB Sevier MOA; Wendover MOA
		Nellis AFB Desert MOA; Nellis Desert MOA	Nellis AFB Desert MOA; Nellis Desert MOA	Nellis AFB Desert MOA; Nellis Desert MOA

Table 2-25 Summary of Impacts for Region III

Resource	Resource Topic	Alternative III-A	Alternative III-B	Alternative III-C
Transportation (Continued)	MOAs with 250-foot-Wide Transmission ROW Overlap	Hill AFB Sevier B MOA	Hill AFB Sevier B MOA	Hill AFB Sevier B MOA
		(Most Overlap)	(Conflict)	(Conflict)
			Nellis AFB Desert MOA	Nellis AFB Desert MOA
			(Conflict)	(Most Conflict)
Socioeconomics				
	Short-term Socioeconomic effects	Temporary employment, population and tax effects similar to those for Alternative II-A.	Essentially the same as those in Alternative III-A.	Similar to, but up to 10% higher than those in Alt. III-A.
		Effects distributed between Utah and Nevada.	Distribution of effects more focused in Nevada than under Alt. III-A.	Distribution of effects more focused in Nevada than under Alt. III-A.
		Substantial tax revenues, but magnitude will reflect lack of a terminal in Region III.	Essentially the same as those in Alternative III-A.	Similar to, but up to 10% higher than those in Alt. III-A.
		Temporary housing availability limited in western Utah.	Temporary housing availability limited in western Utah and outlying areas of Nevada.	Temporary housing availability limited in western Utah and outlying areas of Nevada.
	Long-term socioeconomic effects	Long-term economic effects similar to those for Alternative I-A.	Generally the same as, but slightly higher tax revenues than Alternative III-A.	Generally the same as, but slightly higher tax revenues than Alternative III-A.
		Project generates ad valorem/property taxes on improvements in the region. A terminal is not planned under III-A, but could be under design options	Distribution of fiscal benefits more focused in Nevada than under Alt. III-A.	Distribution of fiscal benefits more focused in Nevada than under Alt. III-A.
		Most of this corridor passes through undeveloped rural area, therefor limited potential for adverse effects to property value, on social values or outdoor recreation. Relatively higher, but still limited potential for effects to outdoor recreation on Dixie NF.	Similar to effects from Alternative III-A, but avoids the Dixie NF.	Similar to effects from Alternative III-A, but avoids the Dixie NF.
		Federal government and other lessors receive rental/ lease income on ROW.	Same as Alternative III-A	Same as Alternative III-A
		Project development and operations would not result in effects warranting further consideration under Environmental Justice.	A segment of this alternative passes through the Moapa Reservation, in an area with substantial industrial development in place. Location would require agreement with the Moapa Tribe. No further consideration warranted under Environmental Justice.	Same as Alternative III-A

Table 2-25 Summary of Impacts for Region III

Resource	Resource Topic	Alternative III-A	Alternative III-B	Alternative III-C
Health and Safety				
	Serious injuries to workers and the public at-large	Workers during construction and operation may be injured by heavy equipment, working at heights, working in the vicinity of high voltage equipment, as well as from typical hazards found on a construction site. The workers and the public may be injured by fire as well as downed power lines.	Same as Alternative III-A	Same as Alternative III-A
	Adverse health impacts from EMF, stray voltage, and induced voltage associated with transmission lines	Four outbuildings, three commercial/industrial structures, and two residential structures would be within 200 feet of the reference line, resulting in potential impacts from EMF, stray voltage, and induced voltage.	Four outbuildings, three commercial/industrial structures, and one residential structure would be within 200 feet of the reference line, resulting in the potential for impacts from EMF, stray voltage, and induced current that would be slightly less than Alternative III-A.	Four outbuildings, four commercial/industrial structures, and one residential structure would be within 200 feet of the reference line, resulting in the potential for impacts from EMF, stray voltage, and induced current that would be similar to slightly less than Alternative III-A.
(4.a) (4.b)	Noise impacts to nearby communities and residences	There would be two communities within the 2-mile transmission line corridor; seven residential structures within 500 feet of the reference line, and two residential structures within 200 feet of the reference line, resulting in potential impacts from noise with this alternative.	There would be eight communities within the 2-mile transmission line corridor; two residential structures within 500 feet of the reference line, and one residential structure 200 feet of the reference line, resulting in impacts from noise that would be greater than Alternative III-A.	There would be nine communities within the 2-mile transmission line corridor; two residential structures within 500 feet of the reference line, and one residential structure within 200 feet of the reference line, resulting in impacts from noise that would be greater than Alternative III-A.
Wild Horses				
	Temporary and permanent loss of forage areas	69 acres of 250-foot-wide ROW within the Chloride Canyon HMA (<0.03% of the HMA). 100 acres of temporary disturbance, 24 acres permanent.	No acres of 250-foot-wide ROW within the Eagle HMA. Less than 1 acre of temporary permanent/ disturbance. No acres of 250-foot-wide ROW within the North Hills HMA. 11 acres of temporary disturbance, 3 acre permanent.	Same as Alternative II-B.
	Temporary construction noise and human activity	2.909 acres of 2-mile transmission line corridor within the Chloride Canyon HMA (1.4% of HMA).	56 acres of 2-mile transmission line corridor within the Eagle HMA (0.01% of HMA). 2,795 acres of 2-mile transmission line corridor within the North Hills HMA (5.6% of HMA).	Same as Alternative II-B.
	Presence of transmission line within HMAs / HAs restrict helicopter use during wild horse gathers	2 miles of transmission line within the Chloride Canyon HMA.	No miles of transmission line within the Eagle or North Hills HMA.	Same as Alternative II-B.

Table 2-25 Summary of Impacts for Region III

Resource	Resource Topic	Alternative III-A	Alternative III-B	Alternative III-C
Lands with Wilderness Characteristics				
(5.e)	Number of LWC Units Affected	2	6	9
(5.e)	Number (acres) of LWC Units Eliminated	0	1 (9,108)	0
(5.e)	Number (acres) of LWC Units Remaining	3 (54,147)	7 (187,931)	12 (237,291)
(5.e)	Number (acres) of Unit Portions Eliminated	2 (510)	13 (4,518)	12 (3,364)
Plan Amendments				
(2.a)	Location, length, and reason for plan amendment	None	None	CFO (9 miles)—ROW exclusion area exception

[1] Number includes nest for which the species is not known.

[2] Number does not include MIS that are classified as special status.

Table 2-26 Summary of Impacts for Region IV

Resource	Resource Topic	Alternative IV-A	Alternative IV-B	Alternative IV-C
Region IV				
Climate and Air				
	Fugitive Dust Emissions (PM_{10})	44.4 tons	47.2 tons	49.4 tons
Geology				
	Geologic Hazards Risk	Near active Black Hills fault, ground motion potential, low landslide, low subsidence.	Same as Alternative IV-A	Same as Alternative IV-A
	Mineral Resource Access	No oil and gas or coal mining. No potential mineral conflicts.	No oil and gas or coal mining. Potential conflicts with gypsum mining.	
	Paleontological Resources Loss	0 miles PFYC Class 5.	0 miles PFYC Class 5.	0 miles PFYC Class 5.
Soils				
	Soils – Wind Erodible	`	66 acres	109 acres
	Soils – Water Erodible	16 acres	1 acre	1 acre
	Soils-Compaction Prone	0 acres	3 acres	2 acres
	Soils-LRP	191 acres	191 acres	166 acres
	Soils- Prime Farmland	0 acres	0 acres	0 acres
Water				
	Erosion and Sedimentation Direct Effects from Crossings	One perennial stream crossings	Three perennial stream crossings	Two perennial stream crossings
	Impaired Stream Effects from Crossings	One impaired stream crossed	One impaired stream crossed	One impaired stream crossed
	Effects to Water Users from Construction Water Use	28 acre-feet required	29 acre-feet required	33 acre-feet required
	Maximum Road Density Change in Watershed (HUC10, 300-foot, or 100-foot perennial buffer area)	0.16 mile/mile^2 (100 feet: Duck Creek-Las Vegas Wash Watershed)	0.18 mile/mile^2 (Government Wash-Colorado River Watershed)	0.18 mile/mile^2 (Government Wash-Colorado River Watershed)
Vegetation				
	Vegetation clearing of woody vegetation over 6 feet in height	<1 acre of the woody riparian and wetlands	7 acres of the woody riparian and wetlands	7 acres of the woody riparian and wetlands
	Wetlands and Riparian Areas impacted by Facilities Construction (acres)	5 acres of riparian, and < 1 acre of woody riparian and wetlands	1 acre of herbaceous wetlands, 1 acre of riparian, and 5 acres of woody riparian and wetlands	1 acre of herbaceous wetlands, 1 acre of riparian, and 5 acres of woody riparian and wetlands
	Wetlands and Riparian Areas impacted by Operations (acres)	<1 acre of herbaceous wetlands and 1 acre of riparian	<1 acre of herbaceous wetlands, <1 acre of riparian, and 2 acres of woody riparian and wetlands	< 1 acre each of herbaceous wetlands and riparian and 2 acres of woody riparian and wetlands
	USFS MIS Species	NA	NA	NA

Table 2-26 Summary of Impacts for Region IV

Resource	Resource Topic	Alternative IV-A	Alternative IV-B	Alternative IV-C
Special Status Plants				
	Number of USFWS species with known occurrences impacted	0	0	0
	Number of USFWS species with potential habitat impacted	1	1	1
	Number of BLM Sensitive species with known occurrences impacted	4	3	2
	Number of BLM Sensitive species with potential habitat impacted	19	18	16
	Number of USFS Sensitive species with known occurrences impacted	0	0	0
	Number of USFS Sensitive species with potential habitat impacted	0	0	0
	Number of Lake Mead NRA Sensitive species with known occurrences impacted	0	2	2
	Number of Lake Mead NRA Sensitive species with potential habitat impacted	0	2	2
	Number of Nevada state listed species with known occurrences impacted	1	1	1
	Number of Nevada state listed species with potential habitat impacted	5	5	5
Wildlife				
(5.a)	Desert bighorn sheep occupied range – Nevada (acres)	122/39	69/31	39/19
	Small game, nongame habitat (acres) construction/operation	900/98	897/121	924/122
	Waterfowl habitat (acres) construction/operation	13/1	21/7	Same as Alternative IV-B
(5.b)	Number of raptor nests within 1 mile of the reference line	0	0	0
	IBAs crossed by the 2-mile transmission line corridor (acres)	0	Lake Mead NRA (643 acres)	Lake Mead NRA (643 acres)

Table 2-26 Summary of Impacts for Region IV

Resource	Resource Topic	Alternative IV-A	Alternative IV-B	Alternative IV-C
SSS Wildlife				
(3.d)	Impacted desert tortoise potential habitat (acres) construction/operation	566/148	553/171	645/172
	Impacted Yuma clapper rail habitat (acres) construction/operation	1/<1	12/2	Same as Alternative IV-B
	Impacted western yellow-billed cuckoo habitat (acres) construction/operation	1/<1	12/2	Same as Alternative IV-B
	Impacted southwestern willow flycatcher habitat (acres) construction/operation	1/<1	12/2	Same as Alternative IV-B
(3.b)	Number of special status raptor nests within 1 mile of the reference line	1	1	1
Aquatic Biological Resources				
	Effects on aquatic habitat and species from potential direct and indirect disturbance or water quality changes	1 perennial streams crossed by 250-foot-wide ROW; 1 game fish stream crossed by 250-foot-wide ROW	4 perennial streams crossed by 250-foot ROW; 1 game fish stream crossed by 250-foot-wide ROW	3 perennial streams crossed by 250-foot ROW; 1 game fish stream crossed by 250-foot-wide ROW
	Potential aquatic habitat alteration or loss (feet^2)	400	1,600	1,200
	Potential amphibian mortalities from vehicle traffic	39 ROW miles	41 ROW miles	43 ROW miles
Special Status Aquatic Resources				
	Effects on habitat and special status species from direct disturbance or water quality changes	1 perennial streams with special status aquatic species crossed by 250-foot ROW	No perennial streams with special status aquatic species crossed by 250-foot ROW	No perennial streams with special status aquatic species crossed by 250-foot ROW
		1 stream with federally listed or petitioned aquatic species	1 stream with federally listed or petitioned aquatic species	1 stream with federally listed or petitioned aquatic species
	Number of special status aquatic species with potential habitat alteration or loss	0	0	0
	Number of watersheds supporting special status aquatic species with increased road densities	1	0	0
	Potential direct disturbance on critical habitat for federally listed species	None	None	None

Table 2-26 Summary of Impacts for Region IV

Resource	Resource Topic	Alternative IV-A	Alternative IV-B	Alternative IV-C
Cultural Resources				
	NRHP-listed Sites	2	0	0
	NRHP-Eligible Sites	6	12	17
	Unevaluated Sites	4	6	7
	Potential TCPs	8	7	7
	Trail Crossings	Old Spanish Trail (0)	Old Spanish Trail (0)	Old Spanish Trail (0)
	Average Inventory Coverage	39%	34%	32%
	Site Density (sites per 100 acres inventoried)	0.007	0.005	0.005
	Overall Trail Visibility (within 5-mile viewshed)	0 miles	0 miles	0 miles
Visual Resources				
	High Sensitivity Viewers			
	0–0.5 miles	25	17	14
	0.5–2.5 miles	8	15	17
	2.5–5 miles	7	7	9
	>5 miles	--	--	5
	Moderate Sensitivity Viewers			
	0–0.5 miles	7	20	16
	0.5–2.5 miles	23	17	26
	2.5–5 miles	8	2	3
	>5 miles	--	--	--
	Scenic Quality (miles)			
	A	3	7	8
	B	17	2	2
	C	17	30	35
	BLM VRI Classifications (miles)			
	Class II	14	2	2
	Class III	8	6	6
	Class IV	4	--	--

Table 2-26 Summary of Impacts for Region IV

Resource	Resource Topic	Alternative IV-A	Alternative IV-B	Alternative IV-C
Visual	BLM VRM Classifications (miles)			
Resources	Class II	--	--	--
(Continued)	Class III	22	8	8
	Class IV	3	--	--
	USFS SIO/VQO Classifications (miles)			
	High Retention	--	--	--
	Moderate Partial Retention	--	--	--
	Low Modification	--	--	--
	Residual Impacts Landscape Scenery (miles)			
	High	6	6	6
(5.c)	Moderate	3	9	10
	Low	29	24	29
	Residual Impacts High Sensitivity Viewers (miles)			
	High	6	8	8
(5.c)	Moderate	17	13	10
	Low	15	18	27
	Residual Impacts Moderate Sensitivity Viewers (miles)			
	High	--	7	7
	Moderate	12	18	14
	Low	25	14	24
	BLM VRM USFS SIO/VQO Compliance/Consistency (miles) Before Mitigation			
	Compliant	20	8	8
	Non-compliant	5	--	--
	NA	12	31	37
	BLM VRM USFS SIO/VQO Compliance/Consistency (Miles) After Mitigation			
	Compliant	20	8	8
	Non-compliant	5	--	--
	NA	12	31	37

Table 2-26 Summary of Impacts for Region IV

Resource	Resource Topic	Alternative IV-A	Alternative IV-B	Alternative IV-C
Recreation				
	Recreation Area/Site in Region IV	250-foot-wide ROW Acres (% of Total Area)	250-foot-wide ROW Acres (% of Total Area)	250-foot-wide ROW Acres (% of Total Area)
		2-mile Corridor Acres (% of Total Area)	2-mile Corridor Acres (% of Total Area)	2-mile Corridor Acres (% of Total Area)
	BLM Las Vegas FO			
	Dispersed, undesignated recreation areas	213 (0.01%)	190 (0.01%)	190 (0.01%)
		6,990 (0.4%)	6,765 (0.4%)	6,765 (0.4%)
	Nellis Dunes SRMA	0	0	0
		183 (1.2%)	183 (1.2%)	183 (1.2%)
	Sunrise Mountain SRMA	330 (0.9%)	43 (0.1%)	43 (0.1%)
		11,155 (29.7%)	1,825 (4.9%)	1,825 (4.9%)
	Las Vegas Valley SRMA	296 (0.2%)	12 (<0.01%)	N/A
		8,209 (4.2%)	535 (0.3%)	
	Nelson/Eldorado SRMA	151 (0.2%)	107 (0.1%)	0
		7,871 (8.6%)	3,498 (3.8%)	29 (<0.1%)
	Other Federally Managed Recreation Areas			
	Sloan Canyon NCA	0	NA	N/A
		2,684 (6.0%)		
	Lake Mead NRA (NPS)	0	427 (0.03%)	414 (0.03%)
		25 (<0.01%)	12,871 (<1%)	14,482 (<1%)
	Local Recreation Areas			
	Clark County Wetlands Park	18 (0.6%)	N/A	N/A
		376 (13%)		
	Cascata Golf Course	N/A	0	N/A
			229 (53%)	
	Bootleg Canyon	N/A	66 (2.9%)	N/A
			1,627 (70%)	
	River Mountains Loop Trail	4 crossings	8 crossings	6 crossings
		8 miles	11 miles	11 miles

Table 2-26 Summary of Impacts for Region IV

Resource	Resource Topic	Alternative IV-A	Alternative IV-B	Alternative IV-C
Land Use and Planning				
(1.a) (6.a)	Federal, State and Tribal lands and Use of Designated Utility Corridors	39 miles total: 81% located on federally managed lands.	41 miles total: 56% located on federally managed lands.	43 miles total: 55% located on federally managed lands.
		6 miles of BLM RMP corridors and 16 miles of designated WWEC.	5 miles in BLM RMP corridors and 6 miles in WWEC.	5 miles in BLM RMP corridors and 6 miles in WWEC.
	Avoidance/Exclusion areas crossed by reference line	11 miles designated avoidance areas in the Rainbow Gardens and River Mountains ACEC. 1 mile in the Sunrise Mountain ISA exclusion area.	2 miles avoidance areas in the Rainbow Gardens ACEC; no exclusion areas.	2 miles avoidance areas in the Rainbow Gardens ACEC; no exclusion areas.
(6.a)	Private Lands and Zoning	8 miles (19 %) located on private land. 11 residential structures and 3 commercial/ industrial structures within 500 feet of the proposed reference line. Two communities within the 2-mile transmission line corridor.	18 miles (44%) would be located on private land. 9 residential structures and 2 commercial/industrial structures within 500 feet of reference line. One community within the 2-mile transmission line corridor.	19 miles (45%) would be located on private land. 9 residential structures and 1 commercial/industrial structures within 500 feet of the proposed reference line. There would be 1 community within the 2-mile transmission line corridor.
	Agriculture	None	None	None
	Livestock Grazing	None	None	None
(5.f)	Greenfield	0 miles (0%)	12 miles (31%)	12 miles (27%)
Special Designation Areas				
	Las Vegas FO	250-foot ROW would cross one ISA and 2 ACECs.	250-foot ROW would cross one ACEC; 2 mile corridor would encompass portions of one ISA and 2 ACECs. Impacts to Lake Mead NRA discussed under Recreation.	250-foot ROW would cross one ACEC; 2 mile corridor would encompass portions of one WA, one ISA, one ACEC and NRA.
		One mile of the 250-foot-wide transmission line ROW would fall within the Sunrise Mountain ISA but outside of the designated utility corridor.	3 miles of the ROW within Rainbow Gardens ACEC and 6.9% of ACEC (2,590 acre) within 2-mile corridor. Impacts similar to Alternative IV-A.	Impacts to Rainbow Garden ACEC same as under Alternative IV-B.

Table 2-26 Summary of Impacts for Region IV

Resource	Resource Topic	Alternative IV-A	Alternative IV-B	Alternative IV-C
Special Designation Areas (Continued)		This is not compatible with special designation area (SDA) management, as the ISA is a ROW exclusion area. The BLM has recommended the release of the IRA from wilderness consideration primarily because of a lack of wilderness character. Therefore, construction of the TWE power line is not likely to appreciably change the wilderness character of the ISA.		
			5.2% the Sunrise Mountain ISA (532 acres) within 2-mile corridor; impacts similar to Alternative IV-A.	5.8 percent of the Black Mountain WA (1,005 acres) within 2-mile corridor. Development of road or use of motorized vehicles would not be compatible with area management and wilderness quality in the areas closest to the 250-foot-wide transmission line ROW could be temporarily reduced during construction from noise and activity.
		11 miles of ROW within the Rainbow Gardens ACEC, 9 miles of which would be outside of designated corridors and within ROW avoidance area. 28 % of the ACEC (10,563 acres) within 2-mile corridor, with corresponding impacts to geological, scenic, cultural, or sensitive plant R&I values from construction and operation.		
			73 acres of the 2-mile transmission line corridor would be located within River Mountain ACEC, with corresponding impacts as discussed under Alternative IV-A.	'Impacts to Sunrise Mountain ISA same as under Alternative IV-B.

Table 2-26 Summary of Impacts for Region IV

Resource	Resource Topic	Alternative IV-A	Alternative IV-B	Alternative IV-C
Special Designation Areas (Continued)		5 miles of ROW within the River Mountain ACEC, fully within designated utility corridor. 56% of the ACEC (3,127 acres) within 2-mile transmission line corridor and ROW avoidance area, with corresponding impacts to bighorn sheep habitat and scenic viewshed R&I values.	14 miles of ROW within Lake Mead NRA; 427 acres within 2-mile transmission line corridor. NPS has indicated that construction and operation of this alternative is incompatible with NRA management.	14 miles of ROW within Lake Mead NRA; 414 acres within 2-mile transmission line corridor. NPS has indicated that construction and operation of this alternative is incompatible with NRA management.
Transportation				
	Total Miles of New Permanent Access Roads	63	73	73
	Total Miles of Steep and Mountainous Terrain	25	37	32
	Road Crossings	5	7	6
	Railroad Crossings	2	2	1
	Center Line Passing Through Public Land (miles)	32	23	24
	Center Line Passing Through Private Land (miles)	8	18	19
	Number of Airports within 5 Miles	4	2	2
	MOAs within 20 Miles	Nellis AFB	Nellis AFB	Nellis AFB
	MOAs with 250-foot-Wide Transmission ROW Overlap	0	0	0
Socioeconomics				
	Short-term socioeconomic effects	Temporary economic effects, i.e., construction jobs and sales and use tax revenues, would be similar to those for Alternative I-A, but concentrated in the Las Vegas Valley and with little temporary worker or population influx.	Essentially the same as those in Alternative IV-A.	Essentially the same as those in Alternative IV-A.
		Tax revenues generated would reflect the additional capital investment associated with a terminal in Region IV.	Essentially the same as those in Alternative IV-A.	Essentially the same as those in Alternative IV-A.
		Adequate temporary housing available to meet demands.	Essentially the same as those in Alternative IV-A.	Essentially the same as those in Alternative IV-A.
	Long-term socioeconomic effects	Long-term economic effects similar to those for Alternative I-A.	Essentially the same as those in Alternative IV-A.	Essentially the same as those in Alternative IV-A.
		Negligible, if any, effect on livestock grazing and agricultural production.	Same as Alternative IV-A	Same as Alternative IV-A

Table 2-26 Summary of Impacts for Region IV

Resource	Resource Topic	Alternative IV-A	Alternative IV-B	Alternative IV-C
Socioeconomics (Continued)		Project generates ad valorem/property taxes on improvements in the region. Tax revenues boosted by location of the southern terminal in this region. Location of terminal could be altered under design options.	Same as Alternative IV-A	Same as Alternative IV-A
		Limited effects on outdoor recreation due to location in developed metropolitan area. Potential minor effects due to location in urbanized area, including near existing and future residential development.	Higher potential for dissatisfaction and conflict with outdoor recreation due to location within Lake Mead NRA, but lower potential effects on property values because more removed from residential and commercial development.	Higher potential for dissatisfaction and conflict with outdoor recreation due to location within Lake Mead NRA, but lower potential effects on property values because more removed from residential and commercial development.
		Federal government receives rental/ lease income on ROW.	Essentially the same as Alternative IV-A.	Essentially the same as Alternative IV-A.
		Project development and operations would not result in effects warranting detailed consideration under Environmental Justice.	Same as Alternative IV-A	Same as Alternative IV-A
Health and Safety				
	Serious injuries to workers and the public at-large	Workers during construction and operation may be injured by heavy equipment, working at heights, working in the vicinity of high voltage equipment, as well as from typical hazards found on a construction site. The workers and the public may be injured by fire as well as downed power lines.	Same as Alternative IV-A.	Same as Alternative IV-A.
	Adverse health impacts from EMF, stray voltage, and induced voltage associated with transmission lines	Two commercial/industrial structures would be within 200 feet of the reference line, resulting in potential impacts from EMF, stray voltage, and induced voltage.	There would be no structures within 200 feet of the reference line, resulting in the potential for impacts from EMF, stray voltage, and induced current that would be less than Alternative IV-A.	There would be no structures within 200 feet of the reference line, resulting in the potential for impacts from EMF, stray voltage, and induced current that would be less than Alternative IV-A.

Table 2-26 Summary of Impacts for Region IV

Resource	Resource Topic	Alternative IV-A	Alternative IV-B	Alternative IV-C
Health and Safety (Continued) (4.a) (4.b)	Noise impacts to nearby communities and residences	There would be two communities within the 2-mile transmission line corridor; 11 residential structures within 500 feet of the reference line, and no residential structures within 200 feet of the reference line, resulting in potential impacts from noise with this alternative.	There would be one community within the 2-mile transmission line corridor; nine residential structures within 500 feet of the reference line, and no residential structure 200 feet of the reference line, resulting in impacts from noise that would be slightly less than Alternative IV-A.	There would be one community within the 2-mile transmission line corridor; nine residential structures within 500 feet of the reference line, and no residential structure 200 feet of the reference line, resulting in impacts from noise that would be slightly less than Alternative IV-A.
	Impacts from associated accidental release of hazardous materials.			
Wild Horses				
	Impacts to HMAs or HAs.	No wild horse HMAs and HAs in Region IV.	No wild horse HMAs and HAs in Region IV.	No wild horse HMAs and HAs in Region IV.
Lands with Wilderness Characteristics				
(5.e)	LWC	No LWC units affected in Region IV.	No LWC units affected in Region IV.	No LWC units affected in Region IV.
Plan Amendments				
(2.a)	Location, length, and reason for plan amendment	LVFO (1 mile)—ISA corridor exception	None	None

Table 2-27 Comparison of Applicant Proposed and Agency Preferred Alternatives Across Entire Project

	Topic	Detail (units)	Applicant Proposed	Agency Preferred
Climate and Air				
	Fugitive Dust Emissions	(PM_{10})	489 tons	503 tons
Geology				
	Geologic Hazards Risk		Six active faults crossed. Moderate risk for ground motion. Moderate to high risk for landslide impacts. Low to moderate risk for ground subsidence.	Four active faults crossed. Moderate risk for ground motion. Moderate to high risk for landslide impacts. Increased risk for subsidence due to historic coal mining.
	Mineral Resource Access		Thirteen oil and gas fields crossed. Encroaches on propose coal mine permit area, Deserado Mine. Potential conflict with active mining areas near Milford, Utah.	Fourteen oil and gas fields crossed. Encroaches on proposed coal mine permit area, Deserado Mine. Potential conflict with active mining areas near Milford, Utah.
	Paleontological Resources Loss	(miles of PFYC 5)	216	157
Soils				
	Wind Erodible	(acres)	593	589
	Water Erodible	(acres)	546	578
	Compaction Prone	(acres)	2,657	3,173
	Limited Revegetation Potential	(acres)	3,610	3,804
	Prime Farmland	(acres)	608	427
Water				
	Erosion and Sedimentation Direct Effects from Crossings	(perennial stream crossings)	25	37
	Impaired Stream Effects from Crossings	(impaired streams crossed)	9	4
	Effects to Water Users from Construction Water Use	(acre-feet)	542	567
	Maximum Road Density Change in Watershed	(mi/mi2 in HUC10, 300-foot or 100-foot perennial buffer area)	1.61 (100 feet: The Big Wash-Beaver River Watershed)	1.61 (100 feet: The Big Wash-Beaver River Watershed)

Table 2-27 Comparison of Applicant Proposed and Agency Preferred Alternatives Across Entire Project

	Topic	Detail (units)	Applicant Proposed	Agency Preferred
Vegetation				
	ROW Clearing-woody vegetation >6 feet height	aspen forest and woodland (acres)	165	162
		conifer forest (acres)	69	192
		deciduous forest (acres)	29	4
		pinyon-juniper (acres)	1,051	1,241
		woody riparian and wetlands (acres)	93	92
	Wetlands and Riparian Areas - Construction	greasewood flat (acres)	362	481
		herbaceous wetland (acres)	81	100
		riparian (acres)	46	55
		woody riparian and wetlands (acres)	63	59
	Wetlands and Riparian Areas - Operation	greasewood flat (acres)	90	114
		herbaceous wetland (acres)	18	19
		riparian (acres)	14	12
		woody riparian and wetlands (acres)	18	16
		USFS MIS Species	Alternative does not cross USFS Fishlake National Forest	Based on elevation, there is no potential habitat for this species within the USFS Fishlake National Forest.
Special Status Plant				
	USFWS species -known occurrence	(count)	3	6
	USFWS species -potential habitat	(count)	11	12
	BLM sensitive species -known occurrence	(count)	22	26

Table 2-27 Comparison of Applicant Proposed and Agency Preferred Alternatives Across Entire Project

	Topic	Detail (units)	Applicant Proposed	Agency Preferred
Special Status Plant (Continued)	BLM sensitive species -potential habitat	(count)	101	113
	USFS sensitive species -known occurrence	(count)	1	2
	USFS sensitive species -potential habitat	(count)	5	9
	Lake Mead NRA Sensitive species -known occurrence	(count)	0	0
	Lake Mead NRA Sensitive species -potential habitat	(count)	0	0
	Nevada state listed species - known occurrence	(count)	4	4
	Nevada state listed species - potential habitat	(count)	9	11
Wildlife				
(5.a)	Pronghorn crucial winter range	construction (acres)	2,650	3,384
		operation (acres)	677	819
	Mule deer crucial winter range	construction (acres)	1,545	1,253
		operation (acres)	963	381
	Elk crucial winter range	construction (acres)	1,411	1,338
		operation (acres)	491	674
	Moose occupied habitat	construction (acres)	222	710
		operation (acres)	72	255
	Rocky Mountain or desert bighorn sheep	construction (acres)	106	140
		operation (acres)	39	81
	Small game, nongame habitat	construction (acres)	23,092	24,315
		operation (acres)	2,601	2,705

Table 2-27 Comparison of Applicant Proposed and Agency Preferred Alternatives Across Entire Project

	Topic	Detail (units)	Applicant Proposed	Agency Preferred
Wildlife (Continued)	Waterfowl habitat	construction (acres)	490	534
		operation (acres)	52	50
(5.b)	Number of raptor nests within 1 mile of the reference line	(count)	413	340
	IBAs crossed by the 2-mile transmission line corridor	(count)	Powder Rim (9,708 acres); Upper Strawberry Watershed (UT12) (1,399 acres)	Powder Rim (11,988 acres); Muddy Creek Wetlands (3,131 acres)
	Number of MIS species whose habitat is crossed by alternative	(count)	3	12
Special Status Wildlife				
(3.a)	Impacted greater sage-grouse habitat	construction (acres)	4,044	2,423
		operation (acres)	1,100	639
(3.a)	Occupied greater sage-grouse leks within 4 miles of reference line	construction (acres)	49	62
		operation (acres)	0	0
	Impacted potential black-footed ferret habitat	construction (acres)	368	381
		operation (acres)	95	97
	Impacted western yellow-billed cuckoo potential habitat	construction (acres)	156	153
		operation (acres)	19	16
	Impacted Canada lynx potential habitat	construction (acres)	120	418
		operation (acres)	20	91
	Impacted Utah prairie dog potential habitat	construction (acres)	77	86
		operation (acres)	31	36
	Impacted California condor potential habitat	construction (acres)	4,810	4,308
		operation (acres)	525	401
	Impacted Yuma clapper rail potential habitat	construction (acres)	23	82
		operation (acres)	3	6

Table 2-27 Comparison of Applicant Proposed and Agency Preferred Alternatives Across Entire Project

	Topic	Detail (units)	Applicant Proposed	Agency Preferred
Special Status Wildlife (Continued) (3.b)	Impacted southwestern willow flycatcher potential habitat	construction (acres)	23	82
		operation (acres)	3	6
	Special status raptor nests within 1 mile of the reference line	(count)	525	528
	Impacted desert tortoise potential habitat	construction (acres)	1,559	1,647
		operation (acres)	447	427
Aquatic Biological Resources				
	Effects on aquatic habitat and species from potential direct and indirect disturbance or water quality changes	perennial streams crossed by 250-foot-ROW	33	36
		game fish streams crossed by 250-foot-ROW	17	17
	Potential aquatic habitat alteration or loss	(feet^2)	12,000	8,800
	Potential for amphibian mortalities from vehicle traffic	(miles)	726	759
Special Status Aquatic Resources				
	Effects on habitat and special status species from potential direct disturbance or water quality changes	SSAS streams crossed by 250-foot-ROW	19	17
		Federally listed or petitioned aquatic species streams crossed	5	6
	Special status aquatic species with potential habitat alteration or loss	(count)	21	9
	Watersheds supporting special status aquatic species with increased road densities	(count)	17	16
	Potential direct disturbance on critical habitat for federally listed species	(acres)	5	8

Table 2-27 Comparison of Applicant Proposed and Agency Preferred Alternatives Across Entire Project

	Topic	Detail (units)	Applicant Proposed	Agency Preferred
Cultural Resources				
	NRHP-listed Sites	(count)	2	3
	NRHP-eligible Sites	(count)	61	60
	Unevaluated Sites	(count)	24	32
	Potential TCPs	(count)	12	24
	Average Inventory Coverage	(percent)	23%	30%
	Site Density (sites per 100 acres inventoried)		0.79	1.62
	Overall Trail/Road Visibility within 5-mile viewshed	(miles)	115	107
Visual Resources				
(5.c)	Residual Impacts Landscape Scenery	High (miles)	221	251
		Moderate (miles)	194	233
		Low (miles)	310	276
	Residual Impacts High Sensitivity Viewers	High (miles)	97	101
		Moderate (miles)	300	376
		Low (miles)	328	284
	Residual Impacts Moderate Sensitivity Viewers	High (miles)	88	127
		Moderate (miles)	216	222
		Low (miles)	421	411
	BLM VRM USFS SIO/VQO Compliance/Consistency-After Mitigation	Compliant (miles)	467	478
		Non-compliant (miles)	19	28
		N/A (miles)	239	153

Table 2-27 Comparison of Applicant Proposed and Agency Preferred Alternatives Across Entire Project

	Topic	Detail (units)	Applicant Proposed	Agency Preferred
Recreation				
	State/Federal Parks crossed by 2-mile corridor	(count)	4	4
	SRMAs crossed by 2-mile corridor	(count)	7	7
	Dispersed, undesignated within 2-mile corridor	(acres)	430,908	468,404
Land Use and Planning				
(6.a)	Land Jurisdiction	Federal (percent)	68	68
		State (percent)	6	8
		Tribal (percent)	0	2
		Private (percent)	25	23
(1.a)	Use of Designated Utility Corridors	(miles of BLM/USFS)	103	144
		(miles of WWEC)	227	126
(5.f)	Greenfield	(percent)	27	49
Special Designation Areas				
(5.d)	National Historic and Scenic Trails	CDNST	1 segment crossed. 4 acres within the 250-foot ROW and 179 acres with the 2-mile corridor. Impacts to the trail itself would be minimized by the placement of the transmission line ROW within a designated overhead utility corridor; towers would be placed to avoid surface disturbance near the actual trail.	1 segment crossed. 4 acres within the 250-foot ROW and 179 acres with the 2-mile corridor. Impacts to the trail itself would be minimized by the placement of the transmission line ROW within a designated overhead utility corridor; towers would be placed to avoid surface disturbance near the actual trail.
		Overland Trail NHT	1 contributing segment crossed. Visible along 9 miles of trail, 5 of which are contributing.	1 contributing segment crossed. Visible along 9 miles of trail, 4 of which are contributing.
		Cherokee Trail NHT	1 contributing segment crossed. Visible along 24 miles of trail, 10 of which are contributing.	1 contributing segment crossed. Visible along 28 miles of trail, 10 of which are contributing

Table 2-27 Comparison of Applicant Proposed and Agency Preferred Alternatives Across Entire Project

	Topic	Detail (units)	Applicant Proposed	Agency Preferred
Special Designation Areas (Continued)		Old Spanish Trail NHT	3 segments of the Old Spanish NHT crossed; 1 NHT-1, 2 unrated. Visible along 10 miles of the trail ,of which - 8 miles are NHT-I, 1.9 miles are NHT-II, and 0.1 mile of NHT-IV.	No segments of the Old Spanish NHT crossed. Visible along 6.2 miles of the trail, of which 5 miles are NHT-I, 1 mile are NHT-II, and 0.1 mile is NHT-IV.
	WSR-suitable river reach	(count)	1	3
	ACEC within 2-mile corridor	(count)	4	6
		(acres)	27,018	23,534
	IRA within 2-mile corridor	(count)	16	14
		(acres)	29,502	11,775
Transportation				
	Total Miles of New Permanent Access Roads	(miles)	950	978
	Total Miles of Steep and Mountainous Terrain	(miles)	515	458
	Road Crossings	(count)	42	33
	Railroad Crossings	(count)	10	23
	Reference Line Passing Through Public Land (miles)	(miles)	534	581
	Reference Line Passing Through Private Land (miles)	(miles)	193	184
	Number of Airports within 5 Miles	(count)	13	11
	Military Operations Areas (MOAs) within 20 Miles	(count)	2	2
	MOAs crossed by 250-foot-wide Transmission ROW		Hill AFB Sevier B MOA	Hill AFB Sevier B MOA; Nellis AFB

Table 2-27 Comparison of Applicant Proposed and Agency Preferred Alternatives Across Entire Project

	Topic	Detail (units)	Applicant Proposed	Agency Preferred
Socioeconomics				
	Short-term Socioeconomic effects		Temporary increases in local employment, demand on temporary housing, and public facilities and services. Temporary effects similar in nature to those associated with transmission line construction for Alternative I-A; mostly transient as construction progresses along the corridor. No effects related to terminal construction, unlike for Alternative I-A. Alternative III-A Temporary economic effects, i.e., construction jobs and sales and use tax revenues, would be similar to those for Alternative I-A, but concentrated in the Las Vegas Valley and with little temporary worker or population influx.	Temporary increases in local employment, demand on temporary housing, and public facilities and services. Temporary effects similar in nature to those associated with transmission line construction for Alternative I-A; mostly transient as construction progresses along the corridor. No effects related to terminal construction, unlike for Alternative I-A. Alternative III-B Temporary economic effects, i.e., construction jobs and sales and use tax revenues, would be similar to those for Alternative I-A, but concentrated in the Las Vegas Valley and with little temporary worker or population influx.
	Long-term socioeconomic effects		Little long-term effects on employment, population, housing need or public services.	Little long-term effects on employment, population, housing need or public services.
			Substantial ad valorem taxes paid; primarily to counties and other taxing jurisdictions.	Substantial ad valorem taxes paid; primarily to counties and other taxing jurisdictions.
			Limited effects on property values, social values, and limited conflicts with outdoor recreation. Limited private land and existing energy resource development in proximity to much of the ROW.	Limited effects on property values, social values, and limited conflicts with outdoor recreation. Limited private land and existing energy resource development in proximity to much of the ROW.
			Federal government and other lessors gain ROW rental/lease income.	Federal government and other lessors gain ROW rental/lease income.

Table 2-27 Comparison of Applicant Proposed and Agency Preferred Alternatives Across Entire Project

	Topic	Detail (units)	Applicant Proposed	Agency Preferred
Health and Safety				
	Serious injuries to workers and the public at-large		Workers during construction and operation may be injured by heavy equipment, working at heights, working in the vicinity of high voltage equipment, as well as from typical hazards found on a construction site. The workers and the public may be injured by fire as well as downed power lines.	Workers during construction and operation may be injured by heavy equipment, working at heights, working in the vicinity of high voltage equipment, as well as from typical hazards found on a construction site. The workers and the public may be injured by fire as well as downed power lines.
	Adverse health impacts from EMF, stray voltage, and induced voltage associated with transmission lines (Structures within 500 feet)	Residential	71	26
		Commercial/Industrial	86	48
		Agricultural	1	0
		Outbuilding	24	18
(4.b)	Noise impacts to nearby communities and residences	Communities within 2-mile corridor	13	20
Wild Horses				
	Presence of transmission line within HMAs	(miles)	23	1
Lands with Wilderness Characteristics				
(5.e)	LWC Units Affected	(count)	11	18
	LWC Units Eliminated	(count)	0	2
		(acres)	0	15,451
	LWC Units Remaining	(count)	13	19
		(acres)	140,047	464,753
	Unit Portions Eliminated	(count)	11	32
		(acres)	7,413	14,004

Table 2-27 Comparison of Applicant Proposed and Agency Preferred Alternatives Across Entire Project

	Topic	Detail (units)	Applicant Proposed	Agency Preferred
Plan Amendments				
(2.a)	Location, length, and reason for plan amendment		RFO (58 miles)—Expand existing and designate new utility corridor LSFO (42 miles)—New utility corridor VFO (19 miles)—New utility corridor LVFO (1 mile)—ISA corridor exception	RFO (76 miles)—Expand existing and designate new utility corridor LSFO (37 miles)—New utility corridor VFO (22 miles)—New utility corridor SLFO (3 miles)—New utility corridor LVFO (1 mile)—ISA corridor exception

3.0 Affected Environment and Environmental Consequences

This chapter describes the natural and human environment in the areas potentially affected by the TWE Project, and discloses the anticipated impacts from the proposed project, alternatives, and design options.

Each environmental or human resource section in this chapter contains subsections that discuss the regulatory framework (if applicable), data sources, analysis area, current (baseline) conditions, and impacts. Both the baseline conditions and impacts are discussed in the context of the four project regions described in Section 2.5, Alternative Transmission Line Routes and Ancillary Facilities.

Affected Environment

Baseline conditions are described in regional terms to provide an environmental setting. Where possible, resource data was mapped to indicate similarities and differences in resources intercepted by the various alternative corridors.

Environmental Consequences

The impact discussion includes more specific details regarding the resources that may be affected by the proposed action and alternatives. Direct, indirect, and cumulative impacts to the resources are discussed. Direct and indirect impacts are contained within this chapter. Cumulative impacts are discussed in Chapter 5.0.

The impact topics for each environmental or human resource are discussed in the following order:

- Northern and Southern terminal construction, operation, maintenance, and decommissioning. These facilities are common to all alternatives.
- Impacts common to alternative transmission line route alternatives and their associated components (e.g., access roads, transmission line tower sites, temporary work areas). This includes transmission line construction, operation, maintenance, and decommissioning. For each impact issue, agency stipulations and BMPs and applicant-committed design features (**Appendix C**) were considered at a local level to estimate the levels of project impact more accurately. If necessary, additional mitigation measures were recommended to further reduce or avoid impacts, and measure effectiveness described. Conclusion statements summarize the anticipated residual impacts.
- Quantified impact levels were tabulated for comparison by alternative within each project region, and impacts unique to each region described. A residual impact conclusion is provided for each major route alternative within each region to allow for comparisons among alternatives. Impact levels and comparisons among route variations, route connecters, and ground electrode sites also are provided, depending on regional location.
- The estimated impacts of design options are provided, based on available information.
- The effects of the No Action Alternative (continuation of current trends) are provided for each resource.

Within each resource section is an analysis of the direct and indirect impacts of these components based on the specific impacts that may occur, but a general approach and methodology for determining an impact parameter for direct impacts such as ground disturbance from construction (decommissioning would be similar) and operation (including maintenance) was developed and used for many resources.

Because the actual location of project facilities (e.g., access roads, transmission line tower sites, temporary work areas, terminal locations, and electrode bed sites) has not been established, reference lines have been established and TransWest has provided acreages of the disturbance necessary to develop transmission line segments according to assumptions (see **Appendix D**). For the purposes of analysis, a 250-foot-wide transmission line ROW was assumed to be centered on these reference lines. This 250-foot-wide ROW allows for the quantification of Project impacts and relative comparison between alternatives. During final engineering design, this 250-foot-wide transmission line ROW would be shifted as needed within the 2-mile transmission line corridor to address resource issues and facilitate compliance with design features and mitigation measures.

The impact parameter methodology used GIS analyses to characterize the resources in areas identified as potential disturbance locations (e.g., 250-foot-wide transmission line ROW and 2-mile transmission line corridor). The resource characterizations were applied as a ratio to the disturbance acreages by transmission line segment. A simplified example follows: Segment 1's 250-foot-wide transmission line ROW consists of 40 percent grassland and 60 percent shrubland, and TransWest identifies 10 acres of disturbance within the ROW during construction, then this methodology quantifies 4 acres of grassland and 6 acres of shrubland disturbed in the ROW during construction.

This same ratio approach was applied to the 2-mile transmission line corridor, and the two quantities were totaled for each segment. Additional 250-foot-wide transmission line ROW clearing was calculated as the remainder of the total ROW area after construction disturbance occurs. The impacts of segments comprising the regional alternatives identified in the EIS (see Section 2.5, Alternative Transmission Line Routes and Ancillary Facilities) were then summed. The result of this methodology is an estimate of the total disturbance to the specific resource by regional alternative.

3.1 Climate and Air Quality

This section describes the climate and existing air quality resource of the region and the applicable air regulations that would apply to the proposed action and alternatives.

3.1.1 Regulatory Background

The Federal CAA amendments of the 1990s require all states to control air pollution emission sources so that National Ambient Air Quality Standards (NAAQS) are met and maintained. The NAAQS are established by the USEPA, are outlined in 40 CFR 50, and represent maximum acceptable concentrations that generally may not be exceeded more than once per year, except the annual standards, which may never be exceeded. An area that does not meet the NAAQS is designated as a nonattainment area on a pollutant-by-pollutant basis. In addition to these requirements, the NPS Organic Act requires the NPS to protect the natural resources of the lands it manages from the adverse effects of air pollution.

The Clean Air Act identifies two types of national ambient air quality standards. ***Primary standards*** provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. ***Secondary standards*** provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

The criteria for potential air quality impacts include NAAQS requirements for carbon monoxide (CO), particulate matter (PM) with an aerodynamic diameter of 10 micrograms or less (PM_{10}), PM with an aerodynamic diameter of 2.5 micrograms or less ($PM_{2.5}$), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2)/oxides of nitrogen (NO_X). Applicable federal and state criteria are presented in **Table 3.1-1**.

Table 3.1-1 National and State Ambient Air Quality Standards

		State Standards	National Standards	
Pollutant	**Averaging Time**	**Concentration**	**Primary**	**Secondary**
Ozone	8-Hour	0.08 ppm	0.08 ppm	0.08 ppm
CO	1-Hour	35 ppm	35 ppm	35 ppm
	8-Hour	9 ppm	9 ppm	9 ppm
SO_2[3]	1-hour	0.075 ppm	0.075 ppm	None
	3-Hour	0.5 ppm	None	0.5 ppm
	24-Hour	None	None	None
	Annual Average	0.030 ppm	0.030 ppm	None
NO_2	1-hour	100 ppb	100 ppb	None
	Annual Average	53 ppb	53 ppb	53 ppb
PM_{10}	24-Hour	150 µg/m^3	150 µg/m^3	150 µg/m^3
	Annual Average[1]	50 µg/m^3	None	None
$PM_{2.5}$	24-Hour	35 µg/m^3	35 µg/m^3	35 µg/m^3
	Annual Average	12 µg/m^3	12 µg/m^3	12 µg/m^3

[1]Annual Average PM_{10} standard remains in effect in Wyoming and Nevada.

µg/m^3 = micrograms per cubic meter

In addition to the designations relative to attainment of conformance with the NAAQS, the CAA requires the USEPA to place selected areas within the U.S. into one of three categories, which are designed to limit the deterioration of air quality when it is better than the NAAQS. Class I is the most restrictive air quality category. It was created by Congress to prevent further deterioration of air quality in national

parks and wilderness areas of a given size, which were in existence prior to 1977, or those additional areas that have since been designated Class I under federal regulations (40 CFR 52.21).

Federal Class I areas, which include certain national wilderness areas, national memorial parks, and national parks, are afforded the highest level of protection. The visibility program is codified at: 42 U.S.C. §§ 7491 to 7492 (CAA §§ 169A to 169B). Implementing regulations for this provision are at 40 CFR 51.300 through 40 CFR 51.309. The locations of these Federal Class I areas are depicted in relation to the Project in **Figure 3.1-1**. Ambient air criteria that apply within PSD Class I areas are more stringent than those that apply to other areas (i.e., Class II areas). In addition to more stringent ambient air increments, Class I areas also are protected by the regulation of air quality related values (AQRVs) within their borders. Federal Land Managers (FLMs) are responsible for the management of Class I areas. Haziness is characterized by an index with deciview (dv) units, which are related to the logarithm of the sum of the particulate extinction coefficient (b_{ex}) and Rayleigh scattering. A change of 1 dv is usually perceived as a small change in haziness, regardless of the initial haze level.

3.1.2 Data Sources

Data sources for Section 3.1, Climate and Air Quality include climate data from the National Oceanographic and Atmospheric Administration (NOAA) State Climatologist Programs, and Western Region Climate Center (WRCC) station climate summaries; air pollution data from USEPA Air Quality System and National Emission Inventory databases, as well as information from the states of Wyoming, Colorado, Utah, and Nevada, and Clark County, Nevada.

3.1.3 Analysis Area

The analysis area for direct air quality impacts is the area within 5 kilometers (km) of the proposed and alternative reference lines.

3.1.4 Baseline Description

3.1.4.1 Climate

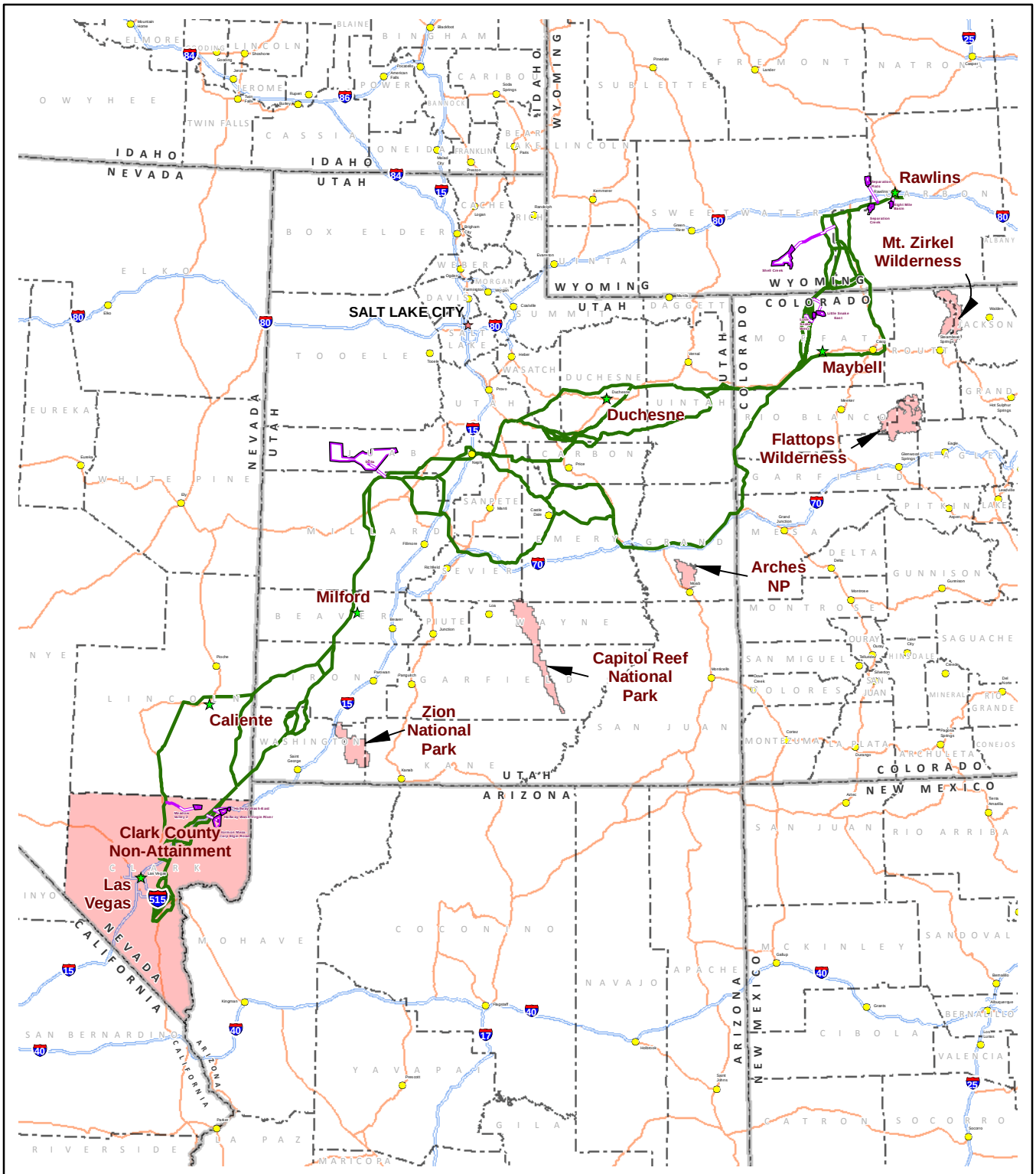
The climate in the northern portions of the project is characterized as arid, with cold winters and warm summers. The climate in the central portions of the Project also is arid, and the winter temperatures are similar to those in Wyoming; however, seasonal temperatures tend to be a little warmer. Annual precipitation (rainfall and snowfall) in the northern and central region ranges from 8 inches to well over 25 inches and is highly dependent on elevation and aspect of the terrain. The climate in the southern portions of the project in Nevada is hotter and drier, with generally mild winters and annual average precipitation below 5 inches.

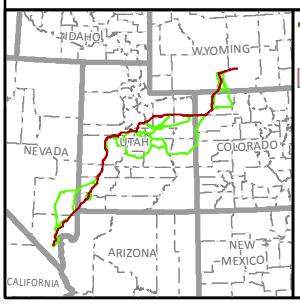
Representative climate summaries for various regions across the analysis are including Rawlins, Wyoming; Maybell, Colorado; Rifle, Colorado; Duchesne, Utah; Milford, Utah; Caliente, Nevada; and Las Vegas, Nevada, are presented in **Tables 3.1-2** through **3.1-8**. As an example of rainfall variability across the analysis area, 30 years of precipitation data for Ashford Canyon, in Garfield County, approximately 18 miles north of Grand Junction, Colorado, is displayed in **Figure 3.1-2**. The locations of these climate stations in relation to the Project are depicted in **Figure 3.1-1**.

Southwestern Wyoming is quite windy, and during the winter there are frequent periods when the wind reaches 30 to 40 miles per hour (mph) with gusts to 50 or 60 mph. Prevailing wind directions in the different localities vary from west-southwest through west to northwest. In many localities, winds are so strong and constant from those directions that trees show a definite lean towards the east or southeast (NOAA 1985).

Wind speeds over elevated terrain are often greater than those recorded for nearby airports or other wind monitors.

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Project Reference Line
Climate Station Location
Class I Area
Potential Ground Electrode Siting Area
Potential Ground Electrode Site
Potential Ground Electrode Overhead Electrical Line

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 3.1-1
Class I Air Quality

0 20 40 80 Miles
0 20 40 80 km
1:5,250,000
N

Western AREA POWER ADMINISTRATION

Exported On: 6/5/2013

Table 3.1-2 Monthly Climate Summary for Rawlins, Wyoming

	Average Max. Temperature (F)	Average Min. Temperature (F)	Average Total Precipitation (in.)	Average Total Snow Fall (in.)	Average Snow Depth (in.)
January	30.9	12.7	0.48	7.9	2
February	33.8	14.6	0.51	7.5	2
March	41.2	20.3	0.67	7.8	1
April	52.5	27.7	1.04	7.1	0
May	63.8	36.4	1.32	1.6	0
June	75.2	44.6	0.90	0.2	0
July	83.7	51.4	0.74	0.0	0
August	81.1	50.0	0.75	0.0	0
September	70.5	40.8	0.80	1.2	0
October	57.1	31.2	0.80	3.4	0
November	40.5	20.3	0.58	7.7	1
December	32.1	14.0	0.47	7.5	1
Annual	55.2	30.3	9.05	51.9	1

Source: WRCC 2011.

Period of Record: 3/6/1951 to 12/31/2005.

Table 3.1-3 Monthly Climate Summary for Maybell, Colorado

	Average Max. Temperature (F)	Average Min. Temperature (F)	Average Total Precipitation (in.)	Average Total Snow Fall (in.)	Average Snow Depth (in.)
January	32.3	1.9	0.82	12.3	6
February	37.4	7.1	0.84	10.2	5
March	47.9	17.9	1.07	8.9	2
April	29.0	25.8	1.34	4.5	0
May	69.6	33.4	1.14	0.9	0
June	79.6	40.6	0.99	0.1	0
July	87.2	47.0	0.78	0.0	0
August	84.5	45.6	0.91	0.0	0
September	74.8	36.2	1.16	0.4	0
October	62.7	25.3	1.21	1.8	0
November	45.9	15.3	1.13	9.6	1
December	34.1	4.1	1.00	13.1	4
Annual	59.6	25.0	12.38	61.8	2

Source: WRCC 2011.

Period of Record: 4/3/1958 to 12/31/2010.

Table 3.1-4 Monthly Climate Summary for Rifle, Colorado

	Average Max. Temperature (F)	Average Min. Temperature (F)	Average Total Precipitation (in.)	Average Total Snow Fall (in.)	Average Snow Depth (in.)
January	36.8	9.3	0.86	11.0	4
February	43.9	16.6	0.77	7.6	3
March	53.8	24.2	0.97	3.7	0
April	64.2	31.4	1.01	0.8	0
May	74.0	38.7	1.00	0.0	0
June	84.0	45.2	0.73	0.0	0
July	90.2	52.1	1.03	0.0	0
August	87.7	50.4	1.14	0.0	0
September	79.4	41.5	1.14	0.0	0
October	67.3	31.1	1.19	0.5	0
November	51.4	21.2	0.88	3.7	0
December	39.4	12.4	0.93	11.1	2
Annual	64.3	31.2	11.61	38.5	1

Source: WRCC 2011.

Period of Record: 4/3/1958 to 12/31/2010.

Table 3.1-5 Monthly Climate Summary for Duchesne, Utah

	Average Max. Temperature (F)	Average Min. Temperature (F)	Average Total Precipitation (in.)	Average Total Snow Fall (in.)	Average Snow Depth (in.)
January	31.2	4.7	0.55	6.1	2
February	37.7	11.5	0.59	5.8	2
March	50.1	22.7	0.69	3.7	0
April	61.7	30.6	0.74	1.0	0
May	71.6	38.4	0.85	0.2	0
June	80.6	45.4	0.80	0.0	0
July	87.1	52.4	0.92	0.0	0
August	84.8	50.8	1.23	0.0	0
September	76.3	41.6	1.07	0.0	0
October	63.3	31.4	0.97	0.7	0
November	46.6	19.7	0.53	2.6	0
December	33.8	9.0	0.59	5.7	1
Annual	60.4	29.8	9.51	25.7	0

Source: WRCC 2011.

Period of Record: 4/3/1906 to 12/31/2005.

Table 3.1-6 Monthly Climate Summary for Milford, Utah

	Average Max. Temperature (F)	Average Min. Temperature (F)	Average Total Precipitation (in.)	Average Total Snow Fall (in.)	Average Snow Depth (in.)
January	39.1	13.6	0.65	6.8	2
February	45.6	19.6	0.77	5.7	1
March	54.6	25.3	1.04	6.7	0
April	63.9	31.6	0.87	3.2	0
May	73.8	39.3	0.72	1.0	0
June	84.5	46.9	0.46	0.0	0
July	92.1	55.8	0.71	0.0	0
August	89.7	54.1	0.86	0.0	0
September	80.7	43.8	0.70	0.2	0
October	67.8	32.6	0.91	1.1	0
November	52.5	22.2	0.65	3.6	0
December	41.3	14.9	0.71	5.8	1
Annual	65.5	33.3	9.03	34.0	0

Source: WRCC 2011.

Period of Record: 11/1/1906 to 12/31/2005.

Table 3.1-7 Monthly Climate Summary for Caliente, Nevada

	Average Max. Temperature (F)	Average Min. Temperature (F)	Average Total Precipitation (in.)	Average Total Snow Fall (in.)	Average Snow Depth (in.)
January	46.6	17.8	0.82	3.5	0
February	52.4	22.9	0.94	2.6	0
March	60.6	28.3	1.01	1.2	0
April	68.8	34.3	0.70	0.2	0
May	78.6	42.0	0.52	0.0	0
June	88.5	49.5	0.34	0.0	0
July	95.4	56.6	0.77	0.0	0
August	93.1	55.3	0.88	0.0	0
September	85.2	46.1	0.62	0.0	0
October	73.4	35.1	0.78	0.1	0
November	59.1	25.1	0.68	0.7	0
December	48.3	18.9	0.66	2.9	0
Annual	70.8	36.0	8.72	11.2	0

Source: WRCC 2011.

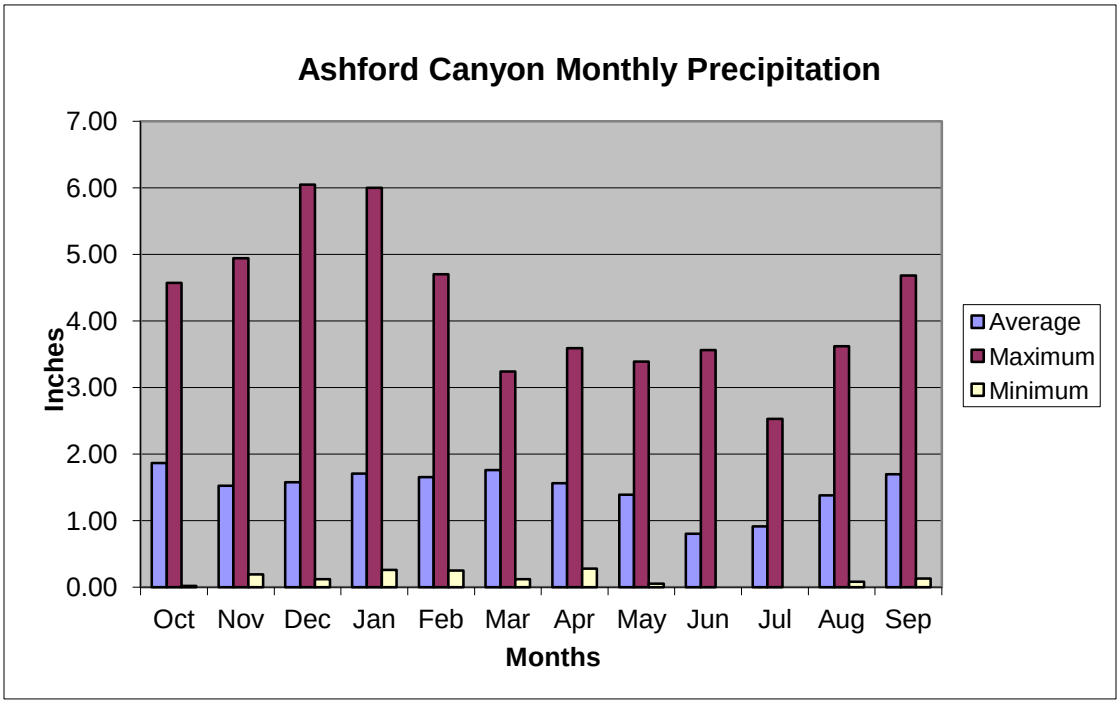
Period of Record: 4/1/1903 to 12/23/2010.

Table 3.1-8 Monthly Climate Summary for Las Vegas WSO Airport, Nevada

	Average Max. Temperature (F)	Average Min. Temperature (F)	Average Total Precipitation (in.)	Average Total Snow Fall (in.)	Average Snow Depth (in.)
January	57.1	34.5	0.52	0.7	0
February	62.5	38.9	0.58	0.0	0
March	69.4	44.3	0.44	0.0	0
April	78.2	51.7	0.20	0.0	0
May	88.4	61.1	0.15	0.0	0
June	98.6	70.0	0.07	0.0	0
July	104.6	76.7	0.43	0.0	0
August	102.2	74.9	0.43	0.0	0
September	94.7	66.6	0.31	0.0	0
October	81.3	54.4	0.26	0.0	0
November	66.5	42.1	0.36	0.1	0
December	57.3	34.9	0.41	0.1	0
Annual	80.1	54.2	4.16	0.9	0

Source: WRCC 2011.

Period of Record: 2/1/1937 to 12/23/2010.



Source: BLM GJFO

Figure 3.1-2 Ashford Canyon Monthly Precipitation for Water Years 1981 – 2011

3.1.4.2 Air Quality

Three important meteorological factors influence the dispersion of pollutants in the atmosphere: mixing height, wind (speed and direction), and stability. Mixing height is the height above ground within which rising warm air from the surface will mix by convection and turbulence. Local atmospheric conditions, terrain configuration, and source location determine dilution of pollutants in this mixed layer. Mixing heights vary diurnally with the passage of weather systems and with season. Temperature inversions, where air temperatures near the ground are colder than the temperatures above, are common in the basins and other lower elevations of the region. Inversions commonly occur in winter when snow accumulation on the ground combines with short daylight hours. In summer, inversions dissipate rapidly when early morning sunlight warms the air near the ground surface. Inversions can hinder air pollutant dispersion by preventing emissions from mixing with the ambient air in the vertical direction. On average, mean morning mixing heights in the area are approximately 1,000 feet; mean afternoon mixing heights are more than 7,800 feet (Holzworth 1972). Mean morning mixing heights tend to be lowest in fall and highest in spring.

Morning atmospheric stability conditions tend to be stable because of the cooling of the layers of air nearest the ground. Afternoon conditions, especially during the warmer months, tend to be neutral to unstable because of the rapid heating of the surface under clear skies. During the winter, periods of stable afternoon conditions may persist for several days in the absence of synoptic (continental scale) storm systems to generate higher winds with more turbulence and mixing. A high frequency of inversions at lower elevations during the winter can be attributed to the nighttime cooling and sinking air flowing from higher elevations to the low lying areas in the basins. Although winter inversions generally are quite shallow, they tend to be more stable because of reduced surface heating.

The latitude of the proposed transmission line project is within the belt of prevailing westerly winds that circle the globe around the earth's northern hemisphere. However, much of the proposed project activities would be located in complex terrain where the local winds are affected by topographic features.

Because of the typically dry atmosphere throughout these western states, bright sunny days and clear nights frequently occur. This diurnal cycle allows rapid heating of the ground surface during daylight hours and rapid cooling at night. Since heated air rises, and cooled air sinks, winds tend to blow uphill during the daytime and down slope at night. This upslope and downslope cycle generally occurs in all the geographical features, including mountain range slopes and river courses. The complexity of terrain features cause complex movements in the cyclic air patterns, with thin layers of moving air embedded within the larger scale motions. The lower level, thermally driven winds also are embedded within larger scale upper wind systems (synoptic winds). Synoptic winds in the region are predominantly west to east, are characterized by daily weather variations that enhance or diminish the boundary layer winds, and are significantly channeled by regional and local topography.

Air pollutant dispersion also is dependent on wind direction and speed. Wind direction is highly influenced by the local terrain, and will vary along the transmission line routes.

Air quality in a given location is defined by pollutant concentrations in the atmosphere and is generally expressed in units of parts per million (ppm) or $\mu g/m^3$. One measure of a pollutant is its concentration in comparison to the NAAQS and/or state ambient air quality standard, such as those established by Wyoming. These standards represent the maximum allowable atmospheric concentrations that may occur without jeopardizing public health and welfare, and include a reasonable margin of safety to protect the more sensitive individuals in the population. The State of Wyoming has adopted the NAAQS as state air quality standards and has additional AAQS for other pollutants that are more applicable to oil and gas projects (e.g., hydrogen sulfide) and are not included in this document in an effort to retain clarity. Colorado, Utah, and Nevada standards that are pertinent to the impacts from this project are the same as the NAAQS. The pollutants of interest for the proposed project are listed below.

3.1.4.3 Regional Sources of Criteria Air Pollutants

According to the USEPA Airdata website, the largest industrial sources of emissions of criteria pollutants in the analysis area include refineries and power plants. Other industrial, commercial, or government facilities in the general area also may be sources of the criteria pollutants.

Regional Air Quality

The existing air quality of most of the analysis area is typical of the largely undeveloped regions of the western U.S. Current sources of air pollutants in the region include wildland fires, mining, agriculture, industrial sources, urban transportation, rural transportation on unpaved roads, construction activities, and disturbed land. With the exception of urban transportation, which emits other air pollutants, all of these sources predominately emit PM. PM is the primary pollutant of concern in the project development area.

For the purposes of statewide regulatory planning, all of the northern portions of the analysis area have been designated by USEPA as attainment areas for all pollutants that have an AAQS; however, Clark County, Nevada, is designated as nonattainment or maintenance area for specific pollutants. This nonattainment area is depicted in relation to the Project in **Figure 3.1-2**.

Particulate Matter

Natural sources of PM are dust generated by wind across unvegetated soil surfaces and by wildland fire. Dry playa basins and areas cleared of vegetation are particularly susceptible to dust generation, particularly where soils are silty. In southern Nevada including the Las Vegas area, most PM air pollution is a result of windblown dust from disturbed ground.

The size of PM is important from a human health perspective. There are three common size classifications of PM: the largest size classification is total suspended particulate (TSP), the second largest classification is PM_{10}, and the smallest classification is $PM_{2.5}$.

The southern portion of the Project is in Clark County, where the air quality is very different from the rest of the analysis area due to the influence of the Las Vegas metropolitan area. Particulate data collected by Clark County at a site in Apex near Highway 93 and I-15 are listed in **Table 3.1-9**. The second highest 24-hour PM_{10} concentrations measured at USEPA monitoring stations in Clark County have exceeded 150 µg/m^3, which is above both National and State of Nevada AAQS. This has caused Hydrographic Basin 212 (all of Clark County) to be designated as a nonattainment area for PM_{10} (see **Appendix E** for additional information regarding attainment designations).

Table 3.1-9 Intersection of Highway 93 and I-15 Apex, Nevada PM_{10} Concentrations 2002-2007

Year	24-hour PM_{10} (µg/m^3)			Annual PM_{10} (µg/m^3)
	Maximum	Day Maximum Recorded	Second Highest	
2002	465[1]	04/15/02	176	26.4
2003	348[1]	10/30/03	105	23.8
2004	150	05/10/04	85	19.1
2005	97	05/16/05	72	18.9
2006	152[1]	09/15/06	97	17.7
2007	255[1]	06/05/07	96	23.2

[1]Includes exceptional events.

Source: USEPA 2008a.

USEPA made the determination that the Las Vegas Valley is in attainment with the PM_{10} NAAQS on August 3, 2010 (75 FR 45485), and will re-designate the area to attainment upon approval of the pending maintenance plan and request for re-designation that was submitted to USEPA in August 2012. Average annual PM_{10} concentrations in this region generally range from 20 to 30 µg/m^3, which is below the 50 µg/m^3 State of Nevada AAQS (USEPA 2008a).

Maximum measured values of 24-hour PM_{10} shown in **Tables 3.1-9** include exceptional events such as wildfires and dust storms. The frequency and severity of exceptional events can be an indicator of regional dust storm activity. In Clark County, Nevada exceptional events occurred 4 times in a 6 year period from 2002-2007, as shown in **Table 3.1-9**.

Ozone

Monitoring results in Las Vegas Valley (HB 212) in Clark County have exceeded the current 8-hour ozone standard. In 2004, the USEPA designated hydrographic basins 164A, 164B, 165, 166, 167, 212, 213, 214, 216, 217, and 218 as nonattainment for the 8-hour ozone standard.

In March 2004, Nevada submitted an 11-factor analysis indicating that the Las Vegas nonattainment area was much smaller than the presumptive area and that the smaller area proposed was consistent with the definition of nonattainment in section 107(d)(1) of the Clean Air Act. The USEPA concurred with this smaller boundary, and excluded the Las Vegas Paiute Tribal Community and the Moapa Band of Paiute Tribal Land and other tribal lands within Clark County, Nevada. The State recommended nonattainment areas include all violating air monitors in the Las Vegas area. The Joe Neal (elementary school) site had a design value of 86 parts per billion (ppb) for 2001 to 2003, just 1 ppb greater than the trigger for nonattainment designation, 85 ppb. On March 29, 2011 (76 FR 17343), the USEPA re-designated Clark County as attaining the standard for ozone. In April, 2011, Clark County submitted to the USEPA an Ozone Re-designation Request, along with a maintenance plan for a formal re-designation from nonattainment to attainment for the 1997 8-hour ozone NAAQS. On November 13, 2012, USEPA published the proposed rule for Approval of the Maintenance Plan and Re-designation of Clark County for the 1997 8-Hour Ozone Standard.

Carbon Monoxide

In 2000, the Clark County, Department of Air Quality submitted to the USEPA a CO State Implementation Plan (SIP), describing control measures and technologies to bring Las Vegas into compliance with the CO NAAQS.

Prevention of Significant Deterioration

The closest Class I areas to project alternative routes are Zion National Park (20 miles to the east), Arches National Park (10 miles to the south), Flat Tops Wilderness (30 miles south), and Mount Zirkel Wilderness (50 miles east) (**Figure 3-1.1**). Areas outside of the designated Class I boundaries are designated as Class II areas, which are allowed a relatively greater deterioration of air quality, although it must still be maintained below NAAQS. Dinosaur National Monument and Lake Mead NRA are Class II areas. No Class III areas have been designated in the U.S.

Regional Air Quality Related Values

AQRVs include changes in visibility or atmospheric deposition of pollutants to soils and waterbodies. Regional haze is visibility impairment caused by the cumulative air pollutant emissions from numerous sources over a wide geographic area. Visibility impairment is caused by particles and gases in the atmosphere. Some particles and gases scatter light while others absorb light. The primary cause of regional haze in many parts of the country is light scattering resulting from fine particles (i.e., $PM_{2.5}$) in the atmosphere. Additionally, coarse particles between 2.5 and 10 microns in diameter can contribute to light extinction. Coarse particulates and $PM_{2.5}$ can be naturally occurring or the result of human activity.

The natural levels of these species result in some level of visibility impairment, in the absence of any human influences, and will vary with season, daily meteorology, and geography (Malm 1999).

The total nitrogen deposition trend is relatively stable at around 2.0 kilograms per hectare (approximately 40 percent from dry deposition and the remaining 60 percent from wet deposition). The total sulfur deposition trend is relatively stable, perhaps decreasing slightly over the last 10 years, and is approximately 0.7 kilograms per hectare (approximately 30 percent from dry deposition and the remaining 70 percent from wet deposition) (CASTNet 2010).

3.1.4.4 Visibility

The smallest dv values, or best visibility, are in a broad region including the Great Basin, most of the Colorado Plateau, and portions of the central Rockies, which have visibility impairment of less than 8 dv (Hand 2011). The annual mean dv reported from the IMPROVE network has shown an improvement from the baseline years of 2000-2004 in the vicinity of the proposed project. All IMPROVE monitors in Utah, Colorado, and Wyoming have shown this trend (Hand et al. 2011).

3.1.5 Regional Summary

Table 3.1-10 is a summary of air quality conditions and visibility concerns by Project region.

Table 3.1-10 Air Quality and Visibility by Region

	Exceedances of Air Quality Standards					Visibility
	NO_2	O_3	SO_2	PM_{10}	$PM_{2.5}$	Class I Areas
Region I	No	No	No	No	No	No
Region II	No	Yes[1]	No	No	No	No
Region III	No	No	No	No	No	No
Region IV	No	Yes	No	Yes	No	No

[1] Winter ozone exceedances of NAAQS were recorded in the Uintah Basin during the winter 2010-2011. Area is designated un-classifiable and is treated as attainment.

3.1.5.1 Region I

Air quality monitoring data show that air quality in Region I is considered to be in compliance with state and Federal ambient air quality standards. Past exceedances of the PM_{10} NAAQS in the region are associated with exceptional events (USEPA 2012a).

3.1.5.2 Region II

Air quality monitoring data show that air quality in northwestern Colorado and northeastern Utah is considered to be in compliance with state and Federal ambient air quality standards. There were ozone exceedances recorded in the Uintah Basin during the winter of 2010-2011; however, the region remains designated as un-classifiable and is treated as in attainment (USEPA 2012b). There were no ozone exceedances in the Uintah Basin during the winter of 2011 through 2012. The Proposed Route and Alternatives are near Dinosaur National Monument, which is classified under PSD as a Class II sensitive area, and Arches and Capitol Reef national parks, which are Class I. Flat Tops Wilderness, located about 40 miles south of the easternmost alternative, and Mount Zirkel Wilderness, located about 50 miles east of the easternmost Alternative route are PSD Class I areas.

3.1.5.3 Region III

Air quality monitoring data show that air quality in southwestern Utah is considered to be in compliance with state and Federal ambient air quality standards. The Proposed Route through southwest Utah passes within about 20 miles of Zion National Park, which is classified under PSD as a Class I area.

3.1.5.4 Region IV

Much of the southern portion of the Project is located in Clark County, where the air quality is considered to be nonattainment for ozone (8-hour) and PM_{10} (24-hour). The Moapa River Indian Reservation and the Fort Mojave Indian Reservation in Clark County are excluded from the ozone nonattainment area. As of September 27, 2010, Clark County has been re-designated to a maintenance area for CO. The nonattainment status of Clark County requires a conformity demonstration that is discussed in Section 3.1.6.

3.1.5.5 Global Changes

Ongoing scientific research has identified the potential impacts of anthropogenic (man-made) greenhouse gas emissions and changes in biological carbon sequestration due to land management activities on global climate. Through complex interactions on a regional and global scale, these greenhouse gas emissions and net losses of biological carbon sinks (e.g., vegetation) could cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth back into space (Intergovernmental Panel on Climate Change [IPCC] 2007).

Global climate model predictions indicate that increases in temperature will not be equally distributed, but are likely to be accentuated at higher latitudes (IPCC 2007). Warming during the winter months is expected to be greater than increases in daily maximum temperatures. Increases in temperatures would increase water vapor in the atmosphere and reduce soil moisture, increasing generalized drought conditions, while at the same time enhancing heavy storm events. Although large-scale spatial shifts in precipitation distribution may occur, these changes are more uncertain and difficult to predict.

As with any field of scientific study, there are uncertainties associated with the science of climate change. This does not imply that scientists do not have confidence in many aspects of climate change science. Some aspects of the science are known with virtual certainty, because they are based on well-known physical laws and documented trends (USEPA 2008b).

Several activities contribute to the phenomena of climate change, including emissions of greenhouse gases (especially carbon dioxide [CO_2] and methane) from fossil fuel development, large wildfires, and activities using combustion engines; changes to the natural carbon cycle; and changes to radiative forces and surface reflectivity (i.e., albedo). It is important to note that greenhouse gases will have a sustained climatic impact over different temporal scales. For example, recent emissions of CO_2 can influence climate for hundreds of years.

Emissions of CO_2 from fossil fuel use and from the effects of land use change on plant and soil carbon are the primary sources of increased atmospheric CO_2. Since 1750, it is estimated that about two-thirds of anthropogenic CO_2 emissions have come from fossil fuel burning and about one-third from land use change. For the southwestern U.S. subregion, it is estimated that the present emissions rate of CO_2 equivalents (CO_2e) (a way of expressing all the different greenhouse gases as a single number) for power generation is 1,258 lb/megawatt hours (MWh) (**Table 3.1-11**). This is compared to the NWPP of 863 lb/MWh, where much of the electrical generation comes from renewable sources, primarily hydroelectric. On average, each MWh of electricity from wind and solar energy delivered to the Las Vegas area will avoid emissions from fossil fuel burning by over 1,000 lb/MWh.

Table 3.1-11 CO_2e Emission Rates for the Southwestern and Northwestern U.S. Subregions

Subregion	Name	Location	Emissions CO_2 (tons)	Emissions Rate (lb/MWh)	Emissions CH_4 (tons)	Emissions rate CH_4 (lb/MWh)	Emissions N_2O (tons)	Emissions rate N_2O (lb/MWh)	Emissions CO_2e (tons)	Emissions rate CO_2e (lb/MWh)
AZNM	WECC	Southwest	113,156,263	1,253	3,396,787	19	2,993,639	17	113,656,000	1,258
NWPP	WECC	Northwest	115,898,956	859	4,410,058	16	3,682,826	14	116,516,100	863

Source: Year 2007 eGRID Subregion Emissions – GHG (eGRID2010 Version 1.1 Created May 2011).

3.1.6 Impacts to Air Quality

Impacts to air quality include increases in criteria pollutants including fugitive dust emissions, emissions of hazardous air pollutants and greenhouse gas (GHG) emissions. Local effects are analyzed within 5 km of the project boundaries; cumulative effects are analyzed within 100 km of project boundaries. Generally, minor surface-based particulate emissions have maximum impact levels within 500 m of the source, and do not have noticeable effects (i.e., greater than 1 $\mu g/m^3$) in areas beyond 5 km. Visibility impacts to Class I areas are analyzed at much greater distances. **Table 3.1-12** lists the relevant management considerations for air quality.

Table 3.1-12 Relevant Management Considerations for Air Quality

Resource Topic	Management Considerations
NAAQS	Compliance with NAAQS and state standards
Visibility	Federal guidelines for visibility impairment
Atmospheric Deposition	Federal guidelines for atmospheric deposition
GHG	Climate Change

Issues

- Air pollutants emitted from the tailpipes of construction equipment, including criteria pollutants and greenhouse gas emissions;
- Fugitive dust generated during construction and facility maintenance;
- Windblown dust generated due to wind erosion of disturbed surfaces;
- Impairment of visibility conditions in Class I areas (e.g., Zion and Arches national parks); and
- Conformity requirements in nonattainment areas.

Assumptions

Assumptions regarding compliance with regulatory requirements, detailed project operations, inputs for emission factors, and future conditions are required to estimate impacts to air quality and climate.

Key assumptions regarding compliance with regulatory requirements include:

- All state and local air quality construction permits will be received prior to initiation of project construction;
- Dust control plans will be prepared and submitted as required by the responsible agencies; and

- Any operating permits or dust control plans required in nonattainment areas will address conformity requirements or demonstrate that total emissions in nonattainment areas will be below applicable thresholds.

Methodology for Analysis

Project construction air quality emissions and impacts are similar within each Region, and can be classified as consisting of area and point sources. Emissions from construction activities are classified as area sources, would be confined to the daytime hours, and would occur only during active construction periods. Such emissions are transitory, moving with the construction progress, and temporary, not occurring in one area for a long duration. Point sources are identified as the portable concrete batch plants.

For the estimation of air quality related impacts, the methodology depends on the activity (construction equipment, windblown dust, etc.) and the type of air impacts (criteria emissions, greenhouse gases, etc.). The activity/air impact combinations are grouped together based on the issues identified above. The calculation methodology for each activity affecting air quality is described below.

Tailpipe Emissions from Construction Equipment and Facility Maintenance

Tailpipe emissions from construction are based on equipment-specific emission factors, the equipment type, the number of each type of equipment, and estimated hours of operation. Equipment-specific emission factors are from the California Environmental Quality Act, Air Quality Handbook (South Coast Air Quality Management District 2010). The hours of operation were calculated based on assumptions regarding typical construction activities.

Tailpipe emissions from maintenance vehicles are calculated the same as for construction equipment. Emissions are based on the emission factors for light-duty passenger vehicles (South Coast Air Quality Management District 2010) and the calculated maintenance trips.

The proposed construction equipment is comprised primarily of heavy-duty, non-road mobile equipment powered by diesel fuel. Only pickup trucks will operate on gasoline rather than diesel fuel. Emissions from diesel engines would be minimized because engines must be built to meet the standards for mobile sources established by the USEPA mobile source emissions regulations (40 CFR Part 85). In addition, the USEPA is requiring that the maximum sulfur content of diesel fuel for highway vehicles be reduced from 500 ppm by weight (ppmw) to 15 ppmw, making ultra low sulfur diesel available nationwide.

- For tailpipe emissions from construction equipment, assumptions include:
  - All construction equipment, except for pickup trucks, will consume ultra low sulfur diesel fuel. Pickup trucks are assumed to be equivalent to light-duty, gasoline powered, passenger vehicles.
  - Construction activities will occur for 12 hours per day, 6 days a week.
  - Not all pieces of construction equipment will operate simultaneously. At any given time, roughly a third of the equipment will be operating; thus, it is assumed that each piece of equipment operates 4 hours out of a 12-hour construction day. This is a conservative approach since a particular piece of equipment, such as a crane, has a very specific function and must remain on-site to perform this function, but this function is not required to occur continuously.
  - Pickup trucks used for transporting crews and other local trips, will make two trips per hour on average over a 12-hour work day (24 trips per day). Each trip is assumed to be 4 miles on average.

- Emission factors for year 2012 are used since this is predicted to be the first year of construction. Future years are anticipated to have lower emission rates due to federal and state emission reduction programs for mobile equipment.

Fugitive Dust Emissions from Construction Equipment and Facility Maintenance

Fugitive dust is lofted into the air by construction equipment during many types of activities: driving over unpaved surfaces, excavation of topsoil and rock, and transfer of excavated material from one place to another. The USEPA has developed a generic emission factor of 1.2 tons per acre per month for fugitive dust that includes all construction activities (USEPA 1995). The emission calculations for fugitive dust associated with construction activities are based on the estimated acres of land actively undergoing construction and emission factors for heavy construction operations from the USEPA (USEPA 1995). The estimate of area actively constructed on any given day includes the north and south terminals, transmission line, temporary construction staging areas, and access roads. However, all this area is not undergoing construction simultaneously; for the purposes of project emission calculations, it is estimated that approximately 5 percent of the regional acreage (roughly 2,040 acres per region) per day are under active construction. Fugitive dust emissions during construction will be controlled as specified in the required dust control plan. For the purposes of emission calculations, the estimated fugitive dust emissions are assumed to be reduced by 50 percent through use of appropriate control measures.

Localized air quality emissions at a given location are expected to occur during construction activities. Emissions from construction equipment will be controlled by following state and local regulations. Actual construction control measures are part of a Construction Plan and a Dust Control Plan. In addition, operating permits for stationary sources, such as batch plants and operating permits for larger combustion sources, such as engines greater than 250 horsepower, will be obtained prior to construction activities. The development of a Construction Traffic Management Plan with measures to reduce the number of construction trips also will reduce air emissions from construction transportation vehicles.

- For fugitive dust from construction and maintenance, assumptions include:
  - For north and south terminal facilities, 3.25 acres are actively being constructed per day. This is a conservative assumption for the purposes of estimating the maximum daily emissions of fugitive dust from construction equipment;
  - For the purposes of estimating the PM_{10} emissions associated with construction fugitive dust, it is assumed that 75 percent of the fugitive dust is in the PM_{10} size range (USEPA 1998). Similarly, the USEPA recommends that 10 percent of the PM_{10} is in the $PM_{2.5}$ size range (WRAP 2006);
  - Site grading is the primary general construction activity that would produce fugitive emissions;
  - A control efficiency of 50 percent is assumed for purposes of emission calculations. Controls will be described in the dust control plan; and
  - Facilities will be regularly maintained and a light-duty truck will travel the length of the transmission line once per month.

Best Management Practices

The following BMPs are included in the project plan:

The applicant shall cover construction materials and stockpiled soils if these are sources of fugitive dust.

- To minimize fugitive dust generation, the applicant shall water land before and during surface clearing or excavation activities. Areas where blasting would occur should be covered with mats (AIR-2);

- Dust abatement techniques (e.g., water spraying) shall be used by the applicant on unpaved, un-vegetated surfaces to minimize airborne dust. Water for dust abatement should be obtained and used by the applicant under the appropriate state water use permitting system. Used oil will not be used for dust abatement (AIR-3);
- Predict future impacts from externally initiated actions prior to approval of those actions. Comply with all applicable local, state, and federal regulations to limit air quality degradation;
- Reduce vehicle speeds on native surfaced roads (e.g. 15 mph)
- Restrict surface disturbing activities to periods when wind speeds are less than 25 mph.
- To minimize fugitive dust, the applicant shall cover, at all times when in motion, open bodied trucks, transporting materials likely to give rise to airborne dust; and
- Access roads and on-site roads should be surfaced with aggregate, wherever appropriate.

Applicant Committed Design Features include:

- The Construction, Operation, and Maintenance (COM) Plan will include a Dust Control and Air Quality Plan. Requirements of those entities having jurisdiction over air quality matters will be adhered to and dust control measures will be developed (TWE-47);
- Open burning of construction trash will not be allowed unless permitted by appropriate authorities (TWE-47); and
- The Contractor and Subcontractor(s) will be required to have and use air emissions control devices on construction machinery, as required by federal, state or local regulations or ordinances (TWE-48).

Greenhouse Gas Emissions

Construction of the project would result in gaseous emissions, including CO_2e from fuel combustion in construction vehicles.

Annual construction engine emissions of GHGs (CO_2e, which include CO_2, methane, and N_2O) from construction engine sources are less than 800 tpy for all alternatives. The total GHG emissions from construction would be negligible in terms of impacts to climate change. In the final regulation on greenhouse gas permitting, the USEPA considers a source that emits more than 100,000 tpy of CO_2e to be a major source and requires a stationary source that emits more than 25,000 tpy to report their emissions. An equivalency calculation indicates that the total CO_2e emissions from construction would release about the same amount of CO_2e as the annual energy use for 52 average households in the U.S.

There would be maintenance activities during operations at the terminals and along the transmission line resulting in fuel usage from mostly light duty vehicles. Assuming that the transmission line is used primarily to carry renewable energy, direct air emissions would be offset by reductions in gaseous emissions from existing fossil-fuel fired power plants that would produce less electricity or those fossil-fueled power plants that would not be constructed in the future to meet electrical demand.

Any potential savings in GHG emissions is based on the assumption that the transmission line would primarily transmit renewable energy that would replace energy demands that would otherwise be met by non-renewable power sources. However, if this transmission line ends up transmitting more electricity from non-renewable sources, the calculated decrease would not be realized.

Decommissioning of the project would result in gaseous emissions, including CO_2e; however, emissions would be less than those associated with construction of the project.

Criteria Pollutant Air Emissions – Area Sources

Construction emissions would occur during construction of all alternatives including the north and south terminals, ground electrode facilities, access roads, preparation of transmission structure sites, erecting those structures, and construction of the transmission line. Fugitive dust results from the use of earth-moving equipment, including loaders, scrapers, bulldozers, shovels, and backhoes.

Tailpipe emissions also would occur from mobile sources including earth-moving equipment such as scrapers, loaders, bulldozers, and backhoes during construction of access roads and preparation of structure sites as well as from pickup trucks and semi-tractor trailers used to transport crews and materials. Structure components and transmission line equipment, as well as electrical cable and other equipment and supplies would be delivered by large trucks and semi-tractors. Large cranes are used to install structures. Emissions from these activities include fugitive dust and tailpipe emission (CO, NO_X, volatile organic compounds [VOCs], particulates, SO_2, and air toxics).

Approximately 10,024 acres would be disturbed during the construction phase of TransWest's Proposed Action (Alternative A) distributed across the regions. Construction and reclamation activities are expected to take place over a span of about 2 years. Fugitive dust from construction activities and travel on project roads would be controlled by water trucks. An approximate conservative emission factor for uncontrolled particulate emissions from construction activity operations is 1.2 tons/acre/month of activity. This value is most useful for developing estimates of overall emissions from construction scattered throughout a large geographical area (USEPA 1995).

Fugitive dust emissions from disturbed areas assume 12 months of construction each year and 50 percent dust controls with water applied twice a day as needed. Construction would contribute to fugitive dust emissions and include personnel vehicle access, occasional road maintenance activities, and ongoing reclamation/re-vegetation activities.

Conclusions

- Assuming that the transmission line would carry 80 percent renewable energy, there would be a net production and transmission of about 16,000 GWh of power on an annual basis without the burning of fossil fuels. The USEPA GHG Equivalencies Calculator indicates that this is equivalent to CO_2e emissions of 12.2×10^6 tons per year. This is about the same as the electricity use of 1.4 million homes for 1 year.
- Equipment tailpipe emissions, and fugitive dust emissions predicted during the construction of the northern terminal would not cause state or federal air quality standards to be exceeded, based on a screening level air quality analysis.
- Based upon the use of conservative emissions estimates, the emissions from the construction and operation of TWE in the Clark County nonattainment area would be below the conformity thresholds; therefore, the Project is exempt from performing a comprehensive conformity analysis.
- Equipment tailpipe emissions, and fugitive dust emissions predicted during the construction of the southern terminal would not cause state or federal air quality standards to be exceeded, based on a conservative screening level air quality analysis.

Criteria Pollutant Emissions – Point Sources

Project construction air quality emissions and impacts are similar within each Region, and can be classified as consisting of point and area sources. The point sources for this project are the portable concrete batch plants that will be temporarily located approximately every 15 miles along the transmission line. Area sources are mobile sources, roadways, bulldozers, tractors, construction traffic, and other sources that cause emissions of air pollutants not situated at a fixed location.

Concrete for use in the structure foundations would be dispensed from portable concrete batch plants generally located at staging areas. Equipment typically required at a batch plant site includes generators, concrete trucks, front-end loaders, skid loaders, dump trucks, transport trucks and trailers, water tanks, concrete storage tanks, scales, and job site trailers. Rubber-tired trucks and flatbed trailers would be used to assist in relocating the portable plant along the transmission line. Commercial ready-mix concrete might be used when access to structure construction sites is economically feasible. Batch plant sites, although temporary in nature, would be fenced.

Concrete batch plants are proposed to provide concrete for the foundation for each structure. Highest annual emissions from concrete batch plants for all alternatives are shown in **Table 3.1-13**.

Table 3.1-13 Annual Point Source Emissions from Concrete Batch Plants (tons/year)

Pollutant	Highest
CO[1]	1.20
VOCs[1]	0.44
NO_X[1]	5.60
SO_2[1]	0.38
PM_{10}	5.2
$PM_{2.5}$	1.5

[1] Engine Emissions.

Calculations provided in **Appendix E**, **Table E-11**.

It is assumed that:

- Batch plants would be staged approximately every 15 miles along the transmission line route and produce concrete over the construction period. Emission factors are from USEPA AP-42, Volume 1, 5th Edition Chapter 11.12, Table 11.12-2 for Concrete Batching. Batch plant emissions PM_{10} and $PM_{2.5}$ data include total engine and batch emissions.
- The concrete batch plants would require air permits from state air permitting agencies. The air permit would provide enforceable limits and potential air pollution mitigation measures to reduce air emissions impacts from operation of the batch plants.

Screen3 Modeling Results

Screening dispersion modeling was performed to assess PM_{10} and $PM_{2.5}$ impacts of fugitive dust from disturbed acres during construction. Air modeling was performed using the USEPA-approved SCREEN3 model. SCREEN3 is a single source Gaussian plume model, which provides maximum ground-level concentrations for point, area, flare, and volume sources. SCREEN3 is a screening version of the Industrial Source Complex model. For this study, SCREEN3 model version 96043 was used to evaluate impacts from fugitive dust. The construction area was modeled as an area source using full meteorology as well as regulatory model default values for mixing heights and anemometer heights. Impacts were assessed at a distance of 50 meters from the disturbance that is representative of all such activities in the direct impacts assessment area. Results of the conservative screening level dispersion modeling analysis that are applicable throughout the entire Proposed Project for all Alternatives are shown in **Table 3.1-14** and indicate that the impacts due to fugitive dust emissions from disturbed acres are well within the National and State AAQS. Background levels shown in **Tables 3.1-14** and **3.1-15** are representative of the rural background levels for the pollutants throughout the region including the locations for the proposed transmission line and all Alternatives.

Table 3.1-14 SCREEN3 Model Results for Construction Fugitive Dust

Pollutant	Averaging Time	Impact (µg/m^3)	Background (µg/m^3)	Total Impact (µg/m^3)	NAAQS (µg/m^3)	Percent of NAAQS
PM_{10}	24-hour	0.8	10.2	11.0	150	7
	Annual	0.2	9	9.2	50	18
$PM_{2.5}$	24-hour	0.2	6.9	7.1	35	20
	Annual	0.1	2.6	2.7	12	22.5

Table 3.1-15 SCREEN3 Model Results for Heavy Duty Vehicles on Unpaved Roads

Pollutant	Averaging Time	Impact (µg/m^3)	Background (µg/m^3)	Total Impact (µg/m^3)	NAAQS (µg/m^3)	Percent of NAAQS
NO_2	1-hour	1.9	NA	1.9	188	1.0
	Annual	0.1	NA	0.1	100	0.1
CO	1-hour	0.9	NA	0.9	40,000	<0.1
	8-hour	0.6	NA	0.6	10,000	<0.1
SO_2	1-hour	0.1	NA	0.1	196	0.1
	3-hour	0.1	NA	0.1	700	<0.1
	24-hour	0.0	NA	0.0	365	<0.1
	Annual	0.0	NA	0.0	80	<0.1
PM_{10}	24-hour	39.9	10.2	50.1	150	33.4
	Annual	4.0	9	13.0	50	25.9
$PM_{2.5}$	24-hour	4.0	6.9	10.9	35	31.2
	Annual	0.4	2.6	3.0	12	25

Screening dispersion modeling also was performed to assess impacts of criteria pollutants from heavy and light duty truck emissions. Air modeling was performed using USEPA approved SCREEN3. The trucks were modeled as volume sources using full meteorology as well as regulatory model default values for mixing heights and anemometer heights. Gaseous pollutant emissions from light and heavy duty vehicles are much less than particulate emissions when vehicles are traveling on unpaved roads. Background concentrations of gaseous pollutants in rural settings are typically not available, since monitoring generally takes place where there are larger or more abundant sources of these pollutants. Impacts were assessed at a distance of 10 meters from the road for a generic road segment that is representative of all dirt roads throughout the analysis area. Results of the conservative screening level dispersion modeling analysis for heavy duty vehicles are shown in **Table 3.1-15** and indicate that the impacts from unpaved road traffic are well within the National and State AAQS. Impacts due to light duty vehicles (pickup trucks) on unpaved roads would be much less than impacts for the larger trucks.

Hazardous Air Pollutants Impacts

The regulated hazardous air pollutants (HAPs) listed in Section 112 of the CAA that would be emitted from construction activities are benzene, toluene, xylenes, acetaldehyde, formaldehyde, and propylene. Emissions of the remaining HAPs are orders of magnitude smaller. **Table 3.1-16** provides an estimate of emissions of HAPs in pounds per year for the range of transmission line alternatives.

Table 3.1-16 Principal Hazardous Air Pollutant (lbs/yr)

Pollutant	Low	High
Benzene	8.45	10.20
Toluene	3.70	4.48
Xylenes	2.58	3.12
Acetaldehyde	6.95	8.40
Formaldehyde	10.70	12.90
Propylene	23.40	28.30

HAPs are regulated by emissions only, and they do not approach the level of concern which is 10 tpy for individual HAPs or 25 tpy in aggregate. HAPs modeling was not performed for this project since the primary sources of HAPs are internal combustion engines used to power construction equipment and vehicles.

Impacts at Class I and II Areas – Acid Deposition

The proposed project would emit low levels of NO_X and SO_2, which are the potential acid producing pollutants emitted from mobile sources during construction and operation. However, by providing a conduit and contributing a portion of the power from renewable sources (i.e. solar and wind power) to the southwest region, the net impact of the project would be to improve atmospheric conditions since the generation of electricity from renewable sources would avoid the use of electricity generated in fossil fuel-fired power plants and their associated acid-producing pollutants.

Impacts at Class I and II Areas – Visibility

Background visibility data are available from Zion National Park and Arches National Park, and visibility is considered to be very good. Although construction of the proposed project would emit low levels of pollutants, principally PM_{10} and $PM_{2.5}$, as well as tailpipe emissions from mobile sources, the net impact of the project would be negligible as discussed below.

The FLMs have visibility protection responsibility under 40 CFR §51.307 (New Source Review), which spells out the requirements for SIP visibility protection programs, as well as 40 CFR §52.27 (Protection of visibility from sources in attainment areas) and 40 CFR §52.28 (Protection of visibility from sources in nonattainment areas). These three provisions, taken together along with the SIP-approved rules, establish the visibility protection program for new and modified sources throughout the country.

Section 165 (42 U.S.C. 7475) of the CAA requires the USEPA, or the State/local permitting authority, to notify the FLM if emissions from a proposed project may impact a Class I area. The permitting authority should forward PSD applications to the FLM for review and analysis as soon as possible after receipt, giving the FLM an opportunity to review the application concurrently with the permitting authority. TransWest's Proposed Action (Alternative A), and the other regional alternatives do not constitute a major PSD source and do not require notification to the FLM. Nonetheless, an assessment of visibility impacts has been made using FLAG screening level criteria.

The Agencies are using a fixed Q/D factor of 10 as a screening criteria for sources located greater than 50 km from a Class I area, where Q is the total emissions of certain pollutants in tons per year and D is the distance from the facility to the Class I area. Furthermore, the Agencies are expanding the screening criteria to include all AQRVs, not just visibility. Therefore, the Agencies will consider a source located greater than 50 km from a Class I area to have negligible impacts with respect to Class I AQRVs if its total SO_2, NO_X, PM_{10}, and H_2SO_4 annual emissions (in tons per year, based on

24-hour maximum allowable emissions), divided by the distance (in km) from the Class I area (Q/D) is 10 or less. The Agencies would not request any further Class I AQRV impact analyses from such sources. (FLAG 2010)

For purposes of this analysis, it is assumed that no concrete batch plants would be located within 50 km of any Class I areas. Total emissions from a concrete batch plant more than 50 km from any Class I areas added to construction emissions in the immediate vicinity would total far less than 500 tpy and thus would result in a Q/D ratio of less than 10 and satisfy the screening criteria for all AQRVs.

Impacts on Ambient Ozone Levels

TransWest's Proposed Action is unlikely to cause or contribute to the formation of regional ozone at detectable levels due to the low level of emissions of potential ozone forming compounds, including NO_X and VOCs.

Operation Impacts

Routine line maintenance and repairs during operation of the transmission line would result in negligible air emissions.

Decommission Impacts

Decommissioning of the transmission line would require removal of buildings and other infrastructure and would take place over a shorter period of time compared to construction. As a result, air emissions during decommissioning would be less than construction emissions, which are not expected to cause state or federal air quality standards to be exceeded.

3.1.6.1 Impacts from Terminal Construction and Operation

Terminals and Ground Electrode Sites

Particulate emissions from construction activities at the Northern and Southern terminals are shown in **Table 3.1-17**. Estimated criteria pollutant emission from construction activities at the Northern and Southern terminals are shown in **Table 3.1-18**. These values are representative regardless of the emission location; the proposed action would include terminals and ground electrode systems in Wyoming and Nevada, Design Option 2 would include terminals and ground electrode systems in Wyoming and Utah, and Design Option 3 would include facilities in Wyoming, Utah, and Nevada.

Table 3.1-17 Particulate Emissions from Construction of Northern and Southern Terminals and Ground Electrode Beds

Site	Initial Disturbance (acres)			PM_{10} Emissions (tons)			$PM_{2.5}$ Emissions (tons)		
	Site-specific	Corridor	Total	Site-specific	Corridor	Total	Site-specific	Corridor	Total
Northern Terminal Area	190.0	313.0	503.0	5.7	9.4	15.1	0.6	0.9	1.5
Southern Terminal Area	140.0	269.0	409.0	4.2	8.1	12.3	0.4	0.8	1.2
Northern Electrode Bed	160.0	90.0	250.0	4.8	2.7	7.5	0.5	0.3	0.8
Southern Electrode Bed	160.0	90.0	250.0	4.8	2.7	7.5	0.5	0.3	0.8

Calculations provided in **Appendix E**, **Tables E-9** and **E-10**.

Table 3.1-18 Mobile Source Emissions of Criteria Pollutants from Construction of Terminals and Ground Electrode Beds

Location	Pollutant (tons)					
	CO	NO_X	SO_2	VOC	PM_{10}	$PM_{2.5}$
Northern Terminal and Electrode Bed	0.63	2.94	0.19	0.23	0.21	0.21
Southern Terminal and Electrode Bed	1.14	5.29	0.35	0.42	0.38	0.38

Calculations provided in **Appendix E**, **Tables E-9** and **E-10**.

General Conformity Analysis for Clark County

The Southern Terminal would be located in Clark County, Nevada, under the proposed action or Design Option 3. Portions of Clark County, Nevada, are designated nonattainment or maintenance for one or more federally regulated pollutants. Portions of Clark County are either designated as nonattainment or maintenance for CO, PM_{10}, and ozone.

A federal agency must make a determination that permitting or approving an activity will conform to the state implementation plan in accordance with 40 CFR Part 93.150. A conformity determination is required for each pollutant when the total of direct and indirect emissions caused by a federal action in a non-attainment area would equal or exceed threshold quantities specified in 40 CFR Parts 93.153(b) (1) and (2). The applicable conformity thresholds for the Project area are as follows:

- NSR – 100 tons per year for nitrogen oxides, carbon monoxide, volatile organic compounds, sulfur oxides, and particulate matter with a diameter of less than 10 microns (NO_X, CO, VOC, SO_X, and PM_{10}, respectively).
- PSD – 250 tons per year for NO_X, CO, VOC, SO_X, and PM_{10}.
- Title V – 100 tons per year for NO_X, CO, VOC, SO_X, and PM_{10}.
- Conformity Thresholds – 100 tons per year for NO_X, CO, VOC, SO_X, and PM_{10}.

Since the project is predicted to emit all of these emissions (or precursors in the case of ozone), a conformity review was conducted based on USDOE guidance (USDOE 2000). To conduct the conformity review, the impact of the project ROW construction and facility maintenance activities was assessed in the nonattainment areas. The nonattainment area is a small subset of the whole project area. Emissions in the nonattainment area were calculated using the methodology described above for tailpipe emission and fugitive dust emissions, except calculations were limited to the nonattainment area. Estimated emissions were compared with the emissions threshold for conformity determinations as published by USDOE (2000).

Based upon the use of conservative emissions estimates, the emissions from the construction and operation of TWE in the Las Vegas nonattainment area as shown in **Tables 3.1-14** and **3.1-15** would be below the conformity thresholds; therefore, the Project is exempt from performing a comprehensive conformity analysis.

Key Parameter Summary

- Equipment tailpipe emissions, and fugitive dust emissions predicted during the construction of the northern terminal, substations, and ground electrode facilities would not cause state or federal air quality standards to be exceeded, based on a screening level air quality analysis.
- Based upon the use of conservative emissions estimates, the emissions from the construction and operation of TWE in the Las Vegas nonattainment area would be below the conformity

thresholds; therefore, the Project is exempt from performing a comprehensive conformity analysis.

- Equipment tailpipe emissions, and fugitive dust emissions predicted during the construction of the southern terminal would not cause state or federal air quality standards to be exceeded, based on a screening level air quality analysis.

Mitigation

No additional mitigation measures beyond the BMPs and Applicant Committed Design Features are anticipated for construction of the north and south terminal areas.

Operations

Routine vegetation maintenance, repairs and line maintenance during operation of the terminals would result in negligible air emissions.

Decommissioning

Decommissioning of the terminals would require removal of buildings and other infrastructure and would take place over a brief period of time. Air emissions during decommissioning would be less than construction emissions, and are not expected to cause state or federal air quality standards to be exceeded.

3.1.6.2 Impacts Common to All Alternative Routes and Associated Components

Air quality impacts from area sources during construction and operations of the transmission line are listed in **Table 3.1-19**. In general, area source impacts are caused by construction activities that disturb soils and release fugitive dust as well as tailpipe emissions from light pickups, heavy trucks, and construction equipment. Such impacts are transitory and temporary, and do not pose a threat to national or state AAQS. Alternative A is the shortest overall route and disturbs the fewest acres; therefore, it has less potential to impact air quality from area sources than the other alternatives. The point sources are portable concrete batch plants used to prepare material for tower foundations. Shorter transmission line routes would be expected to result in fewer towers requiring less concrete for tower bases, but only if the terrain and underlying soil structures are similar. Nevertheless, there is no appreciable difference in air quality impacts from point sources between the alternatives in each of the regions.

Table 3.1-19 Fugitive Dust Emissions from Construction by Region and Alternative

Region	PM_{10} (tpy)						$PM_{2.5}$ (tpy)					
	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
I	119.2	121.2	143.1	130.6	NA	NA	11.9	12.1	14.3	13.1	NA	NA
II	205.6	272.4	282.4	210.2	212.9	211.0	20.6	27.2	28.2	21.0	21.3	21.1
III	119.4	117.1	128.7	NA	NA	NA	11.9	11.7	12.9	NA	NA	NA
IV	44.4	47.2	49.4	NA	NA	NA	4.4	4.7	4.9	NA	NA	NA
Total	488.5	557.8	603.6	340.9	212.9	211.0	48.9	55.8	60.4	34.1	21.3	21.1

Calculations provided in **Appendix E**, **Table E-2**.

Discrepancies in totals due to rounding error.

Mitigation

No additional mitigation measures beyond the BMPs and Applicant Committed Design Features are anticipated for construction in Region I.

***AQ-1**: In Region II, the Alternative B transmission line route passes within about 10 miles of Arches National Park. No concrete batch plants would be located within 30 miles of Arches National Park; therefore, concrete required for structure foundations should be acquired from local sources in the vicinity of Moab.*

Effectiveness: Location of batch plants at 30 miles or more from Class I boundaries would avoid project contributions to air quality related value reductions in these Class I areas.

***AQ-2**: In Region III, the Proposed Action (Alternative A) passes within about 20 miles of Zion National Park. No concrete batch plants would be located within 30 miles of Zion National Park; therefore, concrete required for structure foundations should be acquired from local sources in the vicinity of Cedar City or St. George, Utah.*

Effectiveness: Location of batch plants at 30 miles or more from Class I boundaries would avoid project contributions to air quality related value reductions in these Class I areas.

***AQ-3**: The Clark County nonattainment area is located in both Region III and Region IV. No new concrete batch plants are to be located within the nonattainment area; concrete required for structure foundations and other construction are to be acquired from existing local vendors.*

Effectiveness: Use of local concrete sources would avoid project contributions to nonattainment conditions in the Las Vegas region.

Key Parameter Summary and Conclusion

The following statements are derived from the analysis presented for various air quality factors. At the present time, there is no known phase or activity proposed to be conducted during the Project that is not consistent with current air quality regulations in Wyoming, Colorado, Utah, or Nevada.

Neither the construction nor operations phase of the proposed action or alternatives is expected to:

- Cause or contribute to any violation of any state or federal ambient air quality standard;
- Interfere with the maintenance or attainment of any state or federal ambient air quality standard in the analysis area;
- Increase the frequency or severity of any existing violations of any state or federal ambient air quality standard in the analysis area;
- Delay the timely attainment of any standard, interim emission reduction, or other air quality milestone promulgated by the USEPA or state air quality agency;
- Cause any adverse impacts to AQRVs;
- Cause any adverse impact to AQRVs in a federal Class I area; or
- Exceed state or federal general conformity thresholds.

Construction GHG emissions are expected to be both temporary and negligible when compared to the preliminary statewide GHG inventories. Operations GHG emissions would be negligible.

Estimated project emissions for point sources and areas sources for the proposed project including the alternatives and alternative variations in each of the regions are listed in more detail in **Appendix E**.

3.1.6.3 Residual Impacts

There would be no residual impacts to air quality from the proposed project because reclamation and revegetation would stabilize exposed soil and control fugitive dust emissions. As vegetation becomes established, particulate levels would return to typical conditions of the surrounding environment.

3.1.6.4 Impacts to Air from the No Action Alternative

There would be no project specific air quality impacts from the No Action Alternative since there would be no project sources of emissions. No action would mean that valuable renewable resources would not be tapped to replace power generation from fossil fuel-fired generation facilities, and GHG emissions on the order of 12 million tons of CO_2e per year would potentially not be avoided.

3.1.6.5 Irreversible and Irretrievable Commitment of Resources

There would be no irreversible impacts to air quality. However, there would be an irretrievable localized impact to air quality from fugitive dust emissions and equipment emissions during construction and before reclamation and revegetation is completed.

3.1.6.6 Relationship Between Local Short-term Uses and Long-term Productivity

The short-term uses associated with project construction and installation and would not substantively impact the long-term air quality in the analysis area.

3.2 Geological, Paleontological, and Mineral Resources

The proposed project covers several physiographic provinces including the Wyoming Basins, Colorado Plateau, Middle Rocky Mountains, and Basin and Range provinces. The proposed routes cross a variety of bedrock and surficial deposits that also include geologic hazards. Mineral resources in the areas crossed by the proposed Project include oil and natural gas, coal, aggregate and industrial minerals.

3.2.1 Regulatory Background

3.2.1.1 Geological Resources

Regulations pertaining to geological resources are concerned with the preservation of unique geological features. The National Registry of Natural Landmarks (16 USC 461-467) set up the National Natural Landmarks (NNL) program in 1962 and is administered under the Historic Sites Act of 1935. Implementing regulations were first published in 1980 under 36 CFR 1212 and the program was re-designated as 36 CFR 62 in 1981. A National Natural Landmark is defined as:

- An area designated by the Secretary of the Interior as being of national significance to the United States because it is an outstanding example(s) of major biological and geological features found within the boundaries of the United States or its Territories or on the Outer Continental Shelf (36 CFR 62.2).
- An area designated as one of the best examples of a biological community or geological feature within a natural region of the United States, including terrestrial communities, landforms, geological features and processes, habitats of native plant and animal species, or fossil evidence of the development of life (36 CFR 62.2).

Geological Hazards

Various federal and state regulations provide design standards for facilities located in areas that may have potentially damaging ground movements due to movement on active or potentially active faults, or landslides.

3.2.1.2 Paleontological Resources

Federal legislative protection for paleontological resources stems from the Antiquities Act of 1906 (P.L. 59-209; 16 U.S.C. 431 et seq.; 34 Stat. 225), which calls for protection of historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on federally administered lands. Federal protection for scientifically important paleontological resources would apply to construction or other related project impacts that would occur on federally owned or managed lands. This act provides for funding of mitigation of paleontological resources discovered during federal aid highway projects, provided that “excavated objects and information are to be used for public purposes without private gain to any individual or organization.” In addition to the foregoing, the National Registry of Natural Landmarks provides protection to paleontological resources. The BLM manages paleontological resources (fossils) on federal lands under the following statutes and regulations (BLM 2012a):

- FLPMA (P.L. 94-579);
- NEPA (P.L. 91-190);
- Title 43 of the CFR (Public Lands:Interior) (addresses the collection of invertebrate, vertebrate and plant fossils); and
- The Paleontological Resources Preservation Act of 2009 (P.L.111-011). The law authorizes the BLM and USFS and other land management agencies of the federal government to manage and provide protection to fossil resources using “scientific principles and expertise.” The act defines

paleontological resource as “any fossilized remains, traces, or imprints of organisms, preserved in or on the earth’s crust, that are of paleontological interest and that provide information about the history of life on earth.”

In addition to the statutes and regulations listed above, fossils on public lands are managed according to internal BLM guidance and manuals. BLM Manual 8270 (BLM 1998a) and the BLM Handbook H-8270-1 (BLM 1998b) contain the BLM's policy and guidance for the management of paleontological resources on public land and information. The manual presents information on the authorities and regulations related to paleontological resources. The handbook gives procedures for permit issuance, requirements for qualified applicants, and information on paleontology and planning. Important guidance for the protection of paleontological resources is contained in IM 2009-011 which provides guidelines for the assessment and mitigation of impacts to paleontological resources (BLM 2008a). Other IMs include WO-IM-2012 140 and 141 (BLM 2012a,b).

The USFS also manages paleontological resources, but under the NFMA and NEPA.

3.2.1.3 Mineral Resources

Federally-owned minerals in the public domain are classified into specific categories and these categories only apply to minerals in the federal mineral estate. Because most of the mineral estate in the project area is owned by the federal government, it is important to identify the mineral commodity classifications used by the BLM and the USFS. Within legal constraints, publicly-owned minerals are available for exploration, development, and production, while subject to existing regulations, standard terms and conditions, and stipulations. These categories are locatable minerals, leasable, and salable minerals. The classifications listed below are based on Acts passed by the U.S. Congress.

- Locatable minerals include precious and base metallic ores and nonmetallic minerals such as bentonite, gypsum, chemical grade limestone, and chemical grade silica sand. Uncommon varieties of sand, gravel, building stone, pumice, rock, and cinders also are managed as locatable minerals. Locatable minerals are acquired under the General Mining Law of 1872, as amended and the Surface Use and Occupancy Act of July 23, 1955 (American Geological Institute 1997).
- Leasable minerals are those minerals that are leased to individuals for exploration and development. The leasable minerals have been subdivided into two classes, fluid and solid. Fluid minerals include oil and gas, geothermal resources and associated by-products, oil shale, native asphalt, oil impregnated sands, and any other material in which oil is recoverable only by special treatment after the deposit is mined or quarried. Solid leasable minerals are specific minerals such as coal and phosphates. Leasable minerals are associated with the following laws; Mineral Leasing Act of 1920, as amended and supplemented, Mineral Leasing Act for Acquired Lands of 1947, as amended, and the Geothermal Steam Act of 1970, as amended (American Geological Institute 1997). Leasable minerals are acquired by applying to the federal government for a lease to explore and develop the minerals.
- Salable minerals are common mineral materials that include sand, gravel, roadbed, ballast, and common clay and are sold by contract with the federal government. These have been identified as all other minerals that were not designated as leasable or locatable. These minerals are regulated under the Mineral Material Act of July 23, 1947, as amended, and the Surface Use and Occupancy Act of July 23, 1955 (American Geological Institute 1997).

3.2.2 Data Sources

Data sources include published maps and reports and internet websites of the U.S. Geological Survey (USGS) and UGS. Other data sources included academic and professional journals and publications. Specific reference citations are provided within the text and a complete description of each reference is provided in reference section of the document.

3.2.3 Analysis Area

The analysis area for geology, minerals, and paleontological resources generally encompasses the area within the 2-mile transmission line corridor. However, the Baseline Description includes general descriptions of the physiography, geology, paleontological resources, and mineral resources of the regions where the alternatives are located in order to provide a sense of the geological setting.

3.2.4 Baseline Description

3.2.4.1 Physiography and Geology

The proposed project covers several physiographic provinces including the Wyoming Basins, Colorado Plateau, Middle Rocky Mountains, and Basin and Range (Fenneman 1928).

The Wyoming Basins province covers 40,000 square miles in much of central and southwestern Wyoming and a portion of northwestern Colorado (Howard and Williams 1972). The province is characterized by basins, small mountain ranges, plateaus, and mesas where elevations generally range from 6,000 to 7,000 feet above mean sea level (amsl) in the basins to more than 8,000 feet amsl elevation in the mountain ranges. The area is semi-arid and playas, deflation basins, sands dunes, and badlands are common features.

In the Wyoming Basins section, the bedrock formations generally consist of Upper Cretaceous and Lower Tertiary rocks. Surficial materials consist of recent and older quaternary alluvium, colluvium and terrace deposits. Also present are sand dunes, playa deposits, and landslide material. Various structural features are present in the Wyoming Basins, including (from east to west) the Hanna Basin, Rawlins Uplift, southeast Greater Green River Basin (including the Washakie and Sand Wash Basins), and the Axial Arch (Grose 1972). Among the major structural features are numerous smaller structural features including folds and faults.

The Colorado Plateau province is 140,000 square miles in area and covers portions of Utah, Colorado, Arizona, and New Mexico (Howard and Williams 1972). The plateau is semi-arid to arid and landforms typically consist of highly dissected plateaus and mesas and badland topography.

Within the Colorado Plateau province are the Uinta Basin, High Plateaus of Utah, and Canyonlands sections of the Colorado plateau province (Fenneman 1928). The Uinta Basin is a strong-relief, dissected plateau where elevations range from about 5,000 to 7,000 feet amsl. The High Plateaus of Utah section is characterized by elevated and dissected block plateaus and terrace plateaus covered in part by volcanic flows. The High Plateaus of Utah is a transition zone between the Colorado Plateau and the Basin and Range province to the west because the area has characteristics of both provinces (Utah Geological Survey [UGS] 2011a). The High Plateaus of Utah section is rugged and elevations range from about 7,000 to 10,000 feet amsl. The western portion of the Canyonlands section (west of the Green River) is characterized by eroded plateaus and high relief with elevations ranging from 5,000 to 7,000 amsl. From the Utah-Colorado state line to the Green River, elevations range from less than 4,300 amsl at the Green River to 5,000 amsl.

Bedrock in the Colorado Plateaus primarily consists of nearly-flat lying Cretaceous and Paleozoic rocks, but also includes Tertiary sedimentary rocks (in the Uinta Basin) and Tertiary and Quaternary volcanic rocks (UGS 2011a). Surficial deposits are not very extensive and primarily consist of alluvium, terraces, colluvium, and sand dunes. Major structural features include the Piceance Basin, Douglas Creek Arch, Uinta Basin, San Rafael Uplift, and the Wasatch Plateau. Within the larger structural features, there are smaller order structures including folds and faults.

The Middle Rocky Mountains province consists of mountain ranges of varying structural styles and origins (fault block, dissected volcanic plateau, shallow thrust sheets, or deep seated eroded anticlinal folds). The

eastern extension of the Middle Rocky Mountain province is the Uinta Mountains. The Uinta Mountains are a large, deep-seated, breached anticline that trends east-west. Elevations in the eastern Uinta Mountains range from around 8,000 feet amsl along the crest of the range to approximately 6,500 feet amsl on the Wyoming side. In the Uinta Basin elevations are approximately 5,000 feet amsl. The Wasatch Range, which is the southern extremity of the Middle Rocky Mountain province, is a block-faulted mountain range with Mount Nebo being the highest point in the range at 11,877 feet amsl.

The major rock types exposed in the Uinta Mountains consist of Precambrian metamorphic sedimentary rocks (Hintze 1988). In the southern Wasatch Mountains the rocks consist of Tertiary volcanic and Upper Cretaceous rocks as well as intrusive masses of Jurassic-aged salt and gypsum containing highly deformed Jurassic to Quaternary deposits (Witkind and Weiss 1991).

The Great Basin section of the Basin and Range province is characterized by narrow, block-faulted mountain ranges that generally have a north-south trend and are separated by basins or valleys. In low-relief valleys such as the Pahroc-Delamar Valley, Dry Lake Valley, Tule Desert, Escalante Desert, Muddy River Valley, and Las Vegas Valley, elevations range from about 6,000 feet amsl in central Utah to 2,000 feet amsl near Las Vegas, Nevada. Mountain ranges include the Cedar Range, the Delamar Mountains, the Clover Mountains, Bull Valley Mountains, and the Beaver Dam Mountains, where elevations approach 7,000 feet amsl.

In the Great Basin, the alternatives cross primarily unconsolidated deposits of alluvium, alluvial fan, pediment, sand dune, lake sediments, and occasional outcrops of sedimentary Cambrian rocks (Hintze and Davis 2002; Hintze et al. 2003; Steven et al. 1990; Rowley et al. 2006). The alternatives also cross Tertiary volcanic lava flows and folded Mesozoic and Paleozoic rocks in southwest Utah. In the Nevada portion of the Great Basin, the alternatives cross Tertiary volcanic and sedimentary rocks, Precambrian rocks, Paleozoic limestone and dolomite, and Triassic sedimentary rocks (Tschanz and Pampeyan 1970; Longwell et al. 1965).

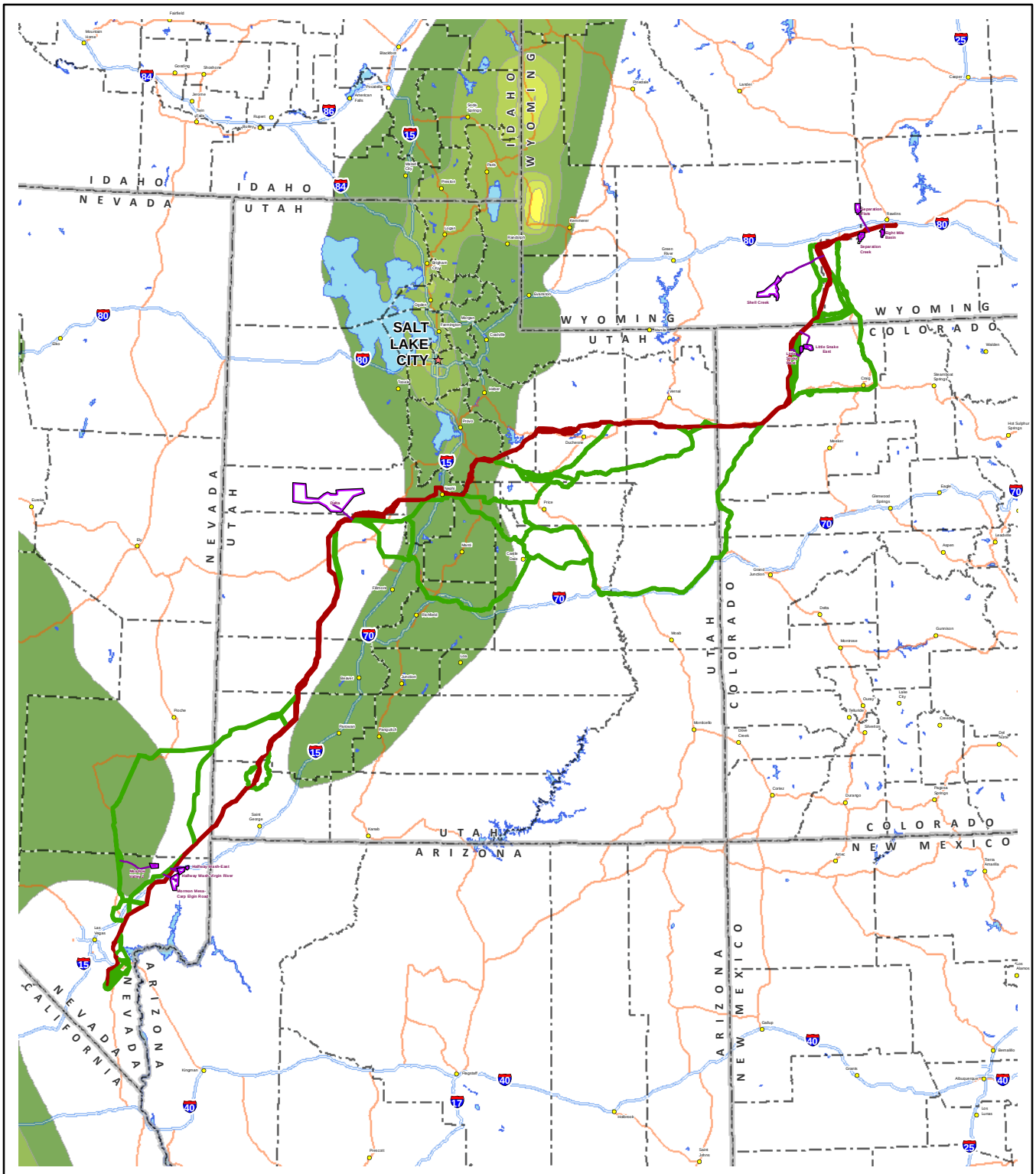
3.2.4.2 Geologic Hazards

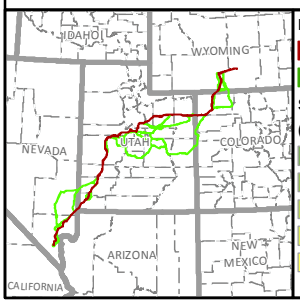
Seismic Hazards

Seismic hazards occur as the result of energy that is released when there is movement on faults in the Earth's crust that results in an earthquake. Seismicity refers to the frequency of earthquakes which varies with geographic location. A fault is a fracture whereby the ground on either side of the fracture has moved relative to one another, and parallel to the fracture (USGS 2009a). An active fault is a fault on which movement has occurred within the last 10,000 years. A quaternary fault is a fault where evidence indicates that movement has taken place within the last 1.6 million years, but no evidence of movement within the last 10,000 years.

An earthquake generates waves of energy that cause the ground to shake, even many miles from the site of the fault rupture. The USGS develops estimates of potential ground motion using the peak acceleration of ground motion expressed as a percentage of the acceleration of gravity (**g**) with a 10 percent probability of exceedance in 50 years (Petersen et al. 2008). This information is presented in map form (**Figure 3.2-1**) to provide an indication of potential seismic risk for regions to be crossed by the alternatives. This figure shows that ground motion is expected to be low except along the seismically active area along the Wasatch Mountains and High Plateaus of Utah.

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Project Corridors
- Applicant Proposed
- Alternative

Seismic Hazard
(Peak Ground Acceleration in % G)
- 10-15
- 15-20
- 20-25
- 25-30
- 30-40

- Potential Ground Electrode Siting Area
- Potential Ground Electrode Site
- Potential Ground Electrode Overhead Electrical Line

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Figure 3.2-1
Seismic Hazard

0 20 40 80 Miles
0 20 40 80 km
1:5,000,000

N

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Exported On: 6/5/2013

Landslides

Landslide is a term used for various processes involving the movement of earth material down slopes (USGS 2004). Landslides can occur in a number of different ways in different geological settings. Large masses of earth become unstable and by gravity begin to move downhill. The instability can be caused by a combination of factors including steep slopes, periods of high precipitation, undermining support by natural processes (stream erosion), or unintentional undercutting or undermining the strength of unstable materials in the construction of roads and structures.

The degree of landslide hazard is defined on the basis of landslide incidence and degree of landslide susceptibility as determined by the USGS in (Radbruch-Hall et al. 1982). Geologic map units or portions of map units "with more than 15 percent of their area involved in landsliding were classified as having high incidence; those with 1.5 to 15 percent of their area involved in landsliding, as having medium incidence; and those with less than 1.5 percent of their area involved, as having low incidence." Landslide susceptibility has been defined as "the probable degree of response of the areal rocks and soils to natural or artificial cutting or loading of slopes or to anomalously high precipitation. High, medium, and low susceptibility are delimited by the same percentages used in classifying the incidence of landsliding" (i.e., high greater than 15 percent, medium 1.5 to 15 percent, and low, less than 1.5 percent). The project area contains, for the most part, areas of low landslide incidence and susceptibility, but there are areas of high susceptibility and incidence of landslides, especially in central Utah.

Subsidence

Subsidence is a decrease of surface elevation of the ground and may be caused by a variety of phenomena including, but not limited to, dissolution of subsurface strata, compaction, removal of groundwater, and earthquake ground motion. The surface expression from subsidence can range from localized precipitous collapses (sinkholes) to broad regional lowering of the earth's surface. Sinkholes have been identified in the North Horn Formation in the Wasatch Plateau area and the Scipio Valley (Bjorkland and Robinson 1968; Gillette and Miller 1999). Other causes of subsidence are underground mining and subsidence due to groundwater withdrawal. Subsidence due to coal mining may be a hazard in the coal resource and mining areas that are crossed. Subsidence due to groundwater withdrawal may be of greatest concern in southwestern Utah.

3.2.4.3 Paleontological Resources

The BLM has adopted the PFYC system to identify and classify fossil resources on federal lands (BLM 2007). Paleontological resources are closely tied to the geologic units (i.e., formations, members, or beds) that contain them. The probability for finding paleontological resources can be broadly predicted from the geologic units present at or near the surface. Therefore, geologic mapping can be used for assessing the potential for the occurrence of paleontological resources. The alternatives cross bedrock that has the potential to contain valuable paleontological resources. The various geographic regions have formations that have yielded high value fossils, especially vertebrates such as dinosaurs and mammals. The formations also contain valuable invertebrate and plant fossils.

The PFYC system is a way of classifying geologic units based on the relative abundance of vertebrate fossils or scientifically significant fossils (plants, vertebrates, and invertebrates) and their sensitivity to adverse impacts. A higher class number indicates higher potential. The PFYC is not intended to be applied to specific paleontological localities or small areas within units. Although important localities may occasionally occur in a geologic unit, a few widely scattered important fossils or localities do not necessarily indicate a higher class; instead, the relative abundance of significant localities is intended to be the major determinant for the class assignment. The PFYC system is meant to provide baseline guidance for predicting, assessing, and mitigating paleontological resources. The classification should be considered at an intermediate point in the analysis and should be used to assist in determining the need for further mitigation assessment or actions. The BLM intends for the PFYC system to be used as a

guideline as opposed to rigorous definitions. Descriptions of the potential fossil yield classes are summarized in **Table 3.2-1**.

Table 3.2-1 Potential Fossil Yield Classification

Class	Description	Basis	Management Considerations
1	Very low potential. Geologic units not likely to contain recognizable fossil remains. Rocks such as igneous or metamorphic units, (excluding reworked volcanic ash units) and units that are Precambrian in age or older.	The probability for impacting any fossils is negligible. Assessment or mitigation of paleontological resources is usually unnecessary. The occurrence of significant fossils is non-existent or extremely rare.	Management concern for paleontological resources in Class 1 units is usually negligible or not applicable. Assessment or mitigation is usually unnecessary except in very rare or isolated circumstances.
2	Low Potential. Sedimentary geologic units which are not likely to contain paleontological resources. Included in Class 2 are rock units or geologic deposits have the following characteristics: Vertebrate or significant invertebrate or plant fossils not present or very rare; units that are generally younger than 10,000 years before present; recent aeolian deposits; and sedimentary rocks that exhibit significant physical and chemical changes (i.e., diagenetic alteration).	The probability for impacting vertebrate fossils or paleontological resources is low. Assessment or mitigation of paleontological resources is not likely to be necessary. Localities containing important resources may exist, but would be rare and would not influence the classification. These important localities would be managed on a case-by-case basis.	Management concern for paleontological resources is generally low and assessment or mitigation is usually unnecessary except in rare or isolated circumstances.
3a, 3b	Moderate or Unknown Potential. Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential. Class 3 units include the following types of geologic units: • Often marine in origin with sporadic known occurrences of vertebrate fossils. • Vertebrate fossils and scientifically important invertebrate or plant fossils known to occur intermittently; predictability known to be low. • Poorly studied and/or poorly documented. Potential yield cannot be assigned without ground reconnaissance. **Class 3a** – Moderate Potential. Units are known to contain paleontological resources, but these occurrences are widely scattered. Common invertebrate or plant fossils may be found in the area, and opportunities may exist for hobby collecting. The potential for a project to be sited on or impact a significant fossil locality is low, but is somewhat higher for common fossils.	This classification includes a broad range of paleontological potential. It includes geologic units of unknown potential, as well as units of moderate or infrequent occurrence of paleontological resources. Surface-disturbing activities may require field assessment to determine whether significant paleontological resources occur in the area of a proposed action, and whether the action could affect the paleontological resources. These units may contain areas that would be appropriate to designate as hobby collection areas due to the higher occurrence of common fossils and a lower concern about affecting significant paleontological resources.	Management concern for paleontological resources is moderate or cannot be determined from existing data. Management considerations cover a broad range of options as well, and could include pre-disturbance surveys, monitoring, or avoidance. Surface-disturbing activities will require sufficient field assessment to determine appropriate course of action.

Table 3.2-1 Potential Fossil Yield Classification

Class	Description	Basis	Management Considerations
3a, 3b (continued)	**Class 3b** – Unknown Potential. Units exhibit geologic features and preservational conditions that suggest paleontological resources, but little information about the paleontological resources of the unit or the area is known. This may indicate the unit or area is poorly studied, and field surveys may uncover significant finds. The units in this Class may eventually be placed in another Class when sufficient survey and research is performed. The unknown potential of the units in this Class should be carefully considered when developing any mitigation or management actions.		
4a,b	High Potential. Geologic units containing a high occurrence of paleontological resources. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability. Surface disturbing activities may adversely affect paleontological resources in many cases. Class 4 units have the following characteristics: • Extensive soil or vegetative cover; bedrock exposures are limited or not expected to be impacted. • Areas of exposed outcrop are smaller than two contiguous acres. • Outcrops form cliffs of sufficient height and slope so that impacts are minimized by topographic conditions. • Other characteristics are present that lower the vulnerability of both known and unidentified paleontological resources. **Class 4a** – Unit is exposed with little or no soil or vegetative cover. Outcrop areas are extensive with exposed bedrock areas often larger than two acres. Paleontological resources may be susceptible to adverse impacts from surface disturbing actions. Illegal collecting activities may impact some areas.	The probability for impacting paleontological resources is moderate to high, and is dependent on the proposed action. Mitigation considerations must include assessment of the disturbance, such as removal or penetration of protective surface alluvium or soils, potential for future accelerated erosion, or increased ease of access resulting in greater looting potential. If impacts to significant fossils can be anticipated, on-the-ground surveys prior to authorizing the surface disturbing action will usually be necessary. On-site monitoring or spot-checking may be necessary during construction activities.	Management concern for paleontological resources in Class 4 is moderate to high, depending on the proposed action. A field survey by a qualified paleontologist is often needed to assess local conditions. Management prescriptions for resource preservation and conservation through controlled access or special management designation should be considered. Class 4 and Class 5 units may be combined as Class 5 for broad applications, such as planning efforts or preliminary assessments, when geologic mapping at an appropriate scale is not available. Resource assessment, mitigation, and other management considerations are similar at this level of analysis, and impacts and alternatives can be addressed at a level appropriate to the application.

Table 3.2-1 Potential Fossil Yield Classification

Class	Description	Basis	Management Considerations
4a,b (continued)	**Class 4b** – These are areas underlain by geologic units with high potential but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. The bedrock unit has high potential, but a protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts to the bedrock resulting from the activity.		
5a,b	Very High Potential. Highly fossiliferous geologic units that consistently and predictably produce paleontological resources, and that are at risk of human caused adverse impacts or natural degradation. Class 5 units have the following characteristics: • Extensive soil or vegetative cover; bedrock exposures are limited or not expected to be impacted. • Areas of exposed outcrop are smaller than two contiguous acres. • Outcrops form cliffs of sufficient height and slope so that impacts are minimized by topographic conditions. • Other characteristics are present that lower the vulnerability of both known and unidentified paleontological resources. **Class 5a** – Unit is exposed with little or no soil or vegetative cover. Outcrop areas are extensive with exposed bedrock areas often larger than two contiguous acres. Paleontological resources are highly susceptible to adverse impacts from surface disturbing actions. Unit is frequently the focus of illegal collecting activities. **Class 5b** – These are areas underlain by geologic units with very high potential but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. The bedrock unit has very high potential, but a protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts to the bedrock resulting from the activity.	The probability for impacting significant fossils is high and fossils known or can reasonably be expected to occur in the impacted area. On-the ground surveys prior to authorizing any surface disturbing activities will usually be necessary. On-site monitoring may be necessary during construction activities.	Management concern for paleontological resources in Class 5 areas is high to very high. A field survey by a qualified paleontologist is usually necessary prior to surface disturbing activities or land tenure adjustments. Mitigation will often be necessary before and/or during these actions. Official designation of areas of avoidance, special interest, and concern may be appropriate.

Source: BLM 2007.

3.2.4.4 Mineral Resources

Mineral resources in the various regions include metallic ores (gold, silver, and copper), non-metallic deposits (sand, gravel, and gypsum), geothermal, coal, and hydrocarbons (oil and natural gas). The following subsections provide a summary of the mineral resources found in each region.

3.2.5 Regional Description

3.2.5.1 Region I

Physiography and Geology

Region I is primarily located in the Wyoming Basins and Colorado Plateau physiographic provinces; a small portion in Utah and Wyoming also crosses the Middle Rocky Mountain province (**Figure 3.2-2**) (Fenneman 1928).

In Wyoming, Region I is located in the Hanna Basin and the southeast portion of the Greater Green River Basin (within the Wyoming Basins physiographic area). The basins contain thousands of feet of sedimentary rocks and were created during the formation of the Rocky Mountains in late Cretaceous and early Tertiary time. Bedrock is composed of Triassic, Jurassic, Cretaceous and Tertiary rocks (Love and Christensen 1985). The Cretaceous units include the Niobrara, Steel Shale, Mesaverde, Lewis, and Lance formations. The Cretaceous rocks consist of marine shale, sandstones, mudstones, and minor coal beds (Watson 1980). Tertiary units crossed are the Fort Union, Ferris, and Hanna formations that consist of non-marine, continental, and fluvial (river) deposits of sandstone, conglomerate, mudstones, carbonaceous shales, and coal. South of Wamsutter, Wyoming, the bedrock consists of mainly Tertiary Fort Union, Wasatch, and Green River formations. In Colorado, the bedrock units are the Wasatch and Green River formations, the Mancos shale, Mesaverde, and Miocene Browns Park formations.

Geological Hazards

Seismic Hazards

Region I is an area of low earthquake activity. There are no active faults in the Colorado and Wyoming portions of Region I and the routes in these states do not cross any quaternary faults (USGS 2006; USGS and Colorado Geological Survey 2006). The USGS seismic hazard mapping indicates that in areas crossed by the corridors in Region I, ground movement that could be triggered by a maximum credible earthquake is expected to be low, having a peak ground acceleration (PGA) of less than 10 percent of the acceleration of **g** with a 10 percent probability of exceeding that PGA in 50 years (Petersen et al. 2008).

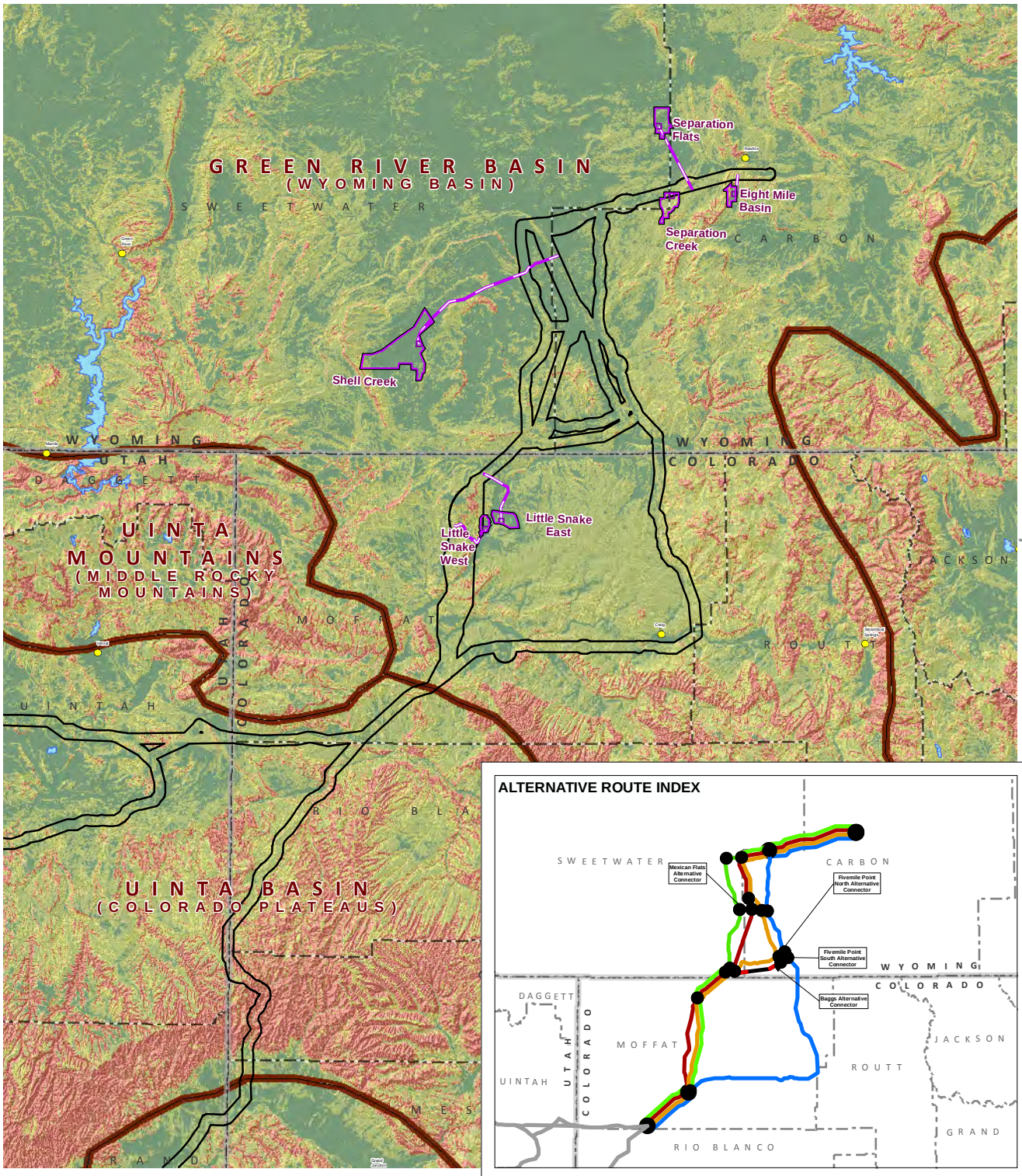
Landslides

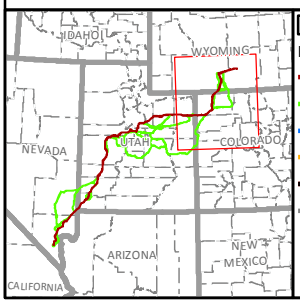
In Region I, there are areas of moderate to high susceptibility and low incidence in Wyoming and northwestern Colorado. **Figure 3.2-3** shows the landslide areas in Region I. The upper Cretaceous and Tertiary formations are particularly susceptible to movement and landslides.

Subsidence

Alternates cross areas of current and historic underground coal mining and these areas may be subject to ground subsidence. Specific areas crossed by the 2-mile transmission line corridors are discussed under the Mineral Resources topic for Region I.

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Project Corridor

DEIS Alternative Routes

- Applicant Proposed I-A
- Alternative I-B
- Alternative I-C
- Agency Preferred I-D
- Alternative Variation or Connector
- Segment not in this Region

- Potential Ground Electrode Siting Area
- Potential Ground Electrode Site
- Potential Ground Electrode Overhead Electrical Line
- Physiographic Section (Province)

Topography

- Flat (<5%)
- Rolling (5-15%)
- Steep (15-25%)
- Rugged (>25%)

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Figure 3.2-2
Region I
Physiography and Topography

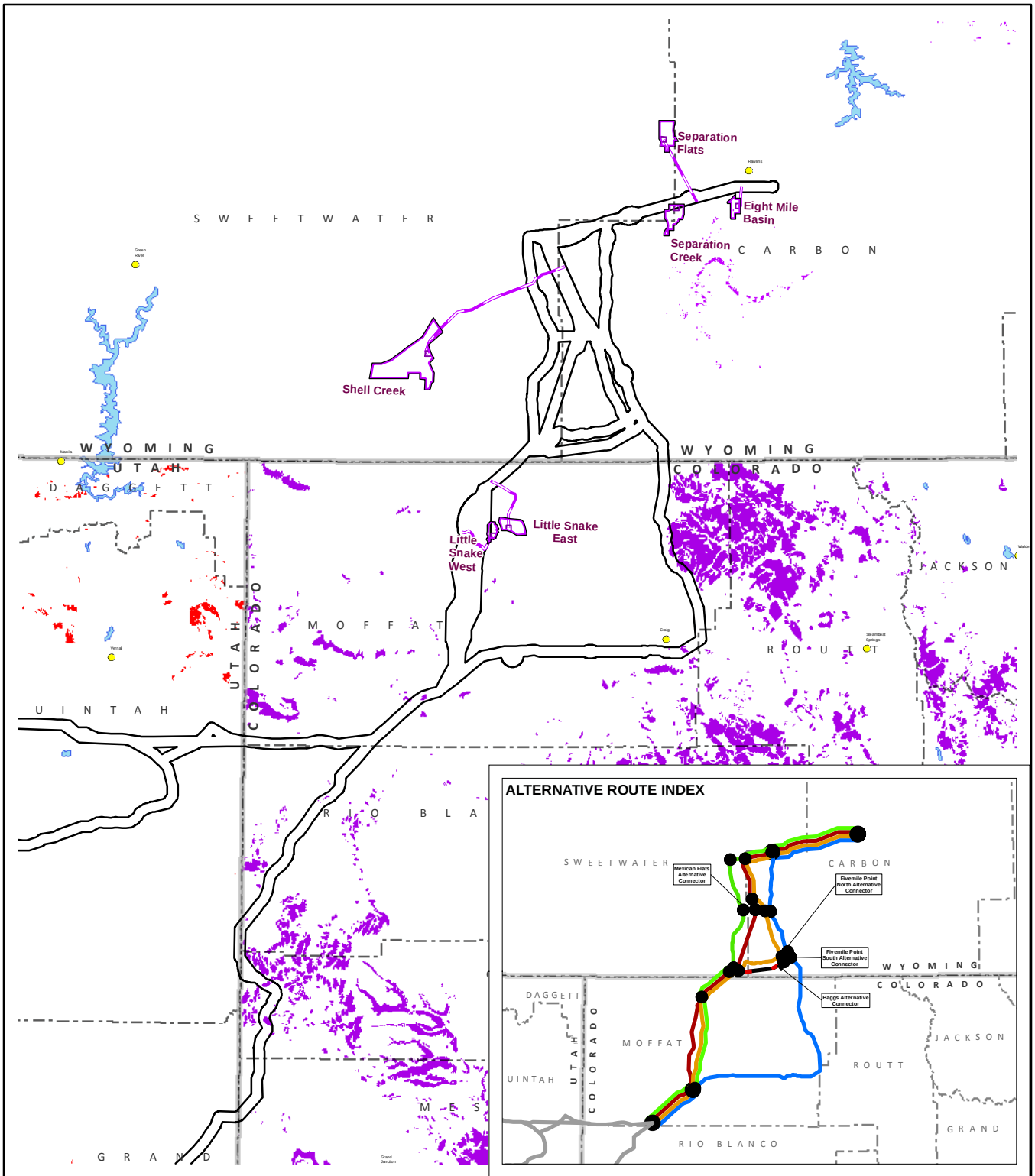
0 5 10 20 Miles
0 5 10 20 km
1:1,750,000

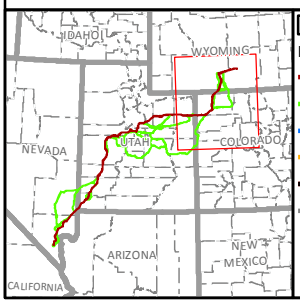
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Project Corridor

DEIS Alternative Routes

- Applicant Proposed I-A
- Alternative I-B
- Alternative I-C
- Agency Preferred I-D
- Alternative Variation or Connector
- Segment not in this Region

- Potential Ground Electrode Siting Area
- Potential Ground Electrode Site
- Potential Ground Electrode Overhead Electrical Line
- Unclassified Landslide (CO & WY)

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 3.2-3
Region I
Landslide Incidence

0 5 10 20 Miles
0 5 10 20 km
1:1,750,000

N

Western AREA POWER ADMINISTRATION

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Paleontological Resources

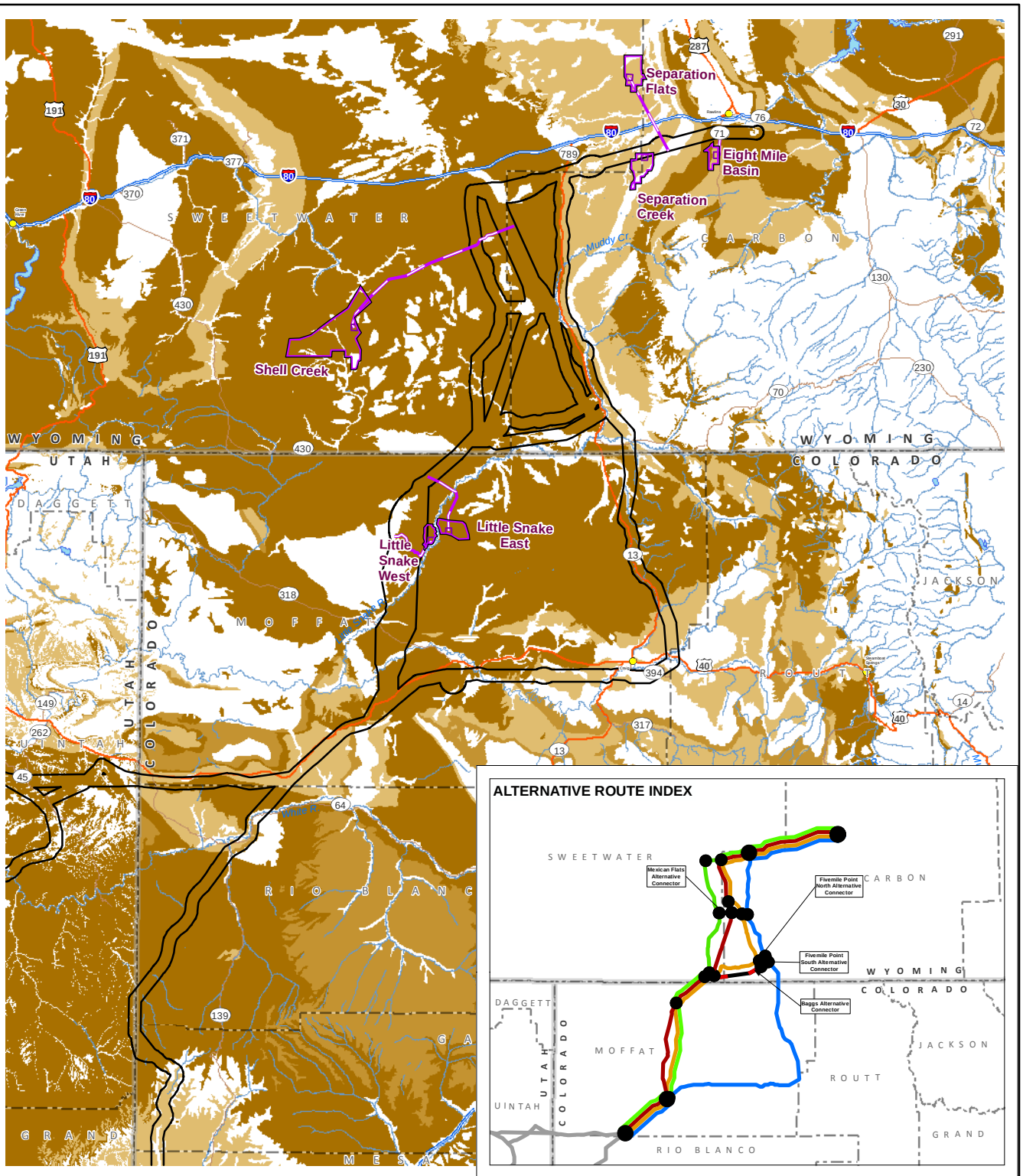
In Region I, there are a number of important fossil bearing formations. **Table 3.2-2** lists the formations in order of relative age and provides the PFYC ratings for the formations or geologic units. **Figure 3.2-4** shows the PFYC ratings crossed in Region I. Dinosaur National Monument, an outstanding fossil resource, is located in Region I a few miles east of Vernal, Utah.

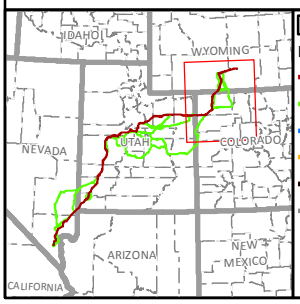
Table 3.2-2 Potential Fossil-bearing Formations and PFYC Classifications in Region I

Formation/Rock Unit	Age	PFYC Rank
Browns Park	Miocene to Pliocene	3-5
Bishop Conglomerate	Oligocene	3
Duchesne River	Eocene to Oligocene	5
Washakie Formation	Eocene	5
Battle Spring Formation	Eocene	3
Uinta Formation	Upper Eocene	4
Green River Formation and Parachute Creek and Douglas Creek Members	Eocene	4-5
Wasatch Formation	Lower Eocene	5
Hanna Formation	Lower Eocene	5
Fort Union	Paleocene	3
Ferris Formation	Paleocene	3-5
Medicine Bow Formation	Upper Cretaceous	3
Lance Formation	Upper Cretaceous	5
Lewis Shale	Upper Cretaceous	3
Williams Fork	Upper Cretaceous	5
Iles Formation	Upper Cretaceous	4
Mesaverde Group or Formation	Upper Cretaceous	3-5
Steele Shale	Upper Cretaceous	3
Niobrara Shale	Upper Cretaceous	5
Sego Sandstone of the Mancos Shale	Upper Cretaceous	3
Frontier Formation	Upper Cretaceous	3
Dakota Formation	Lower Cretaceous	5
Madison Formation	Devonian- Mississippian	3

Sources: BLM 2012b, 2008b; USDOE and USDOI 2008.

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Project Corridor

DEIS Alternative Routes

- Applicant Proposed I-A
- Alternative I-B
- Alternative I-C
- Agency Preferred I-D
- Alternative Variation or Connector
- Segment not in this Region

- Potential Ground Electrode Siting Area
- Potential Ground Electrode Site
- Potential Ground Electrode Overhead Electrical Line

Potential Fossil Yield Class (PFYC)

- Class 3
- Class 4
- Class 5

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Figure 3.2-4
Region I
Potential Fossil Yield Classes

0 5 10 20 Miles
0 5 10 20 km
1:1,500,000

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Mineral Resources

The major mineral resources in the study area are oil, natural gas, and coal. The Green River Basin is a prolific area of natural gas production, but oil also is an important resource. The Uinta Basin also has a large resource of oil and natural gas. Coal bed methane is a potentially important resource in the region (BLM 2010). The analysis area crosses numerous oil and gas fields, especially in the Wyoming portion of the region (De Bruin 2007; Wray et al 2002). **Table 3.2-3** lists the oil and gas fields crossed by the proposed and alternative 2-mile transmission line corridors in Region I. Coal also is an important resource; portions of the Green River Coal Region are located within Region I. Alternative 2-mile transmission line corridors cross the following coal fields in Region I: Hanna, Kindt, Great Divide, Rock Springs, Yampa, and Lower White River (Biewick 2012; Carrol 2004; Tabet and Wakefield 2006). **Figure 3.2-5** depicts the oil and gas fields and coal mines in Region I.

Table 3.2-3 Oil and Gas Fields Crossed by Alternatives in Region I

Alternative I-A	State	Alternative I-B	State	Alternative I-C	State	Alternative I-D	State
Unnamed	Wyoming	Unnamed	Wyoming	Unnamed	Wyoming	Unnamed	Wyoming
Cont. Divide- Creston	Wyoming	Cont. Divide- Creston	Wyoming	Cont. Divide- Creston	Wyoming	Cont. Divide-Creston	Wyoming
Cedar Breaks	Wyoming	Fairway	Wyoming	Blue Gap	Wyoming	Cedar Breaks	Wyoming
Fireplace Rock	Wyoming	Mulligan Draw	Wyoming	Craig North	Colorado	Blue Gap	Wyoming
Round Table	Colorado	Dripping Rock	Wyoming	Buck Peak	Colorado	Round Table	Colorado
Powder Wash	Colorado	Cedar Breaks	Wyoming	Craig	Colorado	Powder Wash	Colorado
Elk Springs	Colorado	McPherson Springs	Wyoming	Bell Rock	Colorado	Elk Springs	Colorado
		Stateline	Wyoming	Elk Springs	Colorado		
		Stateline	Colorado				
		North Big Hole	Colorado				
		Big Hole	Colorado				
		Elk Springs	Colorado				

Sources: DeBruin 2007; Wray et al. 2002.

The Alternative I-C (Segment 190.00) 2-mile transmission corridor crosses a coal planning area and there are tracts in the Craig, Colorado, area that have been identified as suitable for coal leasing (BLM 1980). However, the corridor does not cross any of these potential coal lease tracts. The segment also crosses areas of abandoned coal mines located in Sections 9, 10, and 20 in Township 6 North, Range 90 West; and Section 9, Township 6 North, Range 91 west; 2 to 3 miles south and southwest of Craig, Colorado (Colorado Geological Survey 2011). There is subsidence associated with these historic abandoned coal mines.

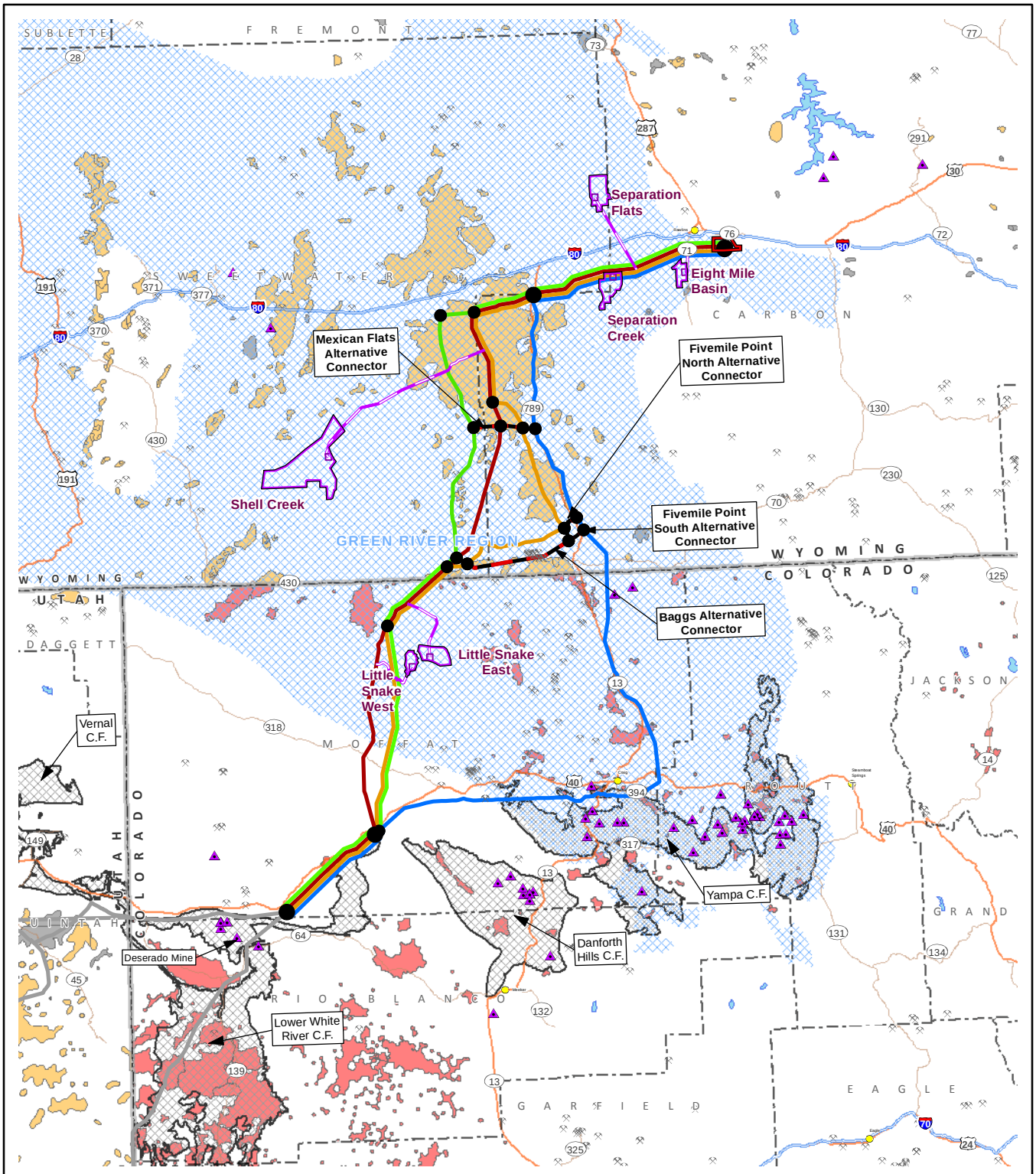
Other mineral resources in Region I include oil shale and aggregate (sand, gravel, and crushed stone).

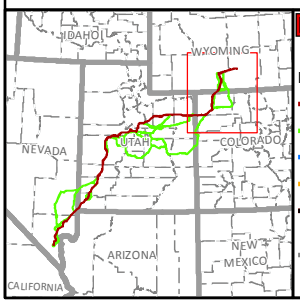
3.2.5.2 Region II

Physiography and Geology

Region II is located in the Colorado Plateau, Middle Rocky Mountains, and the Basin and Range provinces (**Figure 3.2-6**) (Fenneman 1928).

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- Terminal Siting Area
- Node

DEIS Alternative Routes

- Applicant Proposed I-A
- Alternative I-B
- Alternative I-C
- Agency Preferred I-D
- Alternative Variation or Connector
- Segment not in this Region

- Potential Ground Electrode Siting Area
- Potential Ground Electrode Site
- Potential Ground Electrode Overhead Electrical Line

- Mines - Past and Present Metals Production
- Active/Inactive Coal Mine
- Coal Region
- Coal Field

Oil and Gas Fields

- Oil
- Gas
- Oil and Gas

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Figure 3.2-5
Region I
Mining and Mineral Extraction

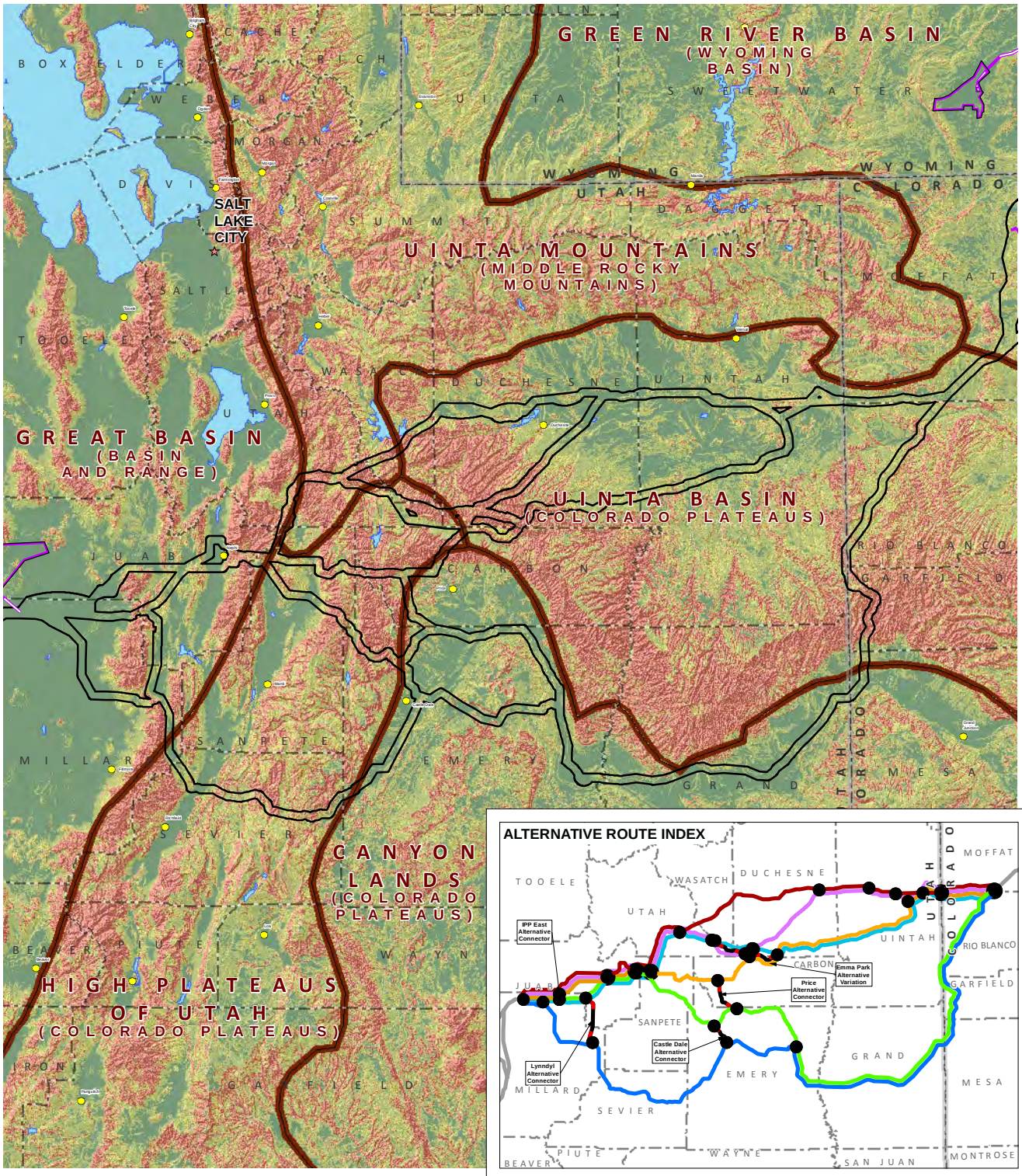
0 5 10 20 Miles
0 5 10 20 km
1:1,500,000

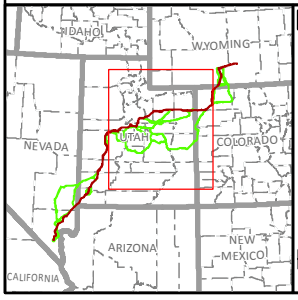
N

Western AREA POWER ADMINISTRATION

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Project Corridor

DEIS Alternative Routes

- Applicant Proposed II-A
- Alternative II-B
- Alternative II-C
- Alternative II-D
- Alternative II-E
- Agency Preferred II-F
- Alternative Variation or Connector
- Segment not in this Region
- Physiographic Section (Province)

- Potential Ground Electrode Siting Area
- Potential Ground Electrode Site
- Potential Ground Electrode Overhead Electrical Line

Topography

- Flat (<5%)
- Rolling (5-15%)
- Steep (15-25%)
- Rugged (>25%)

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 3.2-6
Region II
Physiography and Topography

0 10 20 40 Miles
0 10 20 40 km
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N

Western AREA POWER ADMINISTRATION

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In Region II, the alternative 2-mile transmission line corridors cross bedrock mainly composed of Cretaceous and Tertiary-age rocks, but also cross older Mesozoic and Paleozoic rocks in the western portions of the region. The major structural elements crossed include the Piceance Basin, Douglas Creek Arch, Uinta Basin, San Rafael Uplift, Wasatch Plateau, and the Sevier Orogenic Belt (Grose 1972).

The alternative 2-mile transmission line corridors II-A, II-D, II-E, and II-F cross Mesaverde equivalents in Colorado. After entering Utah, the 2-mile transmission line corridors cross Wasatch, Green River, and Duchesne formations (Sprinkle 2007). The Duchesne, Uinta, and Green River formations are crossed to west of the Wasatch-Utah County line (Bryant 1992; Constenius et al. 2006). On the Wasatch Plateau, alternative 2-mile transmission line corridors cross the North Horn, Flagstaff Limestone, Moroni, and Park City formations. Region II also contains coalesced alluvial fan and alluvial deposits.

Near IPP, the 2-mile transmission line corridor alternatives primarily cross alluvium, alluvial fan, sand dunes, and lake deposits. The Prospect Mountain Quartzite, Dome Limestone, and Fish Haven Dolomite also are crossed.

Along the Colorado-Utah border, the alternative 2-mile transmission line corridors II-B and II-C cross the Mancos Shale, Mesaverde, and Mesaverde equivalents (Cashion 1973). The 2-mile transmission line corridors also cross Wasatch and Green River formations. In west-central Utah, the 2-mile transmission line corridors cross Mancos Shale, other upper Cretaceous units, and limited exposures of the Morrison formation until crossing the Green River (Williams 1964). West of the Green River, the 2-mile transmission line corridors cross the Navajo Sandstone, Carmel formation, Morrison formation, Dakota Sandstone, and Mancos shale. Also crossed in central Utah is the Arapian Shale (Williams and Hackman 1971; Hintze and Davis 2002).

Geological Hazards

Seismic Hazards

Seismic activity in Utah occurs along a line that stretches north to south in the central part of the state from the Salt Lake area and south, then southwest to the southwest corner of the state (**Figure 3.2-7**). The line corresponds to the Wasatch Mountains in the northern part of the state and along the hingeline that marks the boundary between the Great Basin and Colorado Plateau. This area of earthquake activity along the Wasatch Mountains and the hingeline that divides the state is referred to as the Intermountain Seismic Belt (Machette et al. 2004).

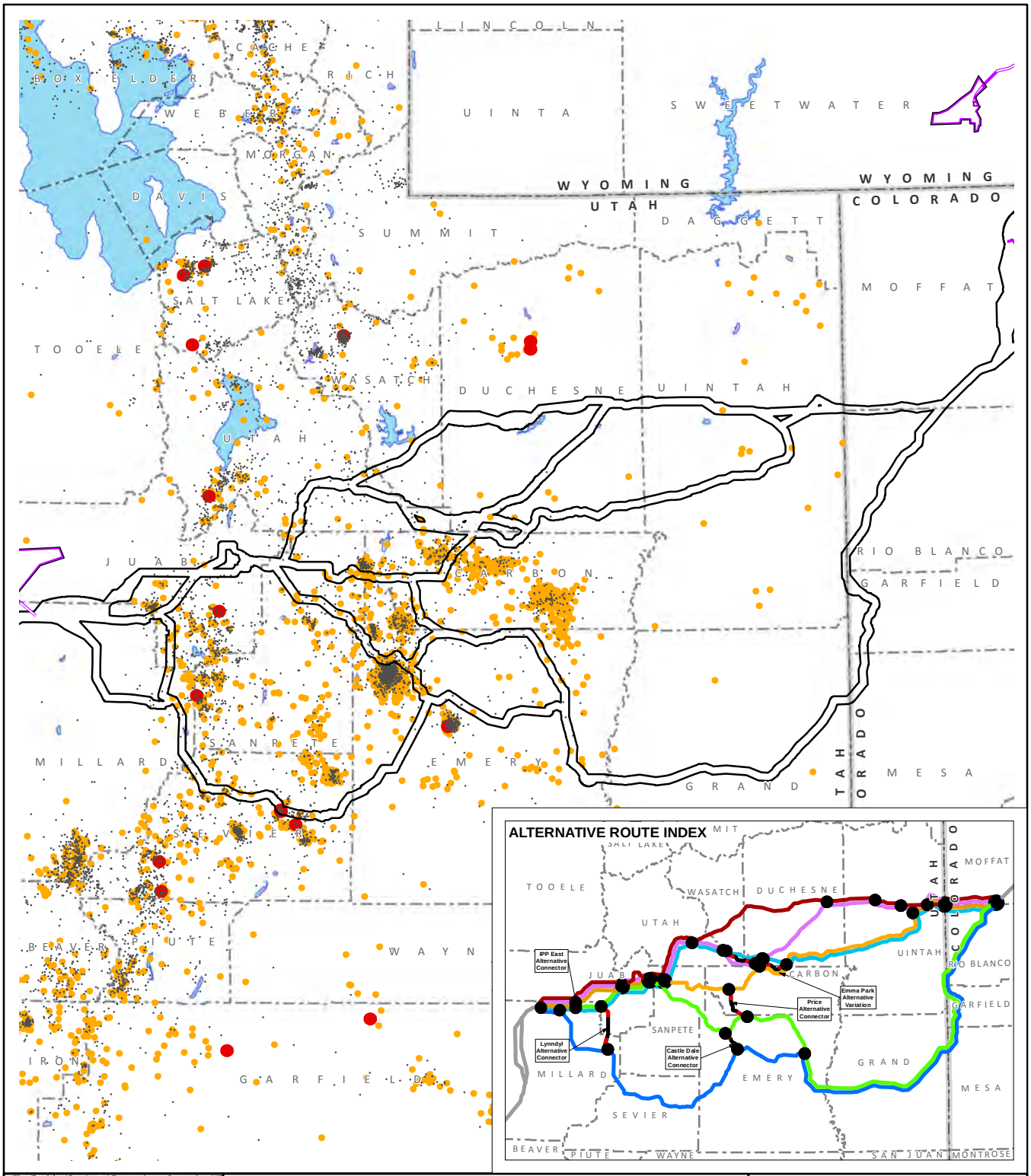
Region II contains a number of potentially active fault zones and includes Stinking Springs, Wasatch, Joes Valley, Little Valley, Scipio Valley, Sugarville, Pavant Range, and Maple Grove fault zones (USGS and UGS 2006).

Except for areas along the Intermountain Seismic Belt, ground motion hazard mapping indicates that there is a low potential for ground motion to cause serious damage from a maximum earthquake that could be predicted for the area (**Figure 3.2-1**). However, in the southern Wasatch Mountains, ground motion could damage vulnerable buildings (Christenson 1994).

Landslides

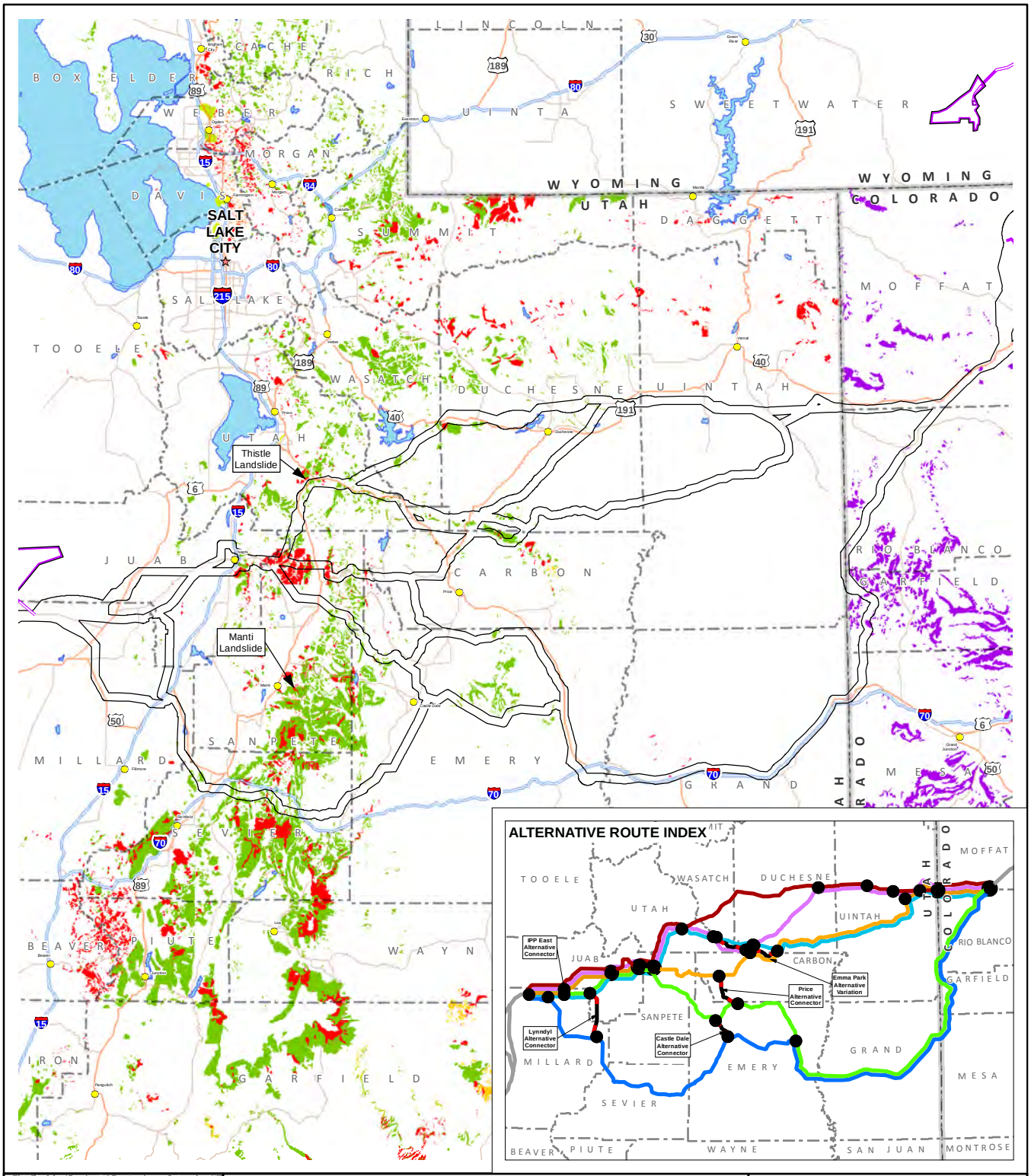
Along the High Plateaus of Utah, the alternative 2-mile transmission line corridors cross areas of moderate to high incidence and susceptibility to landslides (Radbruch-Hall et al. 1982; Giraud et al. 2007). **Figure 3.2-8** shows the landslide incidence in Region II. The North Horn, Green River, and Duchesne formations are primarily responsible for the slope instability in this area, but other formations may be involved too, especially Cretaceous rocks with numerous bentonite clay layers that can become unstable during periods of high precipitation. All alternative 2-mile transmission line corridors cross areas of high landslide incidence and potential.

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Subsidence

The analysis area within Region II crosses areas underlain by carbonate or evaporite rocks and sinkholes have been identified in the North Horn Formation on the Wasatch Plateau and Scipio Valley in central Utah (Bjorkland and Robinson 1968; Gillette and Miller 1999). Alternate 2-mile transmission line corridors do, however, cross areas of current and historic underground coal mining and these areas may be subject to ground subsidence. Specific areas crossed by 2-mile transmission line corridors are discussed under the Mineral Resources topic for Region II.

Paleontological Resources

The alternative 2-mile transmission line corridors in Region II cross a number of important fossil bearing formations. **Table 3.2-4** lists the formations in order of relative age and provides the PFYC ratings for the formations or geologic units. **Figure 3.2-9** shows the PFYC ratings crossed in Region II. Formations in Region II have the potential to have world-class fossil resources as demonstrated by the Cleveland-Lloyd Dinosaur Quarry National Landmark located 20 miles east of Huntington, Utah (BLM 2009). Where alternative 2-mile transmission line corridors cross from the Wasatch Plateau to the lake beds of ancient Lake Bonneville, there is a potential to cross old shore lines left by fluctuations of lake levels during the Pleistocene (1.8 million to 10,000 years ago). Although, sand and gravel deposits associated with old lake shorelines may have fossil resources, the shoreline deposits have a PFYC ranking of 2 (BLM 2008c).

Table 3.2-4 Potential Fossil-bearing Formations and PFYC Classifications in Region II

Formation/Rock Unit	Age	PFYC Rank
Lake Bonneville Shoreline Deposits	Pleistocene	2
Duchesne River	Eocene to Oligocene	5
Uinta Formation	Eocene	5
Green River Formation, Douglas Creek and Parachute Creek members	Middle to Lower Eocene	5
Wasatch Formation	Lower Eocene	5
Flagstaff Limestone	Paleocene	5
North Horn	U. Cretaceous-L. Tertiary	5
Mesaverde Group or Formation[1]	Upper Cretaceous	3-5
Farrer Formation	U. Cretaceous	4-5
Neslen Formation	U. Cretaceous	4-5
Tuscher Formation	Cretaceous	3
Mancos Shale	Upper Cretaceous	3
Indianola Group	Cretaceous	3
Dakota Sandstone	Lower Cretaceous	3
Cedar Mountain	Lower Cretaceous	5
Morrison Formation	Jurassic	5
Carmel Formation	Jurassic	3
Curtis Formation	Jurassic	3
Navajo Sandstone	Jurassic	3
Kayenta	Jurassic	3-5
Chinle Formation	Upper Triassic	4
Moenkopi	Middle to Lower Triassic	3
Kaibab	Permian	3
White Rim Sandstone	Permian	3
Cutler Formation (Cedar Mesa Member)	Lower Permian	3

Table 3.2-4 Potential Fossil-bearing Formations and PFYC Classifications in Region II

Formation/Rock Unit	Age	PFYC Rank
Hermosa Group	Pennsylvanian	3
Humbug Formation	Mississippian	2
Deseret Formation	Mississippian	2
Wheeler Formation	Cambrian	Not determined (ND)
Swasy Limestone	Cambrian	ND
Whirlwind Formation	Cambrian	ND
Dome Limestone	Cambrian	ND
Chisholm Formation	Cambrian	ND
Howell Limestone	Cambrian	ND
Pioche Formation	Cambrian	ND

[1] Includes Price River Formation, Castlegate Sandstone, Blackhawk Formation, Star Point Sandstone.

Sources: BLM 2008d,e; USDOE and USDOI 2008; Western Trilobite Association.

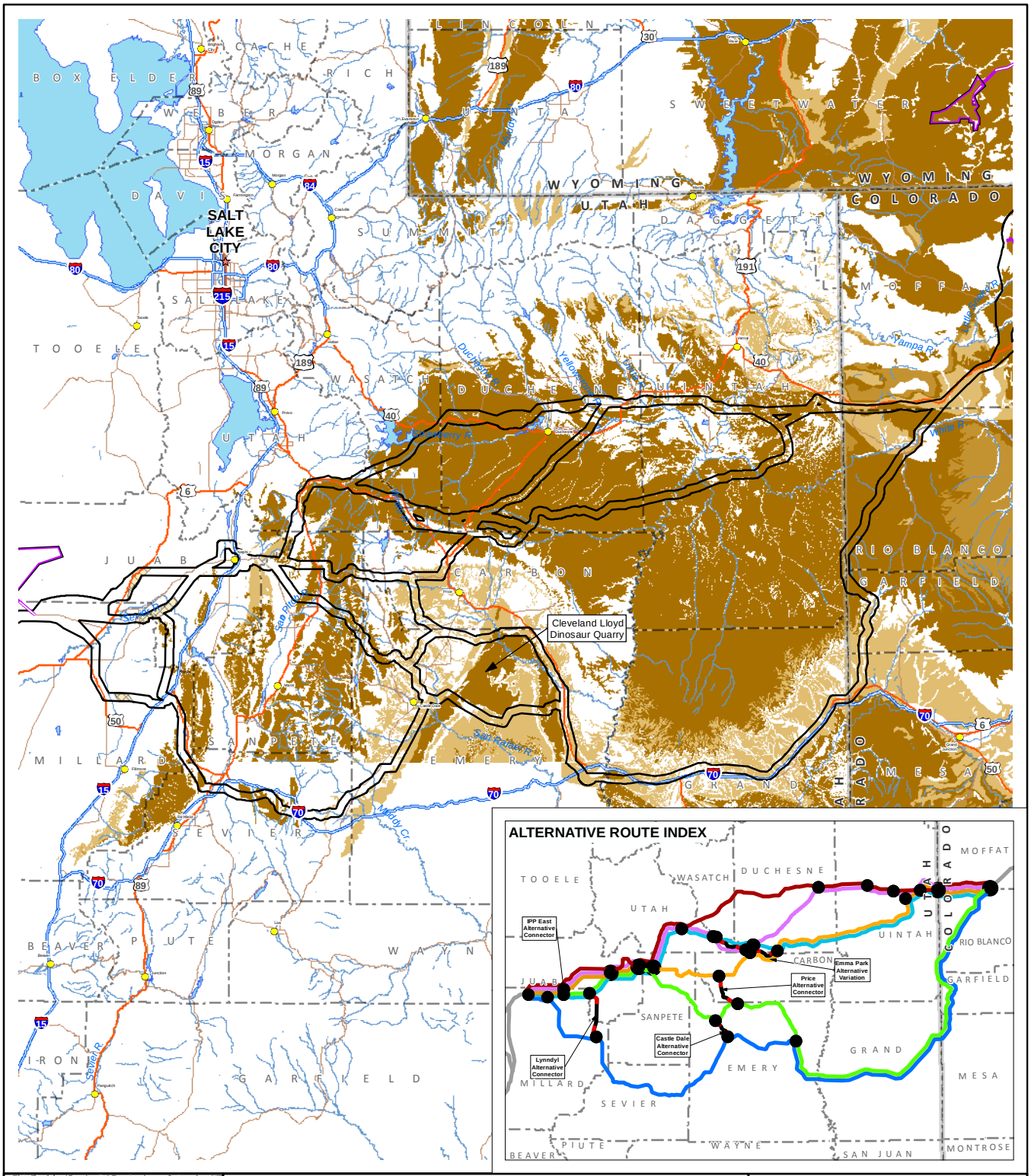
Mineral Resources

The major mineral resources in Region II are oil, natural gas, coal, oil shale, and uranium. Numerous oil and gas fields of the Uinta Basin are within the Region II. **Figure 3.2-10** shows the oil and gas fields and coal mines in Region II. **Table 3.2-5** lists the oil and gas fields crossed by alternative 2-mile transmission line corridors in Region II. Coal is an important resource in Region II as well as coalbed methane.

In Utah, the Emery, Wasatch, and Book Cliffs coal fields are located in the region and coal is actively mined in several locations (UGS 1983; Chidsey et al. 2006; Bon and Wakefield 2008). The Book Cliffs form the southern boundary of the Uinta Basin and the Emery Coal Field is located in the east side of the Wasatch Plateau and the Wasatch coals field is collocated with the Wasatch Plateau. Both coal fields coincide with coal resources in upper Cretaceous rocks that outcrop along these features. Alternative II-D 2-mile transmission line corridor crosses active and inactive coal mining areas as well as potential coal development areas in the Book Cliffs and Wasatch coal fields in Carbon County, Utah (Township13 North, Ranges 6 through 10 East; BLM 2008d). Further south in the Wasatch coal field, Alternative II-B 2-mile transmission line corridor crosses active and historical coal mining areas and potential coal development areas northwest of Huntington, Utah (UGS 2012). The Alternative II-C 2-mile transmission line corridor encroaches on the east side of the Emery coal mine active permit area (Utah Division of Oil, Gas, and Mining [UDOGM] 2011).

In northwest Colorado, the Deserado Mine is located in the Lower White River coal field (Carroll 2004) (**Figure 3.2-5**). Alternatives II-A, II-D, II-E, and II-F 2-mile transmission line corridors cross just north of, and may slightly encroach on, areas proposed for leasing and expansion of the Deserado Mine in Township 3 North, Range 101 West (BLM 2011). Within the aforementioned corridors, there are historic coal mines northwest of the Deserado Mine in Township 3 North, Range 102 West (Carroll 2004). No information was available concerning whether subsidence has occurred or even if these are underground mines (Colorado Geological Survey 2011). Alternative II-B and II-C 2-mile transmission line corridors cross portions of the mine permit area of the Deserado Mine that have previously been mined in Township 2 North, Range 101 West. South of the Deserado Mine, the alternatives cross historic mining areas in Township 1 North, Ranges 101 and 102 West (Sullivan 1984).

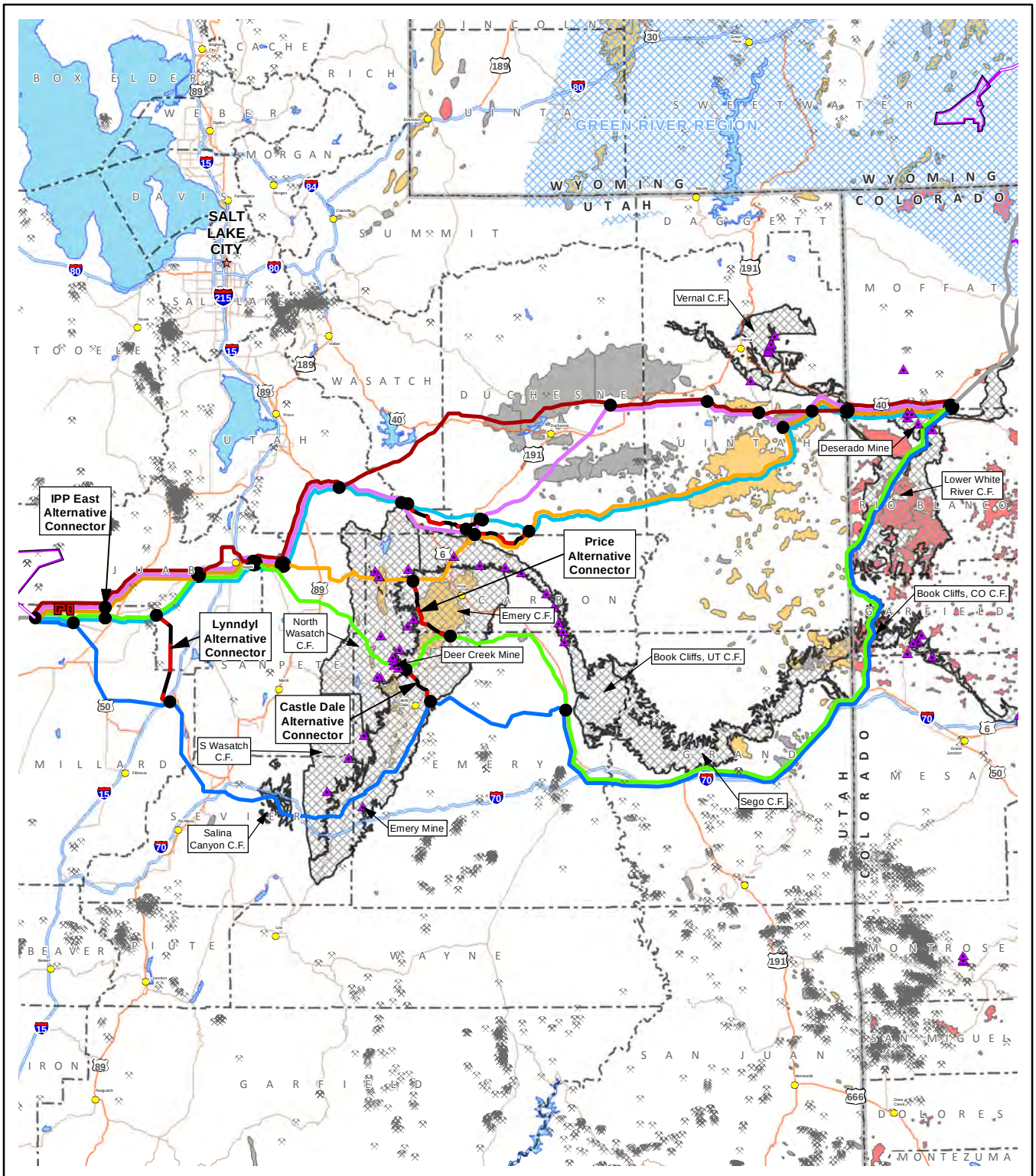
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Note: PFYC data is derived from digital geologic data as available and digitized from hard copy geologic maps as needed. Through a combination of these two methods, there is complete PFYC coverage of the TWE Project.

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Table 3.2-5 Oil and Gas Fields Crossed by Alternatives in Region II

Alternative II-A	State	Alternative II-B	State	Alternative II-C	State	Alternative II-D	State	Alternative II-E	State	Alternative II-F	State
Dinosaur	Colorado	Rangely	Colorado	Rangely	Colorado	Dinosaur	Colorado	Dinosaur	Colorado	Dinosaur	Colorado
Red Wash	Utah	Rangely Southwest	Colorado	Rangely Southwest	Colorado	Red Wash	Utah	Red Wash	Utah	Red Wash	Utah
Horseshoe Bend	Utah	Lower Horse Draw	Colorado	Lower Horse Draw	Colorado	Natural Buttes	Utah	Horse Shoe Bend	Utah	Natural Buttes	Utah
Blue Bell	Utah	Park Mountain	Colorado	Park Mountain	Colorado	Uteland Butte	Utah	Blue Bell	Utah	Uteland Butte	Utah
Altamont	Utah	Missouri Creek	Colorado	Missouri Creek	Colorado	Eight-Mile Flat	Utah	Brundage Canyon	Utah	Eight-Mile Flat	Utah
Cedar Rim	Utah	White Face Butte	Colorado	White Face Butte	Colorado	Wilkin Ridge	Utah			Wilkin Ridge	Utah
		Baxter Pass	Colorado	Baxter Pass	Colorado	Petes Wash	Utah			Petes Wash	Utah
		Bar X	Colorado	Bar X	Colorado	Castlegate	Utah				
		Harley Dome	Utah	Harley Dome	Utah	Clear Creek	Utah				
		Sieber Nose	Utah	Sieber Nose	Utah						
		Sage	Utah	Sage	Utah						
		Gravel Pile	Utah	Gravel Pile	Utah						
		Cedar Springs	Utah	Cedar Springs	Utah						
		Greater Cisco	Utah	Greater Cisco	Utah						
		Feron	Utah	Flat Canyon Creek	Utah						

Sources: Chidsey et al. 2005; UDOGM 2012a; Wray et al. 2002.

Uranium has been mined in the past in Grand County, but there are no active uranium mines at present. The Uinta Basin has a large oil shale resource and recently oil shale mining has been proposed (Enefit 2011). Other mineral resources in Region II include oil shale, gilsonite, oil sands, gypsum, salt, bentonite, geothermal, cement aggregate (sand, gravel, crushed stone) and clay (USGS 2011; UGS 1983).

3.2.5.3 Region III

Physiography and Geology

All of Region III is within the Great Basin section of the Basin and Range province (**Figure 3.2-11**) (Fenneman 1928).

In Region III, the alternative 2-mile transmission line corridors cross primarily unconsolidated deposits of alluvium, alluvial fan, pediment, and sand dune (Hintze and Davis 2002; Hintze et al. 2003; Steven et al. 1990; Rowley et al. 2006). In the northern portion of Region III, the bedrock crossed includes the Flagstaff and Little Drum Formations. South of Enterprise, Utah, there are Tertiary volcanic and sedimentary rocks and folded Mesozoic and Paleozoic rocks in the western portions of Washington County (Biek et al. 2009). Paleozoic rocks are represented by the Permian Kaibab Formation, which is largely composed of limestone. Mesozoic rocks include the Cretaceous-Tertiary Grapevine Wash Formation, Cretaceous Iron Springs Formation, and the following Jurassic-age rock units: Temple Gap Formation, the Navajo Sandstone, and Kayenta Formation. The Jurassic and Cretaceous rocks are largely composed of sandstones, siltstones, and mudstones with occasional gypsum beds. Triassic-aged rocks are the Moenave and Moenkopi Formations that largely are made up of sandstone, siltstone, mudstone, with minor limestone and gypsum. The Tertiary volcanic rocks include ash flow tuffs such as the Oligocene Leach Canyon Formation and Miocene-Pliocene Rencher Formation. Undivided lava flows also comprise the Tertiary volcanic rocks. Tertiary sedimentary deposits consist of the Paleocene-Eocene Claron Formation and Miocene and Pliocene basin fill. In the Beaver Dam Valley in the extreme southwest corner of Washington County, Utah, there are valley fill alluvial deposits (Biek et al. 2009).

Alternative 2-mile transmission line corridors in southeastern Lincoln County, Nevada primarily cross volcanic rocks of the Clover Mountains caldera complex (Tschanz and Pampeyan 1970). After crossing mountain ranges, the 2-mile transmission line corridors drop down into valley areas covered with alluvium, alluvial fan, and playa deposits and cross occasional outcrops of Tertiary volcanic and Paleozoic rocks. In northeastern Clark County, Nevada, the 2-mile transmission line corridors cross mainly alluvial deposits, but also limited outcrops of Precambrian, Paleozoic, Triassic, and Tertiary rocks (Stewart and Carlson 1978; Tschanz and Pampeyan 1970; Longwell et al. 1965).

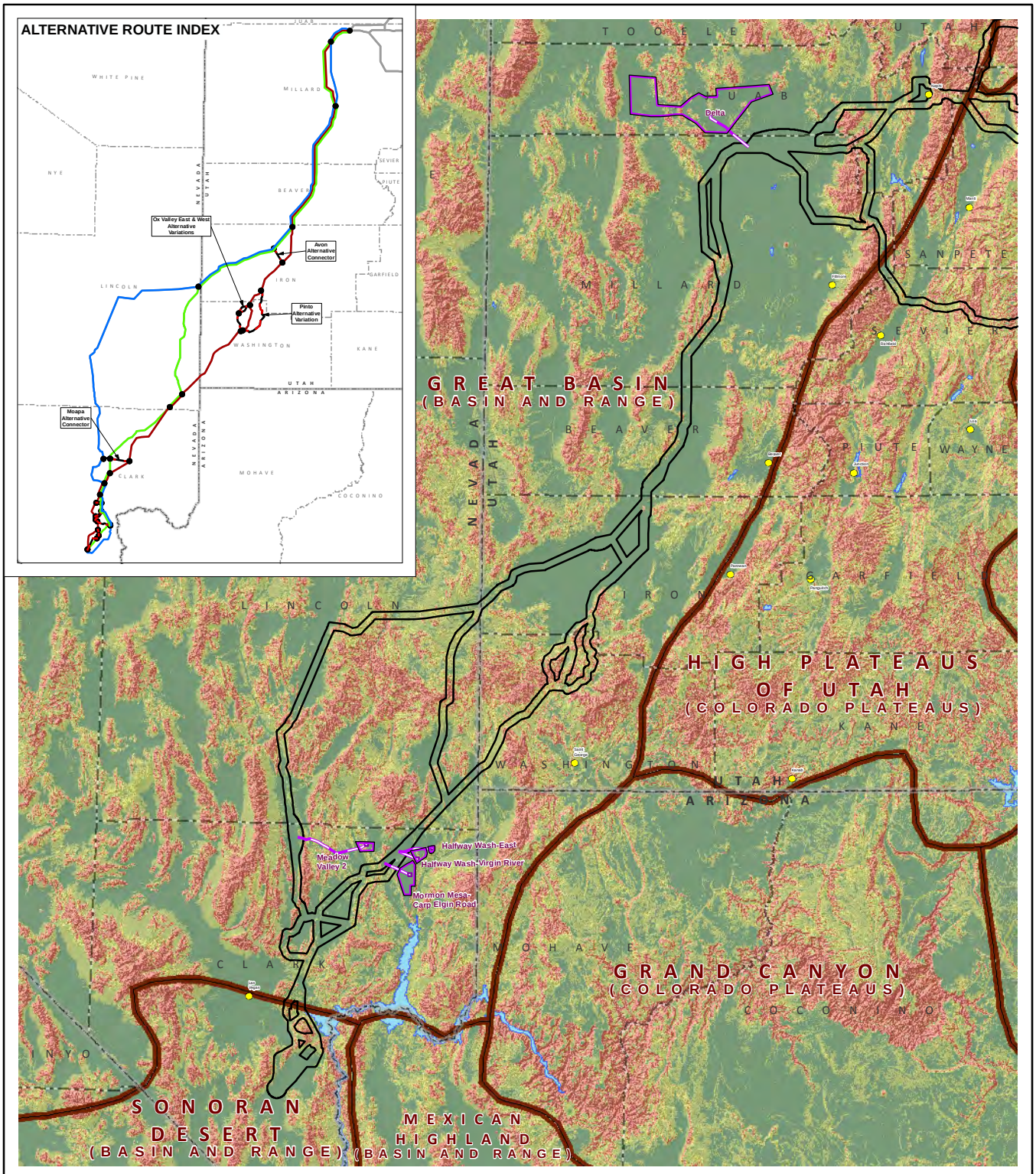
In Region III, Paleozoic rocks include Cambrian Prospect Mountain Quartzite, Pioche shale, and Nopa Formation, undivided Cambrian to Devonian sedimentary rocks, Pennsylvanian-Permian Bird Spring Formation, and Permian Coconino Sandstone and Kaibab Limestone. Triassic rocks include the Chinle, Moenkopi, and Thaynes Formations. The Tertiary Horse Spring Formation is found in outcrops northeast of Las Vegas, Nevada.

Geological Hazards

Seismic Hazards

Region III has less earthquake activity than Region II since the proposed alternatives are located to the west of the Utah hingeline area (USGS 2009b). In the Utah portion of Region III, there are several potentially active faults located near or on proposed routes and include the Drum Mountains fault zone west of Delta, Utah, in north central Millard County, and the Escalante Desert fault zone located at the northeast end of the Escalante Desert in northern Iron County and southern Beaver County (USGS and UGS 2006).

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Project Corridor

DEIS Alternative Routes

- Applicant Proposed III/IV- A**
- Alternative III/IV-B*
- Alternative III/IV-C
- Alternative Variation or Connector
- Segment not in this Region
- Physiographic Section (Province)

* Agency Preferred Region III
** Agency Preferred Region IV

- Potential Ground Electrode Siting Area
- Potential Ground Electrode Site
- Potential Ground Electrode Overhead Electrical Line

Topography

- Flat (<5%)
- Rolling (5-15%)
- Steep (15-25%)
- Rugged (>25%)

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 3.2-11
Regions III & IV
Physiography and Topography

0 10 20 40 Miles
0 10 20 40 km
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N

Western AREA POWER ADMINISTRATION

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In the Nevada portion of Region III the potentially active California Wash fault is located about five miles west of Moapa in northern Clark County (Anderson 1999a). No other potentially active faults have been identified in the Region III study area; however, the south end of Delamar Valley in southern Lincoln County contains fissures of uncertain origin (Swadley 1995). These fissures, present in the Delamar and Dry Lake valleys, are not caused by groundwater withdrawal and are thought to be tectonic in origin, but are not thought to be active in the southern portions of the Delamar Valley. Active fissures may be present in the northern Dry Lake Valley, but the alternative 2-mile transmission line corridors do not cross them.

Ground motion hazard mapping indicates that there is a generally low potential for ground motion to cause serious damage from a maximum earthquake that could be predicted for the area (**Figure 3.2-1**). Alternative III-C crosses an area of slightly increased risk of ground motion, similar to the Wasatch Plateau area.

Landslides

The routes in Region III primarily cross areas of very low landslide susceptibility (Giraud et al. 2007). However, portions of the analysis area in Washington County cross areas of low to moderate landslide risk in the Bull Valley Mountains and north flank of the Beaver Dam Mountains.

Subsidence

Alternative 2-mile transmission line corridors in the Utah portion of Region III generally cross valley deposits and the potential for karst development is low. Areas within Washington County, Utah may be underlain by carbonate rocks, but no subsidence or karst has been documented (Biek et al. 2009). In the Escalante Desert in Western Iron County, there is subsidence risk associated with the withdrawal of groundwater. Investigations by the UGS (Lund et al. 2005) have shown that the ground surface in areas of the Escalante Desert has subsided as much as four feet in an area centered around Beryl Junction, Utah. In addition, ground fissures have also developed in the vicinity of Beryl Junction. Reportedly the subsidence in the Escalante Desert has not resulted in damage to surface structures or utilities (Hansen 2008).

In Nevada, Region III includes locations underlain by carbonate or evaporite rocks, but no associated subsidence or karst has been identified (National Atlas 2011). No subsidence areas due to groundwater withdrawal have been identified in the valleys in the Nevada portion of Region III.

Paleontological Resources

Three high-potential fossil-bearing formations are found within the analysis area of Region III. **Table 3.2-6** lists the formations in order of relative age and provides the PFYC ratings for the formations or geologic units. **Figure 3.2-12** shows the PFYC ratings crossed in Region III. Alternative 2-mile transmission line corridors may cross old shorelines left by fluctuations of Lake Bonneville levels during the Pleistocene (1.8 million to 10,000 years ago). Although sand and gravel deposits associated with old lake shorelines may have fossil resources, the shoreline deposits have a PFYC ranking of 2 (BLM 2008c).

Table 3.2-6 Potential Fossil-bearing Formations and PFYC Classifications in Region III

Formation/Rock Unit	Period/Epoch	PFYC Rank
Lake Bonneville Shoreline Deposits	Pleistocene	2
Muddy Creek Formation	Miocene	3a
Flagstaff Formation	Paleocene	5
Claron Formation	Paleocene	5
Cedar Mountain	Lower Cretaceous	5

Table 3.2-6 Potential Fossil-bearing Formations and PFYC Classifications in Region III

Formation/Rock Unit	Period/Epoch	PFYC Rank
Carmel Formation	Jurassic	3
Navajo Sandstone	Jurassic	3
Kayenta Formation	Jurassic	5
Moenave	Jurassic-Triassic	5
Chinle	Triassic	3
Moenkopi	Triassic	3
Kaibab	Permian	3
Toroweap	Permian	3
Big Horse Limestone Member of the Orr Formation	Cambrian	3
Pioche Shale	Cambrian	Not determined

Sources: Biek et al. 2009; Hintze and Palmer 1976; USDOE and USDOI 2008.

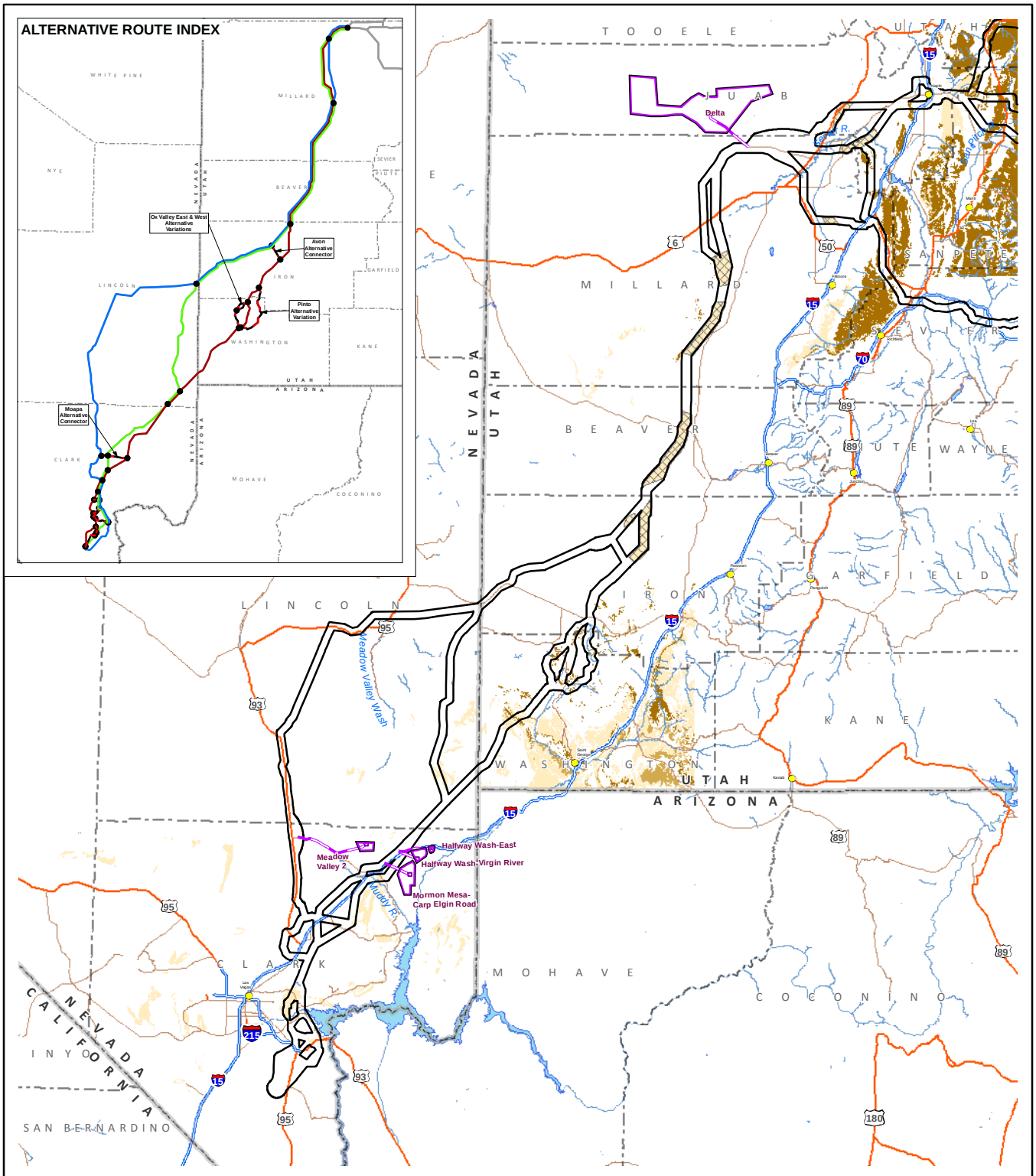
The Cambrian-aged Pioche shale contains numerous fossil localities that have assemblages of fossil trilobites, arthropods that lived during the Paleozoic Era. The BLM has established the Oak Springs Summit Trilobite Area, located north of SH-93, about 12 miles west of Caliente, Nevada (BLM 2012c). Oak Springs Summit Trilobite Area has fossils of six types of trilobites in the Pioche Shale exposed in a gravel pit. The trilobites belong to the *Olenellidae* family and have a shell like a horseshoe crab, jointed legs, and compound eyes. These fossils are the remains of animals that lived in a shallow sea 500 to 524 million years ago. The trilobite area is within the Alternative III-C 2-mile transmission line corridor.

Mineral Resources

Important mineral resources consist of aggregate (sand, gravel, crushed stone), cement, gypsum, lime, perlite, geothermal, precious and base metals, and iron (Davis 2011; Doelling and Tooker 1983; Hess and Davis 2010; USGS 2011; UGS 1983) (**Figure 3.2-13**).The alternative 2-mile transmission line corridors cross sand and gravel mining areas along Interstate 15 in northeastern Clark County, Nevada. Although oil and gas are not yet as important as some mineral resources, there has been recent interest in oil and gas leasing. There are no coal resources in the Nevada portion of Region III (USGS and Nevada Bureau of Mines and Geology 1964). In Utah, the Applicant Proposed 2-mile transmission line corridor crosses an area underlain by coal resources of the Harmony Coal Field in northern Washington County (Tabet and Wakefield 2006). However, the coal resource potential of the Harmony Coal Field has been described as “insignificant” (Kirschbaum and Biewick 2000).

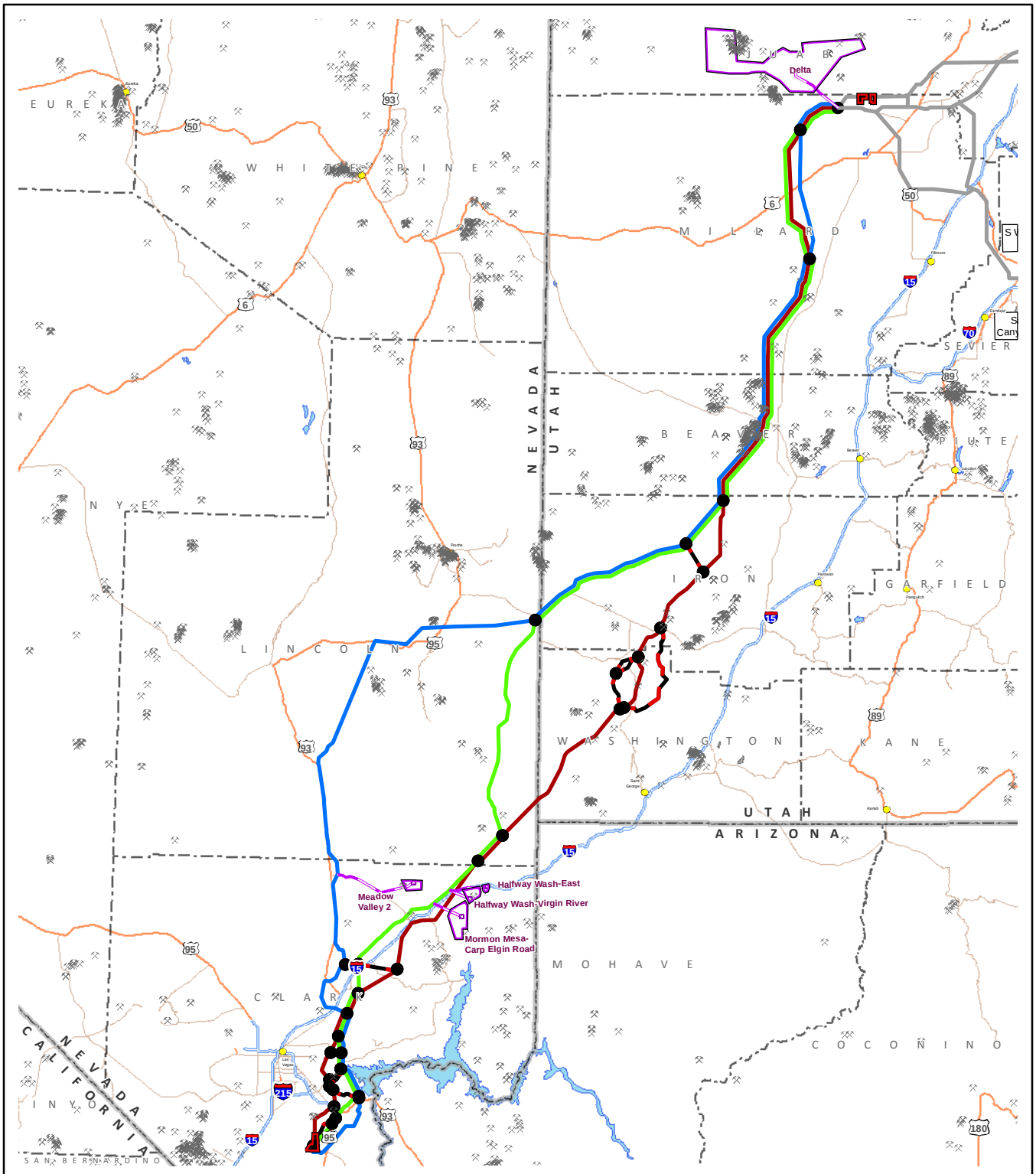
In Lincoln County, the 2-mile transmission line corridor for Alternative III-C crosses the historic mining districts of Acoma, Little Mountain, and Delamar in southeast Lincoln County, Nevada (BLM 2004). Perlite, a volcanic glass with numerous industrial applications, was mined in the Acoma District east of Caliente, Nevada (Tschanz and Pampeyan 1970). The Little Mountain District, also east of Caliente, was prospected for copper, but no commercial production was recorded. The main commodities of the Delamar District, southwest of Caliente, were gold and silver, but there were also prospects of copper and manganese. Most of the mining occurred at these districts in the first half of the 20th Century, but there is no active mining at present (Davis 2011). The only active major mine near the Alternatives III-C and III-D corridor in Lincoln County is the Tenacity perlite mine and mill, located south of SH 93 about 20 miles west of Caliente, Nevada.

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TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 3.2-13
Regions III and IV
Mining and Mineral Extraction

0 10 20 40 Miles
0 10 20 40 km
1:2,250,000

N

Western AREA POWER ADMINISTRATION

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The 2-mile transmission line corridor for Alternative III-B also crosses the Acoma, Vigo, and Gourd Springs mining districts in southeast Lincoln County (Tingley 1998). Very little if any mining took place in the Vigo District, which extends from the southern Clover Mountains to the south end of the Tule Springs Hills (Tingley 1984). A very small quantity of manganese was reported to have been mined in 1926, but the exact location of the prospect is not known. Other potential mineral commodities include gypsum and barium. The Gourd Springs District is located on the east side of the East Mormon Mountains. A small amount (60 tons) of manganese was reported to have been mined from a prospect in the area, but the location could not be found (Tingley 1984).

In Clark County, Nevada high quality limestone and dolomite are mined and processed in the Apex Mining District (Tingley 1998) at the Apex mine and plant operations located about 15 miles northeast of downtown Las Vegas along Interstate 15 (Township 18 South, Range 63 and 64 East). The high-purity limestone from the Crystal Pass Limestone is mined as a constituent in cement (Longwell 1965). Other designated mining districts near or crossed by Region III alternatives in Clark County include the Moapa and Muddy Mountains district. The Moapa District located south of Moapa, Nevada, contains mineral resources of gypsum, magnesite, silica, and uranium (Tingley 1998). Resources of the Muddy Mountains District located east of Interstate 15 and the Virgin River, include borates, bentonite, gypsum, magnesite, and sodium sulfate.

3.2.5.4 Region IV

Physiography and Geology

Region IV is within the Great Basin and Sonoran Desert sections of the Basin and Range province (**Figure 3.2-11**) (Fenneman 1928).

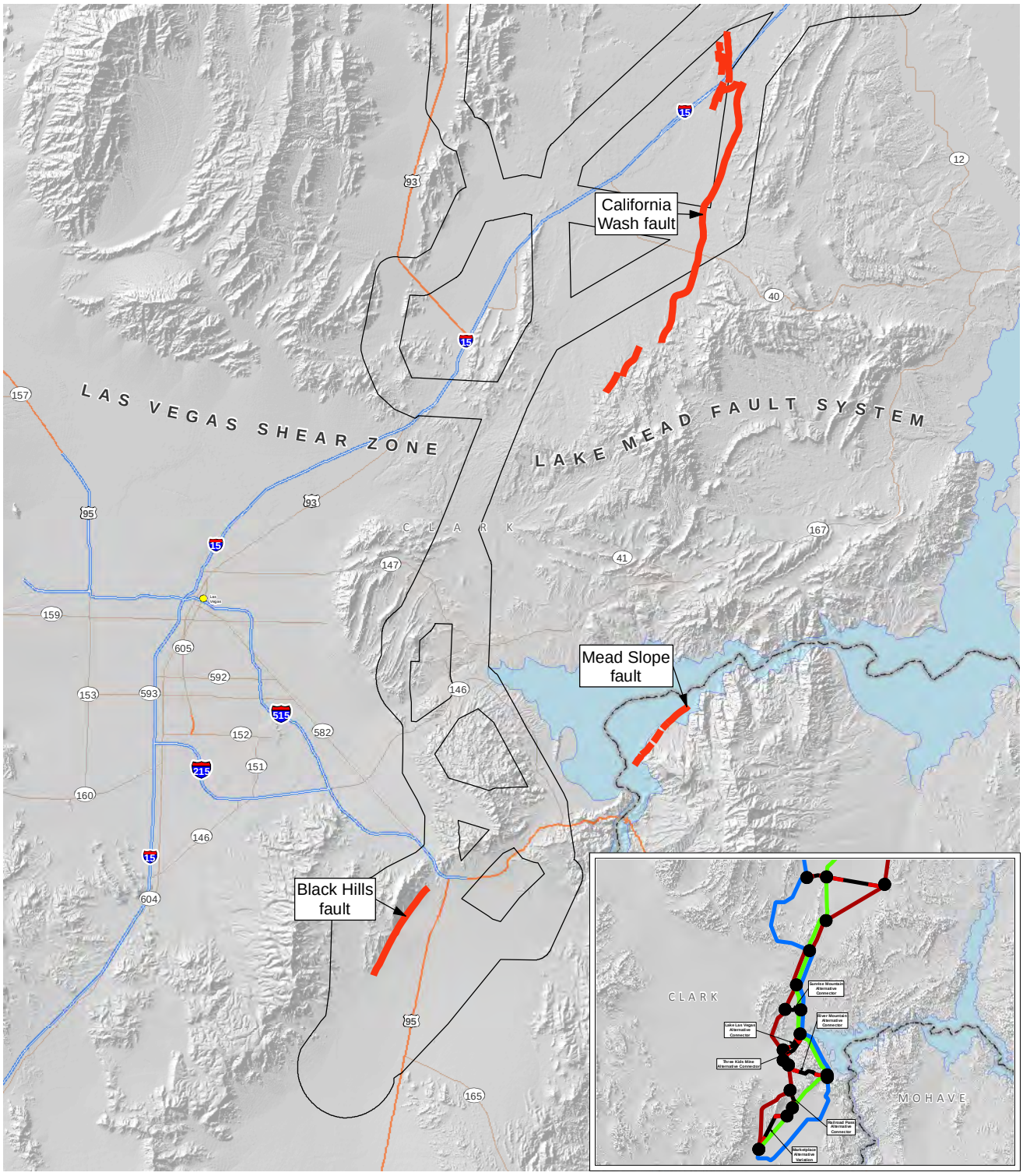
The alternative 2-mile transmission line corridors in Region IV primarily cross alluvial deposits (Stewart and Carlson 1978; Longwell et al. 1965), but also Paleozoic, Triassic and Tertiary sedimentary and volcanic rocks (tuffs and lava flows). Paleozoic rocks include the Pennsylvanian-Permian Bird Spring Formation, Permian Coconino Sandstone, and Kaibab Limestone. Triassic rocks include the Chinle, Moenkopi, and Thaynes formations. Tertiary rocks consist of the Muddy Creek and the Miocene Horse Spring formations and undivided volcanic rocks.

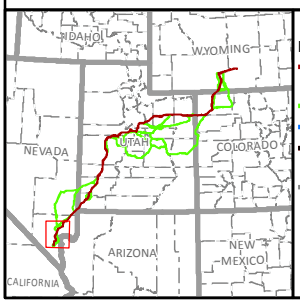
Geological Hazards

Seismicity

The Las Vegas Valley shear zone and the Lake Mead fault system are major east-west strike-slip structural features in Region IV that are believed to have originated as accommodations to extensional forces in the Great Basin (Page et al. 2005; Beard et al. 2010). The Las Vegas shear zone on the north side of the Las Vegas Valley is about 90 miles long and trends northwest to southeast from Mercury, Nevada to the Lake Mead region (**Figure 3.3-14**). Much of the shear zone is buried under basin fill deposits and its geometry has been determined by geophysical studies. Because the shear zone is largely buried under valley fill deposits and has not been documented to cut younger sediments, it is difficult for seismic researchers to determine late Quaternary movement with certainty. The Lake Mead fault system is a generally northeast trending complex of faults that is about 80 miles long from the Lake Mead area to the Virgin Mountains (Beard et al. 2010). Timing of activity along the Lake Mead fault system ranges in age from more than 16 million years ago (Ma) to Quaternary. The Las Vegas shear zone and Lake Mead fault system meet at the north end of the Black Mountains about 6 miles east of Frenchman Mountain, but represent two distinct directions of strike-slip movement. Both the Las Vegas shear zone and Lake Mead fault system are not shown to have potentially active faults in the USGS fold and fault database (USGS and Nevada Bureau of Mines and Geology 2006). However, the Las Vegas shear zone poses concerns as a potential source of very strong earthquakes (DePolo 2008).

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Node

DEIS Alternative Routes

- Applicant Proposed/ Agency Preferred IV-A
- Alternative II-B
- Alternative II-C
- Alternative Variation or Connector
- Segment not in this Region

Potentially Active Quaternary Fault

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 3.2-14
Quaternary Fault Zones in Southern Nevada and Las Vegas and Lake mead Shear Zones

0 2.5 5 10 Miles
0 2.5 5 10 km
1:500,000

N

Western AREA POWER ADMINISTRATION

Exported On: 4/18/2013

The Las Vegas Valley faults are generally north-south striking east dipping normal faults that are identified by prominent scarps that are present in the central part of the Las Vegas Valley (Page et al. 2005). Towards the southeast end of the valley in the Henderson area, the faults are oriented northwest-southeast, while on the northwestern part of the valley the Eglington fault strikes southwest to northeast. The Eglington fault presents a 100-foot scarp that cuts young valley deposits and is considered to be active, the most recent earthquake event has been estimated to have occurred about 2,000 years ago (dePolo 2008). The fault lengths and displacements indicate the Las Vegas Valley faults are capable of generating earthquakes of moment magnitude (M_w) of 6.3 to 6.9 (M_w is a calculation of magnitude that is a function of rock rigidity, fault area, and slip distance) (Louie 1996). It is likely that the Las Vegas fault system is cut off by the Las Vegas Valley shear zone and strong movement on the Las Vegas shear zone may activate movement on the Las Vegas Valley faults (dePolo 2008).

The Frenchman fault at the west base of Frenchman Mountain is not part of the Las Vegas Valley fault system, but is also potentially capable of posing a seismic hazard to the Las Vegas area (Castor et al. 2000). The Frenchman fault strikes to the north from around Las Vegas Wash to Nellis Air Force Base (Anderson 1999b). All of the Region IV alternative 2-mile transmission line corridors cross the Las Vegas Valley shear zone just northeast of Frenchman Mountain, but the corridors do not cross Las Vegas Valley faults. It is possible that the corridors cross the Frenchman Mountain fault as it curves around the south side of Frenchman Mountain in the vicinity of Las Vegas Wash (Bell and Smith 1980; Castor et al. 2006).

A potentially active fault of concern in Region IV is the Black Hills fault, located on the southeast flank of the Black Hills along the northeast side of the McCullough Range just southwest of Railroad Pass. The Black Hills fault is a southeast dipping normal fault that strikes northeast and forms a series of escarpments at the base of the Black Hills (Anderson 1999c). The fault is considered active because movement appears to have occurred in the last 5,000 years based on the age of the deposits offset by the fault. Recent work by Fossett (2005) indicates that the Black Hills fault may be capable of creating an earthquake of M_w 6.9. The South Terminal Siting Area, the 2-mile transmission line corridors for Alternatives IV-A, IV-B, and the Marketplace Alternative Variation may intersect or are very close to the Black Hills fault zone (a 1,000-foot wide area that extends the length of the fault zone from the base of the Black Hills to 1,000 feet into the valley) (Price and dePolo 2011).

The USGS seismic hazard mapping indicates that in areas crossed by the alternatives in Region IV, ground movement that could be triggered by a maximum credible earthquake is expected to be low; having a PGA of 10 to 15 percent of **g** with a 10 percent probability of exceeding that PGA in 50 years (Petersen et al. 2008).

Landslides

Region IV is an area of low incidence and susceptibility to landslides (Radbruch-Hall et al. 1982).

Subsidence

Subsidence due to groundwater withdrawal has long been recognized in the Las Vegas Valley (Bell et al. 2002). Since 1935, total subsidence in the valley has been approximately 5 feet. Accompanying the subsidence has been the development of ground fissures. None of the alternative 2-mile transmission line corridors cross the Las Vegas Valley or any of the subsidence areas.

Paleontological Resources

Region IV does not have formations with high fossil potential. Two medium potential formations are listed in **Table 3.2-7**. Other sedimentary rock units, mainly the Paleozoic formations listed above, may contain fossils, but also have low PFYC ratings (2 or less) (USDOE and USDOI 2008). **Figure 3.2-12** shows the PFYC ratings crossed in Region IV.

Table 3.2-7 Potential Fossil-bearing Formations and PFYC Classifications in Region IV

Formation/Rock Unit	Period Epoch	PFYC Rank
Muddy Creek Formation	Pliocene	3
Panaca Formation	Miocene-Pliocene	ND
Horse Spring Formation	Lower Miocene	3[1]
Moenkopi Formation	Triassic	3
Pakoon Limestone	Permian	ND
Tippipah Limestone	Pennsylvanian	ND
Blue Point Limestone	Mississippian	ND
Pioche Shale	Cambrian	ND

[1] PFYC based on description in BLM (2004).

Sources: BLM 2012c, 2004; Gordon 1968; Longwell 1928; McNair 1951; USDOE and USDOI 2008.

Mineral Resources

Minerals mined in the Las Vegas area (Region IV) include aggregate (sand and gravel), limestone, dimension stone, and gypsum (Davis 2011; Hess and Davis 2010; USGS 2011). The alternative 2-mile transmission line corridors cross sand and gravel and gypsum mining areas east of Las Vegas, Nevada. Coal is found in isolated localities in several counties in Nevada, but there are no commercially mineable coal seams in the state (USGS and Nevada Bureau of Mines and Geology 1964). Although a number of test wells for oil and gas have been drilled in Lincoln and Clark Counties, no commercial oil and gas production has been found (Garside and Hess 2007).

In the Muddy Mountains District, gypsum is mined at the PABCO mine in Township 20 South, Range 64 East. The gypsum has been mined at this location since 1959 (Castor et al. 2000). The gypsum is over 100-feet thick in places with nominal overburden. Production in 2010 was 682,000 tons (Driesner and Coyner 2011). The 2-mile transmission line corridor that includes the Agency Preferred Alternative and Alternatives IV-A, IV-B, and IV-C may cross or encroach upon the PABCO mine area.

In the Las Vegas Mining District, which includes Frenchman Mountain and areas northeast of Henderson, Nevada to Lake Mead (Tingley 1998), manganese was formerly mined in the region at the Three Kids Mine located on the south side of Lake Mead Drive, just northeast of Henderson, Nevada in Section 35, Township 21 South, Range 63 East (Croft 2012, Bell and Smith 1980). Mining was conducted episodically from 1917 to 1961 from manganese-rich deposits in the Muddy Creek Formation or from volcanic rocks. About 2.25 million tons of manganese ore was extracted from the mine (Longwell 1965). Since the early 1960s, the mine was idle and the mill was dismantled, but the Army Defense Logistic Agency continued to maintain stockpiles of processed material until the end of 2003. One of the former mine pits was even used as a solid waste landfill. The site is slated to become a redevelopment area after site characterization and remediation is complete (Croft 2012). The Three Kids Mine Alternative Connector crosses the Three Kids Mine site. Gypsum has also been mined in the Las Vegas district, but other potential mineral resources include limestone, sand and gravel, silica, lithium, and precious and base metals (Castor et al. 2000).

Another mining district in the Las Vegas area crossed by project alternatives is the Alunite District. The district is located southwest of Railroad Pass in the Black Hills and the commodities of interest historically included gold, tungsten, and alunite (a mineral that is mined for alum and potash) (Tingley 1998). There has been no commercial production of these commodities from the district, but sand and gravel are currently mined at pits south of Railroad Pass (Hess and Davis 2010). Portions of the Southern Terminal

Siting Area, Southern Terminal Alternative, the 2-mile transmission line corridors for Alternatives IV-A, IV-B, IV-C, the Railroad Pass Alternative Connector, and the Marketplace Alternative Variation may be within the Alunite District.

3.2.6 Impacts to Geological, Paleontological, and Mineral Resources

The impact analysis area for geologic, mineral, and paleontological resources consists of the proposed and alternative 2-mile transmission line corridors. Analysis was based on review of publicly available government documents and published literature, as well as comments from scoping.

Relevant scoping issues, management concerns, and impact concerns are listed in **Table 3.2-8**.

Table 3.2-8 Relevant Analysis Considerations for Geological, Mineral, and Paleontological Resources

Resource Topic	Analysis Considerations and Relevant Assumptions
Geologic Hazards	Evaluate risk to the proposed project of geologic hazards that include seismicity, landslides, and subsidence due to karst, groundwater withdrawal, or underground mining. Major assumptions in the analysis of the risk to the proposed project because of geological hazards include the following: • The location of active faults is based on information available from USGS (2006). Ground motion estimates are based on recent updates of the USGS seismic hazard mapping by the USGS (Petersen et al 2008). There are numerous Quaternary faults in the project area, which may rupture at any time, however, only those faults with movement in the last 15,000 years are considered to be active as determined by the USGS (2006). • Landslide risk information is based on landslide maps, landslide incident and susceptibility areas, and USGS publications. • Subsidence risk is due to groundwater withdrawal in the Escalante Desert where it has been documented (Lund et al. 2009). There is also subsidence risk over abandoned coal mines and potential karst topography in areas underlain by the North Horn Formation.
Mineral Resources	Analyze the proposed corridor and alternatives with regard to potential interference with existing mineral extraction operations, reduced access to underlying minerals, and interference with future mineral extraction operations. A major assumption used in the analysis of potential impacts to mineral resources is that mineral entry can take precedence over other land uses and that granting of a utility ROW does not overrule mineral owners' right to develop and extract minerals.
Paleontological Resources	Major issues regarding paleontological resources are loss of important fossils because of the following activities or conditions: • Ground disturbing activities such as clearing, grading, and foundation excavation. • Operational and maintenance activities that would require disturbance of previously unaffected areas within the established ROW. • Increased access resulting in vandalism or unauthorized collection. Major assumptions in the analysis of risk to paleontological resources include the following: Areas underlain by medium to high fossil potential based on the PFYC system for valuable fossil resources were defined on the basis of literature review with heavy reliance on USDOE and USDOI (2008, Appendix N). No field surveys were conducted.

Impacts would occur if the following conditions were to result from the construction, operation, and decommissioning of the proposed facilities:

- An impact from geologic hazards would occur if seismicity, landslides, or subsidence were to result in damage to facilities or interruption of service.
- Landslides could also occur as a result of instability from ground disturbance during construction.
- Impacts to mineral resources would occur if mineral resources of economic value are lost or made inaccessible for future use.
- An impact to fossil resources would result if project activities cause the loss or damage to scientifically important paleontological resources.

3.2.6.1 Impacts from Terminal Construction and Operation

Northern Terminal

There are no identified geologic hazards of concern at the Northern Terminal Siting Area.

The Northern Terminal Siting Area encompasses a geologic structure called the Grenville Dome, an elongate east-west anticline about 5 miles long and 2-3 miles wide. Although several oil and gas tests have been drilled on the structure, no commercial production has been established (Wyoming Oil and Gas Conservation Commission [WOGCC] 2011). Coal may be present in the underlying bedrock, but the potential for mineable resources is low (BLM 2008b). There are no gravel pits within the siting area (WDEQ 2011).

The Northern Terminal Siting Area is underlain by bedrock that has the potential to contain fossils and include the Steele Shale, Niobrara Formation, Frontier Formation, Mowry Shale. These units have PFYC ratings ranging from 3 to 5 (**Table 3.2-2**), indicating the potential for direct and indirect impacts to fossil resources. BMPs PAL-1 through PAL-5 and design options TWE-4,TWE-38, and TWE-39 provide for protection of paleontological resources ranging from pre-construction surveys and documentation of resources, re-routing or avoidance, recovery if avoidance is not possible, and proper documentation and curation of recovered fossils, all of which would be detailed in a Paleontological Resources Management and Mitigation Plan.

Terminal decommissioning activities likely would occur in previously disturbed areas; therefore, no impacts to paleontological resources would be anticipated. If new disturbance is expected, then the application of appropriate BMPs would be required for protect potential fossil resources. No impacts to project facilities from geological hazards or mineral resources would be expected.

Southern Terminal

The Southern Terminal Siting Area is located near the Black Hills fault zone, which may be active. As discussed in Section 3.2.5.4, the Black Hills fault may be capable of generating earthquakes of up to M_w 6.9. Earthquakes of this magnitude have the potential to generate strong ground motion that could damage surface structures. Expected ground motions in any given area are dependent on several factors including distance from the source, local geology, and depth to shallow water. As presented in Section 3.2.5.4, ground motions that might be experienced in southern Nevada could range from 10 to 15 percent of **g** (Petersen et al. 2008). Magnitude is a measure of the energy released from the source earthquake, but intensity is a measure of shaking and associated effects on people and structures (USGS 2010). **Table 3.2-9** compares peak ground acceleration as a percent of **g** to intensity as defined on the Modified Mercalli Intensity Scale. From the table it can be seen that ground motions of 10 to 20 percent of **g** would damage poorly built and non-resistant structures, but well designed structures would sustain slight to no damage.

Table 3.2-9 Abridged Modified Mercalli Intensity Scale Compared to Peak Ground Acceleration

Intensity	Definition	PGA – Percent Acceleration Gravity (g)
I	Not felt except by a very few under especially favorable conditions	
II	Felt only by a few persons at rest, especially on upper floors of buildings.	
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.	
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.	1.5 to 2.0
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.	3.0 to 4.0
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.	6.0 to 7.0
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.	10.0 to 15.0
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.	25.0 to 30.0
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.	50 to 55
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.	More than 60
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.	As above
XII	Total damage. Objects thrown into the air.	As above

Source: Modified from Bolt (1993) and USGS (2010).

It should be noted that electrical transmission system vulnerability to seismic effects depends on which system components are involved. Transmission structures generally survive well in earthquake events since they are composed of lightweight structures at individual locations connected by conductors that have the ability to adjust to the vibrations of ground motion (Rocky Mountain Power 2010). In addition, structures are built to a standard for wind and ice structural loadings and as such exceed earthquake design loads (American Society of Civil Engineers 1991). A ground electrode bed would not be expected to be adversely affected by the expected ground motions. However, transmission structures are at a somewhat greater risk when built on soils prone to liquefaction. Other facilities such as substations and associated equipment such as ceramic insulators do not fare as well unless specific design considerations are built in or are retrofitted to existing facilities (Yokel 1990).

Because the Southern Terminal Siting area is in an area that could be affected by movement on the Black Hills fault, the following mitigation measure is (**GE-1**) is recommended:

***GE-1**: In areas with geologic hazards (e.g., ground shaking, liquefaction, landslides, subsidence from karst, groundwater withdrawal, underground mining, historic mining) and active mining; placement of project structures and other project related disturbance would be avoided to the extent practical. Where avoidance is not possible a site specific geotechnical investigation and engineering design would be implemented during construction and operation of the Project. Depending on the type of potential geologic hazards, the designs may vary and should address specific needs for enhanced structural supports. Site-specific assessment of geologic hazards shall include review of available information concerning areas of mapped hazards and consultation with appropriate governmental agency (USFS, BLM, UGS, USGS) personnel who are knowledgeable about the hazards. Assessment also shall include, if necessary, field surveys and gathering of geotechnical information to determine what engineering design methods would mitigate or lessen potential risks. If active mines cannot be avoided, applicant will conduct similar due diligence in regard to hazards from underground and historic mining to ensure that project facilities will not hinder access to mineral resources or create dangers to mining activities.*

Effectiveness: The mitigation measure would reduce impacts from geologic hazards by incorporating design standards to provide damage protection or by avoidance to lessen risk. The mitigation would also reduce impacts to reduced access to mineral resources.

In addition to the protection measures identified above, some BLM field offices may have stipulations concerning land use restrictions in high landslide incidence areas (**Appendix C**).

As discussed in Section 3.2.5.4, although there is potential for gold, tungsten, and alunite in the Alunite District, those commodities were never commercially mined. The Southern Terminal Siting Area would not interfere with the sand and gravel pits just south of Railroad Pass.

Southern Terminal Alternate

Potential impacts with regard to geologic hazards, paleontological resources, and mineral resources for the Southern Terminal Alternate would be the same as the Southern Terminal.

Southern Terminal near IPP (Design Option 2)

Two fault zones cross the Design Option 2 Delta Ground Electrode Bed Area: the Drum Mountains fault zone and Crater Bench faults (Black et al. 1999a; Black et al. 1999b). The Drum Mountains fault zone is a complex of east- and west-dipping normal faults east of the Drum Mountains. Paleoseismic studies indicate that movement has cut young deposits so that movement may have occurred less than 15,000 years ago, making these faults potentially active. The Crater Bench faults are northeast striking faults east of the Drum Mountains fault zone. The faults also cut deposits younger than Lake Bonneville deposits and therefore may be potentially active. The fault zones described can be easily avoided and the ground bed electrode site can be located away from the fault zones and stay within the boundary of the Delta Ground Electrode Area. Implementation of measure **GE-1** would reduce or eliminate potential impacts with regard to active faults.

The Southern Terminal for Design Option 2 is located on federal minerals that are leased for geothermal exploration (see Section 3.14, Land Use, and **Figure 3.14-18**). The Delta Ground Electrode Bed Area also contains leased geothermal areas and a Known Geothermal Resource Area (KGRA). This situation may lead to potential conflicts with geothermal exploration and development. The substation at the terminal site would have to be located in such a manner to not interfere with geothermal exploration or development. The associated ground electrode bed for Design Option 2 can be located according to siting criteria for ground electrode beds as described in Section 4.2.3 of the PDTR (**Appendix D**) such that the electrode

bed would not interfere with geothermal exploration or future geothermal facilities on nearby leased and lands designated as a KGRA.

Design Option 3 – Phased Build Out

Impacts from development of this design option would be the same as those discussed throughout Section 3.2.6.1, Impacts from Terminal Construction and Operation and Section 3.2.6.2, Impacts Common to All Alternative Routes.

The Southern Terminal Siting Area is not underlain by bedrock that has the potential to contain important fossils. The area is underlain by Tertiary volcanic rock and valley fill alluvium (Longwell et al. 1965), both of which have a low potential to contain fossils.

Terminal decommissioning activities likely would occur in previously disturbed areas; therefore, no impacts to paleontological resources would be anticipated. If new disturbance is expected, then the application of appropriate BMPs would be required to protect potential fossil resources. No impacts to project facilities from geological hazards or mineral resources would be expected.

3.2.6.2 Impacts Common to All Alternative Routes and Associated Components

Construction Impacts

Direct impacts of geological hazards during construction would be the potential for grading and excavation to undercut slopes causing instability of slopes and endangering construction crews. BMP **SOIL-2** limits the creation of excessive slopes during excavation and requires site-specific, specialized construction techniques in areas of steep slopes.

Indirect impacts may result from changes in slope and grade that may increase runoff and erosion. There is a potential for seismically induced ground instability that may be further enhanced by undercutting of slopes. Ground motion from a strong earthquake has the potential to initiate movement of unstable earth, although the actual frequency of earthquake-induced landslide occurrence in Utah is not certain (Christenson 2004). Lessening the potential impact of seismically induced landslides would involve implementation of mitigation measure **GE-1**.

A direct impact to mineral resources would occur if construction activities were to prevent access to mineral resources. Any mineral access issues would occur during active construction and amount to road closures or other access restrictions while construction is conducted in a given area. However, other impacts could occur such as land use conflicts and set back limitations that might occur in densely spaced oil and gas field developments. TWE has committed to site the ROW to avoid wellheads and associated facilities at wellheads, and would implement an additional 250-foot avoidance buffer during final centerline siting (TWE 2012). There are additional restrictions described in Appendix C regarding transmission line location and mineral operations.

Conclusion: The proposed project is not expected to preclude or restrict access to minerals resources.

Direct impacts to or destruction of fossils may occur from facility construction activities conducted through medium to high potential fossil beds. Indirect impacts during construction would include erosion of fossil beds due to slope re-grading and vegetation clearing or the unauthorized collection of scientifically important fossils by construction workers or the public due to increased access to fossil localities along the ROW.

BMPs PAL-1 through PAL-5 and design options TWE-4, TWE-38, and TWE-39 provide for protection of paleontological resources ranging from pre-construction surveys and documentation of resources, re-routing or avoidance, recovery if avoidance is not possible, and proper documentation and curation of

recovered fossils. These measures would provide a process to protect the resources and potentially add to scientific knowledge. Such measures are highly effective in reducing loss or destruction of the resource. In addition to the protection measures cited above, some BLM field offices have specific protection measures or stipulations for the protection of specific formations or PFYC classes (**Appendix C**).

Conclusion: Project construction would not be expected to result in the loss or damage of scientifically important paleontological resources.

Operation Impacts

During operation and maintenance of the proposed facilities, direct impacts due to seismicity would include permanent ground deformation at faults or ground movement that would cause damage to facilities.

Direct impacts from landslides or unstable ground would result in loss of ground support to structures. Electrical transmission lines have reportedly been impacted by ground stability hazards on the Wasatch Plateau in areas associated with the North Horn Formation. Structural failure and relocation of transmission line routes have resulted because of landslides (debris flows) due to anomalous precipitation events (Smith 2011). Also, large debris flows have occurred in the Wasatch Plateau and well documented examples are the Thistle and Manti Landslides (Fleming 1988; Witkind 1986). Both landslides involved millions of cubic feet of earth material and were older slides reactivated by anomalous precipitation and runoff. The Thistle Landslide, which occurred in April 1983 about 8 miles east of Spanish Fork, Utah, was large enough to block Spanish Fork Canyon and dam water upstream of the slide. The Thistle Landslide also took out the Denver Rio Grande railroad and US Highways 6/89, and the town of Thistle was flooded and destroyed by the impoundment of water behind the slide. The Manti Landslide developed on the south rim of Manti Canyon about 6 miles east of Manti, Utah. The landslide was activated in June 1974 during a period of runoff of heavy snowmelt runoff and eventually grew to dimensions of about 2.2 miles long and 0.5 mile wide. In spite of its size, no structures were threatened or damaged.

Any landslide deposits could be rendered unstable with increased precipitation or high levels of moisture, especially during periods of high runoff of periodic heavy snow cover. Impacts from landslides or unstable ground would result in damage to structures and ultimately disruption in service. Implementation of mitigation measure **GE-1** would lower the risk of locating facilities on unstable areas by the use engineering design and appropriate construction practices to lessen potential impacts due to landslides.

Direct impacts due to ground subsidence also would result in the loss of ground support to structures with the potential to damage and disrupt operations. Implementation of mitigation measures **GE-1** would lower the risk of subsidence.

Conclusion: Through implementation of BMPs, design features, and mitigation measures, the risk of damage from seismicity, landslides or subsidence would be substantially reduced.

A potential direct impact during operation would be loss of access to mineral resources and prevention of the mineral owner (including governmental entities) to develop minerals. However, the linear nature of the project would minimize any potential restriction of access to mineral resources.

Indirect effects could occur to mineral industry facilities (such as pipelines and wells) located adjacent to or within the operational ROW due to EMF. Effects from EMF would be dealt with by implementation of BMP **PD-2**, which calls for identification and delineation of existing underground metallic pipelines or well casings in the vicinity of a proposed electricity transmission line project and to design the project to avoid accelerating the corrosion of the pipelines and pumping wells. See Section 3.18, Public Health and Safety for additional information on the effects of EMF.

Conclusion: Project operation would not preclude access or prevent the development of mineral resources.

Indirect impacts may occur to paleontological resources over an extended period of time, because of increased access to medium to high fossil potential formations. The BMPs and design features that protect paleontological resources discussed in construction impacts would lessen the risk of impacts if maintenance activities occur outside of previously disturbed areas. However, the resource would still be at risk through the continuation of natural processes (e.g. erosion) and unauthorized collection.

Conclusion: Project operation would not be expected to result in the loss or damage of scientifically important paleontological resources.

Decommission Impacts

Potential impacts from Project decommissioning to geological hazards and mineral resources are similar to construction impacts, but to a lesser degree. Decommissioning activities would likely occur in previously disturbed areas; therefore no impacts to paleontological resources would be anticipated. If new disturbance is expected, then the application of appropriate BMPs and mitigation measures would be required to protect potential fossil resources similar to construction. Decommissioning may have a positive impact in that the removal of facilities would allow access to mineral resources.

Conclusion: Project decommissioning would not be expected to result in mineral resources of economic value being lost or made inaccessible for future use, or result in the loss or damage to scientifically important paleontological resources.

3.2.6.3 Region I

Project construction, operation, and decommissioning impacts in Region I would be the same as those discussed in Section 3.2.6.2, Impacts Common to All Alternative Routes and Associated Components. **Table 3.2-10** provides a comparison of impacts associated with the alternative routes in Region I after consideration of BMPs, design features, and mitigation measures.

Table 3.2-10 Summary of Region I Alternative Route Impacts

Parameter	Alternative I-A	Alternative I-B	Alternative I-C	Alternative I-D
Seismicity	No active faults; low ground motion potential.	Same as Alternative I-A	Same as Alternative I-A	Same as Alternative I-A
Landslides	Generally low incidence and moderate susceptibility.	Same as Alternative I-A	Same as Alternative I-A	Same as Alternative I-A
Subsidence	Low potential for karst areas.	Same as Alternative I-A	Same as Alternative I-A	Same as Alternative I-A
Mineral Resources	Route crosses 7 oil and gas fields. No active coal mine permit areas are crossed.	Route crosses 12 oil and gas fields. No active coal mine permit areas are crossed.	Route crosses 8 oil and gas fields. No active coal mine permit areas are crossed. Crosses area of abandoned coal mines south of Craig, Colorado.	Route crosses 7 oil and gas fields. No active coal mine permit areas are crossed.
Paleontological Resources	PFYC Class 3: 29 miles Class 4: 2 miles Class 5: 92 miles	PFYC Class 3: 29 miles Class 4:2 miles Class 5: 111 miles	PFYC Class 3: 76 miles Class 4: 2 miles Class 5: 74 miles	PFYC Class 3: 29 miles Class 4: 2 miles Class 5: 123 miles

There are no active faults in Region I and expected ground motions from an earthquake would be low. Seismicity impacts are expected to be minimal for all four alternative routes. Region I has a generally low incidence and moderate susceptibility to landslides. Although many oil and gas fields are crossed, mineral resource access issues would only occur during active construction and consist of road closures or other access problems while construction is conducted in a given area. No alternatives cross proposed coal lease tracts (BLM 1980). The proposed route and alternatives cross medium to high fossil potential formations as listed on **Table 3.2-2**.

Alternative I-A (Applicant Proposed)

Key Parameters Summary

Alternative I-A would not be expected to be impacted by seismicity, landslides, or subsidence that results in damage to facilities or interruption of service. Seven oil and gas fields would be crossed. Approximately 92 miles of PFYC Class 5 formations would be crossed.

Alternative I-B

Key Parameters Summary

Alternative I-B would not be expected to be impacted by seismicity, landslides, or subsidence that result in damage to facilities or interruption of service or result in mineral resources of economic value being lost or made inaccessible for future use. Twelve oil and gas fields would be crossed. Approximately 111 miles of PFYC Class 5 formations would be crossed.

Alternative I-C

Key Parameters Summary

Alternative I-C would not be expected to be impacted by seismicity, landslides, or subsidence that would result in damage to facilities or interruption of service or result in mineral resources of economic value being lost or made inaccessible for future use. Eight oil and gas fields would be crossed. Approximately 74 miles of PFYC Class 5 formations would be crossed. Alternative I-C does not cross the proposed coal lease tracts in the Green River Coal Field as defined by BLM (1980). Corridor segment 190.00 contains historic coal mining areas near Craig, Colorado where subsidence has been documented (Colorado Geological Survey 2011). Implementation of mitigation measure **GE-1** would reduce the risk of impacts of mine subsidence.

Alternative I-D (Agency Preferred)

Key Parameters Summary

Alternative I-D would not be expected to be impacted by seismicity, landslides, or subsidence that result in damage to facilities or interruption of service or result in mineral resources of economic value being lost or made inaccessible for future use. Seven oil and gas fields would be crossed. Approximately 123 miles of PFYC Class 5 formations would be crossed.

Tuttle Easement Micro-siting Options 1, 2, and 3

The geologic formations crossed by the Tuttle Easement micro-siting options 1, 2, and 3 would not differ substantially from Alternative I-D. The micro-siting options would not pose a greater risk to paleontological or mineral resources or increased risk from geologic hazards.

Alternative Connectors in Region I

Table 3.2-11 summarizes impacts and advantages associated with the alternative connectors in Region I.

Table 3.2-11 Summary of Region I Alternative Connector Impacts

Alternative Connector	Analysis	Conclusion
Mexican Flats Alternative Connector	Low geologic hazard risk; one oil and gas field crossed; 5 miles of Class 5 PFYC formations crossed.	There are no apparent unique opportunities or constraints for geologic resources by utilizing this connector.
Baggs Alternative Connector	Low geologic hazard risk; three oil and gas fields crossed; 16 miles of Class 5 PFYC formations crossed.	There are no apparent unique opportunities or constraints for geologic resources by utilizing this connector.
Fivemile Point North Alternative Connector	Low geologic hazard risk; one oil and gas field crossed; 3 miles of Class 5 PFYC formations crossed.	There are no apparent unique opportunities or constraints for geologic resources by utilizing this connector
Fivemile Point South Alternative Connector	Low geologic hazard risk; one oil and gas field crossed; 3 miles of Class 5 PFYC formations crossed.	There are no apparent unique opportunities or constraints for geologic resources by utilizing this connector

Alternative Ground Electrode Systems in Region I

The northern ground electrode system would be necessary within 100 miles of the northern terminal as discussed in Chapter 2.0. Although the location for this system has not been determined, conceptual locations and connections to the alternative routes have been provided in the project POD. The impacts associated with constructing and operating this system are the same as discussed for Alternative I-A. **Table 3.2-12** summarizes impacts associated with the eight combinations of alternative route and location possibilities for the northern ground electrode system.

Table 3.2-12 Summary of Region I Alternative Ground Electrode System Impacts

Ground Electrode System Name	Analysis
Separation Flat – All Alternative Routes	Potential impacts to paleontological resources; bedrock consists of the Battlespring Formation (PFYC 3). No impacts regarding geological hazards or mineral resources.
Separation Creek – All Routes	Potential impacts to paleontological resources; bedrock consists of Fort Union Formation (PFYC 3), Lance Formation (PFYC 5), and Lewis Shale (PFYC 3). No impacts regarding geological hazards or mineral resources.
Eight-Mile Basin – All Routes	Potential impacts to paleontological resources; bedrock consists of Steele Shale (PFYC 3); Niobrara Formation (PFYC 5); and Mesaverde Formation (PFYC 3-5). No impacts regarding geological hazards or mineral resources.
Shell Creek (Alternative I-A)	Potential impacts to paleontological resources; bedrock consists of Green River Formation (PFYC 4-5); Wasatch Formation (PFYC 5), and Washakie Formation (PFYC 5). No impacts regarding geological hazards or mineral resources.
Shell Creek (Alternative I-B)	Impacts would be the same as Shell Creek (Alternative I-A).
Little Snake East (Alternative I-A)	Potential impacts to paleontological resources; bedrock consists of the Wasatch Formation (PFYC 5). No impacts regarding geological hazards or mineral resources.
Little Snake West (Alternative I-A)	Impacts would be same as Little Snake East (Alternative I-A).
Little Snake East (Alternative I-B)	Impacts would be same as Little Snake East (Alternative I-A).

Region I Conclusion

There are no appreciable differences (**Table 3.2-10**) between the Region I alternative corridors in terms of geologic hazards since no active faults are crossed by any of the routes, potential seismic ground motion is low, landslide incidence is low, and there are no ground subsidence hazards. Potential impacts to

minerals are similar except that Alternate I-B crosses more oil and gas fields than the other alternatives. Although coal resource areas are crossed, none of the alternatives cross active mining areas. The alternatives are similar regarding potential impacts to paleontological resources in Class 3 and Class 4 formations. Alternative I-D crosses more miles of Class 5 formations than the other alternatives. The alternative connectors are essentially the same except that the Baggs Alternative Connector may pose more impact to paleontological resources since it crosses 16 miles of PFYC rank 5 formations, as compared to 5 miles or less for the others (**Table 3.2-11**). Paleontological resources are the most potentially impacted by the ground electrode systems (**Table 3.2-12**). Except for Separation Flat, the ground electrode systems are essentially the same in that they have the potential to impact PFYC 4 or 5 formations. No impacts due to geological hazards or mineral resources are anticipated for any of the ground electrode systems. None of the areas appear to have oil and gas well densities that would preclude the siting of a ground electrode system.

3.2.6.4 Region II

Project construction, operation, and decommission impacts in Region II would be the same as those discussed in Section 3.2.6.2, Impacts Common to All Alternative Routes and Associated Components. **Table 3.2-13** provides a comparison of impacts associated with the alternative routes in Region II.

Alternative II-A (Applicant Proposed)

The Alternative II-A corridor has potential for impacts from seismically induced ground instability, which would be decreased through implementation of mitigation measure **GE-1**. It also would be subject to increased slope instability where the route crosses the High Plateaus of Utah (**Figure 3.2-8**). The route crosses not only the North Horn Formation with its high degree of susceptibility to landslides, but also other areas of unstable bedrock and surficial materials. Although the presence of North Horn Formation bedrock has been implicated in many slides and incidents of instability, the landslide mapping by the UGS (Elliott and Harty 2010) clearly shows extensive landslide deposits beyond the areas underlain by the North Horn formation. Construction on unstable materials or on dormant landslide deposits could result in instability and present safety hazards and construction delays.

The Alternative II-A corridor would cross the Thistle Landslide area. From where it enters Wasatch County to about 10 miles east of Nephi, Utah the Proposed Route II-A covers large areas of mapped landslides (Elliott and Harty 2010). The landslide material is characterized as up to 10 feet deep and ranges from easily identified discrete landslide deposits to material coalesced from several landslides. This is an extensive area (8 miles of the 2-mile transmission line corridor) of landslide deposits about 7 miles north of Fountain Green, Utah. The implementation of mitigation measure **GE-1** would reduce the impacts of landslides in the Wasatch Plateau. This mitigation measure would be applied in identified landslide and landslide-prone areas associated with the North Horn, Green River, and Duchesne River formations.

The Alternative II-A corridor crosses the south end of the Strawberry fault zone in Wasatch County just east of the Utah-Wasatch county line. The Strawberry fault zone is generally a north-trending 20 mile-long fault zone that bounds the east side of the Strawberry Valley (Black et al. 1999c). The fault is recognized on well developed scarps and evidence indicates that movement has taken place on the fault 3 times in the last 15,000 to 30,000 years. This alternative also crosses the south end of the Nephi Segment of the Wasatch fault zone just north of Nephi, Utah (Black et al. 2004a). Evidence from faulted surficial deposits indicates that movement on the Nephi segment may have occurred as recently as 300 to 1200 years ago. North of Delta, the Proposed Route II-A crosses the Sugarville Area Faults. The short northeast trending faults are about 4 miles north of Sugarville, Utah and cut Pliocene and Holocene sediments with evidence indicating at least two seismic events (Black et al 1999d). The Nephi Fault has been assigned a potential maximum magnitude that ranges from 6.8 to 7.2 (Petersen et al. 2008). The Strawberry Fault has a potential magnitude of 6.92. The Sugarville Faults have not been assigned an expected earthquake magnitude. Implementation and mitigation measure **GE-1** would reduce potential impacts due to potentially active faults.

Table 3.2-13 Summary of Region II Alternative Route Impacts

Parameter	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Seismicity	Moderate to high risk for ground deformation and strong ground motion. Crosses 3 active fault zones.	Same as Alternative II-A. Crosses 4 active fault zones.	Same as Alternative II-A. Crosses 5 active fault zones.	Low to moderate risk. Crosses 2 active fault zones.	Same as Alternative II-D.	Same as Alternative II-D.
Landslides	Moderate to high risk for landslide impacts.	Same as Alternative II-A.	Same as Alternative II-A.	Same as Alternative II-A.	Same as Alternative II-A.	Same as Alternative II-A.
Subsidence	Low to moderate risk for ground subsidence. Crosses historic coal mining areas.	Same as Alternative II-A.	Slightly higher risk than Alternatives II-A and II-B since evidence of sinkholes found near the route.	Same as Alternative II-A.	Same as Alternative II-A.	Same as Alternative II-A.
Mineral Resources	6 oil and gas fields crossed. Encroaches on lease by application and proposed coal mining areas at the Deserado Mine. Crosses historic coal mine areas northwest of Deserado Mine.	15 oil and gas fields crossed. In Colorado, Deserado mine permit area crossed. In Utah, Deer Creek Coal Mine permit area crossed. Approximately 15 miles of active mine permit areas crossed.	15 oil and gas fields crossed. In Colorado, Deserado mine permit area crossed. In Utah, the II-C corridor encroaches on the eastern side of the active Emery coal mine.	9 oil and gas fields crossed. In Utah, crosses active and inactive coal mining areas as well as potential coal development areas in the Book Cliffs and Wasatch coal fields. Approximately 5 miles of active mine permit areas crossed. Encroaches on lease by application and proposed coal mining areas at the Deserado Mine. Crosses historic coal mine areas northwest of Deserado Mine.	5 oil and gas fields crossed. Encroaches on lease by application and proposed coal mining areas at the Deserado Mine. Crosses historic coal mine areas northwest of Deserado Mine.	7 oil and gas fields crossed. Encroaches on lease by application and proposed coal mining areas at the Deserado Mine. Crosses historic coal mine areas northwest of Deserado Mine.
Paleontological Resources	PFYC Class 3: 8 miles Class 4: 0 miles Class 5: 120 miles	PFYC Class 3: 116 miles Class 4: 6 miles Class 5: 74 miles	PFYC Class 3: 127 miles Class 4: 6 miles Class 5: 77 miles	PFYC Class 3: 20 miles Class 4; 0 miles Class 5: 129 miles	PFYC Class 3: 9 miles Class 4: 0 miles Class 5: 113 miles	PFYC: Class 3: 8 miles Class 4: 0 miles Class 5: 156 miles

There is not a comprehensive database concerning subsidence and karst hazards regarding the North Horn Formation and Flagstaff Limestone in the Wasatch Plateau or valleys in adjacent areas to the west of the plateau. It is not certain how widespread the phenomenon is because in the reports cited above, the descriptions of sinkholes were incidental to the main subject of the respective reports. Because of this it is not possible to assign a risk to the alternatives; however, since all the routes cross the North Horn formation and Flagstaff Limestone, they are potentially subject to ground subsidence hazard risks, which can include loss of support and subsequent damage to structures and possibly loss of service. The risk of subsidence hazards would be substantially reduced by implementation of mitigation measure **GE-1**.

The Alternative II-A 2-mile transmission line corridor lies just north of the Deserado Mine permit area and may encroach upon lease by application and proposed mining areas (BLM 2011). Also, there are historic coal mines within or adjacent to the corridor northwest of the Deserado Mine in Township 3 North, Range 102 West (Carroll 2006). Implementation of mitigation measure **GE-1** would lower the risk of encountering subsidence from active or historic mining.

Alternative II-A may cross relict shorelines and associated deposits from Lake Bonneville. While these deposits have a PFYC rating of 2, scientifically important fossils have been found in sand and gravel deposits associated with the old shorelines. It is recommended BMPs PAL-1 through PAL-5 and design options TWE-4, TWE-38, and TWE-39 be implemented where the 2-mile transmission line corridor crosses these old shorelines to protect potential fossil resources.

Key Parameters Summary

There is an elevated risk that landslide areas crossed by Alternative II-A might result in damage to facilities or interruption of service during the operation of the Project, which would be a significant impact. Seismicity and subsidence risks would not be expected to result in damage to facilities or interruption of service during the operation of the Project. Six oil and gas fields would be crossed. Approximately 120 miles of PFYC Class 5 formations would be crossed.

Strawberry IRA Micro-siting Options 1, 2, and 3

The geologic formations crossed by the Strawberry IRA micro-siting options 1, 2, and 3 would not differ substantially from Alternative II-A. The micro-siting options would not pose a greater risk to paleontological or mineral resources or increased risk from geologic hazards.

Alternative II-B

Alternative II-B also crosses isolated landslide deposits between Huntington and Mount Pleasant, Utah and landslide deposits north and east of Fountain Green, but the deposits are not quite as extensive as the ones further north crossed by Alternative II-A. The Manti Landslide is less than 30 miles south of Alternative II-B where the alternative crosses the high terrain between Huntington and Mount Pleasant. The alternative also crosses areas of high landslide risk in the Baxter Pass area in western Garfield County, Colorado where the route follows the Baxter Pass Road. Landslides have occurred on steep slopes underlain by sandstones, siltstones, and shales of the Green River and Mesaverde formations (Stover 1985). As discussed in Alternative II-A above, implementation of mitigation measure **GE-1** would lessen potential landslide impacts; however there would remain an elevated risk that a landslide in this area might result in damage to facilities or interruption of service during the operation of the Project.

Alternative II-B crosses the Joes Valley faults about 20 miles northwest of Huntington, Utah. The faults consist of 2 parallel north-south trending fault zones (Black et al. 1999e,f). The easternmost of the fault zones marks the east boundary of the graben (a down-dropped block of crust) that forms the Joes Valley. The second fault zone west of the boundary fault is internal to the graben structure. Both sets of faults zones are believed to have been active within the last 15,000 years and would be considered potentially active. The faults described above have been assigned potential maximum magnitudes that range from 6.6 to 7.5, the largest potential magnitude for the Joes Valley east and mid-valley faults (Black et

al. 1999e,f; UGS 2011b). Alternative II-B also crosses the Levan Segment of the Wasatch fault zone and the Sugarville area faults, which are considered to be potentially active. Implementation of mitigation measure **GE-1** would reduce the risk due to potentially active faults.

Alternative II-B crosses the North Horn formation. Its potential for subsidence is discussed in Alternative II-A. Implementation of mitigation measure **GE-1** would decrease the potential risk due to subsidence.

Another subsidence hazard is posed by underground coal mines. Alternative II-B crosses the permit area of the Deer Creek Mine about 10 miles northwest of Huntington, Utah (Townships 16 and 17 South and Ranges 6 and 7 East) (UDOGM 2012b). The mine utilizes the longwall mining method, which controls surface subsidence in comparison to other mining methods (Ismaya 2010). Subsidence has been monitored over mining areas since the early 1980s (Energy West Mining Company 2010). As many as 28 areas were monitored over this period of time, but a number of areas are not actively being monitored because subsidence has occurred to its ultimate extent or little or no subsidence was detected. However, subsidence in some areas has been as much as 17 feet where dual seam mining occurred. In addition to modern mining, there are historic underground mines within the permit area.

The Alternative II-B 2-mile transmission line corridor crosses the southeast portion of the Deserado Mine permit area in northwest Colorado (BLM 2011). Implementation of mitigation measure **GE-1** would reduce or eliminate impacts to crossing an active mine permit area. Sinkholes also have been associated with the North Horn Formation in the Wasatch Plateau. In 1954, mastodon, horse, and bison bones were discovered in a sinkhole in the North Horn formation about 2 miles west of Huntington Reservoir (Gillette and Miller 1999). This sinkhole was reported to be 13 feet deep and was probably instrumental in trapping the animals whose fossilized remains were found in the sinkhole. The sinkhole-fossil locality is only about 5 to 6 miles north of Alternative II-B on the west side of the Wasatch Plateau and about 10 miles east of Mount Pleasant, Utah.

Alternative II-B may cross relict shorelines and associated deposits from Lake Bonneville. While these deposits have a PFYC rating of 2, scientifically important fossils have been found in sand and gravel deposits associated with the old shorelines. Where the 2-mile transmission line corridor crosses these old shorelines, it is recommended that BMPs PAL-1 through PAL-5 and design options TWE-4, TWE-38, and TWE-39 be implemented to protect potential fossil resources.

Key Parameters Summary

There is an elevated risk that landslide areas crossed by Alternative II-B might result in damage to facilities or interruption of service during the operation of the Project. Seismicity and subsidence risks also are present, but would not be expected to result in damage to facilities or interruption of service during the operation of the Project. Fifteen oil and gas fields are crossed that might result in mineral resource access conflicts. Approximately 15 miles of coal mine permit areas are crossed. The Alternative II-B 2-mile transmission line corridor crosses the Deserado Mine permit area in northwest Colorado and also crosses the Deer Creek Coal mine permit area in Utah. Approximately 74 miles of PFYC Class 5 formations are crossed, which have an elevated risk for impacting fossil resources.

Alternative II-C

Between the towns of Emery and Salina, Utah, Alternate II-C roughly follows Interstate 70. Where the 2-mile transmission line corridor is south of the interstate it crosses areas of landslide deposits that can be shallow or deep and include talus, rock-fall, colluvium, and soil creep deposits (Elliott and Harty 2010). The alternative also crosses areas of high landslide risk in the Baxter Pass area in western Garfield County, Colorado where the route follows the Baxter Pass Road. Landslides have occurred on steep slopes underlain by sandstones, siltstones, and shales of the Green River and Mesaverde formations (Stover 1985). Implementation of mitigation measure **GE-1** would lessen the risks of landslides.

The proposed Alternative II-C crosses potentially active faults along the east side of the Pavant Range (Maple Grove, Pavant, and Scipio faults) and northward into the Scipio Valley (Scipio Valley faults) (Black et al. 2004b,c,d,e). These faults trend north-south and all appear to have movement within the last 15,000 years. Further north, The Lynndyl Alternative Connector crosses the Little Valley fault zone where generally north trending faults occur on the east and west sides of the valley (Black et al. 1999g). Offset of valley alluvial deposits indicate movement in the last 15,000 years. Latest evidence indicates that the Pavant, Scipio, Scipio Valley, and Little Valley faults may be part of the same continuous fault zone (UGS 2011b). The faults described above have not been assigned potential maximum magnitudes (Petersen et al. 2008; UGS 2011b). Alternative II-C also crosses the Levan Segment of the Wasatch fault zone and the Sugarville area faults, which are considered to be potentially active. Implementation of mitigation measure **GE-1** would reduce impacts due to potentially active faults.

The Manti Landslide location is less than 30 miles north of Alternative Route II-C where the route follows Interstate Highway 70 between Emery and Salina, Utah. This alternative generally follows the route of a transmission line that was heavily damaged in 1983 due to instability from heavy precipitation and runoff and portions of the line had to be relocated to more stable ground (Smith 2011). Mitigation measure **GE-1** would reduce the risk of damage or interruptions of service; however there would remain an elevated risk that a landslide in this area might result in damage to facilities or interruption of service during the operation of the Project.

Ground subsidence risk also is present in the North Horn formation. The upper part of the North Horn Formation contains limestone that may be subject to dissolution resulting in the development of sinkholes. The Flagstaff Limestone, which lies above and may interfinger with the North Horn formation, also may be subject to dissolution (Bjorkland and Robinson 1968; Lawton et al. 1993). Sinkholes in the southern Scipio Valley have been attributed to groundwater solution of North Horn carbonates and Flagstaff Limestone beneath valley fill deposits. The sinkholes occur on the surface traces of the Scipio Valley faults. Bjorkland and Robinson (1968) postulated that groundwater migrated into fractures in the North Horn and Flagstaff Limestone bedrock and dissolved the carbonate layers. The sinkholes developed as the surface manifestation of the dissolution. The North Horn formation and Flagstaff Limestone exposed on the east side of the Scipio Valley were observed to be heavily fractured with evidence of solution. The sinkholes in the Scipio Valley were described to be up to 25 feet deep, 30 feet wide, and 200 feet long and some may have been interconnected by voids in the subsurface. The sinkholes appear to be just east of the Alternative II-C 2-mile transmission line corridor, but present-day Interstate 15 appears to cross the areas where sinkholes were identified on the geologic map accompanying the USGS report by Bjorkland and Robinson (1968).

Alternative II-C crosses the North Horn formation with its potential for subsidence is discussed in Alternative II-A. Alternative II-C 2-mile transmission line corridor encroaches on the southern and eastern edges of the Emery Deep Coal Mine located in Township 22 South, Range 6 East 4.0 miles south of Emery, Utah (UDOGM 2012b). The mine has been operated intermittently since the 1970s and re-opened in 2005 using the continuous mining method (Consolidation Coal Company 2010; Vanden Berg 2010). Expected subsidence magnitude ranges from 1 to 3.5 feet. Alternative II-C 2-mile transmission line corridor crosses the Deserado Mine permit area in northwest Colorado. Mitigation measure **GE-1** would decrease the potential risk of subsidence due to coal mining.

Alternative II-C may cross relict shorelines and associated deposits from Lake Bonneville. While these deposits have a PFYC rating of 2, scientifically important fossils have been found in sand and gravel deposits associated with the old shorelines. To protect potential fossil resources, it is recommended that BMPs PAL-1 through PAL-5 and design options TWE-4, TWE-38, and TWE-39 be implemented where the 2-mile transmission line corridor crosses these old shorelines.

Key Parameters Summary

There is an elevated risk that landslide areas crossed by Alternative II-C might result in damage to facilities or interruption of service during the operation of the Project. Seismicity and subsidence risks also are present, but would not be expected to result in damage to facilities or interruption of service during the operation of the Project. Fifteen oil and gas fields are crossed that might result in mineral resource access conflicts. Approximately 6 miles of coal mine permit areas are crossed. Additionally, 77 miles of PFYC Class 5 formations are crossed, which have an elevated risk for impacting fossil resources.

Alternative II-D

Alternative II-D crosses areas of mapped landslides and landslide prone areas. The 2-mile transmission line corridor also crosses oil and gas fields and active and inactive underground coal mining areas. The active mine permit areas include the Skyline Mine (located in portions of Townships 12, 13, and 14 South; Range 6 East) and the Horizon Mine (located in Township 13 South; Range 8 East) (UDOGM 2012b). The alternative also crosses the Willow Creek Mine area (located in Townships 12 and 13 South; Ranges 9 and 10 East) which was closed in September 2002 and is undergoing reclamation. Associated with the active mines mentioned above are also areas of historic mining and future potential development areas (BLM 2008d).

The Alternative II-D 2-mile transmission line corridor lies just north of the Deserado Mine permit area and may encroach upon lease by application and proposed mining areas (BLM 2011). Also, there are historic coal mines within or adjacent to the corridor northwest of the Deserado Mine in Township 3 North, Range 102 West (Carroll 2006). Implementation of mitigation measure **GE-1** would lower the risk of encountering subsidence from active or historic mining.

Alternative II-D crosses the Levan Segment of the Wasatch fault zone and the Sugarville area, which are considered to be potentially active. The alternative also crosses landslide prone areas of the Wasatch Plateau. Implementation of mitigation measure **GE-1** would lessen the risks of seismicity and landslides.

Alternative II-D may cross relict shorelines and associated deposits from Lake Bonneville. While these deposits have a PFYC rating of 2, scientifically important fossils have been found in sand and gravel deposits associated with the old shorelines. To protect potential fossil resources, it is recommended that BMPs PAL-1 through PAL-5 and design options TWE-4, TWE-38, and TWE-39 be implemented where the 2-mile transmission line corridor crosses these old shorelines.

Key Parameters Summary

There is an elevated risk that landslide areas crossed by Alternative II-D might result in damage to facilities or interruption of service during the operation of the Project. Seismicity and subsidence risks also are present, but would not be expected to result in damage to facilities or interruption of service during the operation of the Project. Nine oil and gas fields are crossed and active and inactive coal mine areas are crossed that might result in mineral resource access conflicts. Additionally, 129 miles of PFYC Class 5 formations are crossed, which have an elevated risk for impacting fossil resources.

Alternative II-E

Alternative II-E crosses areas of mapped landslides and landslide prone areas. The alternative crosses the Levan Segment of the Wasatch fault zone and the Sugarville area faults, which are considered to be potentially active. Implementation of mitigation measure **GE-1** would lower the risk of landslides and seismicity.

The 2-mile transmission line corridor crosses 5 oil and gas fields in Colorado and Utah.

The Alternative II-E 2-mile transmission line corridor lies just north of the Deserado Mine permit area and may encroach upon lease by application and proposed mining areas (BLM 2011). Also, there are historic coal mines within or adjacent to the corridor northwest of the Deserado Mine in Township 3 North, Range 102 West (Carroll 2006). Implementation of mitigation measure **GE-1** would lower the risk of encountering subsidence from active or historic mining.

Alternative II-E may cross relict shorelines and associated deposits from Lake Bonneville. While these deposits have a PFYC rating of 2, scientifically important fossils have been found in sand and gravel deposits associated with the old shorelines. To protect potential fossil resources, it is recommended that BMPs PAL-1 through PAL-5 and design options TWE-4, TWE-38, and TWE-39 be implemented where the 2-mile transmission line corridor crosses these old shorelines.

Key Parameters Summary

There is an elevated risk that landslide areas crossed by Alternative II-E might result in damage to facilities or interruption of service during the operation of the Project. Seismicity and subsidence risks also are present, but would not be expected to result in damage to facilities or interruption of service during the operation of the Project. Five oil and gas fields are crossed that might result in mineral resource access conflicts. No coal mine permit areas are crossed. Additionally, 113 miles of PFYC Class 5 formations are crossed, which have an elevated risk for impacting fossil resources.

Alternative II-F (Agency Preferred)

Alternative II-F crosses landslide prone areas of the Wasatch Plateau including the Thistle landslide area. The alternative crosses the Levan Segment of the Wasatch fault zone and the Sugarville area faults, which are considered to be potentially active. Implementation of mitigation measure **GE-1** would lower the risk of impacts due to landslides and seismicity.

The 2-mile transmission line corridor crosses 9 oil and gas fields in Colorado and Utah.

Alternative II-F 2-mile transmission line corridor lies just north of the Deserado Mine permit area and may encroach upon lease by application and proposed mining areas (BLM 2011). Also, there are historic coal mines within or adjacent to the corridor northwest of the Deserado Mine in Township 3 North, Range 102 West (Carroll 2006). Implementation of mitigation measure **GE-1** would lower the risk of encountering subsidence from active or historic mining.

Alternative II-F may cross relict shorelines and associated deposits from Lake Bonneville. While these deposits have a PFYC rating of 2, scientifically important fossils have been found in sand and gravel deposits associated with the old shorelines. To protect potential fossil resources, it is recommended that BMPs PAL-1 through PAL-5 and design options TWE-4, TWE-38, and TWE-39 be implemented where the 2-mile transmission line corridor crosses these old shorelines.

Key Parameters Summary

There is an elevated risk that landslide areas crossed by Alternative II-F might result in damage to facilities or interruption of service during the operation of the Project. Seismicity and subsidence risks also are present, but would not be expected to result in damage to facilities or interruption of service during the operation of the Project. Seven oil and gas fields are crossed that might result in mineral resource access conflicts. No coal mine permit areas are crossed. Additionally, 156 miles of PFYC Class 5 formations are crossed, which have an elevated risk for impacting fossil resources.

Cedar Knoll Micro-siting Options 1 and 2

The geologic formations crossed by the Cedar Knoll micro-siting options 1 and 2 would not differ substantially from Alternative II-A. The micro-siting options would not pose a greater risk to paleontological or mineral resources or increased risk from geologic hazards.

Alternative Variation in Region II

Emma Park Alternative Variation

The geologic formations crossed by the Emma Park Alternative Variation would not differ substantially from Alternatives II-E and II-F. The alternative variation would not pose a greater risk to paleontological or mineral resources or increased risk from geologic hazards.

Alternative Connectors in Region II

The Lynndyl Alternative Connector crosses the Scipio and Little Valley faults, which increases the risk to seismic hazards. The connector also crosses an area susceptible to sinkholes in the south end of the Scipio Valley.

Table 3.2-14 summarizes impacts associated with the alternative connectors in Region II.

Table 3.2-14 Summary of Region II Alternative Connector Impacts

Alternative Connector	Analysis	Conclusion
Highway 191 Alternative Connector	There are no identified geologic hazards; no mineral resources; and the connector crosses 3 miles of Class PFYC 5 formations.	There are no apparent unique opportunities or constraints for geologic resources by utilizing this connector.
Castle Dale Alternative Connector	There are no identified geologic hazards; no mineral resources; and no Class 4 or 5 PFYC formations crossed.	There are no apparent unique opportunities or constraints for geologic resources by utilizing this connector.
Price Alternative Connector	There are no identified geologic hazards; no mineral resources; and no Class 4 or 5 PFYC formations crossed.	There are no apparent unique opportunities or constraints for geologic resources by utilizing this connector.
Lynndyl Alternative Connector (Alternatives II-B and II-C)	Scipio and Little Valley faults increase seismic risk; low landslide risk; higher subsidence risk; 2 miles of Class 5 PFYC formations crossed.	There are no apparent unique opportunities or constraints for geologic resources by utilizing this connector.
IPP East Alternative Connector (Alternatives II-A and II-B)	There are no identified geologic hazards; no mineral resources; and no Class 5 PFYC formations crossed. Crosses less than 1 mile of Lake Bonneville deposits.	There are no apparent unique opportunities or constraints for geologic resources by utilizing this connector.

Region II Conclusion

There is some variability between the Region II alternative corridors in terms of geologic hazards although all cross active fault zones, areas of moderate to high landslide risk, and potential subsidence areas (**Table 3.2-13**). Alternative II-C crosses as many as five active fault zones and is potentially the most impacted by seismicity. Alternatives II-D, II-E, and II-F each cross 2 active fault zones. All of the alternatives cross historic coal mining areas that may pose ground subsidence hazards. Potential impacts to minerals also vary. All the alternatives cross oil and gas fields, but alternatives II-B and II-C cross 15 oil and gas fields, more than twice the number of the other alternatives and may be subject to more siting conflict impacts depending on well spacing and density of related surface facilities. All of the alternatives cross active coal mining areas in Colorado and Utah.

Alternative II-A and II-D may pose greater impacts to paleontological resources in Class 3 and Class 4 formations. Alternative II-A crosses 120 miles of Class 5 formations and Alternative II-D crosses 129 miles of Class 5 formations. Alternative II-F poses the most impact risk to paleontological resources.

There are no appreciable differences between the alternative connectors (**Table 3.2-14**) except the Lynndyl Alternative Connector which crosses potentially active fault zones, an area of sinkhole susceptibility, and 2 miles of PFYC rank 5 formations. The other connectors have no identified concerns for geologic hazards, mineral resources, or paleontological resources.

The micro-siting consideration for the Strawberry IRA would not pose unique opportunities or constraints for Alternate II-A Corridor. The micro-siting consideration for the Cedar Knoll IRA would not pose unique opportunities or constraints for Alternate II-A, II-E, and II-F corridors.

3.2.6.5 Region III

Project construction, operation, and decommission impacts in Region III would be the same as those discussed in Section 3.2.6.2, Impacts Common to All Alternative Routes and Associated Components. **Table 3.2-15** provides a comparison of impacts associated with the alternative routes in Region III.

Table 3.2-15 Summary of Region III Alternative Route Impacts

Parameter	Alternative III-A	Alternative III-B	Alternative III-C
Seismicity	Two active fault zones identified (Escalante Desert Faults and California Wash Fault), low ground motion potential.	One active fault zone identified (Escalante Desert Faults), low ground motion potential.	One active fault zone identified (Escalante Desert Faults), slightly elevated ground motion potential in Lincoln County, Nevada. Potential risk from ground fissures in Dry Lake and Delamar valleys.
Landslides	Landslides pose a slight risk.	Same as Alternative III-A.	Same as Alternative III-A.
Subsidence	Risk of abandoned mine hazards including subsidence associated with historic metal mining, southwest of Milford, Utah.	Same as Alternative III-A.	Same as Alternative III-A.
Mineral Resources	2-mile transmission line corridor crosses near or over the Milford Ballast Rock Quarry and the CS Mining Hidden Treasure copper mine northwest of Milford, Utah. Crosses sand and gravel mining areas in Clark County, Nevada.	Same as Alternative III-A.	Same as Alternative III-A.
Paleontological Resources	PFYC Class 3: 21 miles Class 4: 1 mile Class 5: 4 miles	PFYC Class 3: 12 miles Class 4: 0 miles Class 5: 1 mile	PFYC Class 3: 9 miles Class 4: 0 miles Class 5: 1 mile

Alternative III-A (Applicant Proposed)

The Alternative III-A 2-mile transmission line corridor crosses the Escalante Desert Faults, which are located southeast of the Union Pacific railroad tracks near Thermo siding. The normal faults trend generally to the northeast and cut alluvium and lake sediments (Black and Hecker 1999). It is not certain if these faults extend deeply enough into the subsurface to be considered potential sources for earthquakes. This 2-mile transmission line corridor also crosses the California Wash Fault just west of Moapa, Nevada

and the 2-mile transmission line corridor essentially is coincident with the fault zone for about 10 miles along the western flank of Northern Muddy Mountains. The California Wash Fault is a normal fault with the downthrown side to the west (Anderson 1999a). The fault forms the boundary between the basin where California Wash is located and the Muddy Mountains. The deposits cut by the fault indicated movement within the last 15,000 years so the fault is considered to be active.

In most areas covered by the proposed routes in Region III, in a 500-year period, ground motion would range from less than 10 percent of **g** to about 16 percent of **g** in parts of southern Lincoln County, Nevada. Ground motions between 10 and 20 percent of **g**, as shown on **Table 3.2-9**, are not expected to cause damage to well engineered structures. Ground motion risk would be low for Alternative III-A.

The Applicant Proposed Alternative has a slight risk of landslides in western Washington County, Utah, where there is a moderate susceptibility to landslides.

In the Escalante Desert of southwest Utah a potential subsidence hazard has developed as a result of decades of groundwater pumping that has resulted in the formation of earth fissures and subsidence of the ground surface (Lund et al 2005). In the area around Beryl Junction in the southern part of the valley, subsidence has lowered the ground surface by as much as 100 feet and earth fissures have accompanied the subsidence. The north-trending fissures were centered around Beryl Junction and range from 300 to 1300 feet in length. The subsidence and fissuring around Beryl does not appear to pose a concern for the proposed routes since the routes are located at the edges of the valley. Even though subsidence is slight as compared to the maximum (a few inches compared to 100 feet), the hazard does present a risk in this area and mitigation measure **GE-1** should be implemented.

Northeast and southwest of Newcastle, Utah ground cracks have been observed but are believed to be large desiccation cracks and are not related to the groundwater withdrawal except during initial stages of dewatering of the shallow water table when large-scale pumping began over 50 years ago (Lund et al 2005). The Alternative III-A lies near or on areas of ground cracking in the Newcastle area, but based on the conclusion regarding the origin of these cracks (Lund et al. 2005), they do not appear to pose a concern.

Alternative III-A may cross relict shorelines and associated deposits from Lake Bonneville. While these deposits have a PFYC rating of 2, scientifically important fossils have been found in sand and gravel deposits associated with the old shorelines. To protect potential fossil resources, it is recommended that BMPs PAL-1 through PAL-5 and design options TWE-4, TWE-38, and TWE-39 be implemented where the 2-mile transmission line corridor crosses these old shorelines.

Alternative III-A crosses an area of active mining northwest of Milford, Utah in Township 27 South, Range 11 West in the Rocky Range, the northern extension of the historic Star Mining District and sometimes referred to as the North Star district (Butler 1913). The Star and North Star Districts historically produced precious and base metals including gold, silver, copper, and lead beginning in 1870. There are 2 active mines in the Rocky Range portion of the district, one produces crushed rock for railroad ballast (Milford Ballast Rock Quarry; Sections 10, 11, 12, 14, and 15) and the other is a copper mine (CS Mining Hidden Treasure copper mine, sections 7, 8, 17, 20, 21, 22, 28, and 34). In addition to crossing these active mining areas, the alternative crosses abandoned mine areas in the district, some of which have been reclaimed (Gallegos 2009). Notwithstanding the reclamation work in the Star District, there may still be areas of exposed adits and shafts and potential subsidence associated with un-reclaimed mines in the Star District in Townships 27 and 28 South, Range 11 West. Mitigation measure **GE-1** should be implemented in the areas described above to lessen potential conflicts with active mining and to determine the subsidence potential.

The Alternative III-A corridor crosses historic and active mineral districts in Lincoln and Clark Counties, Nevada, but it does not cross active mining areas. The corridor is close to but would not cross the Apex Mine located near the intersection of I-15 and SH 93, in Clark County, Nevada.

Key Parameters Summary

Alternative III-A would cross two fault zones, one area of increased landslide potential, and an area of subsidence due to groundwater withdrawal. None of these would be expected to result in damage to facilities or interruption of service during the operation of the Project. No oil and gas fields are crossed that might result in access conflicts. However there are active and historic mining areas that are crossed near Milford, Utah, which could pose mineral access issues and hazards associated with historic mining. The alternative corridor does not cross active mining areas in Nevada. About 4 miles of high PFYC (Class 5) formations are crossed, therefore crossing these formations constitutes a high risk of loss or damage to scientifically important paleontological resources.

Alternative III-B (Agency Preferred)

The Alternative III-B 2-mile transmission line corridor crosses the north end of the California Wash Fault, but the route's southwest direction across the valley takes it away from the fault. The corridor also crosses the Escalante Desert Faults, which are considered active.

A subsidence area in the Escalante Desert that may possibly affect the Alternative III-B has been documented along the railroad tracks southwest of Milford, Utah. The 2-mile transmission line corridors parallel the railroad tracks in the area and cross areas of subsidence. Maximum subsidence in this area was measured at slightly more than 1.5 inches from 1993 to 1998 in an area southwest of Milford, Utah (Forster 2006). Even though subsidence is slight as compared to the maximum (a few inches compared to 100 feet), the hazard does present a risk in this area and mitigation measure **GE-1** should be implemented.

Alternative III-B may cross relict shorelines and associated deposits from Lake Bonneville. While these deposits have a PFYC rating of 2, scientifically important fossils have been found in sand and gravel deposits associated with the old shorelines. To protect potential fossil resources, it is recommended that BMPs PAL-1 through PAL-5 and design options TWE-4, TWE-38, and TWE-39 be implemented where the 2-mile transmission line corridor crosses these old shorelines.

Alternative III-B crosses an area of active mining northwest of Milford, Utah in Township 27 South, Range 11 West in the Rocky Range, the northern extension of the historic Star Mining District and sometimes referred to as the North Star district (Butler 1913). The Star and North Star Districts historically produced precious and base metals including gold, silver, copper, and lead beginning in 1870. There are 2 active mines in the Rocky Range portion of the district, one produces crushed rock for railroad ballast (Milford Ballast Rock Quarry; Sections 10, 11, 12, 14, and 15) and the other is a copper mine (CS Mining Hidden Treasure copper mine, sections 7, 8, 17, 20, 21, 22, 28, and 34). In addition to crossing these active mining areas, the 2-mile transmission line corridor crosses abandoned mine areas in the district, some of which have been reclaimed (Gallegos 2009). Notwithstanding the reclamation work in the Star District, there may still be areas of exposed adits and shafts and potential subsidence associated with un-reclaimed mines in the Star District in Townships 27 and 28 South, Range 11 West.

Alternative Corridor III-B crosses or is near historic mining districts in Lincoln County (Acoma, Vigo, Gourd Springs), but does not cross active mining areas in the county. The corridor may cross or encroach upon an active sand and gravel operation (Moapa Redi-Mix, Township 14 South, Range 66 East) on the north side of Moapa, Nevada (Hess and Davis 2010). The corridor is close to but would not cross the Apex Mine located near the intersection of I-15 and SH 93, in Clark County, Nevada.

Mitigation measure **GE-1** should be implemented to reduce potential conflicts with active mining and to determine the subsidence potential in historic underground mining areas.

Key Parameters Summary

Alternative III-B would cross one fault zone and one area of slight subsidence risk. Geologic hazards would not be expected to result in damage to facilities or interruption of service during the operation of the Project. No oil and gas fields would be crossed. However there are active and historic mining areas that are crossed near Milford, Utah, which could pose mineral access issues and hazards associated with historic mining. The corridor crosses near a sand and gravel operation near Moapa, Nevada. One mile of formations with high PFYC classifications (Class 5) would be crossed.

Alternative III-C

The Alternative III-C 2-mile transmission line corridor crosses the Escalante Desert Faults, considered to be active (USGS 2006). The corridor also crosses areas of ground fissures located in the southern Delamar Valley and the northern Dry Lake Valley (Swadley 1995). The origin of the fissures is not certain but is thought to either be tectonic or from subsidence. There is evidence that the fissures on the north end of Dry Lake Valley are active whereas the fissures at the south end of the Delamar Valley are inactive. Implementation of mitigation measure **GE-1** would reduce the risk of impacts where Alternative III-C crosses the fissures in Dry Lake and Delamar valleys and the Escalante Desert Faults.

The same subsidence feature southwest of Milford, Utah, and discussed in Alternative III-B, may affect Alternative III-C. Even though subsidence is slight as compared to the maximum (a few inches compared to 100 feet), the hazard does present a risk in this area and mitigation measure **GE-1** should be implemented.

Alternative III-C may cross relict shorelines and associated deposits from Lake Bonneville. While these deposits have a PFYC rating of 2, scientifically important fossils have been found in sand and gravel deposits associated with the old shorelines. To protect potential fossil resources, it is recommended that BMPs PAL-1 through PAL-5 and design options TWE-4, TWE-38, and TWE-39 be implemented where the 2-mile transmission line corridor crosses these old shorelines.

The BLM-managed Oak Springs Summit Trilobite Area is within the Alternative III-C Corridor. A transmission line and facilities built within the corridor must be in accordance with BLM rules concerning stand-offs or buffers from such protected areas.

Alternative III-C crosses an area of active mining northwest of Milford, Utah in Township 27 South, Range 11 West in the Rocky Range, the northern extension of the historic Star Mining District and sometimes referred to as the North Star district (Butler 1913). The Star and North Star Districts historically produced precious and base metals including gold, silver, copper, and lead beginning in 1870. There are 2 active mines in the Rocky Range portion of the district, one produces crushed rock for railroad ballast (Milford Ballast Rock Quarry; Sections 10, 11, 12, 14, and 15) and the other is a copper mine (CS Mining Hidden Treasure copper mine, sections 7, 8, 17, 20, 21, 22, 28, and 34). In addition to crossing these active mining areas, the 2-mile transmission line corridor crosses abandoned mine areas in the district, some of which have been reclaimed (Gallegos 2009). Notwithstanding the reclamation work in the Star District, there may still be areas of exposed adits and shafts and potential subsidence associated with un-reclaimed mines in the Star District in Townships 27 and 28 South, Range 11 West. Mitigation measure **GE-1** should be implemented in the areas described above to lessen potential conflicts with active mining and to determine the subsidence potential.

Alternative Corridor III-C may cross areas of historic mining in Lincoln County Nevada, but would not cross active mine areas. The corridor is close to, but would not cross, the Apex Mine located near the intersection of I-15 and SH 93, in Clark County, Nevada.

Key Parameters Summary

Alternative III-C would cross one area of slight subsidence risk. Geologic hazards would not be expected to result in damage to facilities or interruption of service during the operation of the Project. No oil and gas fields would be crossed. However there are active and historic mining areas that are crossed near Milford, Utah, which could pose mineral access issues and hazards associated with historic mining. The alternative corridor does not cross active mining areas in Nevada. One mile of formations with high PFYC classifications (Class 5) would be crossed.

Alternative Variations in Region III

The Ox Valley East and West alternative variations both cross short areas of elevated PFYC classifications. Through implementation of BMPs and design options discussed in Section 3.2.4.2, Impacts Common to All Alternative Routes and Associated Components, no damage or loss to scientifically important paleontological resources is expected.

Table 3.2-16 provides a comparison of impacts associated with the alternative variations in Region III.

Table 3.2-16 Summary of Region III Alternative Variation Impacts

Alternative Variation	Analysis
Ox Valley East Alternative Variation (Alternative III-A)	2 miles of PFYC Class 5 formations would be crossed by Ox Valley East compared to 1 mile of Class 5 formations crossed by Alternative III-A that it would replace. Moderate landslide susceptibility, no other geologic hazard.
Ox Valley West Alternative Variation (Alternative III-A)	The Ox Valley West Alternative would cross no PFYC Class 5 formations compared to 1 mile of Class 5 formations crossed by Alternative III-A which it would replace. Moderate landslide susceptibility, no other geologic hazard.
Pinto Alternative Variation (Alternative III-A)	The Pinto Valley Alternative Variation would cross 3 miles of PFYC Class 5 formations compared to 1 mile of Class 5 formations crossed by Alternative III-A which it would replace. Moderate landslide susceptibility, no other geologic hazard.

Alternative Connectors in Region III

There are no identified geologic hazards or mineral resources associated with the Moapa Alternative Connector. The connector does cross less than 1 mile of undivided Moenkopi and Thaynes Formations. The Moenkopi is considered to be PFYC 3, a moderate potential for paleontological resources.

Table 3.2-17 summarizes impacts associated with the alternative connectors in Region III.

Table 3.2-17 Summary of Region III Alternative Connector Impacts

Alternative Connector	Analysis	Conclusion
Avon Alternative Connector	There are no identified geologic hazards; no mineral resources; and no Class 4 or 5 PFYC formations crossed.	There are no apparent unique opportunities or constraints for geologic resources by utilizing this connector.
Moapa Alternative Connector	There are no identified geologic hazards; no mineral resources; and does not cross PFYC Class 3 or 5 formations.	There are no apparent unique opportunities or constraints for geologic resources by utilizing this connector except for very low risk to fossil resources.

Alternative Ground Electrode Systems in Region III

The southern ground electrode system would be necessary within 100 miles of the southern terminal as discussed in Chapter 2.0. Although the location for this system has not been determined, conceptual locations and connections to the alternative routes have been provided in the project POD. The impacts associated with constructing and operating this system are the same as discussed for Alternative I-A. **Table 3.2-18** summarizes impacts associated with the eight combinations of alternative route and location possibilities for the southern ground electrode system.

Table 3.2-18 Summary of Region III Alternative Ground Electrode System Impacts

Ground Electrode System Name	Analysis
Mormon Mesa-Carp Elgin Rd (Alternative III-A)	Area may include Muddy Creek Formation PFYC 3. No impacts regarding geological hazards or mineral resources.
Halfway Wash-Virgin River (Alternative III-A)	Impacts would be the same as Mormon Mesa Elgin Rd (Alternative III-A).
Halfway Wash East (Alternative III-A)	Impacts would be the same as Mormon Mesa Elgin Rd (Alternative III-A).
Mormon Mesa-Carp Elgin Rd (Alternative III-B)	Impacts would be the same as Mormon Mesa Elgin Rd (Alternative III-A).
Halfway Wash-Virgin River (Alternative III-B)	Impacts would be the same as Mormon Mesa Elgin Rd (Alternative III-A).
Halfway Wash East (Alternative III-B)	Impacts would be the same as Mormon Mesa Elgin Rd (Alternative III-A).
Meadow Valley 1 (Alternative III-C)	Impacts would be the same as Mormon Mesa Elgin Rd (Alternative III-A).

Region III Conclusion

There are no appreciable differences between alternatives in Region III except for a slightly higher seismic risk for Alternative Corridor III-A which crosses 2 potentially active fault zones compared to one fault zone for the other alternatives (**Table 3.2-15**). There are no appreciable differences between the alternative variations (**Table 3.2-16**), the alternative connectors (**Table 3.2-17**), and the ground electrode system alternative (**Table 3.2-18**).

3.2.6.6 Region IV

Project construction, operation, and decommission impacts in Region IV would be the same as those discussed in Section 3.2.6.2, Impacts Common to All Alternative Routes and Associated Components. **Table 3.2-19** provides a comparison of impacts associated with the alternative routes in Region IV.

Table 3.2-19 Summary of Region IV Alternative Route Impacts

Parameter	Alternative IV-A	Alternative IV-B	Alternative IV-C
Seismicity	May cross or is near potentially active faults; low ground motion potential.	Same as Alternative IV-A.	Same as Alternative IV-A.
Landslides	Generally low incidence and moderate susceptibility.	Same as Alternative IV-A.	Same as Alternative IV-A.
Subsidence	Does not cross areas that have subsided due to groundwater withdrawal. Low potential for karst areas.	Same as Alternative IV-A.	Same as Alternative IV-A.
Mineral Resources	Crosses sand and gravel and gypsum mining areas in Clark County, Nevada. No oil and gas.	Same as Alternative IV-A.	Same as Alternative IV-A.

Table 3.2-19 Summary of Region IV Alternative Route Impacts

Parameter	Alternative IV-A	Alternative IV-B	Alternative IV-C
Paleontological Resources	PFYC Class 3: 9 miles; no Class 4 or 5 crossed.	PFYC Class 3: 1 mile; no Class 4 or 5 crossed.	PFYC Class 3: 1 mile; no Class 4 or 5 crossed.

Alternative IV-A (Applicant Proposed and Agency Preferred)

The Alternative IV-A 2-mile transmission line corridor would not be expected to be impacted by landslides or subsidence. It does not cross subsidence areas that have been documented in the Las Vegas area. The corridor crosses the Las Vegas shear zone. It may also cross the south end of the Black Hills fault, but it is not certain because the fault is difficult to define south of the Black Hills where the fault is buried by valley deposits (Zaragoza 2008). Implementation of mitigation measure **GE-1** would reduce or eliminate potential impacts with regard to the potentially active faults and mineral conflicts. The route would cross 9 miles of moderate PFYC (Class 3) formations, but no Class 4 or 5 formations. However, to protect potential fossil resources, it is recommended that BMPs PAL-1 through PAL-5 and design options TWE-4, TWE-38, and TWE-39 be implemented where the 2-mile transmission line corridor crosses these formations.

Alternative IV-B

The Alternative IV-B 2-mile transmission line corridor would not be expected to be impacted by landslides or subsidence. It does not cross areas of subsidence that have been documented in the Las Vegas area. The corridor crosses the Las Vegas shear zone. Southeast of the Black Hills, the corridor parallels the Black Hills fault, but does not cross the fault and would therefore be subjected to ground motion if a strong earthquake was generated along the fault. The corridor may cross areas of mineral potential in the Las Vegas mineral district and it may cross or encroach upon the PABCO mine. Implementation of mitigation measure **GE-1** would reduce or eliminate potential impacts with regard to the potentially active faults and mineral conflicts. The route would cross 1 mile of moderate PFYC (Class 3) formations, but no Class 4 or 5 formations. However, to protect potential fossil resources, it is recommended that BMPs PAL-1 through PAL-5 and design options TWE-4, TWE-38, and TWE-39 be implemented where the 2-mile transmission line corridor crosses these formations.

Alternative IV-C

The Alternative IV-C 2-mile transmission line corridor would not be expected to be impacted by landslides or subsidence. It does not cross areas of subsidence that have been documented in the Las Vegas area. The corridor crosses the Las Vegas shear zone, but the corridor does not cross the Black Hills fault and would therefore be subjected to ground motion if a strong earthquake was generated along the fault. The corridor may cross areas of mineral potential in the Las Vegas mineral district and it may cross or encroach upon the PABCO mine. Implementation of mitigation measure **GE-1** would reduce or eliminate potential impacts with regard to the potentially active faults and mineral conflicts. The route would cross less than 1 mile of moderate PFYC (Class 3) formations, but no Class 4 or 5 formations. No mineral resources would be crossed. To protect potential fossil resources, it is recommended that BMPs PAL-1 through PAL-5 and design options TWE-4, TWE-38, and TWE-39 be implemented where the 2-mile transmission line corridor crosses these formations.

Alternative Variations in Region IV

The Marketplace Alternative Variation would not be expected to be impacted by landslides or subsidence. Southeast of the Black Hills, the corridor parallels the Black Hills fault, but does not cross the fault and would therefore be subjected to ground motion if a strong earthquake was generated along the fault.

Implementation of mitigation measure **GE-1** would reduce or eliminate potential impacts with regard to the potentially active Black Hills fault. No mineral resources would be crossed that might result in loss of economic value or access conflicts. No formations with PFYC classifications greater than 2 would be crossed, therefore no loss or damage to scientifically important paleontological resources is expected.

Table 3.2-20 provides a comparison of impacts associated with the alternative variation in Region IV.

Table 3.2-20 Summary of Region IV Alternative Variation Impacts

Alternative Variation	Analysis
Marketplace Alternative Variation (Alternative IV-B)	Potential seismic hazards due to Black Hills Fault. No impacts to mineral or paleontological resources.

Alternative Connectors in Region IV

None of the alternative connectors would be expected to be impacted by seismicity, landslides, or subsidence that results in damage to facilities or interruption of service. No mineral resources would be crossed that might result in loss of economic value or access conflicts. No formations with PFYC classifications greater than 2 would be crossed except for the Sunrise Mountain Alternative Connector, which would cross 3 miles of the Class 3 Horse Spring Formation.

Table 3.2-21 summarizes impacts associated with the alternative connectors in Region IV.

Table 3.2-21 Summary of Region IV Alternative Connector Impacts

Alternative Connector	Analysis	Advantage
Sunrise Mountain Alternative Connector	There are no identified hazards or mineral resources. Crosses 3 miles of Class 3 Horse Spring Formation.	There are no apparent unique opportunities or constraints for geologic resources by utilizing this connector except for very slight increase in risk to fossil resources.
Lake Las Vegas Alternative Connector	There are no identified hazards, mineral resources, or paleontological resources.	There are no apparent unique opportunities or constraints for geologic resources by utilizing this connector.
Three Kids Mine Alternative Connector	The alternative connector crosses the abandoned Three Kids Mine area that may present hazards including unstable tailing and waste rock piles, steep slopes, and open pits. No other issues identified with regard to minerals or paleontological resources.	The Three Kids Mine presents concerns about the use of this connector route and therefore is a disadvantage to the use of this connector route. Potential contamination risks present a strong disadvantage for this route which may not be mitigated by implementation of mitigation measure **GE-1**.
River Mountains Alternative Connector	There are no identified hazards, mineral resources, or paleontological resources.	There are no apparent unique opportunities or constraints for geologic resources by utilizing this connector.
Railroad Pass Alternative Connector (Alternatives IV-A and IV-B)	The connector may cross or is immediately adjacent to the Black Hills Fault. The connector may cross or encroach upon active sand and gravel mining pits just south of Railroad Pass between SH 93 and the Black Hills. No issues identified for paleontological resources.	Proximity to the potentially active Black Hills Fault may present a disadvantage. Potential seismicity and mineral concerns can be reduced by implementation of mitigation measure **GE-1**.

Region IV Conclusions

There are no distinct differences between the alternatives in Region IV concerning potential impacts due to geologic hazards, mineral resources, and paleontological resources (**Table 3.2-19**). The Marketplace Variation does not present an advantage over Alternative IV-B. There are concerns with hazards and potential contamination for the Three Kids Mine Alternative Connector that place it at a disadvantage as compared to the other connectors in the region. Although the Railroad Pass Connector is close to the potentially active Black Hills Fault, potential impacts are similar to seismic impacts for the alternatives that cross or are adjacent to the fault. The Railroad Pass Connector also may cross or encroach upon gravel mining operations south of Railroad Pass in the end of the El Dorado Valley.

3.2.6.7 Residual Impacts

Geologic Hazards

Although geotechnical design measures would reduce the risk from geological hazards, there is a small risk of damage to facilities in the event of a major geologic event such as a large magnitude earthquake or a landslide the size of the Thistle landslide. The most highly effective mitigation is recognition and avoidance of the particular hazard (Lund et al. 2009). If avoidance is not possible then engineering solutions must be implemented with the awareness that although the risk may be reduced, the engineering solutions cannot totally eliminate the risk, especially for major events.

Paleontological Resources

Even if BMPs and design options are implemented, some scientifically valuable fossils may be disturbed and lost during construction activities. As a consequence, there would be a small incremental loss of fossil material that would be offset by the material that is recovered and preserved for scientific study purposes. Impacts resulting from unauthorized collection and natural weathering and erosion processes would continue.

Mineral Resources

Proper siting and avoidance of mineral producing sites should reduce potential impacts associated with lack of access to mineral resources. However, it is possible that mineral resources may exist directly underneath the right-of-way and some types of resources would not be practically accessible for the life of the project. The types of mineral resources that would be more affected than others would be near-surface mineral material deposits (e.g., common sand, gravel, and stone). Mineable underground coal deposits under the right-of-way may be subject to reduced recovery since a lower extraction rate may have to be applied to maintain support for surface facilities. Oil and gas resources would be less affected because recovery of the resources would be possible even with a minimum stand-off of 250 feet without having to resort to directional drilling. With directional drilling the right-of-way poses even less of a concern for access.

3.2.6.8 Impacts from the No Action Alternative

Current management across the analysis area would be maintained under the No Action Alternative. Under this alternative, there would be no project construction, operation and maintenance, or decommissioning disturbance to impact or be impacted by geologic hazards, mineral resources, or paleontological resources.

3.2.6.9 Irreversible and Irretrievable Commitment of Resources

Geologic Hazards

There would be no irreversible and irretrievable commitments of resources regarding geologic hazards.

Paleontological Resources

Since paleontological resources are nonrenewable, any impacts would render the resource disturbance irreversible and the integrity of the resource irretrievable.

Mineral Resources

The short term preclusion of access to mineral resources would not constitute an irreversible impact since the resources would not be extracted and consumed. However, the impact would be irretrievable for the operational life of the proposed project.

3.2.6.10 Relationship between Local Short-term Uses and Long-term Productivity

Geological Hazards

There are no relationships between local short-term uses and long-term productivity for geological hazards.

Paleontological Resources

Short-term impacts associated with the exposure of any scientifically important fossils from project activities would not adversely impact the long-term potential for discovery of potential fossil resources.

Mineral Resources

The short term effects are not expected to cause long-term impairment to the productivity of mineral resources.

3.3 Soil Resources

3.3.1 Regulatory Background

Soil resources are managed through a broad set of regulations, guidelines, and formal planning processes. These controls and directions are administered through federal, state, or local units of government. At the federal level, primary land management agencies include the USFS and the BLM. Through state and local agency offices, the Natural Resources Conservation Service (NRCS) administers soil conservation programs on private lands. In addition, the NRCS inventories Prime and Unique Farmlands, as identified in 7 CFR Part 657. These farmlands are of statewide or local importance to crop production. The Farmland Protection Policy Act states that federal programs that contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses will be minimized and shall be administered in a manner that, as practicable, are compatible with state and local government and private programs and policies to protect farmland.

On lands administered by the BLM, the agency addresses soil resources primarily through BLM Handbook H-4810-1, “Rangeland Health Standards,” and by participating as a cooperating agency in the Colorado River Salinity Control Program. The Rangeland Health Standards are based on 43 CFR 4180.1, “Fundamentals of Rangeland Health.” This regulation calls on the BLM to ensure that “watersheds are in, or are making significant progress toward, properly functioning physical condition, including their upland, riparian-wetland, and aquatic components; soil and plant conditions support infiltration, soil moisture storage, and the release of water that are in balance with climate and landform and maintain or improve water quality, water quantity, and timing and duration of flow.” Individual BLM districts and field offices administer these regulations and guidelines, including soil conservation considerations, through RMPs and project-level assessments.

The USFS addresses soil resource management primarily by cooperating in the Colorado River Salinity Control Program and by implanting policy set forth in each Forest or Grassland Plan. Each national forest and grassland is governed by a management plan in accordance with the NFMA. These plans set management, protection and use goals and guidelines. The Forest Service Manual, Soil Management (Chapter 2550) and the Forest Service Handbook, Watershed Conservation Practices Handbook (Chapter 2509.25) specific to each region also provide policy and guidance on managing soil resources.

State conservation laws have been enacted in all of the states that would be traversed by the proposed TWE project. An example is Nevada’s Conservation District Law (Nevada Revised Statutes Chapter 548). Through this type of state legislation, local soil conservation districts (SCDs) have been formed. These report to state administrative agencies, typically conservation commissions associated with state departments. The latter include the Colorado Department of Public Health and Environment, the Nevada Department of Conservation and Natural Resources, the Utah Division of Conservation and Resource Management (within the Department of Agriculture and Food), and the Wyoming Department of Agriculture. The SCDs are responsible for local planning, program development, and reporting in order to administer soil and water conservation programs. They interact with their respective state-level departments as well as the NRCS.

3.3.2 Data Sources

The soil baseline characterization for the proposed project is based on Soil Survey Geographic (SSURGO) database review and analyses. SSURGO is the most detailed level of soil mapping done by the NRCS (NRCS 2010). This investigation focused on soil characteristics or limitations of particular interest to the proposed transmission line construction. The results of the SSURGO data assessment are provided in Section 3.3.4.2, Soil Characteristics. Sensitive soils including prime farmland, hydric, highly erodible, limited revegetation potential, droughty, and landslide prone soils are described in further detail below.

In some cases, USFS soil surveys were available on some USFS lands. Where provided, soil analyses on the Forests were done using USFS specific data.

Locations where SSURGO and USFS soils data were not available, the soils were characterized using the U.S. General Soil Map (GSM). GSM consists of general soil association units. It was developed by the National Cooperative Soil Survey and supersedes the State Soil Geographic (STATSGO) dataset published in 1994. It consists of a broad-based inventory of soils and non-soil areas that occur in a repeatable pattern on the landscape and that can be cartographically shown at the scale mapped.

Information on Major Land Resource Areas (MLRAs) was obtained from the Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin, U.S. Department of Agriculture Handbook 296 (USDA 2006).

3.3.3 Analysis Area

The analysis area for soil resources encompasses the 2-mile-wide transmission line corridor that includes the proposed route and all alternative corridors.

3.3.4 Baseline Description

3.3.4.1 Major Land Resource Areas

Soil resources within the analysis area have formed within eight MLRAs. Generally, from north to south, these include the following (USDA 2006):

- MLRA 34A – Cool Central Desertic Basins and Plateaus;
- MLRA 34B – Warm Central Desertic Basins and Plateaus;
- MLRA 47 – Wasatch and Uinta Mountains;
- MLRA 48A – Southern Rocky Mountains;
- MLRA 29- Southern Nevada Basin and Range;
- MLRA 28A – Great Salt Lake Area;
- MLRA 35 – Colorado Plateau; and
- MLRA 30 – Mojave Desert.

A description of each MLRA follows, including the overall setting and soil types found within each.

MLRA 34A – Cool Central Desertic Basins and Plateaus

The Wyoming portion of this MLRA is bounded on most sides by mountains. The Owl Creek Mountains, the Big Horn Mountains, and the Wind River Range are to the north; the Salt Range and Wasatch Mountains are to the west; and the Laramie and Sierra Madre Mountains are to the east. The part of the MLRA in Colorado is bounded on the south by the Roan Plateau, on the east by the Elkhead Mountains, and on the west by Dinosaur National Monument. In most of the MLRA, elevation ranges from 5,200 feet to 7,500 feet amsl. Small mountainous areas have an elevation as high as 9,200 feet amsl.

The soils in MLRA 34A are generally calcareous and range from shallow or moderately deep to sedimentary bedrock. Alluvial and eolian deposits also are present within the MLRA. Some of the soils formed in slope alluvium or residuum derived from shale or sandstone. Soils that formed in stream- or river-deposited alluvium are near the major waterways. The average annual precipitation is 7 to 12 inches and the freeze-free period ranges from 45 to 160 days. The dominant soil orders in this MLRA are Aridisols and Entisols. Aridisols are well developed soils that have a very low concentration of organic

matter and form in an arid or semi-arid climate. In contrast, Entisols are considered recent soils that lack soil development because erosion or deposition rates occur faster than the rate of soil development.

MLRA 34B – Warm Central Desertic Basins and Plateaus

This MLRA consists of broad intermountain basins bounded by plateaus and steep escarpments. The northern part of the MLRA occurs in the Uinta Basin Section, which is bounded by the Uinta Mountains to the north, the Wasatch Range to the west, the Roan Plateau to the south, and the Rabbit Hills to the east. The southern part of the MLRA occurs in the northern third of the Canyon Lands Section. This section is bounded by the Roan Plateau to the north, the Wasatch Plateau to the west, the southern end of the San Rafael Swell to the south, and the western slope of the Rocky Mountains to the east. Elevation ranges from 4,100 feet near Green River, Utah, to 7,500 feet amsl at the base of the Wasatch Range and the Roan Plateau.

The soils in MLRA 34B generally are calcareous and shallow or moderately deep to sedimentary bedrock. The soils that formed in material weathered from Mancos Shale tend to be saline and high in selenium. Cretaceous shales often weather to form expansive clays that are prone to shrink swell (expansion) and slumping. Most of the soils formed in slope alluvium or residuum derived from shale or sandstone. Soils that formed in alluvium occur near the major waterways, and soils that formed in colluvium occur generally on slopes of more than 35 percent. The soils at the lower elevations generally have significant amounts of calcium carbonate, salts, and gypsum. The dominant soil orders in this MLRA are Aridisols and Entisols. Mollisols occur at the higher elevations, particularly in the northern part of the MLRA. Mollisols are fertile soils with high organic matter and a nutrient-enriched, thick dark surface. Aridisols and Entisols are described in the preceding text.

MLRA 47 – Wasatch and Uinta Mountains

The MLRA includes the Wasatch Mountains, which trend north and south, and the Uinta Mountains, which trend east and west. The steep sloping, precipitous Wasatch Mountains have narrow crests and deep valleys. Active faulting and erosion are a dominant force in controlling the geomorphology of the area. The Uinta Mountains have a broad, gently arching, elongate shape. Structurally, they consist of a broadly folded anticline that has an erosion resistant quartzite core. Some of the mountain areas that are above 7,500 feet and all of the areas above 10,000 feet have been subject to alpine or mountain glaciation. There are arêtes, horns, cirques, all types of moraines, and outwash features. In the southern part of the MLRA, there are rolling mountains and thrust-faulted plateaus that are broad, gently sloping surfaces with steep side slopes that have deep canyons cut into them. The Wasatch and Uinta Mountains have an elevation of 4,900 to about 13,500 feet amsl.

The soils in MLRA 47 primarily formed in slope alluvium, alluvium, colluvium, or residuum derived from sedimentary and igneous rocks. Alluvial fans at the base of the mountains are recharge zones for the basin fill aquifer. Soils derived from the Green River shale unit are fissile, calcareous, soft, and readily break down into clay- and silt-sized particles. The clay layers in sub-horizons impede root growth in locations. These soils also are often truncated due to sheet erosion. Soils derived from the North Horn Formation are subject to soil creep, slumping, and large landslide events. As the soils become saturated the probability of soil movement increases. For additional information on landslide prone areas refer to Section 3.2.5.1, Geology Regional Summary. The dominant soil orders in this MLRA are Aridisols, Entisols, Inceptisols, and Mollisols. Inceptisols are soils that exhibit minimal horizon development, but exhibit more soil development that Entisols. They are often shallow to bedrock or on steeply sloping lands. Aridisols, Entisols, and Mollisols are described in the preceding text.

MLRA 48A – Southern Rocky Mountains

The Southern Rocky Mountains consist primarily of two belts of strongly sloping to precipitous mountain ranges trending north to south. The ranges are dissected by many narrow stream valleys having steep gradients. In some areas the upper mountain slopes and broad crests are covered by snowfields and

glaciers. Several basins, or parks, are between the belts. Some high mesas and plateaus are included. High plateaus and steep-walled canyons are fairly common, especially in the west. Elevation typically ranges from 6,500 to 14,400 feet in this area.

The soils in MLRA 48A primarily formed in slope alluvium and colluvium on mountain slopes or residuum on mountain peaks derived from igneous, metamorphic, and sedimentary parent materials. Younger igneous parent materials, primarily basalt and andesitic lava flows, tuffs, breccias, and conglomerates, are located throughout this area. Representative formations in this area are the Silver Plume and Pikes Peak granites, San Juan Volcanics, and Mancos Shale. Alluvial fans at the base of the mountains are recharge zones for local basin and valley fill aquifers. The dominant soil orders in this MLRA are Mollisols, Alfisols, Inceptisols, and Entisols, which are described in the preceding text.

MLRA 29 – Southern Nevada Basin and Range

This MLRA is an area of broad, nearly level, aggraded desert basins and valleys between a series of mountain ranges trending north to south. The basins are bordered by sloping fans and terraces. The mountains are uplifted fault blocks with steep side slopes. The mountains are not well dissected due to a low amount of rainfall. Most of the valleys in this MLRA are closed basins containing sinks or playa lakes. Elevation ranges from 1,950 to 5,600 feet in the valleys and up to 9,400 feet in the mountains.

The soils in MLRA 29 primarily formed in alluvium on alluvial fans and fan pediments or residuum and colluvium on mountain slopes. Parent materials are derived from andesite, carbonate, and basalt. The soils generally are very shallow to very deep, well drained or somewhat excessively drained, and loamy-skeletal or sandy-skeletal. The valleys consist mostly of alluvial fill, but playa deposits occur at the lowest elevations in the closed basins. The alluvial valley fill consists of cobbles, gravel, and coarse sand near the mountains in the apex of the alluvial fans. Sands, silts, and clays are on the distal ends of the fans. The dominant soil orders in this MLRA are Aridisols and Entisols, which are described in the preceding text.

MLRA 28A – Great Salt Lake Area

This MLRA is an area of nearly level basins between widely separated mountain ranges trending north to south. The basins are bordered by long, gently sloping alluvial fans. The mountains are uplifted fault blocks with steep side slopes. They are not well dissected because of low rainfall. A large salt desert playa is south and west of Great Salt Lake. Most of the valleys in this MLRA are closed basins containing sinks or playa lakes. Elevation ranges from 3,950 to 6,560 feet amsl in the basins and from 6,560 to 11,150 feet amsl in the mountains.

The soils in MLRA 28A primarily formed in alluvium on alluvial fans, terraces, lake plains, and fan pediments or residuum and colluvium on mountain slopes. Dune lands formed in eolian materials. The soils in this area generally are well drained or somewhat excessively drained, loamy or loamy skeletal (lacking soil horizons and rocky), and very deep. Most of this area has alluvial valley fill and playa lakebed deposits at the surface. The dominant soil orders in this MLRA are Aridisols, Entisols, and Mollisols, which are described in the preceding text.

MLRA 35 – Colorado Plateau

In general, the surface consists of gently sloping to strongly sloping plains. Volcanic plugs that rise abruptly above the plains, steep scarps, or deeply incised canyons interrupt the surface of the plains. In most areas elevation is 4,250 to 4,950 feet amsl but the mountains range from 8,000 to 10,385 feet amsl.

The soils in MLRA 35 primarily formed in eolian deposits or alluvium on alluvial fans, cuestas, mesas, fan terraces, and fan pediments or residuum and colluvium on mesas, hills, ridges, and mountain slopes. Areas of shale, sandstone, limestone, dolomite, and volcanic rock outcrop are extensive. The dominant soil orders in this MLRA are Alfisols, Aridisols, Entisols, and Mollisols. Alfisols have a clay-enriched subsoil

and relatively high native fertility. Alfisols typically form under forests. Aridisols, Entisols, and Mollisols are described in the preceding text.

MLRA 30 – Mojave Desert

Broad basins, valleys, and old lakebeds make up most of the area, but widely spaced mountains trending north to south occur throughout the area. Isolated, short mountain ranges are separated by an aggraded desert plain. Long alluvial fans coalesce with dry lakebeds between some of the ranges. Elevation ranges from 282 feet below sea level in Death Valley to 3,950 feet amsl in valleys and basins. Some mountain ranges have peaks that exceed 11,100 feet amsl.

The soils in MLRA 30 primarily formed in alluvial deposits on alluvial fans and valley floors. The soils are generally well drained to excessively drained, loamy-skeletal or sandy-skeletal, and shallow to very deep. They developed from metamorphic, igneous, carbonates, granitics, and nonmarine sedimentary and volcanic deposits. Recent alluvial fans and remnant alluvial fan terraces typically grade from boulder-strewn deposits and coarse desert pavement near the fan apex to finer grained sands, silts, and clays at the distal ends. Playas are at the lowest elevations in the closed basins. They commonly have eolian accumulations along their downwind fringes. Water from shallow subsurface flow and from surface flows that periodically fill the playa basins evaporates, leaving accumulations of evaporite minerals, including salts and borates. Saline and sodic soils are common.

The dominant soil orders in this MLRA are Aridisols and Entisols, which have been described in the preceding text.

3.3.4.2 Soil Characteristics

Soil characteristics such as susceptibility to erosion and the potential for revegetation are important to consider when planning for construction activities and stabilization of disturbed areas. These hazards or limitations for use are a function of many physical and chemical characteristics of each soil, in combination with the climate and vegetation. Sensitive soils including prime farmland, hydric, highly erodible, limited revegetation potential, droughty, and other important soil characteristics are described in further detail below.

Water erosion is the detachment and movement of soil by water. Natural erosion rates depend on inherent soil properties, slope, soil cover, and climate. Erosion prone soils were characterized as having a soil erodibility factor (Kw) greater than 0.28 and slope greater than15 percent. Wind erosion is the physical wearing of the earth's surface by wind. Wind erosion removes and redistributes soil. Small blowout areas may be associated with adjacent areas of deposition at the base of plants or behind obstacles, such as rocks, shrubs, fence rows, and roadbanks (Soil Quality Institute 2001). Wind erodible soils were characterized as having a wind erodibility group value of 1 or 2.

Soils with LRP have chemical characteristics such as high salts, sodium, or pH that may limit plant growth. Saline soils affect plant uptake of water and sodic soils often have drainage limitations. In addition, the success of stabilization and restoration efforts in these areas may be limited unless additional treatments and practices are employed to offset the adverse physical and chemical characteristics of the soils.

Prime farmland is land that has the best combination of physical and chemical characteristics for producing crops and that is available for these uses. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. These soils have the capability to be prime farmland, but may have not yet been developed for irrigated agriculture uses.

Hydric soils are soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. These soils are commonly

associated with floodplains, lake plains, basin plains, and with riparian areas, wetlands, springs, and seeps. Due to the scale of mapping, small areas of hydric soils may not be captured by this dataset.

In areas with a shallow depth to lithic bedrock (relative to the structure foundation excavation depth), excavation may result in rock fragments remaining on the surface at levels that would limit the success of restoration efforts. Where the alternative routes cross soils with lithic bedrock, blasting or specialized drilling equipment may be required for installing structure foundations.

Soil compaction occurs when soil particles are pressed together and the pore spaces between them are reduced and bulk density is increased. This results in a decrease in infiltration and an increase in runoff and erosion. Moist, fine textured (clayey) soils are most susceptible to compaction. Soils with greater than 28 percent clay were interpreted as compaction prone.

Soil limitations within the analysis area related to shallow excavations include cutback caving, flooding, large stones, slope, and a cemented pan within the soil profile. These limitations are important to consider during construction.

Other sensitive soils within the analysis area include expansive soils, collapsible soils, and soils with a high susceptibility to subsidence, dissolution, or piping.

Corrosion potential pertains to soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. For uncoated steel, the risk of corrosion is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract. For concrete, the risk of corrosion is based on soil texture, acidity, and amount of sulfates in the saturation extract (NRCS 2011).

Biological soil crusts are considered an important component in dry arid ecosystems. They provide soil stability, prevent erosion, fix nitrogen, increase infiltration rates, and may reduce noxious weed migration. Biological soil crusts occur throughout the analysis area. The southern portion of the analysis area (specifically the northeast portion of the Mojave Desert) has a relatively high cover of biological soil crusts. No data exist on soil crust coverage of the entire analysis area; however, research shows that biological soil crusts do best where sedimentary parent materials are found (Belnap et al. 2003). In arid environments, biological soil crusts are essential for soil stability due to minimal vegetative growth and soil cover.

3.3.5 Regional Summary

Table 3.3-1 summarizes MLRAs along with important soil limitations within each region. Soils with severe wind and water erosion potential and soils with limited revegetation potential and farmlands of statewide importance along with the MLRAs within each region are depicted in **Figures 3.3-1** through **3.3-16**.

3.3.6 Impacts to Soils

The impact analysis area for soil resources encompasses the applicant-proposed route and all alternatives, and includes a 250-foot-wide transmission line ROW centered on each reference line to analyze all impacts except for the access roads and other ancillary facilities and work areas. For the analysis of the access roads, ancillary facilities, and work areas, a generally 2-mile transmission line corridor along the proposed and alternative routes would be used. A larger analysis area for access roads was required because their locations have not been defined at this time.

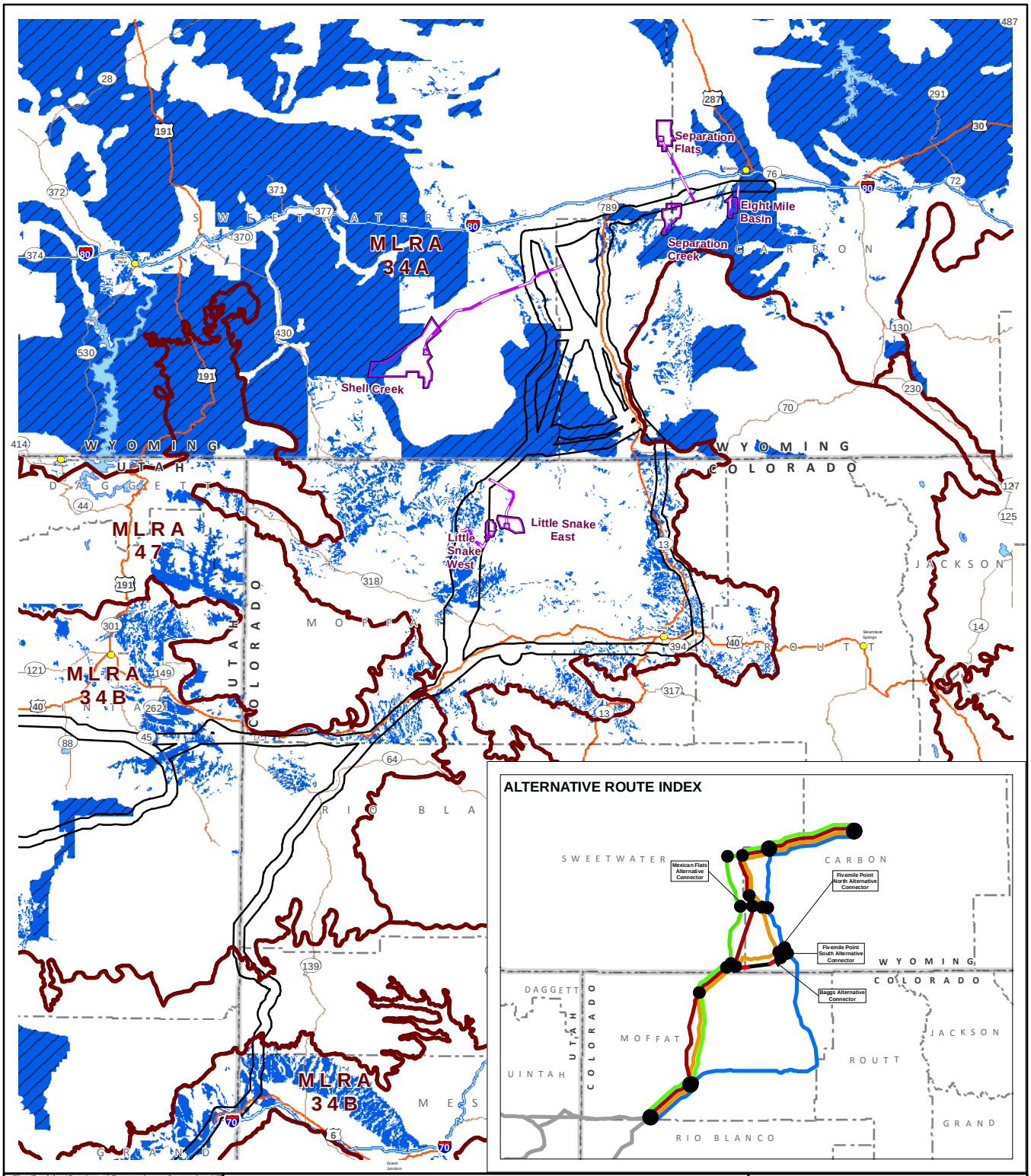
Table 3.3-1 Soil Limitations Within the Regions and MLRAs (Percentage)

Region	MLRA Number	Wind Erosion	Water Erosion	Compaction	Limited Revegetation Potential	Hydric	Prime Farmland	Shallow Bedrock	Risk of Corrosion – Concrete	Risk of Corrosion – Steel	Shallow Excavations	Small Commercial Buildings
I	34A	5.4	5.7	13.9	19.0	0.1	3.0	6.4	5.3	28.8	12.0	15.9
	34B	<0.1	1.4	2.7	2.0	0	0.9	0.3	2.3	3.2	2.2	3.1
	48A	<0.1	<0.1	0.1	<0.1	0	0	0	<0.1	0.1	0	0
II	47	<0.1	1.3	6.3	3.1	<0.1	0.4	5.0	0.2	9.0	4.9	5.4
	28A	3.0	0.1	3.2	6.1	0.8	2.0	1.9	4.9	11	7.5	7.7
	34B	1.1	4.6	14.7	16.5	0.1	2.8	6.9	9.2	27.0	17.9	21.8
	48A	0	0.1	1.4	1.6	0	0.9	2.1	0.2	3.3	1.7	1.9
III	29	<0.1	0.3	4.6	1.8	0	1.5	4.1	0.2	6.7	7.4	6.9
	30	1.2	0.9	1.8	3.9	0.1	0	12.2	2.1	19.2	17.5	16.9
	47	0	0	1.1	0.3	0	<0.1	1.3	<0.1	0.6	0.1	0.1
	28A	1.7	0	16.8	32.4	0.8	2.7	4.0	13.8	41.7	15.8	14.4
IV	30	8.6	0.8	0	26.2	0	0	21.1	17.9	65.1	75.1	73.3

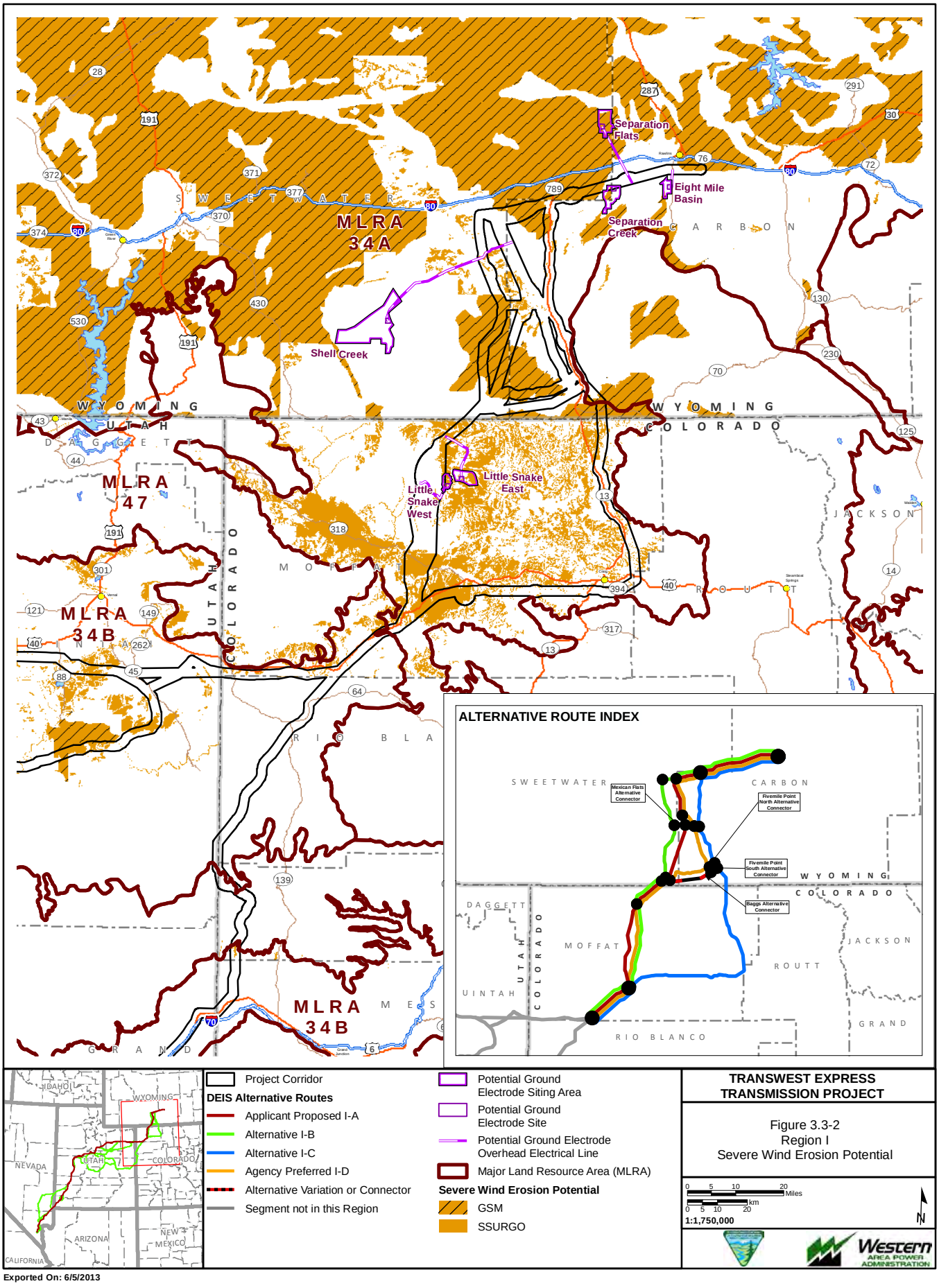
Note: GSM data did not have interpretations for shallow excavations, small commercial buildings, or prime farmland. Percentages for these interpretations exclude areas with only GSM data.

Source: USDA 2006; NRCS 2011.

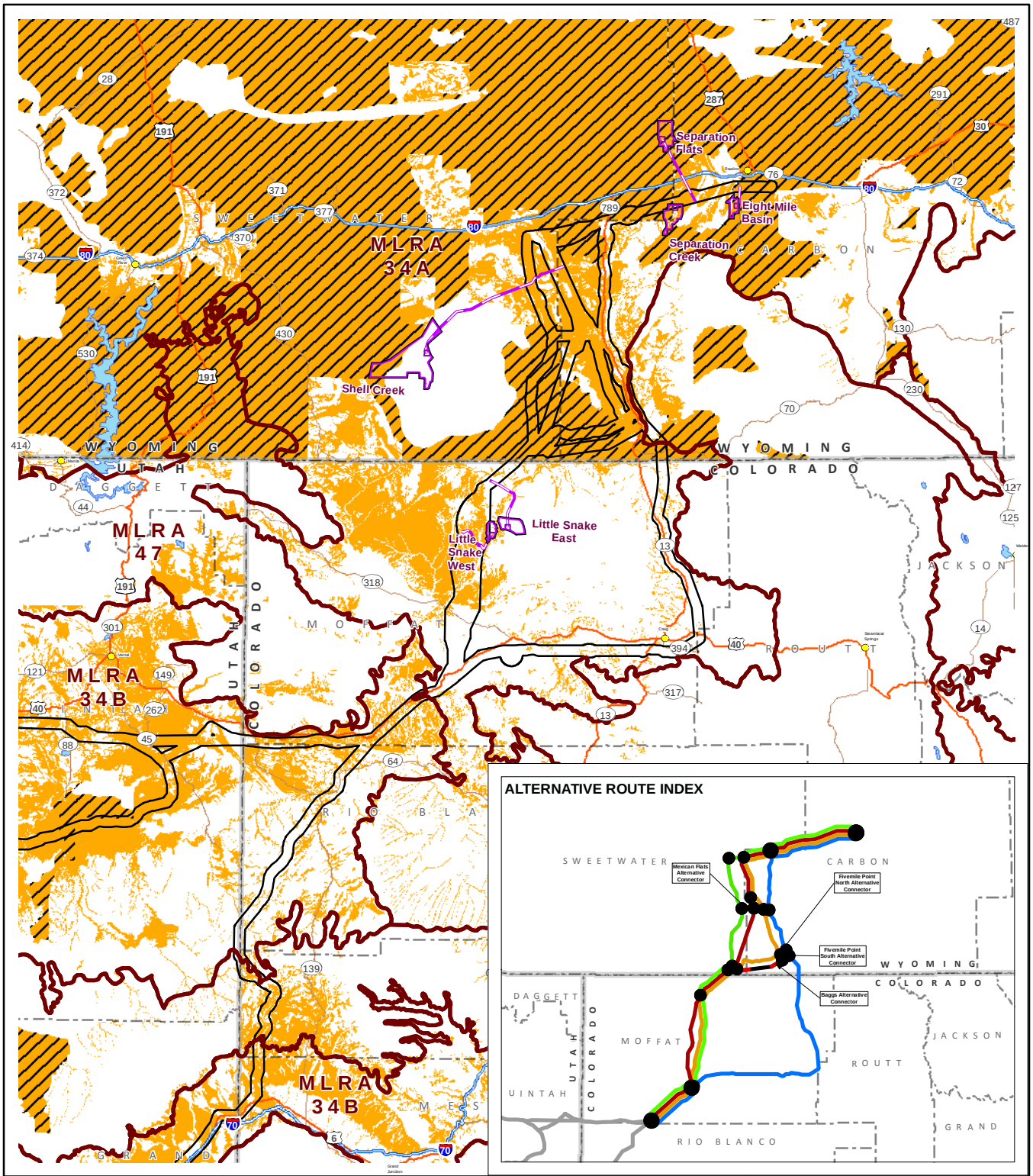
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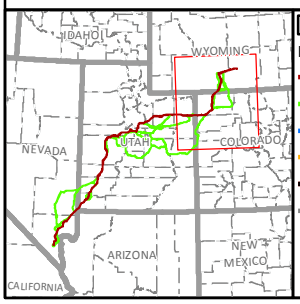


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Separation Flats
Eight Mile Basin
Separation Creek
Shell Creek
Little Snake East
Little Snake West
MLRA 34A
MLRA 47
MLRA 34B
MLRA 34B
WYOMING
UTAH
COLORADO
SWEETWATER
CARBON
MOFFAT
JACKSON
ROUTT
DAGGETT
UINTAH
GRAND
RIO BLANCO
ALTERNATIVE ROUTE INDEX
Mexican Flats Alternative Connector
Fivemile Point North Alternative Connector
Fivemile Point South Alternative Connector
Baggs Alternative Connector
Project Corridor
DEIS Alternative Routes
Applicant Proposed I-A
Alternative I-B
Alternative I-C
Agency Preferred I-D
Alternative Variation or Connector
Segment not in this Region
Potential Ground Electrode Siting Area
Potential Ground Electrode Site
Potential Ground Electrode Overhead Electrical Line
Major Land Resource Area (MLRA)
Severe Wind Erosion Potential
GSM
SSURGO
TRANSWEST EXPRESS TRANSMISSION PROJECT
Figure 3.3-2
Region I
Severe Wind Erosion Potential
0 5 10 20 Miles
0 5 10 20 km
1:1,750,000
N
Western AREA POWER ADMINISTRATION
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Project Corridor

DEIS Alternative Routes

- Applicant Proposed I-A
- Alternative I-B
- Alternative I-C
- Agency Preferred I-D
- Alternative Variation or Connector
- Segment not in this Region

- Potential Ground Electrode Siting Area
- Potential Ground Electrode Site
- Potential Ground Electrode Overhead Electrical Line
- Major Land Resource Area (MLRA)

Limited Reclamation Potential

- GSM
- SSURGO

TRANSWEST EXPRESS TRANSMISSION PROJECT

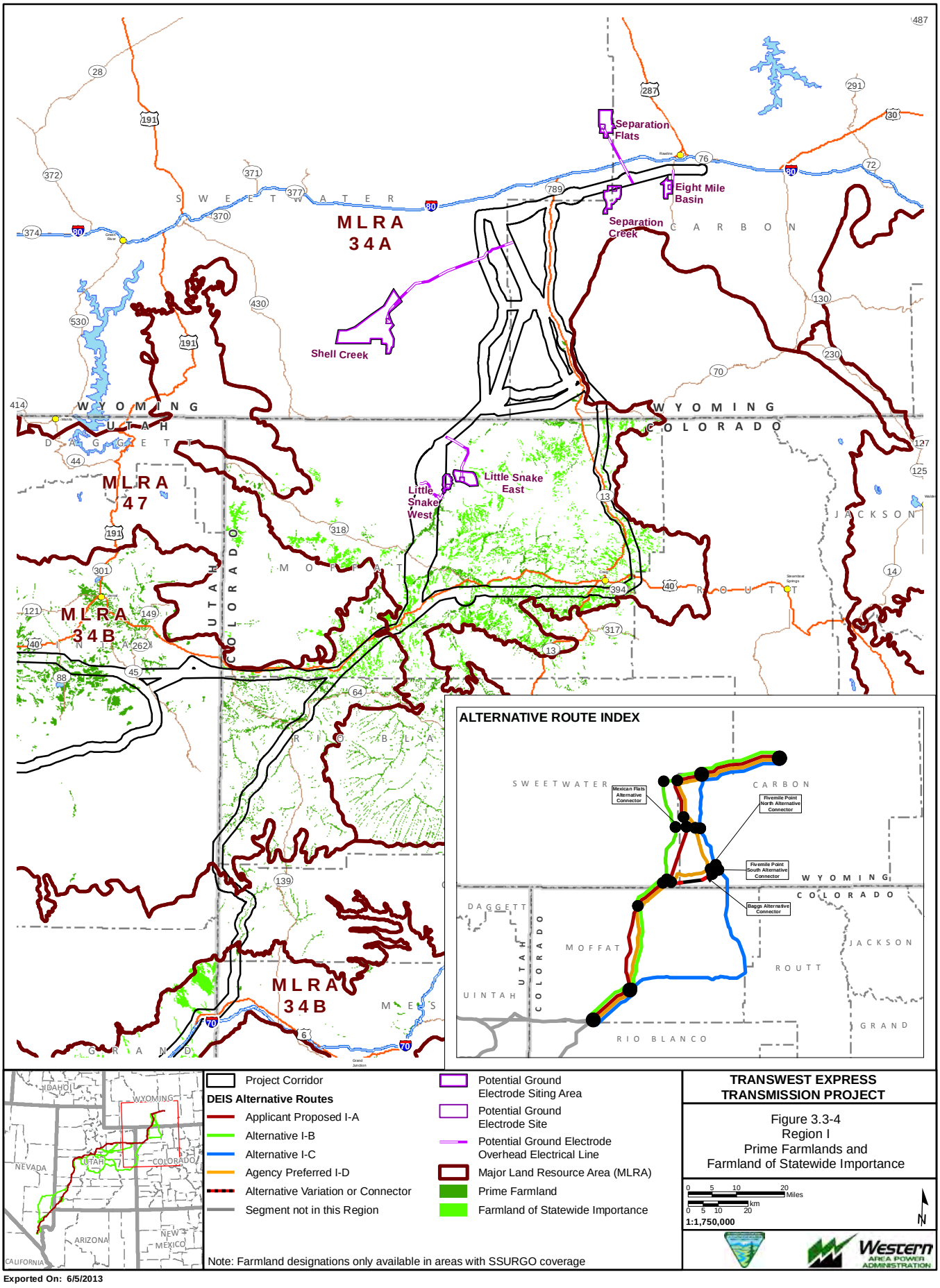
Figure 3.3-3
Region I
Limited Reclamation Potential

0 5 10 20 Miles
0 5 10 20 km
1:1,750,000

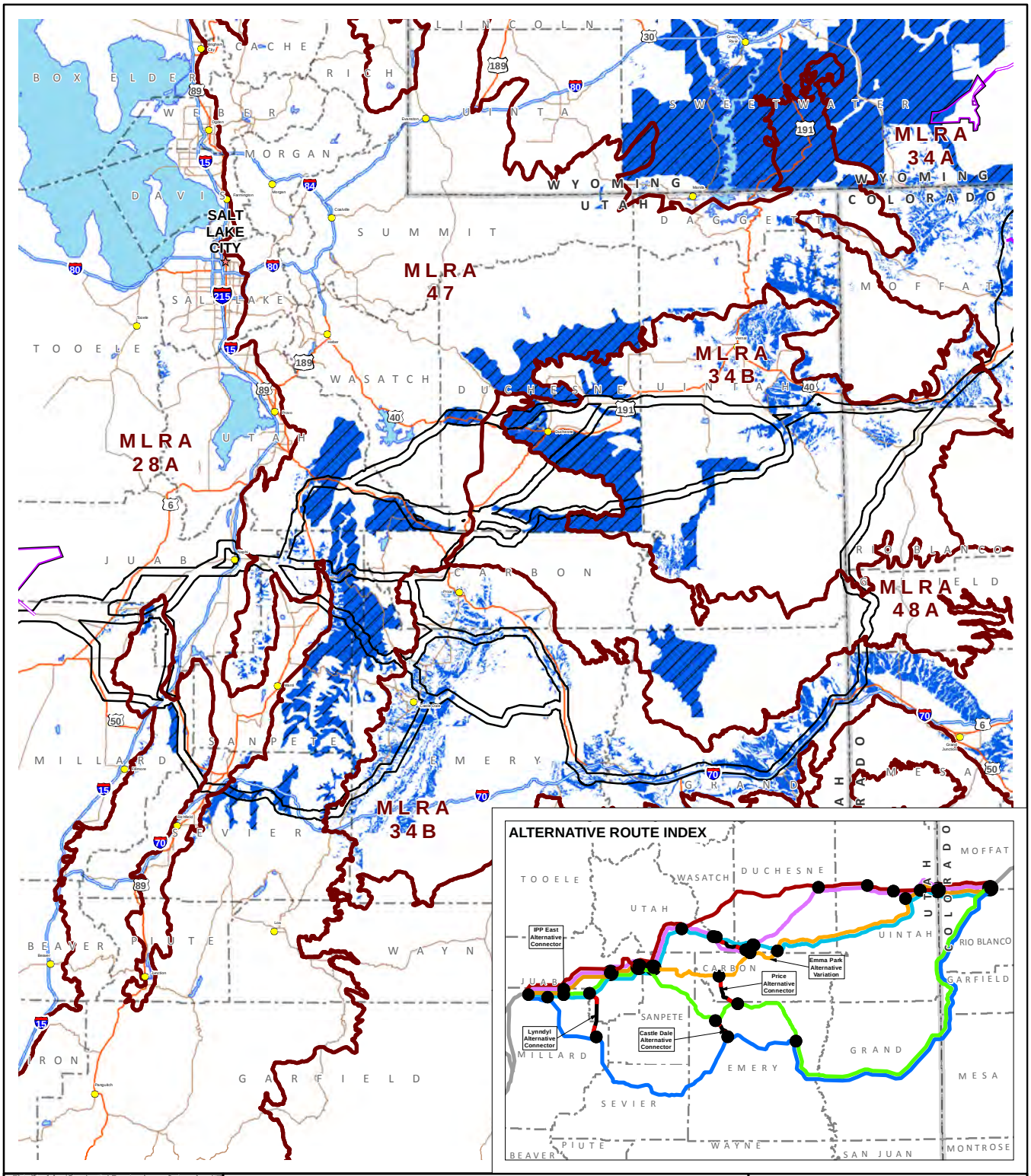
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Western AREA POWER ADMINISTRATION

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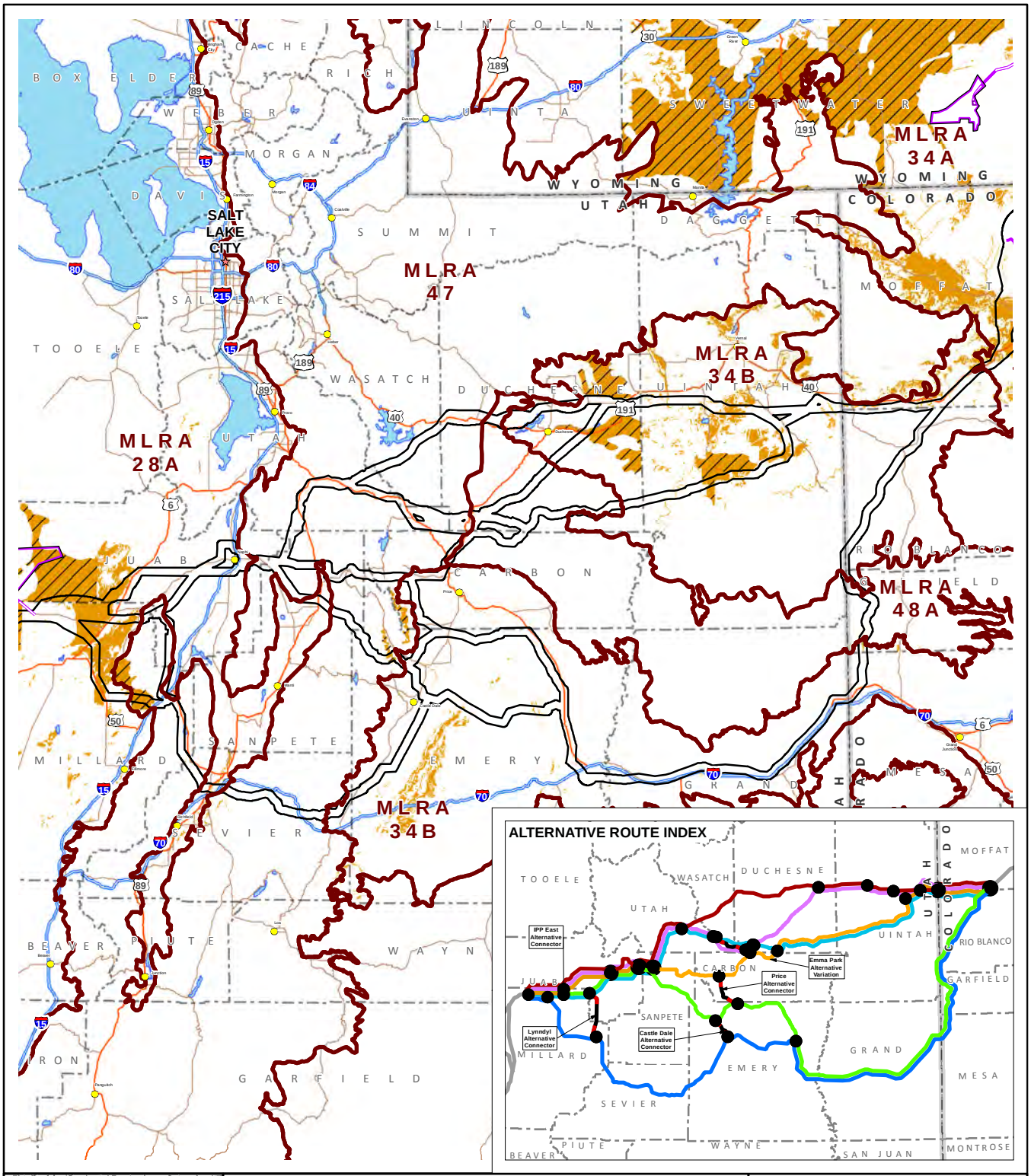

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MLRA 34A
MLRA 47
MLRA 34B
MLRA 34B
Separation Flats
Eight Mile Basin
Separation Creek
Shell Creek
Little Snake West
Little Snake East
SWEETWATER
CARBON
WYOMING
UTAH
COLORADO
DAGGETT
MOFFAT
JACKSON
ROUTT
UINTAH
GRAND
RIO BLANCO
MESA
ALTERNATIVE ROUTE INDEX
Mexican Flats Alternative Connector
Fivemile Point North Alternative Connector
Fivemile Point South Alternative Connector
Baggs Alternative Connector
Project Corridor
DEIS Alternative Routes
Applicant Proposed I-A
Alternative I-B
Alternative I-C
Agency Preferred I-D
Alternative Variation or Connector
Segment not in this Region
Potential Ground Electrode Siting Area
Potential Ground Electrode Site
Potential Ground Electrode Overhead Electrical Line
Major Land Resource Area (MLRA)
Prime Farmland
Farmland of Statewide Importance
Note: Farmland designations only available in areas with SSURGO coverage
TRANSWEST EXPRESS TRANSMISSION PROJECT
Figure 3.3-4
Region I
Prime Farmlands and
Farmland of Statewide Importance
0 5 10 20 Miles
0 5 10 20 km
1:1,750,000
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Western AREA POWER ADMINISTRATION
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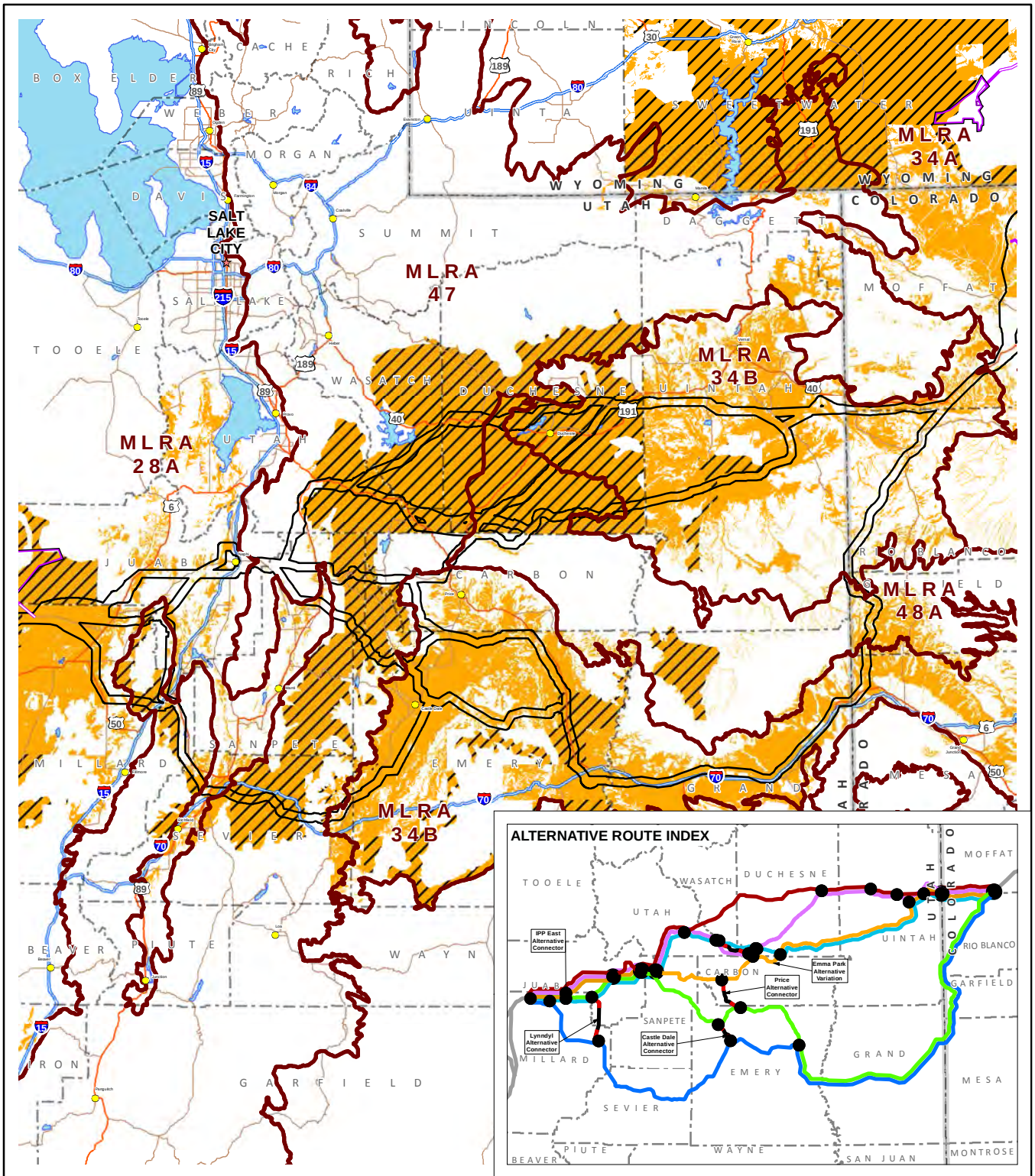
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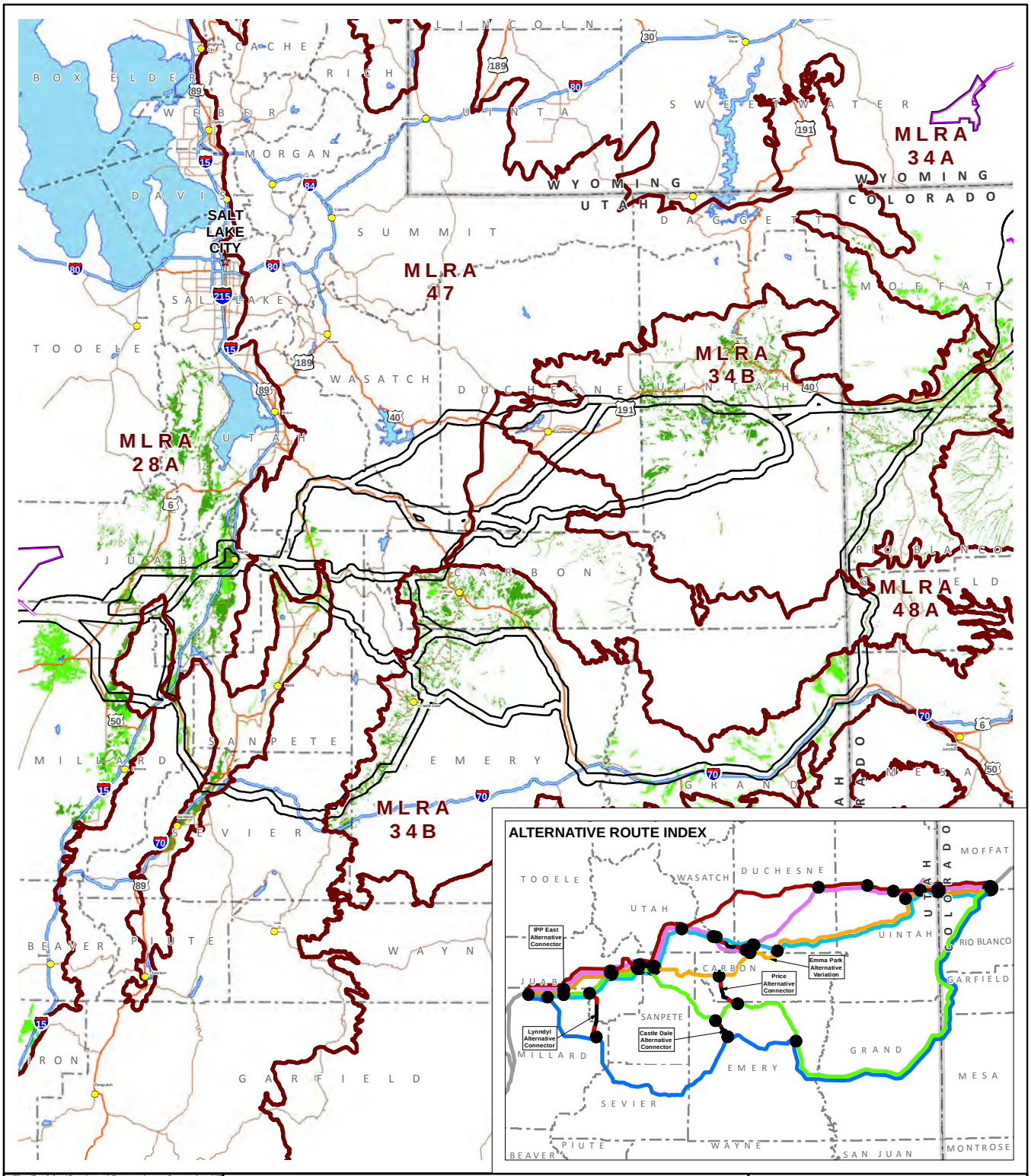
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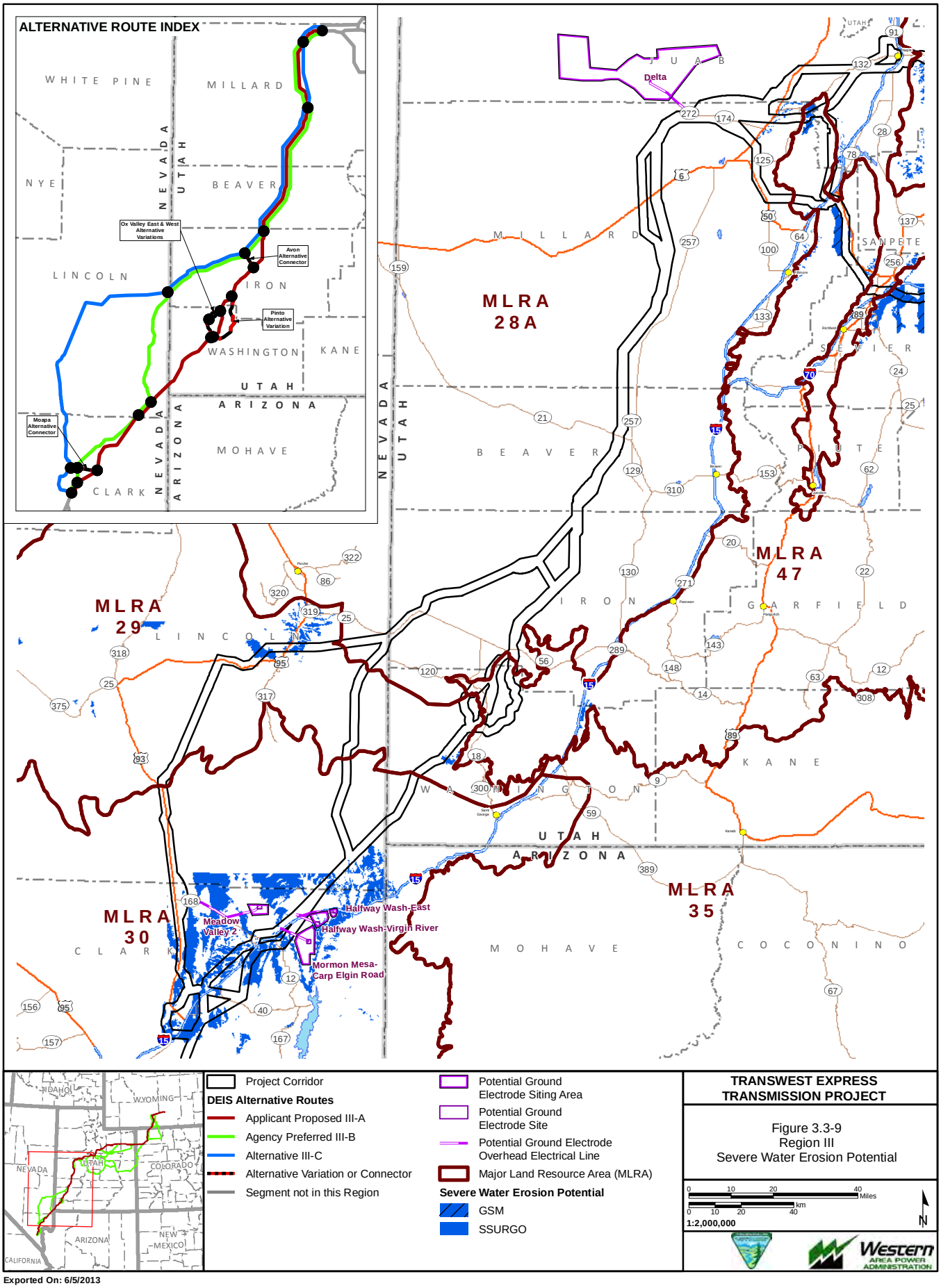


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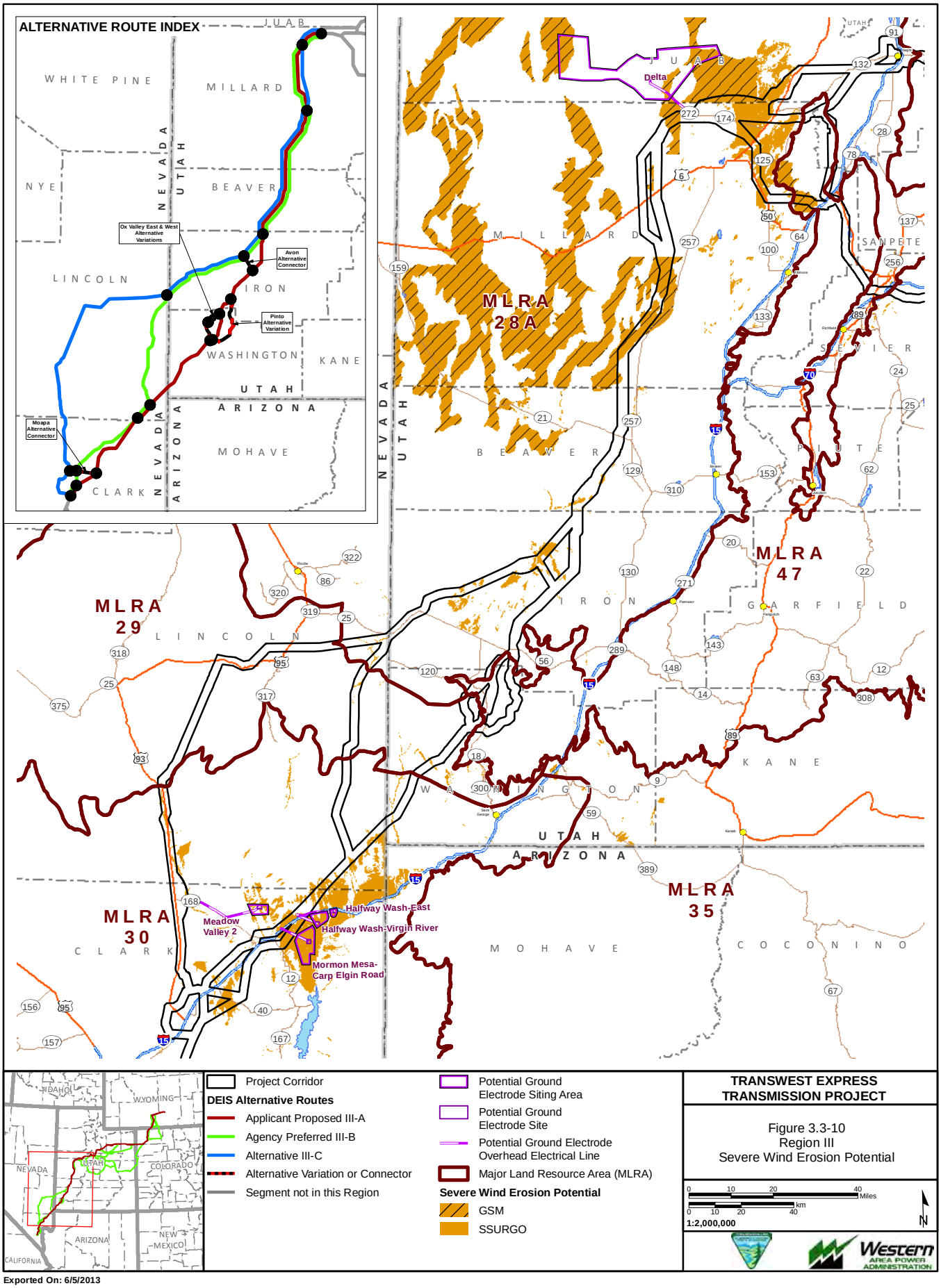


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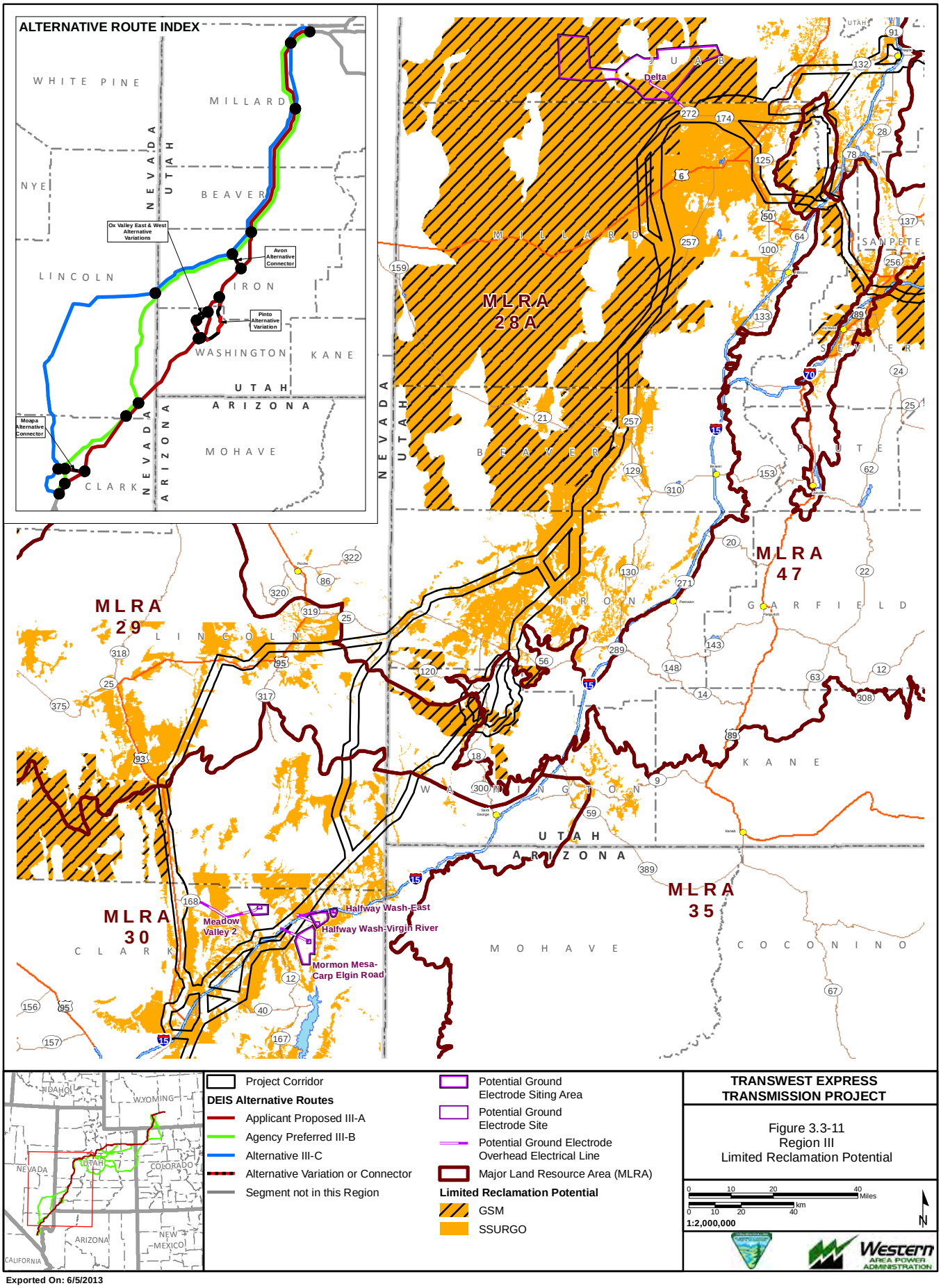


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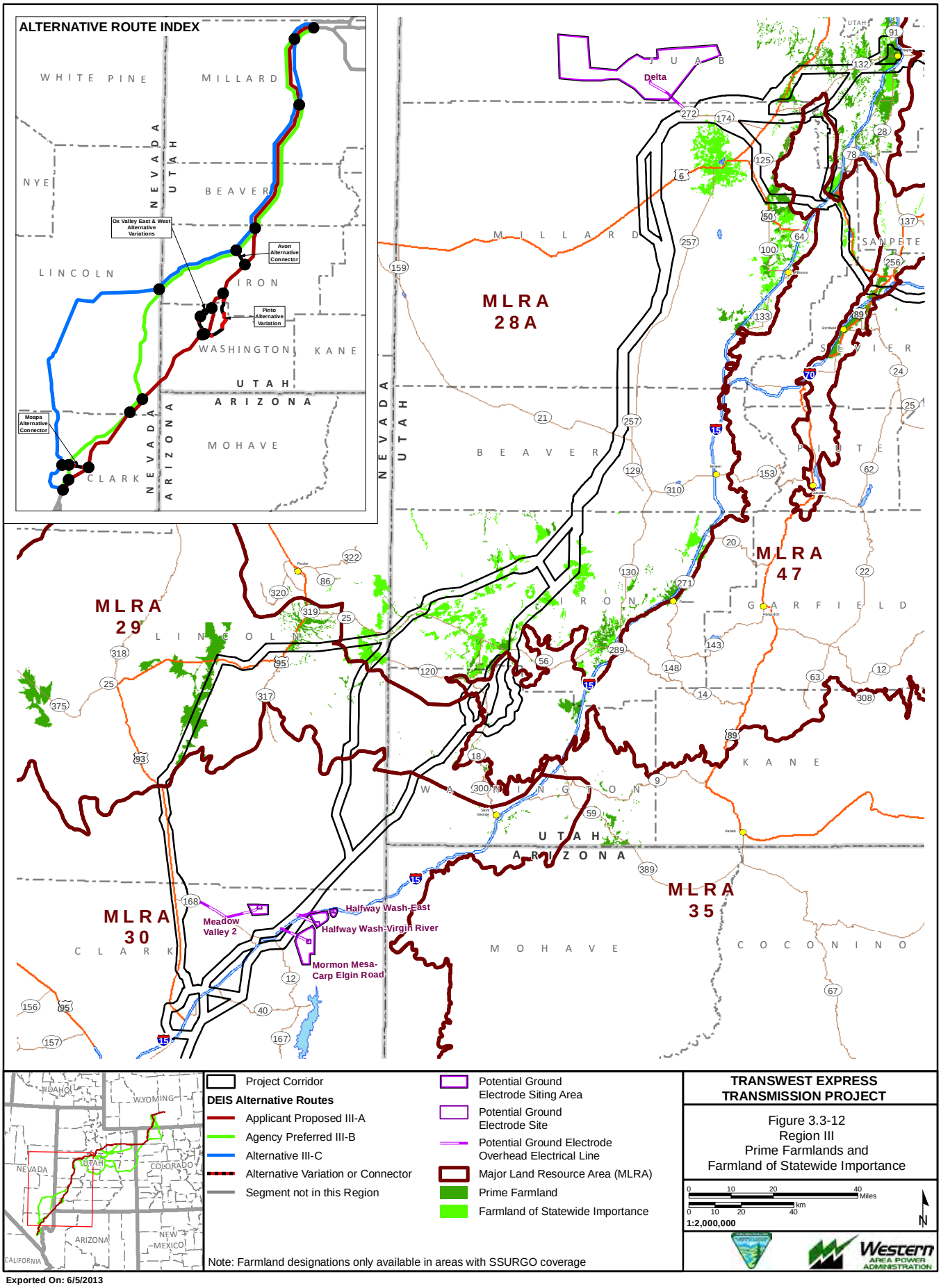


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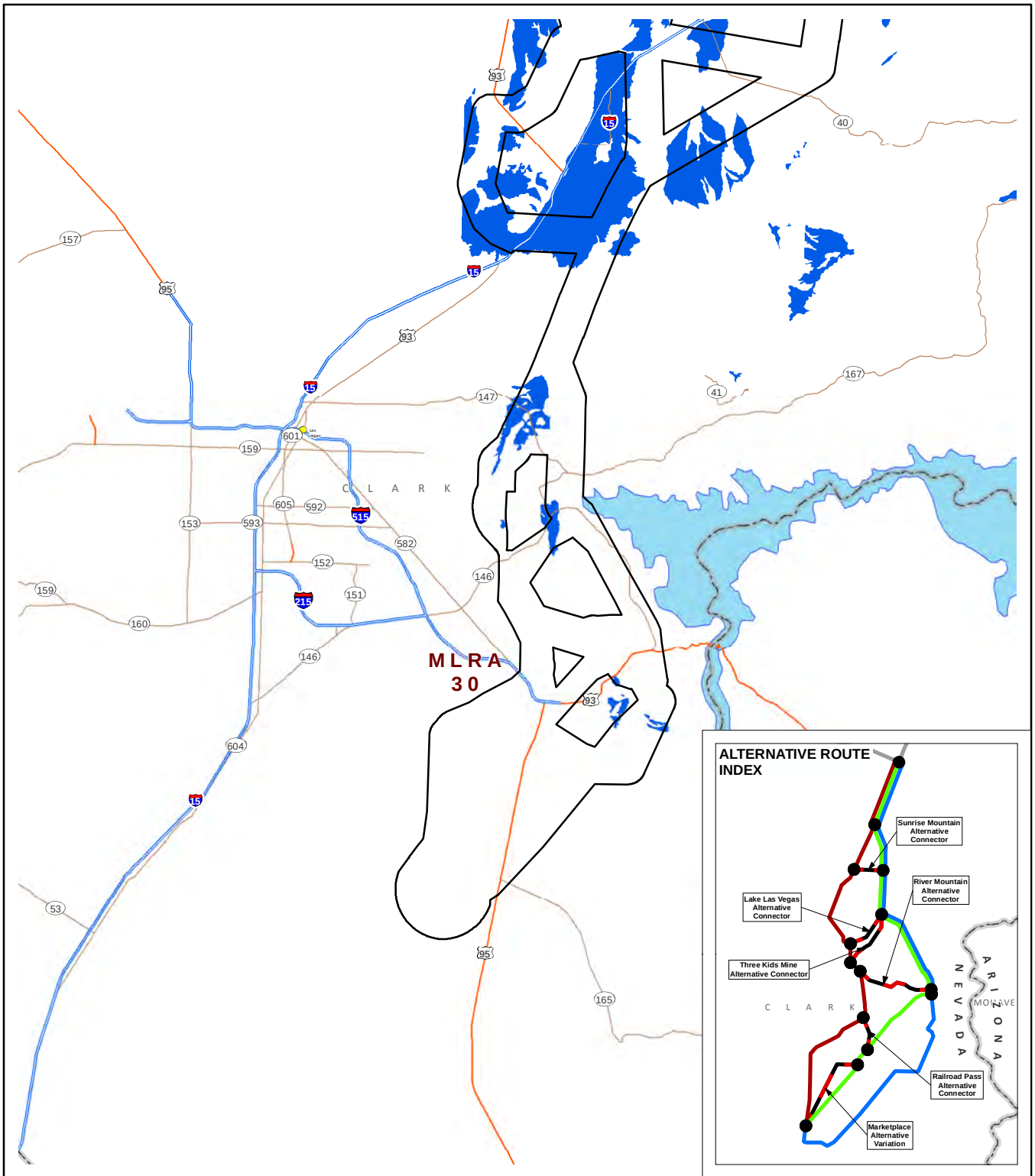
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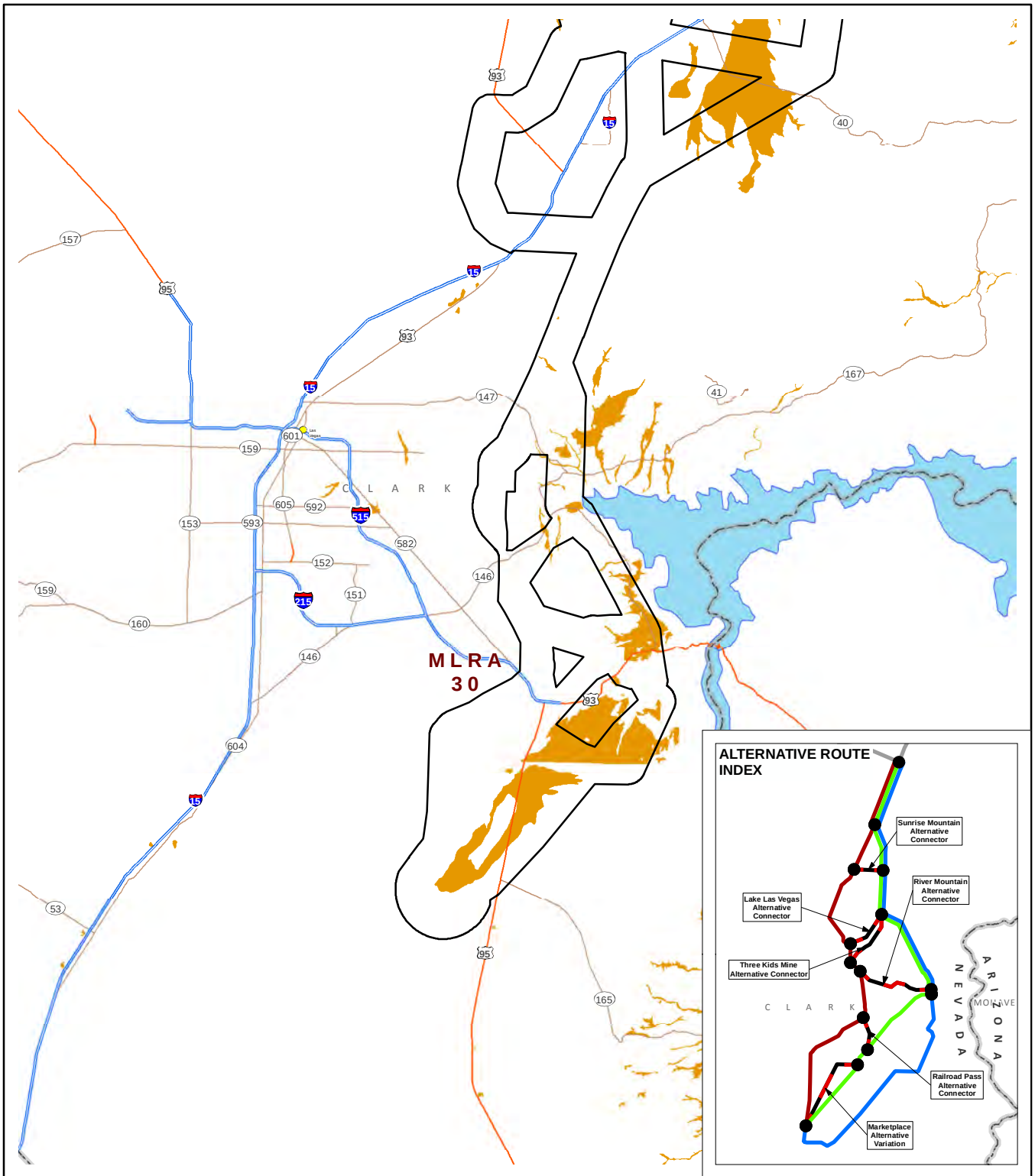
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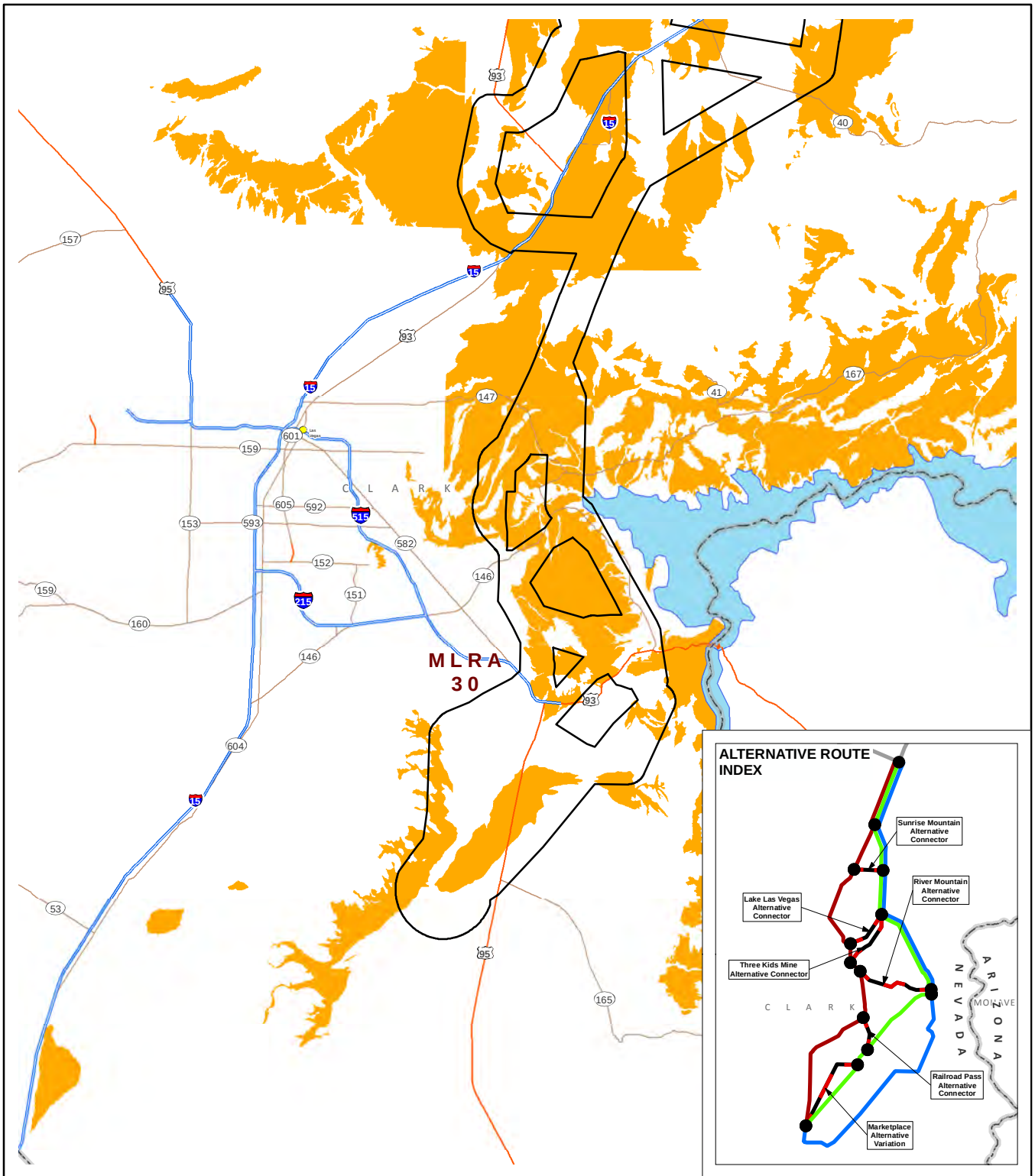
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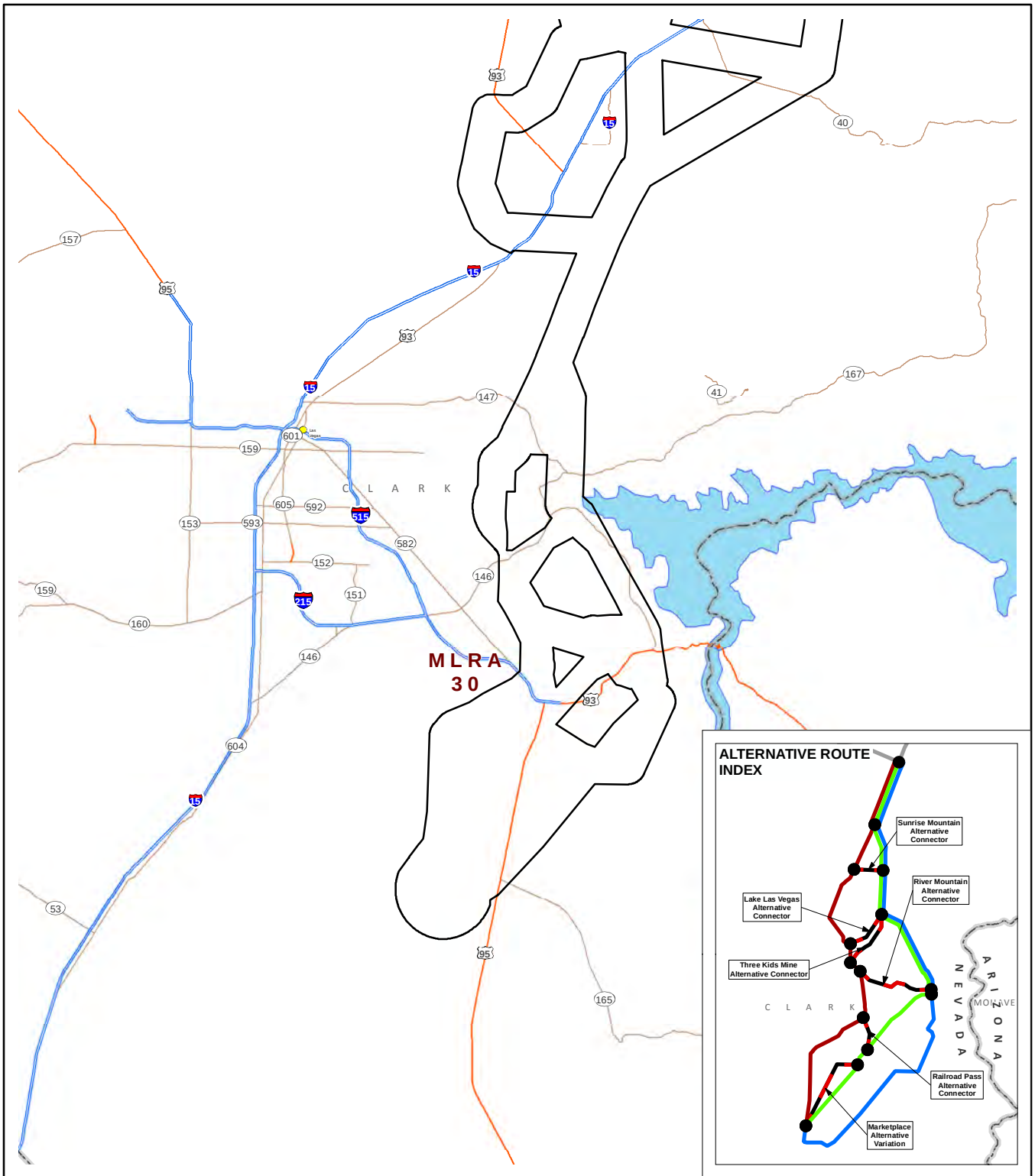


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The methodology for evaluating impacts on soil resources involved analyzing soil survey data in relation to the proposed surface disturbance areas. To determine acres of soils disturbed by the proposed project, the known locations of proposed surface disturbances were overlain on the NRCS SSURGO order 3 soil survey layer (or GSM data where SSURGO data are unavailable) to determine the acreage of soils lost or disturbed. Temporary impacts to soils are those that are anticipated to be short-term in nature and following construction would be reclaimed and revegetated. Long-term impacts to soils would include areas where structures, surface facilities, or long-term access roads would be located for the duration of the project.

The analysis of the impacts to soil resources is based on the assumption that the TWE Project design features, WWEC BMPs, and agency use stipulations would be implemented as part of the project. These design features, agency use stipulations, and BMPs listed in **Appendix C**, address the compensation for damage to agricultural land and fences, erosion control and BMPs, recontouring, and other practices that would minimize soil resources impacts when implemented. To minimize construction related impacts to soil resources, reclamation would be conducted as soon as practical following surface disturbance. Additionally, TWE would be required to abide by the goals, objectives, and management actions outlined in each BLM RMP, and the standards and guidelines in each USFS LRMP. The respective resource management plans for each land management agency crossed by the proposed project are listed in Chapter 1.0, **Table 1-3** and **Table 1-4**.

Third-party Environmental Compliance Monitors (ECMs) would be on-site during construction. These ECMs would be responsible for making sure TWE is in compliance with all applicable recommended mitigation measures, agency use stipulations and requirements, BMPs, and design features.

Issues related to soil resources as identified during the scoping process include the following:

- Disturbance and potential loss of biological soil crusts;
- Soil disturbance during construction activities resulting in accelerated soil erosion, exposed soils, the potential for mass failure, and reduced soil productivity; and,
- Potential for successful reclamation of soils with physical or chemical reclamation constraints.

Relevant management considerations are shown in **Table 3.3-2**.

Table 3.3-2 Relevant Analysis Considerations for Soils

Resource Topic	Analysis Considerations and Relevant Assumptions
Soil Quality and Productivity	Any surface disturbance has the potential to degrade soil quality and productivity because it damages the biological soil crust and exposes the bare soil to the erosive forces of wind and water until vegetation or other ground cover is established.
Soil Erosion	Bare soil (without vegetation or other surface cover) with a surface layer that has been altered from its natural condition is more susceptible to accelerated wind and water erosion than undisturbed soil. Erosion from disturbed areas would be minimal once vegetation is reestablished. Successful establishment of vegetation generally takes a minimum of 3 to 5 years, depending on soil and precipitation, and requires monitoring during this time.
Soil Stability	Surface disturbance from construction would modify soils by disrupting soil stability, changing vegetative cover that can reduce nutrient recycling, damaging biological crusts, decreasing productivity, and increasing compaction.
Sensitive Soils	Sensitive soils, including those that are highly erodible, have a high pH, high salinity or sodicity, have a high clay content, occur on steep slopes of 35% or more, or have a limited revegetation potential, would incur greater adverse impacts from surface-disturbing activities than non-sensitive soils.
Soil Standards	The Standards for Public Land Health (BLM 1997) provide minimum standards for vegetation health, vigor, soil cover, and erosion rates that apply to all BLM administered activities.

Table 3.3-2 Relevant Analysis Considerations for Soils

Resource Topic	Analysis Considerations and Relevant Assumptions
Highly Erodible Soils	When surface disturbance occurs on highly erodible soils, the potential for accelerated erosion is greater than on less erodible soils. The risk of BMP failure is greater on highly erodible soils. To be effective on highly erodible soils, more extensive BMPs and more aggressive maintenance techniques than those commonly used are often required.
Soil Compaction	Operating motorized vehicles on moist soils, especially heavy equipment, is likely to cause compaction of the surface layer, which may increase runoff, decrease infiltration and aeration, and reduce soil productivity by making it more difficult for plant roots to establish or obtain soil moisture and nutrients.
Soil Data	Impact analysis with order 3 SSURGO data is more accurate and detailed than analysis with U.S. GSM data. GSM data has not been field verified and does not have interpretive data associated with prime farmlands, hydric soils, shallow excavations limitations, or small commercial buildings limitations and acreage associated with these would be zero.

3.3.6.1 Impacts from Terminal Construction, Operation, and Decommissioning

The northern and southern terminals would be constructed regardless of alternative route or design option. **Table 3.3-3** summarizes the soil characteristics of soils within the disturbance footprint of the Northern and Southern terminals and Design Options 2 and 3.

Northern Terminal

Construction of the Northern Terminal would disturb approximately 504 acres of soils. A permanent loss of soil resources would be expected on approximately 234 acres for the permanent Project facilities. Approximately 270 acres would be temporarily disturbed for construction work areas. **Table 3.3-3** summarizes the soil characteristics of soils within the disturbance footprint of the Northern Terminal.

The northern terminal is proposed to be constructed on relatively undisturbed uplands. Grading may be required to create a level working surface. Where the topography is relatively flat and grading occurs, it would be limited to the upper subsurface soil horizons. Where cut and fill slopes occur, the soil profiles would be mixed with a corresponding loss of soil structure. Mitigation measure **S-1** is recommended to prevent topsoil mixing with subsoil and to promote successful revegetation during decommissioning. If soils are saturated or frozen when grading or soil salvage activities occur, it could result in improper topsoil segregation due to difficulty with soil handling. Reapplication on or of frozen soils could result in voids or collapses as the soil defrosts. Mitigation measure **S-2** is recommended to mitigate impacts associated with working with frozen or saturated soils. BMPs that would reduce impacts to soil resources during construction include: SOIL-1 (salvage, safeguard, and reapply topsoil from all excavations and construction activities) and AIR-1 (cover construction materials and stockpiled soils if these are sources of fugitive dust). In general most topsoil stockpiles would be temporary and short-term. However at project facilities, a decrease in soil productivity would occur in association with soil salvage and stockpiling activities as microbial action is curtailed, at least to some degree, in the constructed long-term stockpiles.

S-1*: Where permanent facilities or structures would be located, the entire topsoil horizon would be salvaged for use in reclamation, prior to surface disturbance. Topsoil would be spread evenly around the permanent structure (not left in piles) and revegetated for future use.*

Effectiveness: Salvaging all topsoil from locations where permanent facilities or structures would be located, would increase the potential for successful reclamation during decommissioning.

S-2*: Construction, excavation, or re-spreading with frozen or saturated soils would be prohibited.*

Effectiveness: BMPs prohibit topsoil stripping when soils are saturated or frozen. Through the implementation of measure **S-2**, impacts to soils due to uneven settling, compacted surfaces, and physical

crusts reducing water infiltration would be avoided. Through the implementation of mitigation measure **S-3** and BMPs, impacts to soils from grading activities would be effectively reduced.

Soil compaction would result from the movement of construction vehicles on roads and temporary work areas. Soil compaction would impact the upper profile subsoils immediately beneath the road and construction work surface, but also would impact subsurface soils at a greater depth if fine textured soils are present. Soil compaction would result in a corresponding loss of infiltration, permeability, and soil aeration. An increase in runoff and erosion would be expected on bare, compacted soils at construction work areas. BMP WAT-9 would require control of erosion using techniques such as silt fences, water bars, hay bales, or erosion berms; this would reduce soil erosion off site. BMP SOIL-5 would require compacted soils to be chiseled or ripped, which would help to reduce the impacts associated with compaction. Temporary work areas would be reclaimed and revegetated following construction. These impacts, along with a loss in soil productivity, would occur for the duration of project construction and until successful reclamation is achieved. Additional mitigation measure **S-3** is recommended to further mitigate compaction impacts during reclamation.

S-3*: During reclamation, compacted areas (typically any area that receives repeated traffic or 3 or more passes by heavy equipment) will be decompacted, to the depth of compaction, by subsoiling, paraplowing, or parabolic ripping on the contour to the depth of compaction. This would help prepare the seed bed, encourage infiltration and help to prevent accelerated runoff and erosion. Scarification would only be used on shallow soils. Compaction depth would be determined on a case by case basis, by a qualified environmental inspector or soil scientist.*

Effectiveness: Decompacting to the depth of compaction reduces the potential for buildup of alkalinity, salts, or sodium over a subsurface compacted layer. Additionally, it prevents water from infiltrating and flowing laterally once it hits a deep compacted layer, carrying surface soils away, or causing instability of saturated soils on slopes. Site specific permanent impacts to soil quality and productivity would be expected from terminal construction where permanent facilities are located. Through the implementation of the design features, BMPs, agency use stipulations, additional mitigation and considering the upland locations of the terminals, little to no impacts related to erosion and sedimentation are expected.

Southern Terminal

Construction of the Southern Terminal would disturb approximately 412 acres of soils. A permanent loss of soil resources would be expected on approximately 203 acres for the permanent Project facilities. Approximately 209 acres of soils would be temporarily disturbed for construction work areas. Similar impacts would be expected as described for the Northern Terminal. There is a proposed location and an alternative location for the southern terminal. The alternative location would impact more LRP soils than the proposed location for the southern terminal, and therefore may pose more revegetation and reclamation challenges than the proposed terminal location. **Table 3.3-3** summarizes the soil characteristics of soils within the disturbance footprint of the Southern Terminal.

Site-specific permanent impacts to soil quality and productivity would be expected from terminal construction. Through the implementation of the design features, BMPs, and mitigation measure **S-1**, and considering the upland locations of the terminals, little to no impacts related to erosion and sedimentation are expected.

Design Option 2 – DC from Wyoming to IPP; AC from IPP to Marketplace Hub

Under Design Option 2, the location of the Southern Terminal would change. Design Option 2 would result in similar acres of initial and permanent disturbance to soil resources as described for the Proposed Action. Impacts would be similar to what is described in Section 3.3.6.2, Impacts Common to all Alternative Routes and Associated Components, except the Southern Terminal, Delta Ground Electrode Site, and AC/DC converter station would be located at IPP instead of the Marketplace Hub. Acreages of

Table 3.3-3 Soil Characteristics within the Disturbance Footprint of the Northern and Southern Terminal, Design Option 2 Terminal, and Design Option 3 Substation (acres)

Project Components	Region	Wind Erodible	Water Erodible	Compaction Prone	LRP	Hydric	Shallow Bedrock	Risk of Corrosion to Concrete	Risk of Corrosion to Steel	Shallow Excavations	Small Commercial Buildings	Expansive Soils
1-Northern Terminal Siting Area	I	718	917	992	2,500	0	75	0	4,422	0	0	229
1-Northern Terminal	I	23	87	91	114	0	3	0	229	0	0	22
4-Southern Terminal Siting Area	IV	472	0	0	2,031	0	15	278	3,527	3,416	3,527	0
4-Southern Alternative Terminal	IV	0	0	0	74	0	0	0	74	74	74	0
4-Southern Terminal	IV	0	0	0	0	0	0	0	78	78	78	0
3-Southern Terminal Siting Area near IPP (DO2)	III	211	0	463	1,100	0	0	1,100	1,100	637	319	463
3-Southern Terminal near IPP (DO2)	III	0	0	18	18	0	0	18	18	0	0	0
3-Substation near IPP (DO3)	III	0	0	43	43	0	0	43	43	0	0	0

[1] Limited Revegetation Potential.

Source: NRCS 2011.

surface disturbance would be similar; however, the location of disturbance would change. Similar impacts would be expected as described for the Northern Terminal. The southern substation at Eldorado Valley would be sited within one of the two terminal sites as described under the proposed action, therefore impacts would be the same as described for the proposed action.

Design Option 3 – Phased Build Out

Under Design Option 3, an additional substation would be constructed. Construction of Design Option 3 would entail construction of an additional Substation near IPP. Design Option 3 would result in the same acres of disturbance to soil resources as described for the Proposed Action. The phased build out would result in similar impacts to soil resources as described in Section 3.3.6.2, Impacts Common to all Alternative Routes and Associated Components. Phasing the construction would not have a direct effect to impacts on soil resources.

Operation Impacts

Because the entire site would be treated with a soil sterilizer (to prevent vegetation growth) and graveled, soil productivity and quality would be permanently altered. Soil compaction within the fenced areas and access road would continue due to continued movement of operation and maintenance vehicles and equipment. Soil contamination could occur due to potential spills. A Spill Prevention, Notification, and Clean-up Plan would be prepared as part of the COM Plan (TWE-57). Runoff and erosion would increase due to maintained compaction; however the BMPs described above for construction would help to reduce these impacts. In addition, BMPs PHS-9 through 17 would reduce the potential for hazardous waste release.

Decommissioning

If a terminal, substation, or regeneration station is no longer required, the buildings, structures and equipment would be dismantled and removed from the site. Reclamation of terminals and substation facilities would be difficult due to the sterilization of soils. Long-term topsoil stockpiles would result in a decrease in soil productivity and quality in the constructed long-term stockpiles. BMP GEN-14 would require the removal of gravel work pads. Additional mitigation measures **S-1**, **S-2**, **S-3**, and **S-4** are recommended to further mitigate impacts during reclamation and decommissioning.

S-4*: During decommissioning, where a soil sterilizer has been applied, sterile soils will be removed prior to the replacement of topsoil and seeding.*

Effectiveness: Removing chemically sterile soils before applying topsoil would help with revegetation success, should a terminal be decommissioned. Long-term soil quality and productivity would be altered at these sites, but through the application of BMPs, applicant committed design features, and additional mitigation, revegetating and reclaiming these sites to their original uses would be possible.

3.3.6.2 Impacts Common to all Alternative Routes and Associated Components

Potential direct and indirect effects related to construction, operation, maintenance, and decommissioning on soil resources are discussed below. If impacts remain after the application of applicant committed design features and BMPs and stipulations, additional mitigation is recommended to reduce or mitigate impacts.

Construction Impacts

In general, the impacts associated with construction of the transmission line would be temporary. Temporary disturbances would occur within the 250-foot-wide transmission line ROW from construction traffic along the ROW, material storage yards, batch plant sites, temporary staging areas, and work areas around each structure.

Direct impacts to soil resources would include the clearing or crushing of surface cover within the 250-foot-wide transmission line ROW (vegetation, duff, litter). Vegetation clearing would consist of cutting all vegetation over 6 feet in height within the 250-foot-wide transmission line ROW and leaving the stumps in place for erosion control. Trampling is defined as leaving vegetation under 6 feet in height in the 250-foot-wide transmission line ROW, and driving over the vegetation with construction equipment. Where woody material is chipped and left on the 250-foot-wide transmission line ROW, it may act as erosion control, providing the wood chips do not exceed 3 inches in depth. The effects of wood chip additions (at a 3-inch depth) on the soil resource include: increased soil temperature in the winter, moderate increase in soil moisture, and substantial decrease in soil nitrogen supply and understory vegetation. The increase in soil temperature and soil moisture would have relatively minor ecological effects. However, reductions in the soil N supply may temporarily reduce productivity of the soil and affect revegetation rates (Binkley et al. 2003). With increasing depth of woodchips, these impacts will increase in magnitude and duration.

Grading and leveling would be required to construct structures and for temporary work areas, staging areas, fly yards, and concrete batch plants, with the greatest level of effort required on more steeply sloping areas. During construction, the soil profiles would be mixed with a corresponding loss of soil structure. BMPs that would reduce impacts associated with grading include:

- SOIL-1 requires the salvage, safeguarding, and reapplication of topsoil from all excavations and construction activities.
- SOIL-2 requires site-specific and specialized construction techniques for areas of steep slopes, biological soil crusts, erodible soil, and stream channel crossings.
- SOIL-3 requires the applicant to backfill foundations and trenches with originally excavated material as much as possible. Excess excavation materials should be disposed of by the applicant only in approved areas.

Soil compaction would result from the movement of heavy equipment and vehicles during construction activities. Soil compaction and a reduction in ground cover would lead to an increase in bulk density, increased runoff, and erosion. Mitigation measure **S-1**, **S-2**, and **S-3** would help to prevent or mitigate compaction to the depth of compaction, as described in Section 3.3.6.1. Rutting or soil mixing could occur when soils are saturated. Rutting affects the surface hydrology of a site as well as the rooting environment. The process of rutting reduces the aeration and infiltration of the soil, thereby degrading the rooting environment. Rutting may result in soil mixing of topsoil and subsoil, thereby reducing soil productivity. Rutting also disrupts natural surface water hydrology by damming surface water flows or by diverting and concentrating water flows creating accelerated erosion. Soil mixing typically results in a decrease in soil fertility and a disruption of soil structure. Additional mitigation measure **S-5** would help to reduce the potential for rutting and soil mixing. The potential for erosion would increase through the loss of vegetation cover as compared to an undisturbed state. Reclamation and erosion control would be difficult on soils that occur on steeper sloping areas (15 percent or more), particularly those steeper sloping areas over shallow soils (20 inches or less to bedrock). Steep slopes crossed by the project alternatives are shown in Section 3.2 on **Figures 3.2-2**, **3.2-6**, and **3.2-11**.

S-5*: Surface activities are prohibited when soils or road surfaces become saturated to a depth of 3 inches or less if mixing of the topsoil and subsoil will occur or the soil surface becomes unsafe for vehicular travel.*

Effectiveness: This measure would reduce the potential for mixing of topsoil and subsoil and reduce the potential for soil displacement, compaction, and rutting.

Soils with unfavorable properties, including thin topsoil layers, moderate to strong salinity and alkalinity, very clayey or sandy surface or subsoils, and shallow depths over bedrock are common and would present problems for erosion control and revegetation. Badlands also would present reclamation challenges due to the difficulty in stabilization of disturbances in these areas. Based on structure spacing of 700 to 1,500 feet, sensitive areas (such as hydric soils or badlands) could generally be spanned.

Surface restoration would occur as required by the landowner or managing agency, returning the disturbed areas back to their natural contour, reseeding, and installing erosion control if necessary (TWE 13). Runoff from excavated areas would be controlled (TWE 22). Areas that do not require re-contouring would have vegetation left in place wherever possible to maintain vegetation roots and increase soil stability (TWE 27). BMPs such as silt fences and check dams would further minimize this impact by trapping sediments or slowing the flow (BMP WAT-9).

***S-6**: During construction, erosion control measures will be inspected after every storm event and maintained.*

Effectiveness: Erosion controls are only effective if they are maintained. Monitoring of erosion controls after storm events would keep erosion control in effective working order and reduce or prevent sediment from moving off-site. Implementation of design features, BMPs, and mitigation measure **S-6** would effectively control erosion from disturbed areas reducing the loss of surface soils and potential sedimentation effects.

Long-term impacts to vegetation are anticipated associated with regular vegetative clearing, specifically in areas with deciduous or coniferous tree species. Modifying vegetation types (e.g. converting a forested area to grass) would modify soil productivity and soil development. BMPs REST-1 and -2 would require reclamation of vegetation, species composition, and diversity. Although long-term soil productivity would be altered, nutrient cycling would continue due to the continual addition of leafy vegetative litter associated with grass or shrub species.

While the exact locations of access roads are not known, general impacts associated with construction of access roads are described in the subsequent text. Access road construction typically would occur within the 2-mile transmission line corridor as described in **Appendix D**, Section 3. A summary of soil characteristics within the corridor is provided in the discussion specific to each region below. Construction of new access roads would begin with vegetation removal. Smaller vegetation would be lopped and scattered outside the road construction area. For bladed roads, topsoil would be removed and salvaged from the road construction area as required by the appropriate land management agency or private landowner. Topsoil would be stored adjacent to the road or in a nearby workspace. Topsoil would be prone to erosion until adequate erosion controls are applied or topsoil piles are revegetated. Where the topography is relatively flat and grading occurs, soil mixing would be limited to the upper subsurface soil horizons. Where cut and fill slopes occur, the deeper subsurface soil profiles would be mixed with a corresponding loss of soil structure. Soil compaction would considerably impact the upper profile subsoils immediately beneath the road surface but also would impact subsurface soils at a greater depth if fine textured soils are present. Soil compaction would result in a corresponding loss of infiltration, permeability, and soil aeration. Runoff and soil erosion would increase as a result of compaction, particularly on steeper grades such as Category 5 and 6 roads described in **Appendix D**, Section 3. Where road surfacing is applied, this impact would be reduced. As needed, the access roads would be bladed/graded to allow for safe access and construction, which would loosen soils and make them susceptible to erosion. An indirect effect of new access roads is an opportunity for increased access by recreational users. Where public access is increased an increase in bare ground would be expected, along with additional compaction, erosion, sedimentation, and a decline in soil quality.

TWE has committed to install appropriate erosion control devices to prevent erosion or loss of the topsoil, including measures to prevent wind erosion and fugitive dust, and silt fencing to prevent sediment runoff. In addition, TWE has committed to develop an Erosion Control Plan (TWE-19). Access road construction would be avoided on steep hillsides and near watercourses where alternate routes provide adequate access. Where long term surface occupancy occurs (facility sites, permanent roads, etc.), access roads would be upgraded and maintained as necessary to prevent soil erosion and accommodate year round traffic; all disturbed areas unnecessary to operations would be stabilized, and all disturbed areas outside the work area would be seeded with an agency approved seed mixture. Erosion controls such as jute netting, silt fences, and check dams would further minimize erosion and sedimentation impacts (WAT-9).

***S-7**: Permanent access roads would not be constructed on slopes over 25 percent.*

Effectiveness: Accelerated erosion and road failure increases on steep slopes. This mitigation measure is a preventive measure to reduce impacts associated with access roads. Implementation of mitigation measures, design features, and BMPs would effectively reduce or minimize runoff and accelerated erosion from roads.

***S-8**: Temporary and permanent access roads would be gated to restrict motorized use by the public. In some instances, other methods may need to be employed to prevent public access. After construction is complete, permanent access roads would remain gated at the land management agency or landowner's discretion. If the road is no longer needed for operations, it would be obliterated with the following procedures:*

1. Remove all stream crossings and restore stream banks to natural contours;
2. Reestablish natural drainage patterns;
3. Decompact the road surface by subsoiling along the entire disturbed length;
4. Recontour the road prism to the original land contours;
5. Seed with an agency or landowner approved seed mixture; and
6. Gates and closure signage should be left in place until adequate regeneration/rehabilitation occurs.

Effectiveness: Implementation of gating and other closure methods would help to reduce public access and impacts associated with trespass.

Borrow pits would be stripped of topsoil to a depth of approximately 6 inches. Stripped topsoil would be stockpiled and, upon completion of borrow excavation, spread to a uniform depth of 6 inches over the areas from which it was removed. Before replacing topsoil, excavated surfaces would be reasonably smooth and uniformly sloped. The sides of borrow pits would be brought to stable slopes with slope intersection shaped to carry the natural contour of adjacent undisturbed terrain into the pit to give a natural appearance. When necessary, borrow pits would be drained by open ditches to prevent accumulation of standing water. Topsoil excavation, transport, storage, and redistribution would modify existing microbial populations and soil structure, generating adverse impacts relative to aeration and permeability. It is likely that some mixing of textural zones would occur. Topsoil would be re-spread over the remaining subsoils and seeded. Subsoils in the arid west have the potential to have an increase in saline, sodic, and/or strongly alkaline materials. Depending on the amount of topsoil that is re-spread, this may create adverse chemical impacts to soils for seedbeds. Due to these probable effects, the initial soil quality of reconstructed seedbeds and root zones would be less than that of the existing soil resources. Agency BMPs would require the applicant to obtain borrow (fill) material only from authorized sites. Existing sites should be used in preference to new sites. One BMP (see **Appendix C**) requires all suitable topsoil to be stripped from the surface of the location and stockpiled for reclamation once the location is abandoned. When topsoil is stockpiled on slopes exceeding five percent, construct a berm or trench below the stockpile. BMP SOIL-4 would require the applicant to obtain borrow (fill) material only from authorized sites. Existing sites would be used in preference to new sites. Although topsoil would be stripped at all disturbed sites there is still potential for site specific impacts to soil quality at borrow sites. Additionally, a depression would be left ultimately changing the hydrologic regime at the site.

Soil contamination could result from material or fuel spills during construction activities. If large spills occur, contamination could result in the removal and disposal of large amounts of soil. Saturated soils have the potential to disperse contaminants to groundwater or surface water. BMPs PHS-9 through -17 and design features TWE-57 through -62 would reduce the potential for hazardous waste release along the ROW. The application of design features and BMPs would help to reduce the risk of an accidental spill or release

of hazardous materials. The BMPs and design features may not fully prevent soil contamination, but they would reduce the potential for soil contamination and help to meet state and federal requirements.

Construction of the transmission line would result in areas of localized permanent impacts associated with the structure foundations and regeneration sites. Localized long-term impacts to soils would result from loss of surface lands and soil productivity and quality due to installation of structure foundations. Losses of prime farmland could occur if structure foundations or facilities are required in prime farmlands. Acreage of permanent disturbance associated with each alternative is described in Section 3.3.6.9, Irreversible and Irretrievable Commitment of Resources.

In areas where single shaft tubular steel pole structures are used, increased volumes of excavated subsoil spoils may require spreading beyond the general disturbance area. In these areas, topsoil would be salvaged and set aside to be placed over the subsoil material during restoration. Spoil material would be used for backfill where suitable, and the remainder would be spread at the structure site or along graded access roads or in locations previously agreed upon by the Applicant and the appropriate land management agency or private landowner. Subsoils in the arid west are commonly characterized as having high pH, salts, and sodium. If excess subsoils are spread or redistributed on the soil surface undesirable chemical or physical soil characteristics could create adverse impacts to soil quality for seedbeds and reclamation. BMP SOIL-1 would require TWE to salvage, safeguard, and reapply topsoil from all excavations and construction activities. Additionally foundations and trenches must be backfilled with the originally excavated material to the extent possible. Excess excavation materials should be disposed of by the applicant only in approved areas (SOIL-3).

S-9*: Excess subsoil that is excavated for foundations would not be spread on the soil surface (on top of topsoil) or on access roads. Excess subsoil would be disposed of in accordance with federal, state, and local requirements.*

Effectiveness: If soil mixing of topsoil and subsoil is successfully prevented the soil quality and productivity of native topsoil would be maintained. Implementation of BMPs and mitigation measure **S-9** would prevent the contamination or dilution of topsoil with physical or chemically unsuitable subsoil materials.

These following project facilities would be within the 250-foot-wide transmission line ROW and the soils encountered at these sites are discussed by region and alternative below. Two ground electrode facilities are proposed, one connecting to the Northern Terminal and one connecting to the Southern Terminal. The ground electrode facilities would result in a long-term soil disturbance of approximately 0.5 acre at each location. The center of the electrode containing the control house would be fenced. Permanent impacts to soil quality and productivity would be expected within the fenced area. The ground electrode site at Mormon mesa is situated on old soils that contain thick petrocalcic horizons. Over time carbonates have been transported into the subsoil by water that precipitates the carbonates in the subsoil upon evaporation, eventually forming a massive, continuous layer of cemented carbonates. These soils may pose construction challenges and would be corrosive to concrete and metal. Agricultural land uses outside the fenced area, such as grazing and cultivated crops, would be permissible.

Communication regeneration sites would consist of small buildings located within a fenced graveled site. In total, approximately 15 to 20 regeneration sites would be required for the proposed TWE Project. In most cases, the regeneration communication sites would be located within the 250-foot-wide transmission line ROW and typically would be 100 feet by 100 feet in size. The communication regenerations sites would result in a long-term disturbance to soil resources due to the soils being taken out of production and compacted resulting in a long-term loss of soil productivity.

At the conclusion of construction activities, TWE has committed to disk compacted soils in cultivated agricultural areas and scarify road surfaces being reclaimed. Disking does not mitigate compaction, but would break up large soil clods near the surface and help to prepare the seed bed. Scarification breaks up the surface layer of soil and is not an adequate decompaction tool except on shallow soils. On deeper

soils, compaction would remain at depth and water would infiltrate through the soil surface but would not penetrate the compacted subsoil layer. This would result in a lateral subsurface flow of water, which could carry surface soil with it on sloping areas. In addition, **S-3** would require decompaction to the depth of compaction. Additionally, GEN-14 would require the removal of gravel work pads that were used during construction.

At all permanent facilities, BMP SOIL-1 would require topsoil salvage, safeguarding, and reapplication from all excavations and construction activities. GEN-14 would require the removal of gravel work pads that were used during construction. AIR-1 would help to protect salvaged topsoil from erosion and degradation.

***S-10**: Prime farmlands will be avoided to the extent possible for permanent project facilities and structure foundations.*

Effectiveness: Avoidance of prime farmlands for structures or permanent Project facilities would reduce but not fully mitigate the loss of prime farmlands. It may not be possible to completely avoid prime farmlands. Where Project facilities or structure foundations impact prime farmland, the soil resources would be lost and permanently removed from production.

Interim reclamation would occur after construction activities are complete. Reclamation failure, consisting of unsuccessful revegetation efforts, substantial soil erosion, or slumping, would be handled in accordance with each agency's specific guidelines (**Appendix C**) or landowner requirements.

Operation Impacts

Traffic on native surface roads during operations would result in soil compaction or rutting if soils are saturated. Rutting occurs when the soil strength is not sufficient to support the applied load from vehicle traffic. Rutting disrupts surface water hydrology by diverting and concentrating water flows and would cause accelerated erosion and sedimentation to connected waterbodies. If permanent access roads do not have adequate erosion controls or the roads are not properly maintained, the roads would degrade and erode. Where long-term access is required for maintenance of the line, TWE has committed to maintain the approved access roads in a safe, useable condition, as directed by an authorized officer from the appropriate land management agency or private landowner.

***S-11**: Permanent erosion control measures will be installed on all project access roads used for operations and maintenance. Erosion control measures will be inspected and maintained bi-annually.*

Effectiveness: The construction of permanent erosion control on all project access roads required for operations and maintenance would reduce the potential for off-site impacts associated with erosion and sedimentation to nearby waterways. In addition, it would help to prevent road washout, rilling, and down-cutting. If permanent erosion controls are installed and maintained on permanent access roads it would reduce the potential for degradation of native surface roads and sedimentation issues off-site.

Any surface disturbing activities along the ROW for operations or maintenance, would result in the reduction of protective soil cover such as vegetation, duff, and litter due to trampling or removal. Travel along the ROW would cause soil compaction, which would result in a corresponding loss of infiltration, permeability, and soil aeration. Runoff and soil erosion would increase as a result of compaction and a reduction in soil cover. Potential soil productivity impacts would result during maintenance operations along the ROW or at aboveground facilities from wind and water erosion of topsoil or soil mixing. These activities would occur intermittently and impacts would be localized to areas where maintenance occurs.

Where new access roads are built and maintained for operations there is some potential for indirect impacts to soil resources by trespass of the public onto the access roads. Access roads could provide access to the 2-mile transmission line corridor and to previously inaccessible areas along the length of the

road. This is particularly evident where the natural vegetation levels are low and large open areas occur. Evidence of unauthorized cross country travel remains long after it occurs and subsequent users would follow the tracks increasing the potential for loss of vegetation, soil compaction and erosion in areas where no roads previously existed.

Soil contamination could occur during maintenance activities due to fuel or lubricant spills. If spills occur along the ROW they would result in localized impacts and could result in removal of contaminated soils.

BMPs and design features that would reduce impacts to soil resources during operation include the following:

- PHS-11 would require secondary containment for all on-site hazardous materials and waste storage areas.
- PHS-12 would ensure that wastes are properly containerized and removed periodically for disposal at appropriate off-site permitted disposal facilities.
- PHS-13 would require the applicant to initiate spill cleanup procedures and document the event, including a cause analysis; appropriate corrective actions taken; and a characterization of the resulting environmental or health and safety impacts. Documentation of the event should be provided to the land management agency's authorized officer and other federal and state agencies, as required.
- TWE-57: A Spill Prevention Notification and Clean-up Plan would be developed. The Plan would address compliance with all applicable federal, state, and local regulations, and would include: spill prevention measures, notification procedures in the event of a spill, employee awareness training, and commitment of manpower, equipment, and materials to respond to spills, if they occur.
- TWE-58: A Pesticide Use Plan would be developed. The Plan would address compliance with all applicable federal, state and local regulations.
- TWE-59: A Clean-up Work Management Plan would be developed. The plan would address on-site excavation of contaminated soils and debris and would include: identification of contaminants, methods of excavation, personnel training, safety and health procedures, sampling requirements, management of excavated soils and debris, and disposal methods.
- TWE-61: A Hazardous Materials Management Plan would be developed. Hazardous materials would not be drained onto the ground or drainage areas. Totally enclosed containment would be provided for all trash. All construction waste including trash and litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials would be removed to a disposal facility authorized to accept such materials.
- TWE-62: If a reportable release of hazardous substance occurs at the work site, the Contractor would immediately notify the Applicant and all environmental agencies, as required by law. The Contractor would be responsible for the clean-up.

The application of design features and BMPs would help to reduce the risk of an accidental spill or release of hazardous materials. The BMPs and design features may not fully prevent soil contamination, but they would reduce the potential for soil contamination and help to meet state and federal requirements.

Decommission Impacts

Impacts during decommissioning would be similar to the impacts described for the construction phase of the project. During decommissioning, conductors, insulators, and hardware would be dismantled and removed from the ROW. Structures would be removed and foundations removed to below-ground surface. The 250-foot-wide transmission line ROW would have similar impacts to what is described for the construction phase of the project. TWE proposes to abandon foundations in place or just below the ground

surface. This would result in permanent site specific impacts to soils. BMP GEN-16 would require all foundations to be removed to a minimum depth of 3 feet. Any concrete foundation left below the subsurface of the soil would create an artificial impervious layer that would change the hydrologic function of the soil. Additionally, it creates an artificial plane of weakness above the foundation creating potential for mass wasting. If terminals, substations, or regeneration stations are no longer required, the buildings, structures, and equipment would be dismantled and removed from the site. Foundations would be either abandoned in-place or cut off below ground level and buried. If foundations are abandoned in place there would be a permanent loss of soil resources at these locations. The ground electrode site at Morman Mesa is situated on old soils that contain thick petrocalcic horizons. These soils may pose reclamation challenges during decommissioning due to high carbonates and shallow to moderately deep eolian soils.

***S-12**: All concrete foundations will be removed during decommissioning, unless they are permanently anchored into stable bedrock.*

Effectiveness: Removal of the concrete foundations would reduce the potential for mass wasting and erosion of the soil above the concrete foundation. It also would allow for natural root growth of vegetation. If the concrete foundation is completely removed it would help to restore the hydrologic function of the soil back to its original state. This would increase the potential for reclamation success.

Decommissioning and reclamation of access roads following abandonment would be completed in accordance with the landowner's or land agency's direction.

***S-13**: Follow-up seeding using native seed or corrective erosion control measures are required on areas of surface disturbance that experience reclamation failure.*

Effectiveness: In locations where reclamation is unsuccessful, follow-up revegetation efforts would help to restore soil productivity and prevent the loss of topsoil.

BMPs and design features that would reduce impacts to soil resources during decommissioning include the following:

- BMP REST-1: topsoil removed during decommissioning activities shall be salvaged and reapplied during final reclamation; all areas of disturbed soil shall be reclaimed using weed-free native shrubs, grasses, and forbs or other plant species approved by the land management agency; grades would be returned to pre-development contours to the greatest extent feasible.
- BMP MIT-3: the decommissioning plan would include a site reclamation plan and a monitoring program.
- BMP GEN-14: Gravel work pads would be removed and disposed.
- GEN-16: equipment, components, and aboveground structures must be cleaned and removed from the site for reclamation, salvage, or disposal; all below-ground components would be removed to a minimum depth of 3 feet to establish a root zone free of obstacles.
- TWE-3: the COM Plan will include a mitigation monitoring plan that will address how each mitigation measure required by permitting agencies in their respective decision documents and permits will be monitored for compliance.

Measures **S-1**, **S-2**, **S-3**, **S-4**, **S-6**, **S-8**, **S-9**, and **S-12** as described in Sections 3.3.6.1 and 3.3.6.2 would be recommended to mitigate impacts associated with decommissioning. The application of BMPs, design features, and additional mitigation would reduce impacts to soil resources.

3.3.6.3 Region I

Region I would have impacts similar to what is described in Section 3.3.6.2, Impacts Common to all Alternative Routes and Associated Components. **Table 3.3-4** provides a summary of the data sources used for analysis in Region I. As stated in Section 3.3.2, detailed order 3 SSURGO soil survey data were utilized where available; all other areas were characterized using U.S. General Soil Map data. **Table 3.3-5** provides a comparison of impacts associated with the construction and operation of alternative routes in Region I. **Table 3.3-6** provides details of water erosion-prone soils impacted by construction and operation by watershed (HUC10; NRCS et al. 2010).

Table 3.3-4 Region I Data Sources Used for Analysis

Alternatives	Miles		Total Miles[1]	Percentage	
	SSURGO	GSM		SSURGO	GSM
Alternative I-A	111	44	155	71	29
Alternative I-B	104	55	159	66	34
Alternative I-C	162	24	186	87	13
Alternative I-D	123	49	171	72	28
Connectors					
Mexican Flats	8	2	10	83	17
Baggs	6	17	22	26	74
Fivemile Point North Alternative Connector	3	0	3	100	0
Fivemile Point South Alternative Connector	2	0	2	100	0

[1]Discrepancies in totals due to rounding error.

Table 3.3-5 Summary of Impacts to Soils by Alternatives in Region I

Parameter	Alternative I-A		Alternative I-B		Alternative I-C		Alternative I-D	
	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)
Water Erosion-Prone	259	69	271	68	301	75	269	65
Wind Erosion-Prone	231	60	239	57	270	72	238	56
Compaction-Prone	579	150	525	133	947	237	706	169
LRP[1]	741	187	786	184	558	129	913	208
Hydric[2]	0	0	0	0	7	2	0	0
Prime Farmland	129	37	136	36	293	80	136	36
Shallow Bedrock[3]	274	70	211	49	288	63	348	79
Risk of Corrosion (Concrete)	330	86	358	88	256	64	359	89
Risk of Corrosion (Steel)	1,113	287	1,108	266	1,243	309	1,089	256
Shallow Excavation Limitations	570	155	612	150	819	214	497	127
Small Commercial Building Limitations	762	207	731	184	1,178	310	681	173
Expansive Soils	213	57	187	49	350	91	283	69

[1] Limited Revegetation Potential.

[2] Wet Soils.

[3] Lithic Bedrock 60 inches or less from the soil surface.

Source: NRCS 2011.

Note: GSM data did not have interpretations for hydric soils, shallow excavations, small commercial buildings, or prime farmland. Percentages for these interpretations exclude areas with only GSM data.

Table 3.3-6 Project Impacts to Water Erosion-Prone Soils by Watershed in Region I

General Region I		I-A		I-B		I-C		I-D		Tuttle Easement Micro-siting Option 1		Tuttle Easement Micro-siting Option 1 - Comparison		Tuttle Easement Micro-siting Option 2		Tuttle Easement Micro-siting Option 2 - Comparison		Tuttle Easement Micro-siting Option 3		Tuttle Easement Micro-siting Option 3 - Comparison		Mexican Flats Alternative Connector		Baggs Alternative Connector		Fivemile Point North Alternative Connector		Fivemile Point South Alternative Connector	
HUC10	Watershed	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)
1405000505	Crooked Wash-White River	1	0	1	0	1	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0								
1405000204	Deception Creek-Yampa River					23	6																						
1405000111	Dry Creek-Yampa River					26	7																						
1405000106	Elkhead Creek					13	3																						
1405000107	Fortification Creek					61	15																						
1405000305	Fourmile Creek					46	11																						
1404020004	Frewen Lake	1	0	0	0	10	2	1	0																				
1405000309	Greasewood Gulch-Little Snake River	73	21	78	20			78	20	79	22	74	18	80	22	74	18	80	22	74	18								
1405000206	Hells Canyon-Yampa River	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1								
1018000210	Iron Springs Draw-North Platte River	0	0	0	0	0	0	0	0																				
1405000308	Little Snake River-Powder Wash	37	10	35	9			40	10	1	0	1	0	1	0	1	0	1	0	1	0			25	5				
1405000302	Little Snake River-Willow Creek					16	4	0	0															27	7			1	0
1405000403	Lower Muddy Creek					18	4	6	1															9	2	14	1		
1405000307	Lower Sand Creek	18	5	23	5			36	6															18	5				
1405000202	Morgan Gulch-Yampa River					36	9																						
1405000311	Outlet Little Snake River	0	0																										
1405000402	Red Wash	13	3	15	3	1	0	1	0													4	1						
1405000310	Sand Wash	2	1																										
1405000205	Spring Creek-Yampa River	16	4	13	4	25	7	13	4	18	4	13	4	10	3	13	4	11	3	13	4								
1018000213	Sugar Creek	48	11	48	11	48	11	48	11																				

Table 3.3-6 Project Impacts to Water Erosion-Prone Soils by Watershed in Region I

General Region I		I-A		I-B		I-C		I-D		Tuttle Easement Micro-siting Option 1		Tuttle Easement Micro-siting Option 1 - Comparison		Tuttle Easement Micro-siting Option 2		Tuttle Easement Micro-siting Option 2 - Comparison		Tuttle Easement Micro-siting Option 3		Tuttle Easement Micro-siting Option 3 - Comparison		Mexican Flats Alternative Connector		Baggs Alternative Connector		Fivemile Point North Alternative Connector		Fivemile Point South Alternative Connector	
HUC10	Watershed	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)
1405000401	Upper Muddy Creek					1	0	0	0															0	0						
1405000306	Upper Sand Creek			6	1																										
1404020013	Upper Separation Creek	47	12	47	12	58	14	47	12																						
1405000701	Wolf Creek	60	16	60	16	60	16	60	16	53	13	60	16	53	13	60	16	53	13	60	16										

Notes: Discrepancies in totals may occur due to rounding.
Blanks denote no impacts.

Source: NRCS 2011; NRCS et al. 2010.

Alternative I-A (Applicant Proposed)

Key Parameters Summary

Detailed SSURGO data were analyzed on approximately 71 percent of Alternative I-A. The remaining 29 percent was analyzed using U.S. GSM data. The primary constraints for Alternative I-A during construction would be disturbance of 741 acres of soils with limited revegetation potential and 579 acres of compaction prone soils. Mitigation measures **S-1**, **S-2**, **S-3**, **S-5**, **S-9**, and **S-13** would help to reduce impacts on these soils and increase the potential for revegetation. Soils with limitations associated with the risk of corrosion to steel are prevalent along this route (1,113 acres); however the effects of corrosion on steel structures would be offset by the use of protective coating and cathodic protection. No substantive effect is expected related to corrosion.

Alternative I-B

Key Parameters Summary

Detailed SSURGO data were analyzed on approximately 66 percent of Alternative I-B. The remaining 34 percent was analyzed using U.S. GSM data. The primary constraints for Alternative I-B during construction would be disturbance of 786 acres of soils with limited revegetation potential and 525 acres of compaction prone soils. Mitigation measures **S-1**, **S-2**, **S-3**, **S-5**, **S-9**, and **S-13** would help to reduce impacts on these soils and increase the potential for revegetation. Soils with limitations associated with the risk of corrosion to steel are prevalent along this route (1,108 acres); however the effects of corrosion on steel structures would be offset by the use of protective coating and cathodic protection. No substantive effect is expected related to corrosion.

Alternative I-C

Key Parameters Summary

Detailed SSURGO data were analyzed on approximately 87 percent of Alternative I-C. The remaining 13 percent was analyzed using U.S. GSM data. The primary constraints for Alternative I-C during construction would be disturbance of 558 acres of soils with limited revegetation potential and 947 acres of compaction prone soils. Mitigation measures **S-1**, **S-2**, **S-3**, **S-5**, **S-9**, and **S-13** would help to reduce impacts on these soils and increase the potential for revegetation. Soils with limitations associated with the risk of corrosion to steel are prevalent along this route (1,243 acres); however the effects of corrosion on steel structures would be offset by the use of protective coating and cathodic protection. No substantive effect is expected related to corrosion.

Alternative I-D (Agency Preferred)

Key Parameters Summary

Detailed SSURGO data were analyzed on approximately 72 percent of Alternative I-D. The remaining 28 percent was analyzed using U.S. GSM data. The primary constraints for Alternative I-D during construction would be disturbance of 913 acres of soils with limited revegetation potential and 706 acres of compaction prone soils. Mitigation measures **S-1**, **S-2**, **S-3**, **S-5**, **S-9**, and **S-13** would help to reduce impacts on these soils and increase the potential for revegetation. Soils with limitations associated with the risk of corrosion to steel are prevalent along this route (1,089 acres); however the effects of corrosion on steel structures would be offset by the use of protective coating and cathodic protection. No substantive effect is expected related to corrosion.

The Tuttle Easement micro-siting options 1, 2, and 3 would result in similar impacts to soil resources. In general, soil limitations along the micro-siting options 1, 2, and 3 are similar to Alternative I-D. However, micro-siting options 2 and 3 would impact more prime farmland soils than Alternative I-D.

Alternative Connectors in Region I

Table 3.3-7 summarizes the characteristics of soils that would be impacted by the various connectors and advantages associated with the alternative connectors in Region I.

Table 3.3-7 Summary of Region I Alternative Connector Impacts for Soils

Alternative Connector	Analysis	Advantage
Mexican Flats Alternative Connector	Approximately 2 acres of water erodible, 17 acres of wind erodible, 72 acres of LRP, 48 acres of compaction prone, and 52 acres of shallow soils would be impacted during construction if this alternative connector were used.	Less LRP, compaction prone, and erodible soils are located on the Alternative C route compared to the Alternative A or B route. Less compaction prone soils are located on Alternative A than on Alternative B. The connecter would help reduce impacts to the soils on Alterative A or B if the alternate connector was utilized. However, the acreage of soils disturbed would increase if the connector were used to cross over to the Alternative C route.
Baggs Alternative Connector	Approximately 64 acres of water erodible, 1 acres of wind erodible, 38 acres of soils with shallow bedrock, 167 acres of LRP, and 126 acres of compaction prone soils would be impacted during construction if this alternative connector were used.	This connector route would reduce the overall acres of soil resources impacted by Alternative C. This would be a benefit to soil resources.
Fivemile Point North Alternative Connector	Approximately 50 acres of LRP, 26 acres of compaction prone, and 26 acres of shallow soils would be impacted during construction if this alternative connector were used. No water or wind erosion-prone soils would be impacted.	This connector route would reduce the overall acres of soil resources impacted by Alternative C. This would be a benefit to soil resources.
Fivemile Point South Alternative Connector	Approximately 19 acres of LRP, 10 acres of compaction prone, and 5 acres of shallow soils would be impacted during construction if this alternative connector were used. No water or wind erosion-prone soils would be impacted.	This connector route would reduce the acres of soil resources impacted by Alternative C. This would be a benefit to soil resources.

Alternative Ground Electrode System Locations in Region I

Table 3.3-8 summarizes disturbance impacts associated with ground electrode systems in Region I.

Table 3.3-8 Summary of Region I Alternative Ground Electrode System Impacts (Acres)[1]

	Wind Erodible	Water Erodible	Compaction Prone	LRP	Hydric	Prime Farmland	Shallow Bedrock	Risk of Corrosion - Concrete	Risk of Corrosion - Steel	Shallow Excavations	Expansive Soils
Little Snake East (Alternatives I-A, I-B, and I-D)	207	19	67	19	0	0	72	19	250	506	0
Little Snake West (Alternative I-A)	90	0	299	253	0	0	0	274	494	213	21
Little Snake West (Alternatives I-B and I-D)	90	0	299	253	0	0	0	274	494	213	0

Table 3.3-8 Summary of Region I Alternative Ground Electrode System Impacts (Acres)[1]

	Wind Erodible	Water Erodible	Compaction Prone	LRP	Hydric	Prime Farmland	Shallow Bedrock	Risk of Corrosion - Concrete	Risk of Corrosion - Steel	Shallow Excavations	Expansive Soils
Separation Creek	0	39	112	320	0	0	127	233	339	0	16
Separation Flat (All Alternative Routes)	150	0	0	360	0	0	0	0	600	0	0
Shell Creek (Alternative I-B)	138	42	162	462	0	0	0	42	582	0	90
Eight Mile Basin	0	221	305	443	0	0	83	0	526	0	55

[1] Limited Revegetation Potential

[2] Wet Soils

[3] Lithic Bedrock 60 inches or less from the soil surface.

Note: Acreages are based on 600-acre siting areas, but much smaller areas within the siting areas would be required for the facilities as shown in Chapter 2.0, **Table 2-8**.

Region I Conclusion

As presented in **Table 3.3-5**, Alternative I-C would have the greatest impacts on soil resources. Alternative I-C would impact more compaction prone soils, hydric soils, prime farmland, soils prone to shrink-swell, wind and water erodible soils, soils with severe limitations associated with shallow excavations, and soils that are corrosive to steel than the other alternatives. Alternative I-D would impact more LRP, soils with shallow bedrock, and soils corrosive to concrete. In general, Alternative I-A and I-B would have the least overall impact on soil resources.

3.3.6.4 Region II

Region II would have impacts similar to those discussed in Section 3.3.6.2, Impacts Common to all Alternative Routes and Associated Components.

Soils within the San Rafael Swell and throughout the Green River and Grand Valley areas weathered from sedimentary materials (primarily shale, sandstone, and limestone deposits) containing large amounts of selenium, calcium carbonate, and soluble salts. These soils are susceptible to the development of large sinkholes, piping, and subsidence. In addition, these soils have limited revegetation potentials, are corrosive to both cement and steel structures, are highly susceptible to wind and water erosion, and surface puddling. Stabilization and revegetation of these soils following surface disturbance would be difficult.

Alternatives II-A, II-B, II-C, II-D, II-E, and II-F each cross areas of fine textured soils derived from the North Horn Formation. These soils weathered from calcareous claystone, siltstone, mudstone, deposits. During periods of high moisture, soils on steep slopes (**Figure 3.2-8**) become unstable resulting in soil creep, slumping, or large landslides. These soils create hazards for transmission line structures and associated facilities. In addition, where construction modifies the slope face (cut and fill) the incidence for slope failure increases. Landslide susceptibility and incidence in Region II is illustrated on **Figure 3.2-8**. Roads, structures, and facilities would risk damage and loss of service due to unstable soils hazards in Region II. Hazards associated with unstable soils and bedrock are discussed further in Section 3.2.6, Impacts to Geological, Mineral, and Paleontological Resources.

Alternatives II-A, II-D, and II-E each cross areas of sand dunes along segments 360 and 430. Dune lands consist of sand in ridges and intervening troughs that constantly shift with the wind. These soils are highly wind erodible. Blowouts may also be common in these areas and consist of areas from which all or most of the soil material has been removed by extreme wind erosion. Siting towers in these areas could result in towers being buried by dunes or blowouts at the tower site. Biological soil crusts are highly susceptible to disturbance, especially in sandy soils (Belnap and Gardner 1993). Recovery rates are generally slow, specifically for lichen and moss recovery, which can take 45 to 250 years respectively (Belnap and Gillette 1997). Losses of biological soils crusts would be expected where surface disturbance occurs. Surface roughness or crusts (biological or physical) would be damaged by construction activities (i.e., clearing, grubbing, excavation, vehicle traffic) and are likely to be susceptible to wind or water erosion even if they are not rated erosion prone. Disturbed soils that are not successfully reclaimed or stabilized are likely to lose productivity and the ability to sustain vegetation over the long term, which would reduce watershed health and contribute to sedimentation in surface water or degradation of local air quality. It is not possible to quantify or locate all of the areas where this may occur. Losses in soil productivity due to wind erosion are most likely to occur on soils that are saline or alkaline, fine-textured, and formed in some lake sediments.

BMPs that would reduce impacts to soil resources include the following: BMP PHS-6 (applicants would develop a comprehensive emergency plan that considers the vulnerabilities of their energy system to all credible events initiated by natural causes…); and BMP PHS-4 (health and safety program shall establish a safety zone or setback from roads and other public access areas that is sufficient to prevent accidents resulting from various hazards).

S-14*: TWE would avoid constructing in areas of unstable soils prone to slumping or mass wasting. Prior to construction, a hazard plan would be developed by TWE depicting the landslide-prone avoidance areas. This plan would be included in the POD submitted to the agencies for approval prior to the Notice to Proceed.*

Effectiveness: Avoidance of unstable slopes is the best way to prevent impacts to the transmission line and facilities associated with landslides, slumping, and soil creep. Avoidance of landslide prone soils would reduce but may not fully mitigate impacts associated with soils prone to slumping or soil creep. Catastrophic events may not always be predictable, but avoidance of known unstable areas would help to reduce impacts.

Table 3.3-9 provides a summary of the data sources used for analysis in Region II. As stated in Section 3.3.2, detailed order 3 SSURGO soil survey data were utilized where available; all other areas were characterized using U.S. GSM data. **Table 3.3-10** provides a comparison of impacts associated with the construction and operation of alternative routes in Region II. **Table 3.3-11** provides details of water erosion-prone soils impacted by construction and operation by watershed (HUC 10; NRCS et al. 2010).

Table 3.3-9 Region II Data Sources Used for Analysis

Alternatives	Miles		Total Miles[1]	Percentage	
	SSURGO	GSM		SSURGO	GSM
Alternative II-A	168	89	257	65	35
Alternative II-B	305	40	345	88	12
Alternative II-C	316	48	364	87	13
Alternative II-D	214	48	262	82	18
Alternative II-E	167	100	266	63	37

Table 3.3-9 Region II Data Sources Used for Analysis

Alternatives	Miles		Total Miles[1]	Percentage	
	SSURGO	GSM		SSURGO	GSM
Alternative II-F	173	94	267	65	35
Connectors					
Castle Dale Alternative Connector	11	0	11	100	0
Price Alternative Connector	18	0	18	100	0
Lynndyl	24	0	24	100	0
IPP East	3	0	3	100	0
Connector					
Highway 191	0	5	5	0	100
Variation					
Emma Park	15	20	35	42	58
Alternative II-F Comparable	0	32	32	0	100
Variations					
Strawberry A	0	74	74	0	100
Strawberry A comparable	0	74	74	0	100
Strawberry B	0	74	74	0	100
Strawberry B comparable	0	74	74	0	100
Strawberry C	0	74	74	0	100
Strawberry C comparable	0	74	74	0	100
Cedar Knoll A	23	5	28	81	19
Cedar Knoll A comparable	21	7	28	77	23
Cedar Knoll B	24	5	29	84	16
Cedar Knoll B comparable	21	7	28	76	23

[1] Discrepancies in totals due to rounding.

Table 3.3-10 Summary of Impacts to Soils by Alternatives in Region II

Parameter	Alternative II-A		Alternative II-B		Alternative II-C		Alternative II-D		Alternative II-E		Alternative II-F	
	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)
Water Erosion-Prone	194	73	580	159	612	160	252	75	246	75	257	79
Wind Erosion-Prone	247	58	152	38	167	38	280	68	247	57	210	53
Compaction-Prone	1,214	410	2,013	572	1,929	506	1,317	401	1,137	364	1,361	446
LRP[1]	1,092	325	1,921	494	2,351	605	1,081	291	1,045	278	1,247	356
Hydric[2]	50	13	73	19	74	17	26	7	36	9	51	12
Prime Farmland	347	95	413	117	484	120	279	90	278	85	178	62
Shallow Bedrock[3]	663	204	723	233	799	213	1,123	339	816	246	1,174	376
Risk of Corrosion (Concrete)	613	169	1,093	273	1,306	332	595	152	489	117	635	164
Risk of Corrosion (Steel)	2,347	723	3,263	914	3,283	836	2,460	722	2,352	694	2,473	776
Shallow Excavation Limitations	1,368	442	2,504	698	2,414	615	2,004	604	1,340	421	1,587	505
Small Commercial Building Limitations	1,559	499	2,878	796	2,856	731	2,206	660	1,493	465	1,775	556
Expansive Soils	592	208	706	202	600	152	489	148	526	176	609	205

[1] Limited Revegetation Potential

[2] Wet Soils

[3] Lithic Bedrock 60 inches or less from the soil surface

Source: NRCS 2011.

Note: GSM data did not have interpretations for hydric soils, shallow excavations, small commercial buildings, or prime farmland. Percentages for these interpretations exclude areas with only GSM data.

Table 3.3-11 Project Impacts to Water Erosion-Prone Soils by Watershed in Region II

General Region II		II-A		II-B		II-C		II-D		II-E		II-F		Emma Park Alternative Variation		Emma Park Alternative Variation - Comparison		Strawberry IRA Micro-siting Option 1		Strawberry IRA Micro-siting Option 1 - Comparison		Strawberry IRA Micro-siting Option 2		Strawberry IRA Micro-siting Option 2 - Comparison		Strawberry IRA Micro-siting Option 3		Strawberry IRA Micro-siting Option 3 - Comparison		Cedar Knoll IRA Micro-siting Option 1		Cedar Knoll IRA Micro-siting Option 1 - Comparison		Cedar Knoll IRA Micro-siting Option 2		Cedar Knoll IRA Micro-siting Option 2 - Comparison		Highway 191 Alternative Connector		Castle Dale Alternative Connector		Price Alternative Connector		Lynndyl Alternative Connector		IPP East Alternative Connector	
HUC10	Watershed	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)
1406000604	Agency Draw-Willow Creek							17	5			17	5																																		
1406000305	Antelope Creek							5	1	16	4	5	1																																		
1406000402	Avintaquin Creek											5	2			5	2																												
1406000705	Beaver Creek-Price River							13	5	44	11	13	5	24	9	13	5																												
1403000101	Bitter Creek			50	12	50	12																																						
1405000709	Bitter Creek			0	0	0	0																																						
1603000514	Chalk Creek					11	3																																						
1403000106	Cisco Wash			15	4	15	4																																						
1406000102	Cliff Creek	39	13					21	6	21	6	21	6																																
1406000708	Coal Creek-Price River			10	2			0	0					0	0																										1	0				
1403000104	Cottonwood Canyon			13	3	13	3																																						
1406000902	Cottonwood Creek			66	26	51	14																																		2	1				
1406000310	Cottonwood Creek-Dry Gulch Creek	4	1							4	1																																		
1406000710	Cottonwood Wash-Price River			0	0																																								
1405000711	Cottonwood Wash-White River							12	3	10	3	12	3																																
1405000710	Coyote Wash							97	23	57	13	97	23																																
1406000404	Currant Creek	8	3															8	3	8	3	8	3	8	3	8	3	8	3																
1406000707	Desert Seep Wash			70	14																																					8	2				
1602020203	Diamond Fork	0	0															0	0	0	0	0	0	0	0	0	0	0	0																
1405000705	Dripping Rock Creek-White River	14	3					14	3	14	3	14	3																																
1406000309	Dry Gulch Creek	0	0							0	0							0	0	0	0	0	0	0	0	0	0	0	0																
1406000315	Duchesne River									1	0																																		
1405000706	Evacuation Creek			1	0	1	0																																						
1406000903	Ferron Creek					56	16																																						

Table 3.3-11 Project Impacts to Water Erosion-Prone Soils by Watershed in Region II

General Region II		II-A		II-B		II-C		II-D		II-E		II-F		Emma Park Alternative Variation		Emma Park Alternative Variation - Comparison		Strawberry IRA Micro-siting Option 1		Strawberry IRA Micro-siting Option 1 - Comparison		Strawberry IRA Micro-siting Option 2		Strawberry IRA Micro-siting Option 2 - Comparison		Strawberry IRA Micro-siting Option 3		Strawberry IRA Micro-siting Option 3 - Comparison		Cedar Knoll IRA Micro-siting Option 1		Cedar Knoll IRA Micro-siting Option 1 - Comparison		Cedar Knoll IRA Micro-siting Option 2		Cedar Knoll IRA Micro-siting Option 2 - Comparison		Highway 191 Alternative Connector		Castle Dale Alternative Connector		Price Alternative Connector		Lynndyl Alternative Connector		IPP East Alternative Connector	
HUC10	Watershed	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)
1406000704	Gordon Creek							3	1																													12	4						
1406000709	Grassy Trail Creek			15	3																																										
1407000202	Headwaters Muddy Creek					16	5																																									
1406000901	Huntington Creek			44	16	35	7	14	5																													71	19						
1406000407	Indian Canyon									0	0	0	0			0	0																														
1407000201	Ivie Creek					61	17																																									
1603000501	Ivie Creek					5	1																																					0	0				
1406000803	Little Grand Wash			42	12	42	12																																									
1406000711	Little Park Wash-Price River			45	9	35	7																																									
1603000305	Lost Creek-Sevier River					33	9																																									
1406000801	Lost Spring Wash-Saleratus Wash			6	2	42	9																																									
1406000504	Lower Ninemile Creek							5	3			5	3																																			
1406000408	Lower Strawberry River	12	4															12	4	12	4	12	4	12	4	12	4	12	4																				
1401000519	McDonald Creek-Colorado River			10	3	10	3																																									
1603000512	Middle Sevier River			12	4	0	0					12	4																																			
1406000403	Middle Strawberry River	35	12															37	12	35	12	38	13	35	12	38	13	35	12																				
1406000706	Miller Creek																																										0	0				
1406000904	North Salt Wash					35	10																																									
1406000106	Pelican Lake-Green River	10	2							10	2																																				
1406000308	Pigeon Water Creek-Lake Fork River	18	7							5	1							18	7	18	7	18	7	18	7	18	7	18	7																				
1406000406	Rabbit Gulch	25	9															26	9	25	9	26	9	25	9	25	9	25	9																				
1406000405	Red Creek	25	8															25	8	25	8	25	8	25	8	25	8	25	8																				
1405000704	Red Wash-White River	23	6	1	0	1	0	23	6	23	6	23	6																																				

Table 3.3-11 Project Impacts to Water Erosion-Prone Soils by Watershed in Region II

General Region II		II-A		II-B		II-C		II-D		II-E		II-F		Emma Park Alternative Variation		Emma Park Alternative Variation - Comparison		Strawberry IRA Micro-siting Option 1		Strawberry IRA Micro-siting Option 1 - Comparison		Strawberry IRA Micro-siting Option 2		Strawberry IRA Micro-siting Option 2 - Comparison		Strawberry IRA Micro-siting Option 3		Strawberry IRA Micro-siting Option 3 - Comparison		Cedar Knoll IRA Micro-siting Option 1		Cedar Knoll IRA Micro-siting Option 1 - Comparison		Cedar Knoll IRA Micro-siting Option 2		Cedar Knoll IRA Micro-siting Option 2 - Comparison		Highway 191 Alternative Connector		Castle Dale Alternative Connector		Price Alternative Connector		Lynndyl Alternative Connector		IPP East Alternative Connector	
HUC10	Watershed	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)
1403000107	Sagers Wash			71	18	71	18																																								
1603000304	Salina Creek					102	29																																								
1403000501	Salt Wash			8	2	8	2																																								
1406000804	Salt Wash-Green River			30	8	30	8																																								
1406000702	Scofield Reservoir							28	10	2	1																																				
1406000505	Sheep Wash-Green River							20	5			20	5																																		
1603000401	Silver Creek	0	0	4	1			40	13	0	0	0	0																																		
1602020201	Soldier Creek	48	20							65	28	65	28					6	2	7	2	6	2	7	2	6	2	7	2	41	18	41	18	41	18	41	18										
1406000304	Strawberry River-Duchesne River	20	7							28	7							20	7	20	7	20	7	20	7	20	7	20	7																		
1406000805	Tenmile Canyon			11	3	11	3																																								
1602020202	Thistle Creek	72	35					1	1	72	35	72	35																	63	33	72	35	60	33	72	35										
1406000802	Tusher Wash-Green River			1	0	1	0																																								
1406000314	Uinta River	0	0							0	0																																				
1406000503	Upper Ninemile Creek							63	18	21	5	96	30	8	3	40	15																														
1406000501	Upper Pariette Draw							0	0			0	0																																		
1603000402	Upper San Pitch River			62	24			73	29																																						
1406000905	Upper San Rafael River					37	8																																								
1603000504	Upper Sevier River			0	0							0	0																															1	0		
1406000401	Upper Strawberry River	14	4															12	3	14	4	11	3	14	4	11	3	14	4																		
1406000105	Walker Hollow-Green River	80	32					10	2	36	10	10	2																																		
1602020101	West Creek	30	14	0	0			16	9	30	14	30	14																	16	7	17	7	16	7	17	7										
1401000517	West Salt Creek			80	22	80	22																																								
1403000102	Westwater Creek			38	10	38	10																																								
1403000108	Westwater Creek-Colorado River			33	9	33	9																																								

Table 3.3-11 Project Impacts to Water Erosion-Prone Soils by Watershed in Region II

General Region II		II-A		II-B		II-C		II-D		II-E		II-F		Emma Park Alternative Variation		Emma Park Alternative Variation - Comparison		Strawberry IRA Micro-siting Option 1		Strawberry IRA Micro-siting Option 1 - Comparison		Strawberry IRA Micro-siting Option 2		Strawberry IRA Micro-siting Option 2 - Comparison		Strawberry IRA Micro-siting Option 3		Strawberry IRA Micro-siting Option 3 - Comparison		Cedar Knoll IRA Micro-siting Option 1		Cedar Knoll IRA Micro-siting Option 1 - Comparison		Cedar Knoll IRA Micro-siting Option 2		Cedar Knoll IRA Micro-siting Option 2 - Comparison		Highway 191 Alternative Connector		Castle Dale Alternative Connector		Price Alternative Connector		Lynndyl Alternative Connector		IPP East Alternative Connector	
HUC10	Watershed	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)
1406000701	White River									38	10	25	6	22	7	15	4																																
1406000703	Willow Creek							17	7	11	3	26	10	13	5	26	10																													9	3				
1405000701	Wolf Creek	3	1	6	1	6	1	3	1	3	1	3	1																																		

[1] Discrepancies in totals due to rounding.

Note: Blanks denote no impacts.

Sources: NRCS 2011; NRCS et al. 2010.

Alternative II-A (Applicant Proposed)

Key Parameters Summary

Detailed SSURGO data were analyzed on approximately 65 percent of Alternative II-A. The remaining 35 percent was analyzed using U.S. GSM data. The primary constraints for Alternative II-A during construction would be disturbance of 1,092 acres of soils with limited revegetation potential and 1,214 acres of compaction prone soils. Mitigation measures **S-1**, **S-2**, **S-3**, **S-5**, **S-9**, **S-13**, and **VG-1** would help to reduce impacts on these soils and increase the potential for revegetation. Soils with limitations associated with the risk of corrosion to steel are prevalent along this route (2,347 acres); however, the effects of corrosion on steel structures would be offset by the use of protective coating and cathodic protection. No substantive effect is expected related to corrosion. Soil limitations within the analysis area related to shallow excavations include cutback caving, flooding, large stones, slope, and a cemented pan within the soil profile.

Along Alternative II-A are three micro-siting alternatives, Strawberry IRA Options 1, 2, and 3. For the Strawberry IRA micro-siting option, the soils located along Option 1, 2, and 3 have similar soil limitations to the soils located along Alternative II-A.

Alternative II-B

Key Parameters Summary

Detailed SSURGO data were analyzed on approximately 88 percent of Alternative II-B. The remaining 12 percent was analyzed using U.S. GSM data. The primary constraints for Alternative II-B during construction would be disturbance of 1,921 acres of soils with limited revegetation potential and 2,013 acres of compaction prone soils. Mitigation measures **S-1**, **S-2**, **S-3**, **S-5**, **S-9**, **S-13**, and **VG-1** would help to reduce impacts on these soils and increase the potential for revegetation. Soils with limitations associated with the risk of corrosion to steel are prevalent along this route (3,263 acres); however the effects of corrosion on steel structures would be offset by the use of protective coating and cathodic protection. No substantive effect is expected related to corrosion.

Alternative II-C

Key Parameters Summary

Detailed SSURGO data were analyzed on approximately 87 percent of Alternative II-C. The remaining 13 percent was analyzed using U.S. GSM data. The primary constraints for Alternative II-C during construction would be disturbance of 2,351 acres of soils with limited revegetation potential and 1,929 acres of compaction prone soils. Additionally Alternative II-C would cross Mancos shale outcrops near Rangely. Any soils derived from Mancos shale would be saline and difficult to reclaim. Mitigation measures **S-1**, **S-2**, **S-3**, **S-5**, **S-9**, **S-13**, and **VG-1** would help to reduce impacts on these soils and increase the potential for revegetation. Soils with limitations associated with the risk of corrosion to steel are prevalent along this route (3,283 acres); however the effects of corrosion on steel structures would be offset by the use of protective coating and cathodic protection. No substantive effect is expected related to corrosion.

Alternative II-D

Key Parameters Summary

Detailed SSURGO data were analyzed on approximately 82 percent of Alternative II-D. The remaining 18 percent was analyzed using U.S. GSM data. The primary constraints for Alternative II-D during construction would be disturbance of 1,081 acres of soils with limited revegetation potential and 1,317 acres of compaction prone soils. Mitigation measures **S-1**, **S-2**, **S-3**, **S-5**, **S-9**, **S-13**, and **VG-1** would help to reduce impacts on these soils and increase the potential for revegetation. Soils with limitations associated with the risk of corrosion to steel are prevalent along this route (2,460 acres); however the

effects of corrosion on steel structures would be offset by the use of protective coating and cathodic protection. No substantive effect is expected related to corrosion. Soil limitations within the analysis area related to shallow excavations include cutback caving, flooding, large stones, slope, and a cemented pan within the soil profile.

Alternative II-E

Key Parameters Summary

Detailed SSURGO data were analyzed on approximately 63 percent of Alternative II-E. The remaining 37 percent was analyzed using U.S. GSM data. The primary constraints for Alternative II-E during construction would be disturbance of 1,045 acres of soils with limited revegetation potential and 1,137 acres of compaction prone soils. Mitigation measures **S-1**, **S-2**, **S-3**, **S-5**, **S-9**, **S-13**, and **VG-1** would help to reduce impacts on these soils and increase the potential for revegetation. Soils with limitations associated with the risk of corrosion to steel are prevalent along this route (2,352 acres); however the effects of corrosion on steel structures would be offset by the use of protective coating and cathodic protection. No substantive effect is expected related to corrosion. Soil limitations within the analysis area related to shallow excavations include cutback caving, flooding, large stones, slope, and a cemented pan within the soil profile.

Along Alternative II-E are two sets of microsite alternatives, Strawberry IRA Option 1, 2, and 3 and Cedar Knoll IRA Option 1, and 2. For the Strawberry IRA Option microsites, the soils located along Option 1, 2, and 3 have fewer soil limitations than the soils located along Alternative II-E. The Cedar Knoll IRA Option 1 and 2 also have fewer soil limitations than soils along Alternative II-E.

Alternative II-F (Agency Preferred)

Detailed SSURGO data were analyzed on approximately 65 percent of Alternative II-F. The remaining 35 percent was analyzed using U.S. GSM data. Alternative II-F would impact the highest acreage of soils with constraints and limitations. The primary constraints for Alternative II-F during construction would be disturbance of 1,247 acres of soils with limited revegetation potential and 1,361 acres of compaction prone soils. Mitigation measures **S-1**, **S-2**, **S-3**, **S-5**, **S-9**, **S-13**, and **VG-1** would help to reduce impacts on these soils and increase the potential for revegetation. Soils with limitations associated with the risk of corrosion to steel are prevalent along this route (2,473 acres); however the effects of corrosion on steel structures would be offset by the use of protective coating and cathodic protection. No substantive effect is expected related to corrosion. Soil limitations within the analysis area related to shallow excavations include cutback caving, flooding, large stones, slope, and a cemented pan within the soil profile.

Along Alternative II-F are micro-siting options, Cedar Knoll IRA options 1 and 2. The Cedar Knoll IRA options 1 and 2 have fewer soil limitations than soils along Alternative II-F.

Alternative Variation in Region II

Emma Park Alternative Variation

The Emma Park Alternative Variation would impact more water erodible, compaction prone, prime farmland, soils with shallow bedrock, and soils with severe limitations related to shallow excavations and small commercial buildings than Alternative II-F. The Emma Park Alternative Variation would impact fewer LRP soils and expansive soils.

Alternative Connectors in Region II

Table 3.3-12 summarizes the characteristics of soils that would be impacted by the various connectors and impacts and advantages associated with the alternative connectors in Region II.

Table 3.3-12 Summary of Region II Alternative Connector Impacts for Soils

Alternative Connector	Analysis	Advantage
Highway 191 Alternative Connector	Approximately 27 acres of LRP, 4 acres of expansive soils, 18 acres of compaction prone soils, 54 acres of soils shallow to bedrock, and 68 acres soils corrosive to steel, would be impacted during construction.	This connector would link Alternative II-F to the Alternative II-E route or to the Emma Park Alternative Variation. This would reduce impacts to soils with shallow bedrock and may help to reduce impacts to soils prone to slumping or landslides.
Castle Dale Alternative Connector	Approximately 59 acres water erodible soils, 144 acres of LRP, 31 acres of expansive soils, 114 acres of compaction prone soils, 140 acres soils corrosive to steel, and 14 acres of prime farmland would be impacted during construction.	This connector would link the Alternative II-C route to Alternatives II-A, II-B, or II-D, which would result in less acreage of surface disturbance to soils.
Price Alternative Connector	Approximately 4 acres of water erodible soils, 59 acres of LRP soils, 175 acres of soils corrosive to steel, 67 acres of prime farmland, and 44 acres of shallow soils would be impacted. No wind erodible soils would be impacted.	This connector would link the Alternative II-B route to Alternative II-D, which would result in less acreage of surface disturbance to soils.
Lynndyl Alternative Connector (Alternatives II-B and II-C)	Approximately 48 acres of prime farmland, 157 acres of soils with a shallow depth to bedrock, 38 acres of LRP, and 42 acres of compaction prone soils would be impacted if this alternative connector were used. No wind erodible or water erodible soils would be impacted	Less prime farmland, LRP, and wind erodible soils are located on the Alternative II-B route compared to the Alternative II-C route. The connecter would help reduce impacts to the soils on Alterative II-C if the alternate connector was utilized.
IPP East Alternative Connector (Alternatives II-A and II-B)	Approximately 28 acres of wind erodible soils, 30 acres of LRP, and 31 acres of soils corrosive to steel and 30 acres of soils corrosive to concrete would be impacted. No water erodible soils, shallow soils, or prime farmland would be impacted.	Less hydric and LRP soils occur on the Alternative II-B route compared to the Alternative II-A route. The connecter would allow for avoidance of sensitive soils associated with Alternative II-A.

Region II Conclusion

As presented in **Table 3.3-10**, Alternative II-C would have the greatest impact on soil resources. Alternative II-C would impact more water erodible soils, LRP soils, hydric soils, prime farmland soils, and soils corrosive to concrete and steel than the other alternatives. Alternative II-B would impact more compaction prone soils, soils prone to shrink-swell, and soils with severe limitations for shallow excavations than the other alternatives. In general, Alternative II-A and II-E would have the least overall impact on soil resources.

3.3.6.5 Region III

Region III would have impacts similar to those discussed in Section 3.3.6.2, Impacts Common to all Alternative Routes and Associated Components.

Portions of Region III are comprised soils derived from the Green River Formation (lake sediments with interbedded limestone, sandstone, mudstone, saline evaporate deposits, siltstone and dolomite). These soils have a carbonaceous mineralogy (> 40 percent $CaCO_3$ in the subsoil horizons and substratum layers) and are strongly alkaline. These soils would have limited revegetation potentials, especially on south and west aspects and may require seed mixes that include species adapted to the chemical characteristics of the soils.

Alternative III-A crosses an inventoried roadless area on the Dixie NF. IRAs may contain important environmental values that warrant protection and are, as a general rule, managed to preserve their roadless characteristics. The 250-foot-wide transmission line ROW would create a linear disturbance in an otherwise undisturbed landscape, which could create access routes for trespass. Indirect effects that could occur due to trespass include soil compaction and increased erosion.

As stated in Section 3.3.6.4, losses of biological soils crusts would be expected where surface disturbance occurs. Similar impacts to soils would be expected in Region III from loss of surface crusts.

Region III would have impacts similar to those discussed in Section 3.3.6.2, Impacts Common to all Alternative Routes and Associated Components. In locations where operations or maintenance activities disturb or remove the protective soil cover (vegetation and vegetative litter) on droughty, saline, or strongly alkaline soils, these soils would be highly erodible and difficult to revegetate.

Table 3.3-13 provides a summary of the data sources used for analysis in Region III. As stated in Section 3.3.2, detailed order 3 SSURGO soil survey data were utilized where available; all other areas were characterized using U.S. **Table 3.3-14** provides a comparison of impacts associated with the construction and operation of alternative routes in Region III. **Table 3.3-15** provides details of water erosion-prone soils impacted by construction and operation by watershed (HUC10; NRCS et al. 2010).

Table 3.3-13 Region III Data Sources Used for Analysis

Alternatives	Miles			Percentage	
	SSURGO	GSM	Total Miles[1]	SSURGO	GSM
Alternative III-A	195	81	276	71	29
Alternative III-B	222	63	285	78	22
Alternative III-C	258	50	308	84	16
Connectors					
Avon	8	0	8	100	0
Moapa	13	0	13	100	0

Table 3.3-13 Region III Data Sources Used for Analysis

Alternatives	Miles			Percentage	
	SSURGO	GSM	Total Miles[1]	SSURGO	GSM
Variations					
Ox Valley East	0	16	16	0	100
Ox Valley East Comparable	0	15	15	0	100
Ox Valley West	<1	16	17	3	97
Ox Valley West Comparable	0	15	15	0	100
Pinto	8	22	29	26	74
Pinto Comparable	8	15	24	36	64

[1] Discrepancies in totals due to rounding.

Table 3.3-14 Summary of Impacts to Soils by Alternatives in Region III

Parameter	Alternative III-A		Alternative III-B		Alternative III-C	
	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)
Water Erosion-Prone	77	24	36	11	62	15
Wind Erosion-Prone	114	30	140	32	105	25
Compaction-Prone	864	232	1,106	269	1,039	250
LRP[1]	1,586	392	1,453	338	1,579	382
Hydric[2]	47	12	33	8	52	13
Prime Farmland	132	31	113	28	286	70
Shallow Bedrock[3]	1,073	331	871	226	759	188
Risk of Corrosion (Concrete)	650	155	669	150	660	154
Risk of Corrosion (Steel)	2,799	740	2,665	644	2,926	708
Shallow Excavation Limitations	1,604	449	1,662	421	1,964	479
Small Commercial Building Limitations	1,486	418	1,568	398	1,906	470
Expansive Soils	141	37	222	56	221	54

[1] Limited Revegetation Potential.

[2] Wet Soils.

[3] Lithic Bedrock 60 inches or less from the soil surface.

Source: NRCS 2011.

Note: GSM data did not have interpretations for hydric soils, shallow excavations, small commercial buildings, or prime farmland. Percentages for these interpretations exclude areas with only GSM data.

Alternative III-A (Applicant Proposed)

Key Parameters Summary

Detailed SSURGO data were analyzed on approximately 71 percent of Alternative III-A. The remaining 29 percent was analyzed using U.S. GSM data. The primary constraints for Alternative III-A during construction would be disturbance of 1,586 acres of soils with limited revegetation potential and 864 acres of compaction prone soils. Mitigation measures **S-1**, **S-2**, **S-3**, **S-5**, **S-9**, **S-13**, and **VG-1** would help to reduce impacts on these soils and increase the potential for revegetation. Soils with limitations associated with the risk of corrosion to steel are prevalent along this route (2,799 acres); however the effects of corrosion on steel structures would be offset by the use of protective coating and cathodic protection. No substantive effect is expected related to corrosion.

Alternative III-B (Agency Preferred)

Key Parameters Summary

Detailed SSURGO data were analyzed on approximately 78 percent of Alternative III-B. The remaining 22 percent was analyzed using U.S. GSM data. The primary constraints for Alternative III-B during construction would be disturbance of 1,453 acres of soils with limited revegetation potential and 1,106 acres of compaction prone soils. Mitigation measures **S-1**, **S-2**, **S-3**, **S-5**, **S-9**, **S-13**, and **VG-1** would help to reduce impacts on these soils and increase the potential for revegetation. Soils with limitations associated with the risk of corrosion to steel are prevalent along this route (2,665 acres); however the effects of corrosion on steel structures would be offset by the use of protective coating and cathodic protection. No substantive effect is expected related to corrosion.

Alternative III-C

Key Parameters Summary

Detailed SSURGO data were analyzed on approximately 84 percent of Alternative III-C. The remaining 16 percent was analyzed using U.S. GSM data. The primary constraints for Alternative III-C during construction would be disturbance of 1,579 acres of soils with limited revegetation potential and 1,039 acres of compaction prone soils. Mitigation measures **S-1**, **S-2**, **S-3**, **S-5**, **S-9**, **S-13**, and **VG-1** would help to reduce impacts on these soils and increase the potential for revegetation. Soils with limitations associated with the risk of corrosion to steel are prevalent along this route (2,926 acres); however the effects of corrosion on steel structures would be offset by the use of protective coating and cathodic protection. No substantive effect is expected related to corrosion.

Alternative Variations in Region III

Table 3.3-16 provides a comparison of impacts associated with the alternative variations in Region III.

Alternative Connectors in Region III

Table 3.3-17 summarizes the characteristics of soils that would be impacted by the various connectors and impacts and advantages associated with the alternative connectors in Region III.

Alternative Ground Electrode System Locations in Region III

Table 3.3-18 summarizes impacts associated with Ground Electrode Systems connectors in Region III.

Table 3.3-15 Project Impacts to Water Erosion-Prone Soils by Watershed in Region III

General Region III		III-A		III-B		III-C		Ox Valley East Alternative Variation		Ox Valley East Alternative Variation - Comparison		Ox Valley West Alternative Variation		Ox Valley West Alternative Variation - Comparison		Pinto Alternative Variation		Pinto Alternative Variation - Comparison		Avon Alternative Connector		Moapa Alternative Connector	
HUC10	Watershed	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)
1501001207	California Wash	24	8	14	4																	1	0
1501001306	Cathedral Gorge-Meadow Valley Wash					45	11																
1501001305	Clover Creek			2	1	1	0																
1501001206	Dry Lake Valley	0	0	5	1	20	5															1	0
1606000909	Dry Lake Valley					1	0																
1501001204	Elbow Canyon					2	1																
1603000610	Gold Springs Wash			2	1	2	0																
1501000512	Government Wash-Colorado River	5	2	5	2	5	1																
1501001007	Halfway Wash-Virgin River	1	0	1	0																		
1501001307	Kershaw Canyon-Meadow Valley Wash					2	1																
1603000703	Long Lick Canyon-Big Wash	0	0	0	0	0	0																
1501001309	Lower Meadow Valley Wash			0	0																		
1501001209	Lower Muddy River	44	13	2	0																		
1501000808	Lower Santa Clara River	7	2																				
1501001203	Middle Pahranagat Wash					0	0																
1501000806	Moody Wash							1	0			1	0										
1501001504	Nellis Air Force Base					5	1																

Table 3.3-15 Project Impacts to Water Erosion-Prone Soils by Watershed in Region III

General Region III		III-A		III-B		III-C		Ox Valley East Alternative Variation		Ox Valley East Alternative Variation - Comparison		Ox Valley West Alternative Variation		Ox Valley West Alternative Variation - Comparison		Pinto Alternative Variation		Pinto Alternative Variation - Comparison		Avon Alternative Connector		Moapa Alternative Connector	
HUC10	Watershed	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)
1501001006	Sand Hollow Wash-Virgin River	0	0																				
1603000613	Shoal Creek	6	1					15	6			18	6					6	1				
1603000706	The Big Wash-Beaver River	0	0	0	0	0	0																
1501001005	Toquop Wash	18	7	17	6																		
1501001208	Upper Muddy River	3	1	0	0																		

Note: Blanks denote no impacts.

Source: NRCS 2011; NRCS et al. 2010.

Table 3.3-16 Summary of Region III Alternative Variation Impacts for Soils

Alternative Variation	Analysis
Ox Valley East Alternative Variation	This route would impact more LRP, compaction prone, shallow soils, and soils with severe limitations for risk of corrosion to concrete compared to the comparable Alternative III-A segments.
Ox Valley West Alternative Variation	This route would impact more LRP, compaction prone, shallow soils, and soils with severe limitations for risk of corrosion to concrete compared to the comparable Alternative III-A segments.
Pinto Alternative Variation	This route would impact more LRP, compaction prone, shallow soils, and soils with severe limitations for risk of corrosion to concrete compared to the comparable Alternative III-A segments.

Table 3.3-17 Summary of Region III Alternative Connector Impacts for Soils

Alternative Connector	Analysis	Advantage
Avon Alternative Connector	Approximately 5 acres of wind erodible, 83 acres of LRP, 53 acres of expansive soils, and 60 acres of compaction prone soils would be impacted if this alternative connector were used. No water erodible soils would be impacted.	This connector would result in a reduction of impacts to prime farmland soils associated with the Alternative III-C route and a reduction in overall surface disturbance to soils that would result from Alternative III-C.
Moapa Alternative Connector	Approximately 27 acres of wind erodible, 29 acres of soils with shallow bedrock, 65 acres of LRP, and 8 acres of compaction prone soils would be impacted if this alternative connector were used.	This connector route would result in a small reduction of the acreage of soil resources impacted by Alternative III-C, if used to cross over to Alternatives III-A or III-B.

Table 3.3-18 Summary of Region III Alternative Ground Electrode System Impacts (Acres)[1]

	Wind Erodible	Water Erodible	Compaction Prone	LRP	Hydric	Prime Farmland	Shallow Bedrock	Risk of Corrosion - Concrete	Risk of Corrosion - Steel	Shallow Excavations	Expansive Soils
Halfway Wash- Virgin River (Alternative III-A)	34	30	34	73	0	0	485	73	596	561	34
Halfway Wash- Virgin River (Alternative III-B)	34	30	34	73	0	0	485	73	596	561	34
Halfway Wash East (Alternative III-A)	30	0	0	0	0	0	570	0	600	570	0
Halfway Wash East (Alternative III-B)	30	0	0	0	0	0	570	0	600	570	0
Meadow Valley 2 (Alternative III-C)	14	0	0	0	0	0	269	0	283	269	0
Mormon Mesa- Carp Elgin Rd (Alternative III-A)	29	0	13	13	13	0	558	13	600	571	13
Mormon Mesa- Carp Elgin Rd (Alternative III-B)	29	0	13	13	13	0	558	13	600	571	13
Delta Ground Electrode Bed (DO2)	0	0	198	575	0	0	0	321	575	0	0

[1] Limited Revegetation Potential

[2] Wet Soils

[3] Lithic Bedrock 60 inches or less from the soil surface.

Note: Acreages are based on 600-acre siting areas, but much smaller areas within the siting areas would be required for the facilities as shown in Chapter 2.0, **Table 2-17**.

Region III Conclusion

As presented in **Table 3.3-14**, Alternative III-B would have the greatest impact on compaction prone soils, soils prone to expansion, and wind erodible soils than the other alternatives. Alternative III-A, would impact more acres of LRP soils, soils with shallow bedrock, and soils prone to water erosion. Alternative III-C would impact more acres of hydric soils, prime farmland, soils corrosive to steel, and soils with severe limitations for shallow excavations. While all alternative have their limitations, in general, Alternative III-C would have the highest overall impact on soil resources.

3.3.6.6 Region IV

Region IV would have impacts similar to what is described for the construction impacts discussed in Section 3.3.6.2, Impacts Common to all Alternative Routes and Associated Components.

As stated in Section 3.3.6.4, losses of biological soils crusts would be expected where surface disturbance occurs. Similar impacts to soils would be expected in Region III from loss of surface crusts.

The operation impacts in Region IV would be similar to those discussed in Section 3.3.6.2, Impacts Common to all Alternative Routes and Associated Components. In locations where operations or maintenance activities disturb or remove the protective soil cover (vegetation and vegetative litter) on droughty, saline, or strongly alkaline soils, these soils would highly erodible and difficult to revegetate.

Table 3.3-19 provides a summary of the data sources used for analysis in Region IV. Detailed order 3 SSURGO soil survey data were available for all alternatives within Region IV; therefore, no GSM data were utilized. **Table 3.3-20** provides a comparison of impacts associated with the construction and operation of alternative routes in Region IV. **Table 3.3-21** provides details of water erosion-prone soils impacted by construction and operation by watershed (HUC10; NRCS et al. 2010).

Table 3.3-19 Region IV Data Sources Used for Analysis

Alternatives	Miles		Total Miles	Percentage	
	SSURGO	GSM		SSURGO	GSM
Alternative IV-A	37	0	37	100	0
Alternative IV-B	39	0	39	100	0
Alternative IV-C	44	0	44	100	0
Connectors					
Sunrise Mountain	3	0	3	100	0
Lake Las Vegas	4	0	4	100	0
Three Kids Mine	5	0	5	100	0
River Mountain	7	0	7	100	0
Railroad Pass	3	0	3	100	0
Variations					
Marketplace	8	0	8	100	0
Marketplace Comparable	7	0	7	100	0

Table 3.3-20 Summary of Impacts to Soils by Alternatives in Region IV

Parameter	Alternative IV-A		Alternative IV-B		Alternative IV-C	
	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)
Water Erosion-Prone	16	3	1	0	1	0
Wind Erosion-Prone	1	0	66	20	109	29
Compaction-Prone	0	0	3	1	2	1
LRP[1]	191	48	191	59	166	48
Hydric[2]	0	0	3	1	2	1
Prime Farmland	0	0	0	0	0	0
Shallow Bedrock[3]	153	42	109	41	116	38
Risk of Corrosion (Concrete)	105	23	138	38	124	30
Risk of Corrosion (Steel)	371	97	449	135	519	140
Shallow Excavation Limitations	439	116	465	141	545	144
Small Commercial Building Limitations	439	116	462	140	524	139
Expansive Soils	0	0	3	1	2	1

[1] Limited Revegetation Potential

[2] Wet Soils

[3] Lithic Bedrock 60 inches or less from the soil surface

Source: NRCS 2011

Note: GSM data did not have interpretations for hydric soils, shallow excavations, small commercial buildings, or prime farmland. Percentages for these interpretations exclude areas with only GSM data.

Table 3.3-21 Project Impacts to Water Erosion-Prone Soils by Watershed in Region IV

General Region IV		IV-A		IV-B		IV-C		Marketplace Alternative Variation		Marketplace Alternative Variation - Comparison		Sunrise Mountain Alternative Connector		Lake Las Vegas Alternative Connector		Three Kids Mine Alternative Connector		River Mountain Alternative Connector		Railroad Pass Alternative Connector	
HUC10	Watershed	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)	Const. (acres)	Operat. (acres)
1501001507	Duck Creek-Las Vegas Wash	0	0	0	0	0	0							2	1	1	0				
1606001518	Eldorado Valley					0	0														
1501000512	Government Wash-Colorado River	36	9	21	6	21	6					3	1	1	0	2	1				
1501000513	Gypsum Wash-Colorado River					0	0														
1503010101	Jumbo Wash-Colorado River					1	0														

Note: Blanks denote no impacts.

Source: NRCS 2011; NRCS et al. 2010.

Alternative IV-A (Applicant Proposed and Agency Preferred)

Key Parameters Summary

Detailed SSURGO data were analyzed on 100 percent of Alternative IV-A. The primary soil constraint for Alternative IV-A during construction would be disturbance of 191 acres of soils with limited revegetation potential and 153 acres of soils that have shallow bedrock present. Mitigation measures **S-1**, **S-2**, **S-3**, **S-5**, **S-9**, **S-13**, and **VG-1** would help to reduce impacts on these soils and increase the potential for revegetation. Soils with limitations associated with the risk of corrosion to steel are prevalent along this route (371 acres); however, the effects of corrosion on steel structures would be offset by the use of protective coating and cathodic protection. No substantive effect is expected related to corrosion.

Alternative IV-B

Key Parameters Summary

Detailed SSURGO data were analyzed on 100 percent of Alternative IV-B. The primary soil constraint for Alternative IV-B during construction would be disturbance of 191 acres of soils with limited revegetation potential and 109 acres of soils that have shallow bedrock present. Mitigation measures **S-1**, **S-2**, **S-3**, **S-5**, **S-9**, **S-13**, and **VG-1** would help to reduce impacts on these soils and increase the potential for revegetation. Soils with limitations associated with the risk of corrosion to steel are prevalent along this route (449 acres); however, the effects of corrosion on steel structures would be offset by the use of protective coating and cathodic protection. No substantive effect is expected related to corrosion.

Alternative IV-C

Key Parameters Summary

Detailed SSURGO data were analyzed on 100 percent of Alternative IV-C. The primary constraint for Alternative IV-C during construction would be disturbance of 166 acres of soils with limited revegetation potential and 116 acres of soils that have shallow bedrock present. Mitigation measures **S-1**, **S-2**, **S-3**, **S-5**, **S-9**, **S-13**, and **VG-1** would help to reduce impacts on these soils and increase the potential for revegetation. Soils with limitations associated with the risk of corrosion to steel are prevalent along this route (519 acres); however, the effects of corrosion on steel structures would be offset by the use of protective coating and cathodic protection. No substantive effect is expected related to corrosion.

Alternative Variations in Region IV

Table 3.3-22 provides a summary of impacts associated with the alternative variation in Region IV.

Table 3.3-22 Summary of Region IV Alternative Variation Impacts for Soils

Alternative Variation	Analysis
Marketplace Alternative Variation (Alternative IV-B)	This alternative variation would impact less wind erodible soils and soils with severe limitations for risk of corrosion to concrete than the proposed segments it would replace. This alternative would impact more LRP soils and soils with severe limitations for shallow excavations and small commercial buildings than the comparable Alternative IV-B segments.

Alternative Connectors in Region IV

Table 3.3-23 summarizes the characteristics of soils that would be impacted by the various connectors and impacts and advantages associated with the alternative connectors in Region IV.

Table 3.3-23 Summary of Region IV Alternative Connector Impacts for Soils

Alternative Connector	Analysis	Advantage
Sunrise Mountain Alternative Connector	Approximately 3 acres of water erodible, 20 acres of LRP, and 13 acres of shallow soils would be impacted by this alternative. No compaction prone soils would be impacted by this alternative.	This connector route would result in a reduction of the acreage of LRP and shallow soils impacted by Alternative IV-A, if used to cross over to Alternatives IV-B or IV-C.
Lake Las Vegas Alternative Connector	Approximately 4 acres of wind erodible, 4 acres of water erodible, 18 acres of LRP, and 17 acres of shallow soils would be impacted by this alternative. No compaction prone soils would be impacted by this alternative.	This connector route would result in a reduction of the acreage of soils impacted within the Lake Mead National Recreation Area impacted by Alternatives IV-B or IV-C, if used to cross over to the proposed route.
Three Kids Mine Alternative Connector	Approximately 4 acres of wind erodible, 3 acres of water erodible, 38 acres of LRP, and 46 acres of shallow soils would be impacted by this alternative. No compaction prone soils would be impacted by this alternative.	This connector route would result in a reduction of the acreage of soils impacted within the Lake Mead National Recreation Area impacted by Alternatives IV-B or IV-C, if used to cross over to the proposed route.
River Mountains Alternative Connector	Approximately 12 acres of wind erodible, 39 acres of LRP, and 64 acres of shallow soils would be impacted by this alternative. No compaction prone soils or water erodible soils would be impacted by this alternative.	This connector route would result in a reduction of the acreage of sensitive soils impacted by Alternatives IV-B or IV-C, if used to cross over to the proposed route.
Railroad Pass Alternative Connector (Alternatives IV-A and IV-B)	Approximately 4 acres of LRP and 19 acres of shallow soils would be impacted by this alternative. No compaction prone, wind, or water erodible soils would be impacted by this alternative.	This connector route would reduce the acres of LRP and shallow bedrock soils impacted by Alternative IV-A, if used to cross to the Alternative IV-B route.

Region IV Conclusion

As presented in **Table 3.3-20**, Alternative IV-B and Alternative IV-C would have the greatest impact on soil resources. Alternative IV-B would impact more soils corrosive to concrete, soils prone to shrink-swell, and LRP soils. Alternative IV-C would impact more soils corrosive to steel, and soils with severe limitations for shallow excavations. In general, Alternative IV-A would have the least overall impact on soil resources.

3.3.6.7 Residual Impacts

Mitigation measures are designed to reduce impacts to soil resources but do not fully mitigate the impacts. All of the alternatives would result in site specific losses to long-term soil quality and productivity due to accelerated erosion and soil mixing. Because soil formation of topsoil is a slow process, it can take decades for topsoil to recover in the arid west and for soil productivity to improve.

3.3.6.8 Impacts to Soils from the No Action Alternative

Under the No Action Alternative, the proposed project would not be authorized and would not be developed. Associated impacts to soils from construction and maintenance would not occur. Natural and anthropogenic actions such as erosion, agriculture, fire, recreation, and grazing would continue to impact soil resources at present levels in the analysis area.

3.3.6.9 Irreversible and Irretrievable Commitment of Resources

An irretrievable commitment of a resource is one in which the resource or its use is lost for a period of time. An irreversible commitment of a resource is one in which the resource use is lost permanently or indefinitely. If the transmission line is left in operation on a permanent basis or concrete foundations are left in place during decommissioning an irreversible loss of soil productivity and quality would be lost associated with structure foundations, regeneration sites, substations, terminals, and support facilities. Alternately, an irretrievable commitment of soil resources during the life span of the transmission line would be anticipated until all concrete foundations are removed and successful reclamation is achieved.

3.3.6.10 Relationship Between Local Short-term Uses and Long-term Productivity

Overall site productivity is primarily a matter of revegetation success. Productivity varies with vegetation community, but more importantly, with land management objectives as they relate to the establishment of desirable or productive vegetation types. In contrast, soil quality is an inherent soil resource characteristic involving aeration, permeability, texture, salinity and alkalinity, microbial populations, fertility, and other physical and chemical characteristics that are accepted as beneficial to overall plant growth and establishment. Based on this concept, there would be impacts to short-term uses and long-term productivity related to the quality of native soils after project-related disturbance. However, long-term soil productivity can be restored once successful revegetation is completed.

3.4 Water Resources

3.4.1 Regulatory Background

The CWA, originally the Federal Water Pollution Control Act of 1948 (with major amendments in 1972 and 1977), is the framework that regulates water quality standards and pollutant discharges into WUS. Sections 303d and 305b of the CWA require that water quality of streams, rivers, and lakes are assessed on a regular basis; that waters found to be in violation of water quality standards are listed as impaired; and that priorities are set for actions to improve water quality. Section 402 of the CWA created the National Pollutant Discharge Elimination System (NPDES), which is administered by most individual states and includes stormwater permits and requirements for construction areas. Section 404 of the CWA regulates dredging and filling of WUS, and permits for such activities are issued by the USACE.

The Colorado River Basin's water quality also is administered under the Colorado River Basin Salinity Control Act, which is enacted through a forum. The purposes of the forum are to coordinate salinity control efforts among the states, to coordinate with federal agencies on the implementation of the Colorado River Basin Salinity Control Program, to work with Congress on the authorization and funding of the program, to act to disseminate information on salinity control, and to otherwise promote efforts to reduce the salt loading to the Colorado River (Colorado River Basin Salinity Control Forum 2012).

Water use is administered by individual states in some form of the prior appropriation doctrine under the following state statutes:

- Wyoming – Title 41, Wyoming Statutes Annotated, 1977
- Colorado – State Constitution Article XVI sections 5 and 6
- Utah – Utah Code, Title 73
- Nevada – Nevada Revised Statutes, Chapters 532 through 538

3.4.2 Data Sources

The Watershed Boundary Dataset (WBD) is a GIS-based dataset of seamless drainage boundaries for the U.S. (NRCS et al. 2010). The drainages are described as a multi-level or ordered, hierarchal system consisting of hydrographic regions, subregions, basins, subbasins, watersheds, and subwatersheds. There are 21 regions across the U.S., including Hawaii, Alaska, and Puerto Rico/US Virgin Islands. Each subsequent level is divided into smaller drainages that nest within the larger (e.g., the Upper Colorado Region has eight subregions). Drainages within each of the levels are described with a two-digit HUC; thus, hydrographic regions are identified by a two-digit HUC (HUC-2), subregions are HUC-4, basins are HUC-6, subbasins are HUC-8, watersheds are HUC-10, and subwatersheds are HUC-12.

The National Hydrography Dataset (NHD) also is a GIS-based dataset that represents the drainage network of streams, rivers, canals, lakes, and reservoirs in the U.S. (USGS 2011). This dataset is based largely on USGS topographic maps; however, updates to certain areas have occurred and will continue. The NHD is available in high- and medium-resolution. Due to the areal extent of this Project, the medium resolution was chosen, which is based on 1:100,000-scale topographic maps.

Individual states inventory water quality every 2 years and prepare an Integrated Water Quality and Impaired Waters Assessment Report (IR) as required by the CWA, sections 303(d) and 305(b). These reports contain the water quality standards and the status of all classified waters within each state, along with a listing of all waters that are impaired or threatened. The IRs referenced in this document are listed below.

- Colorado: 2012 IR, submitted to USEPA in April 2012
- Nevada: 2006 303(d) List, approval by USEPA on February 27, 2009
  2004 305(b) Report
- Utah: 2010 IR, final approval by EPA on February 10, 2012
- Wyoming: 2012 IR, final approval by EPA on May 3, 2012

3.4.3 Analysis Area

The water resources analysis area consists of all WBD-defined Watersheds (5th order, HUC-10) with Project components located within them. **Table 3.4-1** lists the hydrographic basins within which the analysis area lies, and a detailed tabulation of the watersheds is contained in Section 3.4.5, Regional Summary of Water Resources. Water resources, including perennial streams and rivers (continually flowing), intermittent streams (groundwater component with augmentation by seasonal precipitation), ephemeral streams (flowing in response to precipitation events), lakes, reservoirs, springs, and groundwater within the watersheds and downstream of Project components will be the focus of the water resource section of the EIS.

Table 3.4-1 Hydrographic Regions and Basins Crossed by the TWE Project

Hydrographic Region	Basin
North Platte	North Platte
Upper Colorado	Colorado Headwaters
	Upper Colorado-Dolores
	Upper Green
	Great Divide Closed Basin
	White-Yampa
	Lower Green
	Upper Colorado-Dirty Devil
Great Basin	Jordan
	Escalante Desert-Sevier Lake
	Central Nevada Desert Basins
Lower Colorado	Lower Colorado-Lake Mead
	Lower Colorado-Below Hoover Dam

Source: NRCS et al. 2010

3.4.4 Baseline Description

The water resources analysis area consists of 179 hydrographic watersheds within the North Platte, Great Salt Lake, Upper Colorado, and Lower Colorado River hydrographic regions as defined by the WBD (NRCS et al. 2010). The North Platte Region drains the east side of the Continental Divide and ultimately empties to the Gulf of Mexico. The Upper Colorado Region, Lower Colorado Region, and Great Basin Region all drain the western side of the Continental Divide. Both the Upper and Lower Colorado regions ultimately drain toward the Gulf of California (excepting the Great Divide Closed Basin in south-central Wyoming), while the Great Basin Region is a closed drainage that never reaches an ocean but instead generally drains toward the Great Salt Lake.

Groundwater resources in the analysis area have been characterized by Whitehead (1996), Robson and Banta (1995), and Planert and Williams (1995). These authors report that the major aquifer systems in the analysis area are the Upper Colorado or Colorado Plateaus aquifers, and the Basin and Range aquifers.

Surficial aquifers are present in the floodplains of major surface water features and in the low-lying areas of the Basin and Range area (Whitehead 1996; Robson and Banta 1995; Planert and Williams 1995). There are no sole-source aquifers within the analysis area (USEPA 2012). Springs and seeps are found throughout the analysis area.

3.4.5 Regional Summary

The 179 watersheds (HUC-10) within the analysis area are listed in **Table 3.4-2** and depicted in **Figures 3.4-1** through **3.4-4** by region. The major rivers within each Project Region are listed in **Table 3.4-3**. **Appendix F** contains a detailed listing of waterbodies crossed by Project alternative reference lines.

Table 3.4-2 Watersheds Crossed by the TWE Project

General Project Region	Basin	Watershed	HUC-10[1]	Figure Code[2]
I	North Platte	North Platte River-Iron Springs Draw	1018000210	01
		Sugar Creek	1018000213	04
I	Upper Green	Bitter Creek-Antelope Creek	1404010501	01
		Shell Creek	1404010902	08
I	Great Divide Closed Basin	Latham Draw	1404020004	01
		Upper Separation Creek	1404020013	04
		Mud Springs Lake	1404020003	05
		Lower Separation Creek	1404020014	06
I & II	White-Yampa	Elkhead Creek	1405000106	01
		Fortification Creek	1405000107	02
		Dry Creek-Yampa River	1405000111	03
		Morgan Gulch-Yampa River	1405000202	04
		Deception Creek-Yampa River	1405000204	05
		Spring Creek-Yampa River	1405000205	06
		Hells Canyon-Yampa River	1405000206	07
		Little Snake River-Willow Creek	1405000302	08
		Fourmile Creek	1405000305	09
		Upper Sand Creek	1405000306	10
		Lower Sand Creek	1405000307	11
		Little Snake River-Powder Wash	1405000308	12
		Greasewood Gulch-Little Snake River	1405000309	13
		Sand Wash	1405000310	14
		Upper Muddy Creek	1405000401	15
		Redwash	1405000402	16
		Lower Muddy Creek	1405000403	17
		Wolf Creek	1405000701	18
		Outlet Douglas Creek	1405000703	19

Table 3.4-2 Watersheds Crossed by the TWE Project

General Project Region	Basin	Watershed	HUC-10[1]	Figure Code[2]
I & II (Continued)	White-Yampa (Continued)	Red Wash-White River	1405000704	20
		Dripping Rock Creek-White River	1405000705	21
		Evacuation Creek	1405000706	22
		Bitter Creek	1405000709	23
		Coyote Wash	1405000710	24
		Cottonwood Wash-White River	1405000711	25
		Lay Creek	1405000203	26
		Outlet Little Snake River	1405000311	27
		Crooked Wash-White River	1405000505	28
II	Colorado Headwaters	West Salt Creek	1401000517	01
		McDonald Creek-Colorado River	1401000519	02
II	Upper Colorado-Dolores	Bitter Creek	1403000101	01
		Westwater Creek	1403000102	02
		Cottonwood Canyon	1403000104	03
		Cisco Wash	1403000106	04
		Sagers Wash	1403000107	05
		Westwater Creek-Colorado River	1403000108	06
		Salt Wash	1403000501	07
II	Lower Green	Cliff Creek	1406000102	02
		Twelvemile Wash	1406000104	04
		Walker Hollow-Green River	1406000105	05
		Pelican Lake-Green River	1406000106	06
		Strawberry River-Duchesne River	1406000304	09
		Pigeon Water Creek-Lake Fork River	1406000308	10
		Dry Gulch Creek	1406000309	11
		Cottonwood Creek-Dry Gulch Creek	1406000310	12
		Uinta River	1406000314	13
		Duchesne River	1406000315	14
		Upper Strawberry River	1406000401	15
		Middle Strawberry River	1406000403	16
		Currant Creek	1406000404	17
		Red Creek	1406000405	18
		Rabbit Gulch	1406000406	19
		Lower Strawberry River	1406000408	20
		White River	1406000701	21
		Desert Seep Wash	1406000707	22

Table 3.4-2 Watersheds Crossed by the TWE Project

General Project Region	Basin	Watershed	HUC-10[1]	Figure Code[2]
II (Continued)	Lower Green (Continued)	Cottonwood Wash-Price River	1406000710	23
		Little Park Wash-Price River	1406000711	24
		Lost Spring Wash-Saleratus Wash	1406000801	25
		Tusher Wash-Green River	1406000802	35
		Little Grand Wash	1406000803	26
		Salt Wash-Green River	1406000804	27
		Tenmile Canyon	1406000805	28
		Huntington Creek	1406000901	29
		Cottonwood Creek	1406000902	30
		Ferron Creek	1406000903	31
		North Salt Wash	1406000904	32
		Upper San Rafael River	1406000905	33
		Antelope Creek	1406000305	36
		Upper Pariette Draw	1406000501	37
		Lower Pariette Draw	1406000502	38
		Upper Ninemile Creek	1406000503	39
		Lower Ninemile Creek	1406000504	40
		Sheep Wash-Green River	1406000505	41
		Agency Draw-Willow Creek	1406000604	42
		Scofield Reservoir	1406000702	43
		Willow Creek	1406000703	44
		Gordon Creek	1406000704	45
		Beaver Creek-Price River	1406000705	46
		Miller Creek	1406000706	47
		Coal Creek-Price River	1406000708	48
		Grassy Trail Creek	1406000709	49
		Indian Canyon	1406000407	50
		Avintaquin Creek	1406000402	51
II	Upper Colorado - Dirty Devil	Ivie Creek	1407000201	01
		Headwaters Muddy Creek	1407000202	02
II	Jordan	West Creek	1602020101	01
		Soldier Creek	1602020201	02
		Thistle Creek	1602020202	03
		Diamond Fork	1602020203	04
II	Great Salt Lake Basin	Dry Lake Creek-Fish Springs Wash	1602030603	01

Table 3.4-2 Watersheds Crossed by the TWE Project

General Project Region	Basin	Watershed	HUC-10[1]	Figure Code[2]
II & III	Escalante Desert-Sevier Lake	Salina Creek	1603000304	01
		Lost Creek-Sevier River	1603000305	02
		Silver Creek	1603000401	03
		Upper San Pitch River	1603000402	04
		Ivie Creek	1603000501	05
		Dog Valley Wash	1603000503	06
		Upper Sevier River	1603000504	07
		Tanner Creek	1603000505	08
		Cherry Creek Wash	1603000507	09
		Sugarville-Broad Canyon	1603000508	10
		Picture Rock Wash	1603000509	11
		Hog Back Reservoir-Old River Bed	1603000510	12
		Swasey Wash	1603000511	13
		Middle Sevier River	1603000512	14
		Chalk Creek	1603000514	15
		Oak Creek	1603000515	16
		Soap Hollow	1603000516	17
		Lower Sevier River	1603000517	18
		Iron Springs Creek-Frontal Lund Flats	1603000605	19
		Mud Spring Wash	1603000606	20
		Fisher's Wash	1603000607	21
		Fourmile Wash	1603000608	22
		Mountain Spring Wash	1603000609	23
		Gold Springs Wash	1603000610	24
		McDonald Wash-Negro Liza Wash	1603000612	25
		Shoal Creek	1603000613	26
		Escalante Valley-Pinto Creek	1603000614	27
		Long Lick Canyon-Big Wash	1603000703	28
		The Big Wash-Beaver River	1603000706	29
		Morehouse Canyon-Beaver River	1603000707	30
		Upper Beaver River	1603000803	31
		Lower Beaver River	1603000805	32
		Fillmore Wash-Frontal Sevier Lake	1603000903	33
III & IV	Lower Colorado-Lake Mead	Government Wash-Colorado River	1501000512	01
		Gypsum Wash-Colorado River	1501000513	02
		Moody Wash	1501000806	03

Table 3.4-2 Watersheds Crossed by the TWE Project

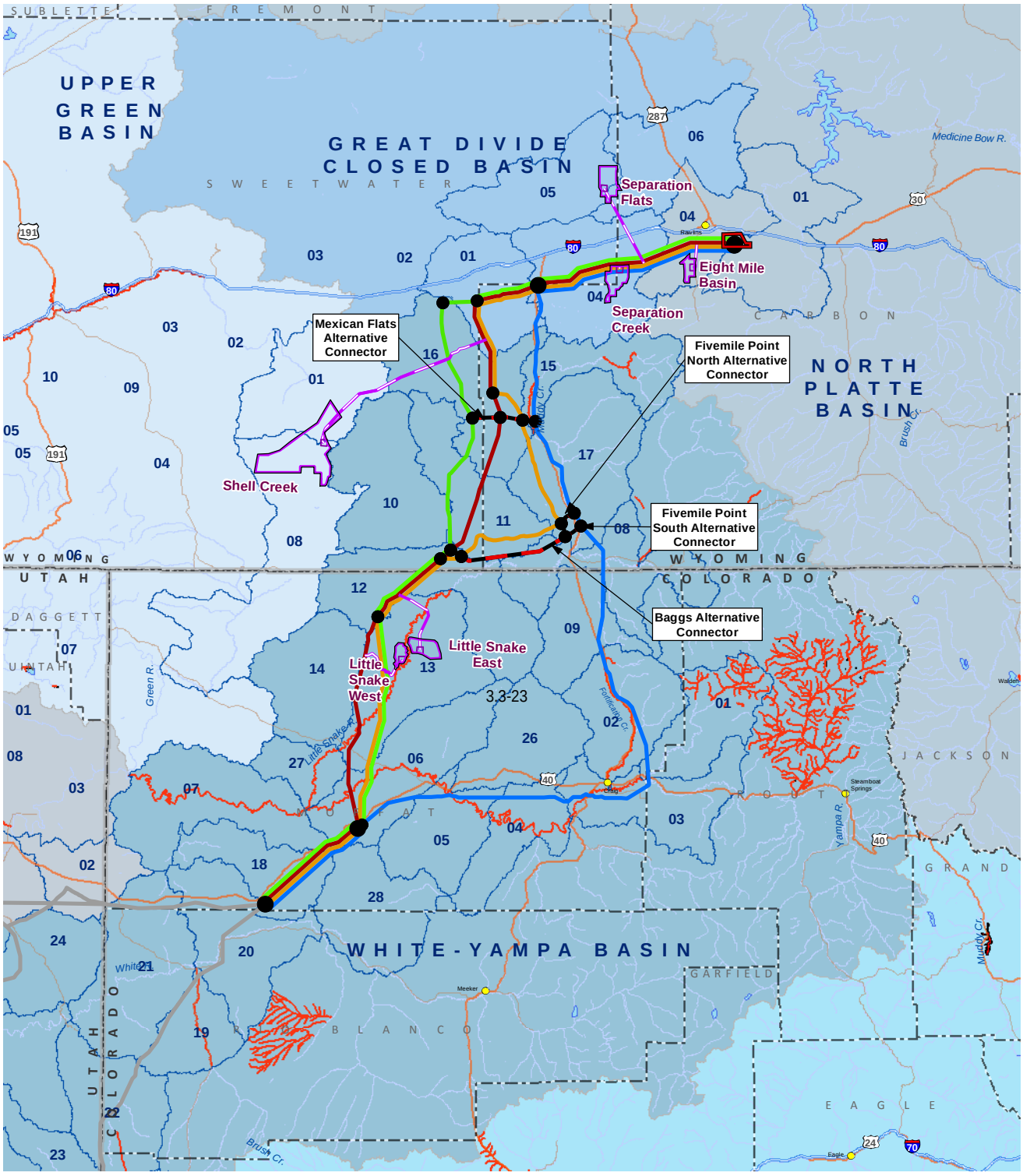
General Project Region	Basin	Watershed	HUC-10[1]	Figure Code[2]
III & IV (Continued)	Lower Colorado-Lake Mead (Continued)	Upper Santa Clara River	1501000807	04
		Lower Santa Clara River	1501000808	05
		Upper Beaver Dam Wash	1501001001	06
		Lower Beaver Dam Wash	1501001002	07
		Garden Wash	1501001004	08
		Toquop Wash	1501001005	09
		Sand Hollow Wash-Virgin River	1501001006	10
		Halfway Wash-Virgin River	1501001007	11
		Pahranagat Creek	1501001116	12
		Kane Springs Wash	1501001201	13
		Upper Pahranagat Wash	1501001202	14
		Middle Pahranagat Wash	1501001203	15
		Elbow Canyon	1501001204	16
		Dry Lake Valley	1501001206	17
		California Wash	1501001207	18
		Upper Muddy River	1501001208	19
		Lower Muddy River	1501001209	20
		Clover Creek	1501001305	21
		Cathedral Gorge-Meadow Valley Wash	1501001306	22
		Kershaw Canyon-Meadow Valley Wash	1501001307	23
		Lower Meadow Valley Wash	1501001309	24
		Nellis Air Force Base	1501001504	25
		Duck Creek-Las Vegas Wash	1501001507	26
		Lower Pahranagat Wash	1501001205	27
III & IV	Central Nevada Desert Basins	Red Rock Wash	1606000908	01
		Dry Lake Valley	1606000909	02
		Delamar Valley	1606000910	03
		Eldorado Valley	1606001518	04
		McCullough Spring	1606001516	05
		Ora Hanna Spring	1606001517	06
IV	Lower Colorado-Below Hoover Dam	Jumbo Wash-Colorado River	1503010101	01

[1] Ten digit USGS HUC, unique to each watershed.

[2] Figure Code refers to the watershed display system utilized on **Figures 3.4-1** through **3.4-4**.

Source: NRCS et al. 2010

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TRANSWEST EXPRESS TRANSMISSION PROJECT

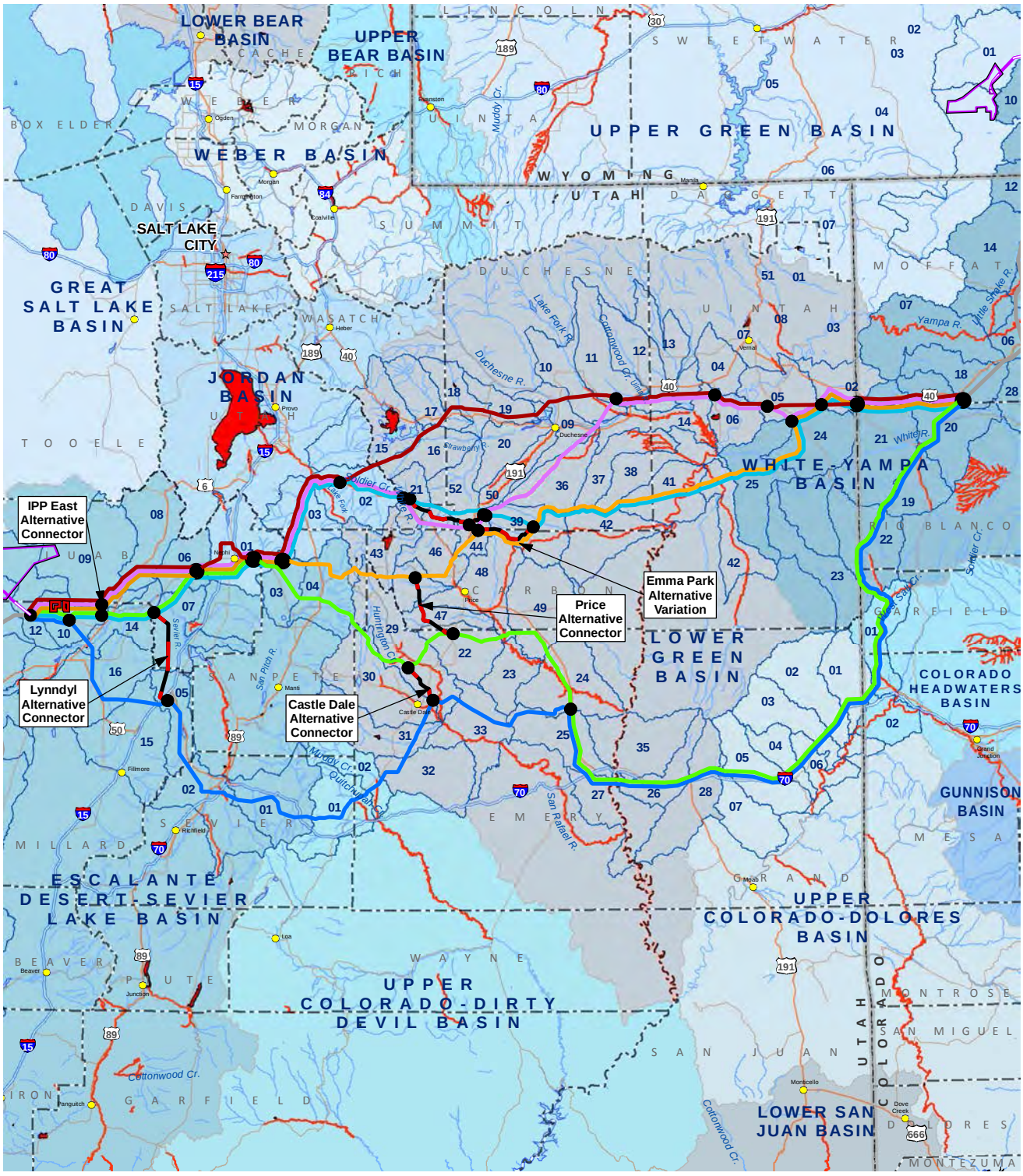
Figure 3.4-1
Region I
Basins, Watersheds and Impaired Waters

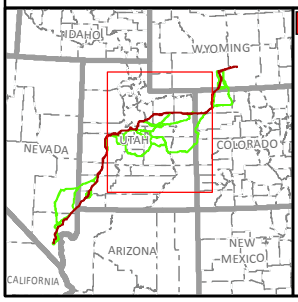
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0 5 10 20 km
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Western AREA POWER ADMINISTRATION

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- Terminal Siting Area
- Node

DEIS Alternative Routes

- Applicant Proposed II-A
- Alternative II-B
- Alternative II-C
- Alternative II-D
- Alternative II-E
- Agency Preferred II-F
- Alternative Variation or Connector
- Segment not in this Region

- Potential Ground Electrode Siting Area
- Potential Ground Electrode Site
- Potential Ground Electrode Overhead Electrical Line
- Subwatershed (HUC10)
- 303d Impaired Stream
- 303d Impaired Waterbody

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 3.4-2
Region II
Basins, Watersheds and Impaired Waters

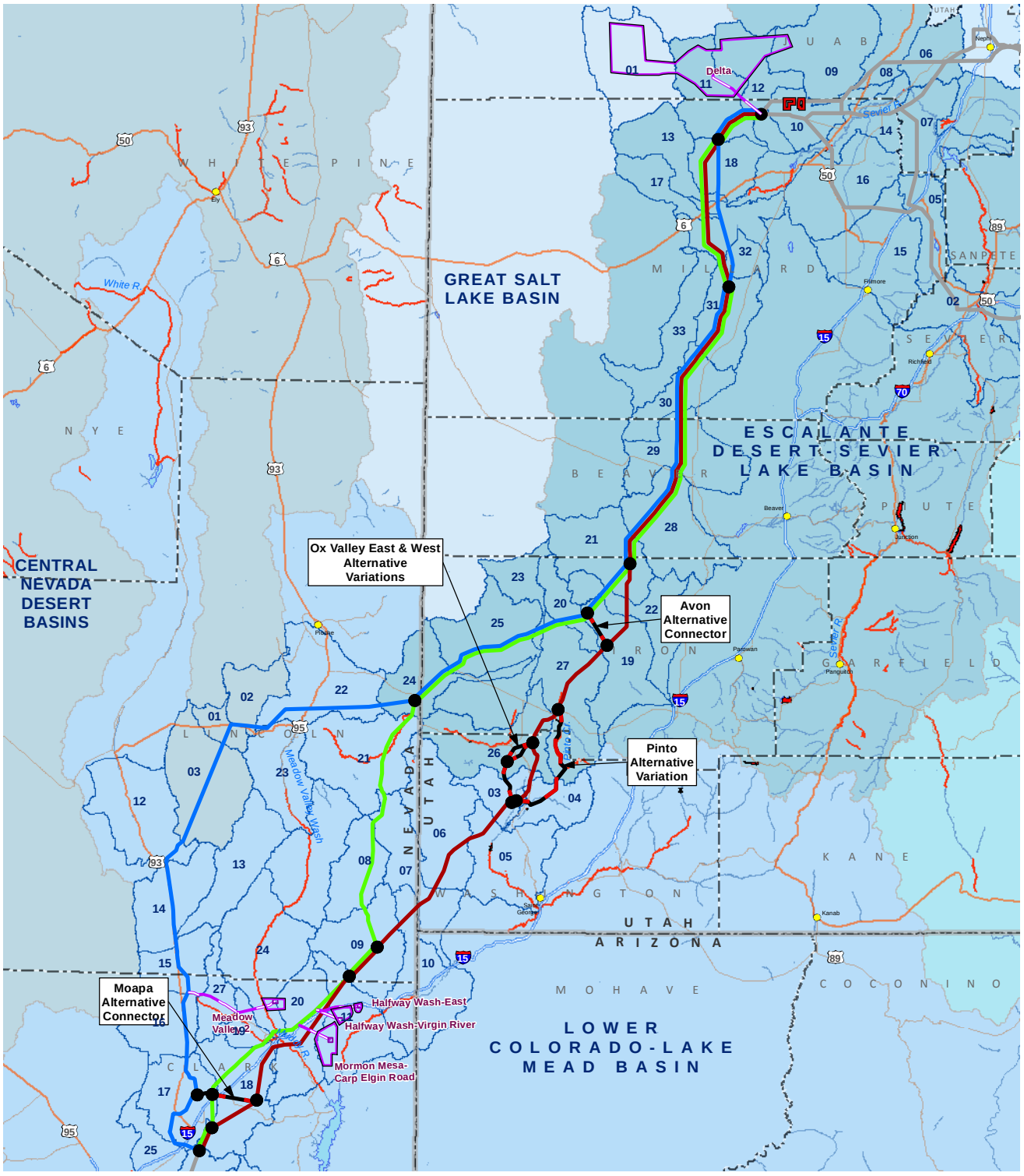
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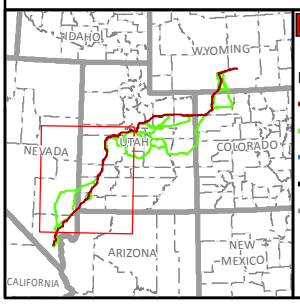
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Western AREA POWER ADMINISTRATION

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Terminal Siting Area
Node

DEIS Alternative Routes

Applicant Proposed III-A
Agency Preferred III-B
Alternative III-C
Alternative Variation or Connector
Segment not in this Region

Potential Ground Electrode Siting Area
Potential Ground Electrode Site
Potential Ground Electrode Overhead Electrical Line
Subwatershed (HUC10)
303d Impaired Stream
303d Impaired Waterbody

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 3.4-3
Regions III
Basins, Watersheds and Impaired Waters

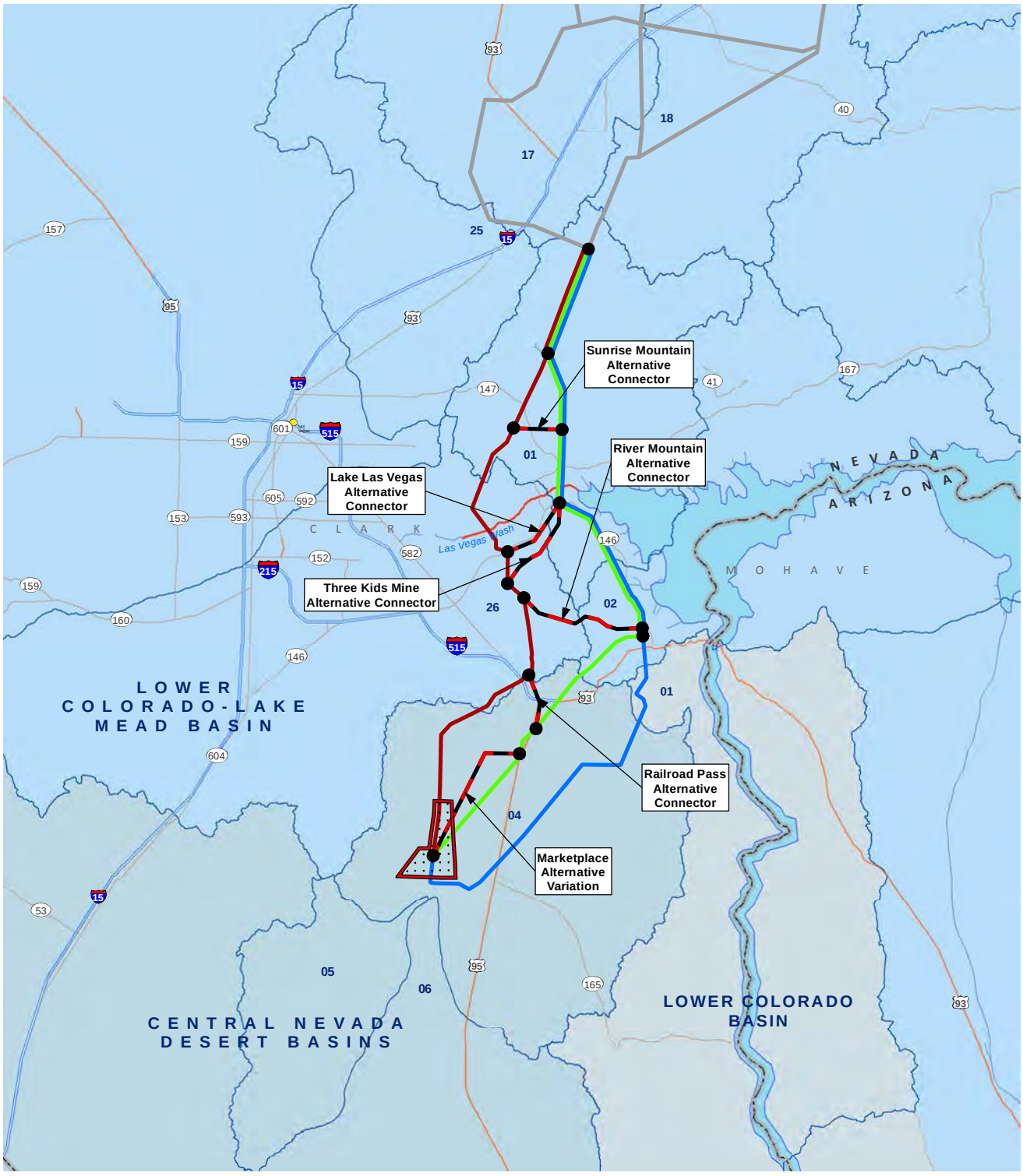
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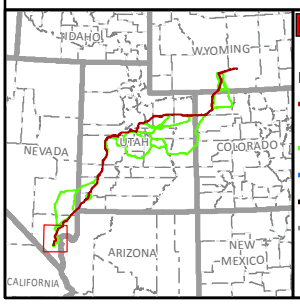
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Western AREA POWER ADMINISTRATION

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- Terminal Siting Area
- Node

DEIS Alternative Routes
- Applicant Proposed/ Agency Preferred IV-A
- Alternative IV-B
- Alternative IV-C
- Alternative Variation or Connector
- Segment not in this Region

- Potential Ground Electrode Siting Area
- Potential Ground Electrode Site
- Potential Ground Electrode Overhead Electrical Line
- Subwatershed (HUC10)
- 303d Impaired Stream
- 303d Impaired Waterbody

TRANSWEST EXPRESS TRANSMISSION PROJECT

Figure 3.4-4
Region IV
Basins, Watersheds and Impaired Waters

0 2.5 5 10 Miles
0 2.5 5 10 km
1:500,000

N

Western AREA POWER ADMINISTRATION

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Table 3.4-3 Major Rivers and Impaired Waters within Analysis Area and Project Regions

Project Region	River/Impaired Water	Reason for Impairment/TMDL[1,2]	Watershed	Hydrographic Basin
I	McKinney Creek	Removed 2012	Upper Muddy Creek	White-Yampa
	Muddy Creek	Removed 2012		
	Muddy Creek	TMDL: Phys Alt		
	Little Snake River	N/A	Little Snake River-Willow Creek	
			Little Snake River-Powder Wash	
	Little Snake River	Sed/Silt	Greasewood Gulch-Little Snake River	
			Outlet Little Snake River	
	Yampa River	Sed/Silt, Fe	Deception Creek-Yampa River	
			Spring Creek-Yampa River	
			Hells Canyon-Yampa River	
	Fortification Creek	Se	Fortification Creek	
	White River	N/A	Red Wash-White River	
			Dripping Rock Creek-White River	
			Asphalt Wash-White River	
			Cottonwood Wash-White River	
	Green River	N/A	Garden Creek-Green River	Lower Green
			Walker Hollow-Green River	
II	Douglas Creek	Sed/Silt	Outlet Douglas Creek	White-Yampa
	West Evacuation Creek	Sed/Silt	Evacuation Creek	
	Salt Creek	Sed/Silt, Se	West Salt Creek	Colorado Headwaters
	Colorado River	Se	McDonald Creek-Colorado River	
			Westwater Creek-Colorado River	Upper Colorado-Dolores
	Green River	N/A	Pelican Lake-Green River	Lower Green
			Sheep Wash-Green River	
			Tusher Wash-Green River	
			Salt Wash-Green River	
			Lower Pariette Draw	
	Pariette Draw and tributaries	Bo, Se, TDS		
			Upper Pariette Draw	
	Willow Creek	Bioassay	Agency Draw-Willow Creek	
	Ninemile Creek	Temp	Lower Ninemile Creek	
			Upper Ninemile Creek	
	Pelican Lake	pH	Pelican Lake-Green River	
	Duchesne River	TDS, Temp, Bioassay	Duchesne River	
	Strawberry River	Bo	Lower Strawberry River	
	Lake Fork River	Phys Alts; TMDL: TDS	Pigeon Water Creek-Lake Fork River	
	Antelope Creek and tributaries	Bo, TDS	Antelope Creek	
	Indian Canyon Creek	As, Bo, TDS	Indian Canyon	
	Red Creek Reservoir	DO	Red Creek	
	Soldier Creek	TMDL: P, Sed/Silt	Coal Creek-Price River	
	Price River	Bioassay		
			Beaver Creek-Price River	

Table 3.4-3 Major Rivers and Impaired Waters within Analysis Area and Project Regions

Project Region	River/Impaired Water	Reason for Impairment/TMDL[1,2]	Watershed	Hydrographic Basin
II (Cont)			Cottonwood Wash-Price River	Lower Green (Continued)
			Little Park Wash-Price River	
	San Rafael River	Bioassay	Upper San Rafael River	
	Huntington Creek	TMDL: TDS - Removed in 2010 listing	Huntington Creek	
		Se		
	Cottonwood Creek	TMDL: TDS	Cottonwood Creek	
	Scofield Reservoir	TMDL: DO, P, pH	Scofield Reservoir	
	Lower Gooseberry Reservoir	DO, P, pH		
	Quichupah Creek	Bioassay	Ivie Creek	Upper Colorado-Dirty Devil
	Soldier Creek	P, Sed/Silt	Soldier Creek	Jordan
	Currant Creek	Temp, pH	West Creek	
	Salina Creek	TMDL: TDS	Salina Creek	Escalante Desert-Sevier Lake
	San Pitch River	N/A	Upper San Pitch River	
	Sevier River	N/A	Upper Sevier River	
			Middle Sevier River	
III	Sevier River	N/A	Lower Sevier River	Escalante Desert-Sevier Lake
	Beaver River	N/A	The Big Wash-Beaver River	
			Morehouse Canyon-Beaver River	
			Upper Beaver River	
			Lower Beaver River	
	Newcastle Reservoir	TMDL: DO, P	Escalante Valley-Pinto Creek	
	Pinto Creek	Bioassay		
	Baker Reservoir	DO	Upper Santa Clara River	Lower Colorado-Lake Mead
	Santa Clara River	Temp, B	Lower Santa Clara River	
	Gunlock Reservoir	TMDL: DO		
	Meadow Valley Wash	P, Temp, B	Kershaw Canyon-Meadow Valley Wash	
			Lower Meadow Valley Wash	
	Muddy River	Temp, Fe, DO, P	Upper Muddy River	
	Muddy River	Temp, Fe, B, Mo, Mn	Lower Muddy River	
	Virgin River	Fe, Temp, P, Mn	Sand Hollow Wash-Virgin River	
			Halfway Wash-Virgin River	
IV	Duck Creek	Se, TDS,	Duck Creek-Las Vegas Wash	Lower Colorado-Lake Mead
	Las Vegas Wash	Fe, Mo; TMDL: P, NH3, Chlor		
	Colorado River	DO, Temp	Jumbo Wash-Colorado River	Lower Colorado-Below Hoover Dam

[1] TMDL – Total Maximum Daily Load

[2] Phys Alt – Physical Alterations; Sed – Sediment; Fe – Iron; Se – Selenium; Bo – Boron; TDS – Total Dissolved Solids; As – Arsenic; DO – Dissolved Oxygen; P – Phosphorous; Temp – Temperature; N/A – Not Applicable; Mo – Molybdenum; Mn – Manganese; NH_3 – Ammonia; Chlor – Chlorophyll-a.

Water use by Project Region is tabulated in **Table 3.4-4**. Regions I, II, and III reflect the major usage of agriculture with significant uses (greater than 1 percent) for thermoelectric uses and public supply, and small uses (less than 1 percent) of water for industrial, livestock, mining, aquaculture, and domestic purposes. The major use in Region IV is public supply, with significant uses for thermoelectric, irrigation,

and domestic uses. Uses for industrial applications, mining, and livestock also are present in small amounts (Kenny et al. 2009).

Table 3.4-4 Water Uses (Surface and Groundwater) in 2005 by Project Region

Project Region[1]	Unit[2]	Irrigation	Public Supply	Thermo-electric	Domestic	Industrial	Livestock	Aqua-culture	Mining (incl. Oil and Gas)	Total Water Use
I	acre-feet/year	703,147	17,060	41,546	706	1,859	1,837	907	1,714	768,776
	Percent	91	2	5	0.1	0.2	0.2	0.1	0.2	
II	acre-feet/year	3,423,837	189,864	85,825	5,858	16,993	7,449	48,357	5,153	3,783,335
	Percent	90	5	2	0.2	0.4	0.2	1	0.1	
III	acre-feet/year	955,145	60,700	25,080	2,711	2,083	6,116	280	1,479	1,053,594
	Percent	91	6	2	0.3	0.2	1	<0.1	0.1	
IV	acre-feet/year	17,474	602,031	28,239	23,870	5,993	146	0	3,002	680,755
	Percent	3	88	4	4	1	<0.1	0	0.4	
Total	Percent	81	14	3	1	0.4	0.2	1	0.2	6,286,461

[1] Water use reported by county. The counties crossed within each Project Region were totaled and reported.

[2] Percent is of total water use in that Project Region.

Source: Kenny et al. 2009.

3.4.6 Impacts to Water Resources

Potential impacts to water resources were identified through federal and state agency consultation and public scoping. These include potential impacts to surface water quality and quantity, such as increased erosion, sediment loads, turbidity, increased ion or salt concentrations, stream channel instability, and increased consumptive use of water. Also considered are potential impacts to springs and groundwater quality, such as degraded water quality or increased consumptive use.

Impacts to water resources would occur during the construction phase of the Project by ground disturbance for roadway, power line, terminal, temporary work areas, and electrode bed construction. Impacts also would occur when water is used for concrete batching and dust abatement. Impacts would continue into the operational phase at more localized areas where permanent disturbance occurs or where roads are constructed or widened at stream crossings, ephemeral drainage ways, or in close proximity to streams. Impacts of the decommissioning phase would be similar to those anticipated during construction. A COM Plan would be developed prior to construction and would include several specific plans relevant to water resources, including a Wetlands and Waters of the U.S. Plan, an Erosion Control Plan, and a Storm Water Pollution Prevention Plan, which will each address specific environmental impacts or localized conditions (TWE-19 and TWE-20). Relevant analysis considerations for water resources are described in **Table 3.4-5**.

Table 3.4-5 Relevant Analysis Considerations for Water Resources

Resource Topic	Analysis Considerations and Relevant Assumptions
Water quality (sedimentation) effects at waterway crossings	Quantify the number of perennial and intermittent waterbodies and crossings. Evaluate adequacy of design features and BMPs for disturbance restoration, sediment control, and bank restoration. It is assumed that the number of stream crossings along reference lines indicates the number of crossings by access roads. Quantify the acres of construction and operation disturbance within 300 feet and 100 feet of perennial streams. Quantify the change in road density from the construction and use of access roads within 300 feet and 100 feet of perennial streams.

Table 3.4-5 Relevant Analysis Considerations for Water Resources

Resource Topic	Analysis Considerations and Relevant Assumptions
Water quality (sedimentation) effects from upland disturbance	Quantify the size of construction disturbance areas. Estimate the relation to receiving perennial, intermittent, and ephemeral waterway crossings. Evaluate adequacy of design features and BMPs for disturbance restoration, sediment control, and bank restoration. Quantify the change in road density from the construction and use of access roads.
Floodplain obstruction and flooding damage	Identify locations of structures and/or ancillary facilities that would be constructed in river floodplain areas with the potential to obstruct overbank flows. A maximum span length of 1,500 feet is assumed; any floodplains requiring spans larger than this will require structures within the floodplain.
Water availability and use	Compare volume of water needed for Project construction to proposed water sources. Consider Project withdrawal rates and water demand at sources. Quantify water use from the Platte River and Colorado River basins.
Accidental releases of hazardous materials	Identify areas where accidental releases could impact both surface and groundwater quality. Evaluate adequacy of design features and BMPs to minimize and control releases.

3.4.6.1 Analyses Methodologies

GIS analyses were performed to quantify the number of stream crossings based on the reference line as well as the amount of potential disturbance based on the footprint of each alternative. Impacts to water quantity were analyzed by comparing the potential water use needed for construction of each alternative along with discussion regarding proposed sources. TransWest indicates that placement of structures in floodplains would be avoided with 1,500-foot spans between towers; however, floodplains crossed by alternatives for lengths greater than approximately 1,000 feet have been identified as areas that may necessitate potential tower sites. Due to the lack of consistent floodplain mapping in the analysis area, this was accomplished though desktop analysis of topographic maps and aerial photography.

Waterway Crossings

Although the locations of access roads have not been identified, the count of stream crossings by the reference lines along each alternative route have been analyzed as a parameter to estimate the magnitude of impacts from stream crossings during construction, operation, and decommissioning. Additionally, streams with impaired water quality and the reasons for the impairment are identified. This approach provides an overestimate of crossings considering TransWest would avoid crossings where possible by utilizing existing roads. Sedimentation impacts from utilization of existing roads are anticipated to be significantly less than impacts from construction of new roads. Furthermore, TransWest has estimated the disturbance from construction of access roads in different terrain types as a ratio of the length of the reference line (see **Appendix D**). An Access Road Plan would be developed by TransWest for the agency preferred alternative during final engineering and design, which would define site-specific access to each structure and temporary work area, including identification of necessary water-crossings, and would be included as part of the COM Plan.

Construction and operation ground disturbance within 100 feet and 300 feet of perennial waterways was quantified using the general methodology described in Section 3.0, Affected Environment and Environmental Consequences. This was done to provide an indication of impacts to water quality from increased erosion and sedimentation. Impacts to water quality from disturbance would decrease with increased distance from the streams. Because TransWest has committed to minimize the impacts to water resources and because there are multiple agency BMPs and stipulations that regulate disturbance near streams (see **Appendix C**), this methodology provides a conservative (overestimate) quantification of disturbance near streams.

Upland Disturbance

Ground disturbance was quantified using the general methodology described in Section 3.0, Affected Environment and Environmental Consequences. The analysis of indirect impacts to surface water quality is based on the assumption that surface disturbance within a given watershed serves as an indicator of the potential for increased sediment and salt runoff, and the acreage of disturbance is used as an impact parameter. Marston and Dolan (1988) conducted research to investigate the major criteria that control upland erosion in an environment similar to many locations within the analysis area. This research showed that slope and vegetative cover exert the most influence on upland erosion rates. Erosion was found to be inversely correlated with vegetation density (i.e., as vegetation density decreases, upland erosion increases).

The surface disturbance associated with the proposed Project would initially remove vegetative cover, which would increase surface runoff and exacerbate erosion. Areas needed for operation of the Project would remain disturbed, including the terminals and access roads; temporary work areas would be reclaimed. Once reclamation is complete in the temporary work areas, the vegetative cover would be reestablished, thereby decreasing erosion. As the vegetative cover approaches desired density levels, the erosion rate also would approach pre-construction levels. This is expected to occur within 3 to 5 years of initiating reclamation under general conditions; however, areas of low reclamation potential (see Section 3.3, Soils) and periods of minimal precipitation might extend this timeframe.

Road Density

Increased road density was analyzed within each affected watershed (HUC10) as a parameter to address impacts from increased erosion from construction and use of new roads. Existing road density was calculated as miles of road per square mile of watershed utilizing the TIGER Roads dataset (U.S. Census Bureau 2010) and the WBD (NRCS et al. 2010). Lengths of Project access roads were determined based on the access road model (see **Appendix D**) and were added to the lengths existing roads and density was recalculated by Project alternative. Existing and new road densities also were analyzed separately for the areas within 100 feet and 300 feet of perennial waters as parameters of the change in density near riparian areas where more change in density would constitute a greater impact to water quality. Because TransWest has committed to minimizing impacts to water resources and because there are multiple agency BMPs and stipulations that regulate disturbance near streams (see **Appendix C**), this methodology provides a conservative (overestimates) quantification of road density near streams.

Springs and Seeps

The NHD (NRCS et al. 2010) was used to define locations of springs and seeps across the analysis area. Springs and seeps located within the 2-mile transmission line corridor were analyzed along each alternative to provide a metric for potential to affect water quality at each location.

3.4.6.2 Impacts from Terminal Construction and Operation

The Northern and Southern terminals would be constructed regardless of alternative route or design option.

Northern Terminal

The Northern Terminal would be sited in the Sugar Creek watershed near Sinclair, Wyoming, and would require disturbance of 503 acres for construction and 234 acres for operation. This location is in a largely undisturbed upland area with low slopes that drain to the North Platte River approximately 10 miles away. Areas of water-erosion prone soils (see Section 3.3, Soils) as well as herbaceous wetland and woody riparian and wetland vegetative communities (see Section 3.5, Vegetation) are within this location. No streams, waterbodies, springs, or seeps are identified at the site.

During construction of the Northern Terminal, ground disturbance would remove vegetation and exacerbate upland erosion in susceptible areas. Erosion control design features such as water bars, cross drains, and vegetation restoration (TWE 13) would minimize upland erosion by directing runoff away from disturbed areas, decreasing velocities, and improving water infiltration. Agency BMPs including silt fencing (BMP WAT-9) also would mitigate impacts to receiving water bodies by providing sediment settling locations and engineered water velocity controls.

Water use for substation/converter station construction primarily would be for dust control during site preparation work. During this period, water trucks patrolling the site to control dust would make as many as one pass per hour over the site. Once site preparation work is complete, concrete for the placement of foundations becomes the largest use of water and dust control becomes minimal. Dust control activities are not expected to occur after construction is complete. Water required for construction of the Northern Terminal is estimated to be approximately 1.8 acre-feet (600,000 gallons), including dust control. Because the terminal is located in the Platte River Basin, it is assumed the source(s) of water will be from that basin as well. The required water would be procured from municipal sources, from commercial sources, or through a temporary water use agreement with landowners holding existing water rights. No new water rights would be required.

Magnesium chloride ($MgCl_2$) may be used in dust abatement. Several studies performed along roadways in Colorado where $MgCl_2$ has been used as a dust inhibitor or a deicer indicate that its use might increase the levels of these constituents in waterways depending on application rates, road proximity to waterways, and weather patterns, among others. These studies show that the increases did not approach concentration limits implemented by USEPA in drinking water secondary standards (Goodrich el al. 2009; Lewis 1999; Stevens 2001).

The potential for accidental releases of hazardous materials at the terminal would be greatest during the construction phase; however, this risk also would be present during the operation phase to a lesser extent. Construction and operation equipment and vehicles are potential sources of hazardous materials. Design features that would be implemented include performing refueling and maintenance activities in designated construction zones located more than 100 feet from waterways (TWE 24), and other prevention and containment measures as needed. A Spill Prevention, Control, and Countermeasure (SPCC) Plan would be prepared as part of the COM Plan (TWE 57), as required by federal law.

Conclusion: Through the implementation of the design features and BMPs, and considering the upland location of the terminal that is distant from waterways, little to no impacts to water quality are anticipated from construction disturbance. Terminal construction and operation would not be expected to alter the existing off-site drainage patterns, or degrade the water quality of streams and rivers. Because existing water rights would be utilized, no impacts to other water users would be anticipated. While the risk of accidental releases of hazardous materials would not be completely mitigated, the above described design features would minimize the risk of occurrence. In the event that an accidental release of hazardous materials did occur, it would have to travel more than 2 miles over upland areas and along ephemeral channels to reach a perennial stream (Sugar Creek) at a point greater than 9 miles upstream of the North Platte River.

Southern Terminal

The Southern Terminal or Alternate Southern Terminal would be sited in the Eldorado Valley watershed near Boulder City, Nevada, in an upland area that is already highly developed and drains to playa lakes at the bottom of a closed watershed. No streams, waterbodies, springs, or seeps are identified at either of the sites. Ground disturbance impacts would be similar to those discussed for the Northern Terminal, and the same design features and BMPs would be implemented to minimize impacts. Through the implementation of the design features and BMPs, and considering the upland locations of the terminals that are distant from waterways, little to no impacts to water quality are anticipated from construction disturbance.

These terminals would require disturbance of 412 acres for construction and 203 acres for operation. Water required for construction of the Southern Terminal or the Alternate Southern Terminal is estimated to be approximately 1.2 acre-feet (400,000 gallons), including dust control. The potential for accidental releases of hazardous materials is the same as discussed under the Northern Terminal.

Design Options 2 and 3

If either of the design options were implemented, the Southern Terminal or a substation would be constructed near IPP in Millard County, Utah (see Section 2.4.3.1, Northern and Southern Terminals). The proposed terminal or substation site near IPP is within the Sugarville-Broad Canyon Watershed and drains to the northwest via intermittent channels to a depression lake approximately 3 miles downstream.

The terminal near IPP under Design Option 2 would require 181 acres of construction disturbance and 118 acres of operation disturbance. The substation near IPP under Design Option 3 would require 161 acres of construction and 98 acres of operation disturbance in the same location. Because similar facilities and structures to the proposed action would be constructed for Design Option 2, it is assumed that the volume of water needed for construction of the terminal would be similar to that of the proposed action's Southern Terminal in the Eldorado Valley (1.2 acre-feet). Design Option 3 would require both the Substation near IPP and the Southern Terminal in the Eldorado Valley, effectively doubling the required water for construction (2.4 acre-feet). The potential for accidental releases of hazardous materials is the same as discussed under the Northern Terminal.

Conclusion: While the risk of accidental releases of hazardous materials would not be completely mitigated, the above described design features would minimize the risk of occurrence. In the event that an accidental release of hazardous materials did occur, the location of this terminal or substation is within and near the bottom of a closed watershed, limiting the geographic extent to this area. Due to the minimal volume of water required for terminal construction, and because existing and active water rights would be utilized, no impacts to other water users would be anticipated. Terminal construction and operation would not be expected to alter the existing off-site drainage patterns.

3.4.6.3 Impacts Common to all Alternative Routes and Associated Components

Construction Impacts

Water quality would be impacted both directly and indirectly from transmission line construction due to the ground disturbance necessary to complete the transmission line and related facilities. Ground disturbance includes areas cleared for construction, such as Project access roads, transmission line tower work areas, conductor stringing and tensioning sites, communication and regeneration sites, material storage yards, batch plants, fly yards, staging areas, and ground electrode systems.

New access roads, facilities, and other disturbed areas would be located away from waterbodies, wherever practicable. Access roads would be designed and constructed to minimize disruption of natural drainage patterns and waterbodies including rivers, streams, ephemeral streams, ponds, lakes, reservoirs, and playas. The roads and necessary stream crossings on BLM lands would be designed and constructed according to BLM manuals 9112, 9113, and the relevant RMPs. USFS standards and guidelines contained in the relevant LRMPs would dictate the road designs and construction practices on NFS lands. Practices described in these documents include avoiding development within riparian areas or employing mitigation if avoidance is not practical, siting stream crossings to minimize bank and channel disturbance and at 90-degree offsets (perpendicular) to channels, not siting new roads that parallel streams except where absolutely necessary, stabilization of stream banks which are damaged by development activities with methods that emphasize revegetation, and maintaining the natural complexity of riparian areas and their ability to act as effective sediment buffer zones.

Direct impacts would occur from the construction of access road waterway crossings, including crossings of perennial, intermittent, and ephemeral streams. **Appendix F** contains a detailed listing of waterbodies

crossed by Project reference lines. These impacts could come in the form of channel instability due to streambank disturbance and increased sediment supply from disturbed areas directly adjacent to the crossings. This may in turn cause increased sediment from mass wasting of channel banks, and down-cutting of the streambed, with resultant changes in channel geomorphology.

Although engineered access road locations have not been determined, three types of waterbody crossings are proposed:

1. Drive Through (Arizona Crossing): Crossing of a channel with minimal vegetation removal where no cut or fill is needed. This is typical for low-precipitation sagebrush country characterized by rolling topography and ephemeral streams that rarely flow with water.
2. Ford: Crossing of a channel that includes grading and stabilization. Stream banks and approaches would be graded and stabilized with rock or other erosion control devices to allow vehicle passage. Coarse rock would be installed in the streambed in a manner such that it would not raise the level of the streambed, allowing continued movement of water, fish and debris. This typically would be used on intermittent, larger ephemeral streams, or smaller perennial streams that would be expected to remain passable during a typical runoff season (e.g., estimated average peak streamflow in the magnitude of 100 cubic-feet per second [cfs] or less, and considering water velocity and depth).
3. Culvert: Crossing of a waterbody that includes installation of a culvert and construction of a stable road surface for vehicle passage over the culvert. Construction would occur during periods of low water. Culverts must be a minimum 18-inch diameter and able to pass a 10-year flow event. They typically would be partially buried in the streambed to maintain streambed material in the culvert. Non-erosive material would be placed around culverts to prevent scour or water flow outside the culvert. Stream banks and approaches also might be stabilized with rock or other erosion control devices. Culvert crossings could be used to limit impacts from in-stream erosion due to traffic within intermittent and smaller perennial streams.

During the final design phase, consultation would be conducted with the managing land agency regarding relevant standards and guidelines for waterbody road-crossing methods. Wherever needed, culverts, low-water crossings, and other devices of agency-approved design would be used to accommodate estimated peak flows of waterways (e.g., 10-year or 50-year flow event) according to the relevant land-managing agency requirements (see **Appendix C**). Each waterbody crossing would be designed and reviewed as advanced engineering is completed. Construction disturbances of banks and beds of waterbodies would be minimized during this design process. Performance of low water stream crossings (i.e., drive through and ford) and culvert installations would be monitored for the life of the access road, and maintained as necessary to preserve water quality. Waterbody crossings would be built as near as possible at right angles (perpendicular) to the streams and washes (TWE 8).

Through the implementation of the Project design features and the engineered design of crossings, the direct impacts would be greatest for short periods of time during construction and through the reclamation process until successful revegetation occurred. Erosion and sedimentation impacts would decrease, but would continue during operation due to the remaining access road disturbance. There are certain waterbodies that the state agencies have identified as having impaired uses due to elevated sediment concentrations or other constituents that might be present in stormwater runoff, among other causes (see **Table 3.4-3**). Access roads crossing these waterbodies would contribute to the sediment being mobilized to these streams. Design Feature TWE 20 states that the applicant will develop a management plan to avoid, reduce, and/or minimize adverse impacts to these streams. Additional BMPs contained in agencies' land-management guidance (BLM FO- and forest-specific) would apply to further minimize impacts, such as avoidance zones from waterways and specific requirements for access road crossing designs. These can be found in **Appendix C** and the documents listed in **Tables 1-3** and **1-4**.

Conclusion: Through the implementation of BMPs and applicant-committed design features, direct impacts to water quality from stream crossings would be limited to times when streamflow was present and/or vehicles were using the crossings or from unstable streambanks contributing sediment.

***WR-1**: Existing stream crossings would be utilized wherever requested by agencies. This would be developed on a site-specific basis during POD development. Stream crossings would be maintained as appropriate.*

***WR-2**: When existing crossings were not used, drive through (Arizona) crossings would not be utilized when un-protected (bare soil) streambeds are wet or when the stream is flowing water. This additional mitigation would reduce erosion and stream stability by limiting the crossing during times when the soil is highly susceptible to erosion.*

Indirect impacts to water quality could occur from ground disturbance required for construction of Project facilities in upland areas when precipitation events would cause overland runoff to erode bare soils and transport sediment to waterways, creating sedimentation, increased suspended sediment concentrations, and changes in channel geomorphology and stability. Structures would be sited a minimum distance of 200 feet from streams, whenever possible (TWE 8). Surface restoration would occur as required by the landowner or managing agency, returning the disturbed areas back to their natural contour, reseeding, and installing erosion control when necessary (TWE 13). Runoff from excavated (disturbed) areas would be controlled (TWE 22). Areas that would not require cut-and-fill for creation of a level workspace would have vegetation left in place wherever possible to maintain vegetation roots and increase soil stability (TWE 27). BMPs such as silt fences and check dams would further minimize this type of impact by trapping sediments or slowing the flow and allowing them to settle out of runoff before reaching the streams (BMP WAT-9). Additional agency BMPs and stipulations found in **Appendix C**, BLM RMPs, and USFS standards and guidelines also would be required as applicable, such as greater waterway setbacks. As successful reclamation and revegetation of the ground disturbance areas progress over multiple years, the erosion potential would decrease, nearing the pre-construction levels for all areas except those remaining disturbed during operation such as access roads.

The design features and BMPs discussed above and included in the Erosion Control Plan and Storm Water Pollution Prevention Plan would minimize runoff and erosion from disturbed areas; however, impacts from Project construction would result in increased erosion rates and sediment being delivered to streams. Although increased erosion would be expected, the disturbance would be dispersed along the linear path of the Project. No significant alterations to the existing drainage patterns or increases of off-site erosion would be expected from the disturbance of upland areas by the Project.

Transmission line structures located in floodplains have the potential to obstruct overbank flood flows, and to increase the risk of damage to the structures from debris in the water colliding with structures or by flows scouring around structure foundations. Project design features address facilities located in wetlands and WUS and state that the applicant would avoid locating structures in wetlands and WUS (TWE-20 and TWE-8), but do not specifically address structures in floodplains (see Section 3.7, Vegetation, for information on wetlands). The majority of floodplains could be spanned by the proposed transmission line, which has potential spans of up to 1,500 feet or more. Where a floodplain is wider than 1,500 feet, transmission line tower structures may require placement within the floodplain. Access roads are not anticipated to impact floodplains because they would be at grade and have minimal disturbance within floodplains. Floodplain development requirements are administered by the states and/or counties that would be crossed in accordance with FEMA regulations (44 CFR 60) and permit conditions would stipulate that structures must be engineered to withstand flood events and that no flood flow patterns would be altered.

Although transmission line tower structures may be necessary in floodplains, due to their “skeletal” design and minimal footprint (1 to 5 foundations per tower depending on type, approximately 10-foot diameter

each, see **Appendix D**), and through adherence to the permit requirements, they would not be expected to impede or redirect flood flows, adversely affect the capacity of the floodplains, or affect the pattern and magnitude of flood flows. Furthermore, because the span lengths could allow for placement of towers at distances of hundreds of feet from active river channels, no scour would be expected that would result in structural or property damage or that would impact the stability of the bed and banks of a waterway.

Water use for transmission line construction is for two primary purposes: foundation construction and ROW dust control. The required water would be procured from municipal sources, from commercial sources, or from temporary water use agreements with landowners holding existing water rights currently being used. No new water rights would be required. The estimated water required per mile of transmission line construction is approximately 3,400 gallons for foundation concrete and 240,000 gallons for dust control, totaling approximately 243,400 gallons (or approximately 0.75 acre-feet) per mile. Water requirements from each Hydrographic Region crossed (**Table 3.4-1**) are estimated based on the length of reference line crossing each.

Because existing water rights and uses (current depletion) would be utilized, no new impacts to other water users or the water source would be anticipated.

Spills or leaks of petroleum products and other hazardous materials from construction vehicles and equipment could impact water resources if they were to occur near, or be transported to, a waterway. TWE has committed to refuel and service vehicles in designated construction zones that are located more than 100 feet from waterways. Spill prevention and containment practices would be incorporated as needed (TWE 24), which would lessen the likelihood for a release and provide containment if a release occurred. A Hazardous Materials Management Plan will be prepared and all waste, including petroleum products and other potentially hazardous materials, would be removed to an authorized disposal facility (TWE 61). A SPCC Plan would be prepared as part of the COM Plan (TWE 57). If a reportable release occurs, the applicable agencies would be notified. TWE's contractor responsible for the release would be responsible for the clean-up (TWE 62).

While the risk of accidental releases of hazardous materials would not be completely mitigated, the above described design features would make it highly unlikely that water quality would be impacted due to Project construction.

Operation Impacts

Water quality would be impacted both directly and indirectly during the operation of the Project due to ground disturbance of permanent access roads and areas of unsuccessful reclamation due to poor reclamation potential.

Direct impacts at waterway crossings similar to those discussed for the construction phase would be anticipated. As stated in the construction phase discussion, the performance of low water stream crossings (i.e., drive through and ford) would be monitored as required by the agency for the life of the access road, and maintained as necessary to preserve water quality. Additionally, culverts installed in appropriate waterway crossings will be kept in good repair for the life of the access road.

This monitoring and maintenance, along with the design features discussed under construction impacts would decrease impacts to water quality; however, the Project would continue to contribute sediment from access road crossings. Existing drainage patterns would likely begin to stabilize as vehicle use at crossings was minimized during operations, but any changes in channel geomorphology that were created by construction would continue to alter stream channels and drainage for years until a new, stable channel is created either by reclamation efforts or the cycles of nature (10 to 100+ years).

Indirect impacts from bare soils on permanent access roads could occur by creating sedimentation issues and increased suspended sediment concentrations in streams. Design features such as water bars across

the roads (TWE 13) would decrease this impact by diverting water to undisturbed areas, thus, limiting the distance that water would run down disturbed areas and slowing the runoff once it reached the undisturbed, vegetated areas.

The design features and BMPs discussed under construction impacts and included in the Erosion Control Plan and Storm Water Pollution Prevention Plan would apply during Project operation and would minimize erosion from disturbed areas. However, increased erosion and sediment delivery would occur to streams from the access roads during periods of precipitation or snowmelt, especially in areas where roads are located in close proximity to streams.

Spills or leaks of petroleum products and other hazardous materials from operation and maintenance vehicles and equipment could impact water resources in the same manner as discussed under construction impacts; however, the risk for impacts is less due to a reduced number of vehicles and equipment in use.

While the risk of accidental releases of hazardous materials would not be completely mitigated, the design features discussed under construction impacts would apply during operations and would make it highly unlikely that water quality would be impacted due to Project operation.

Decommissioning Impacts

Impacts to water resources during the decommissioning phase of the Project would be similar to construction impacts.

3.4.6.4 Region I

Table 3.4-6 provides a tabulation of impacts associated with the alternative routes in Region I. Key impact parameters relate to the impact discussion in Section 3.4.6.2, Impacts Common to all Alternative Routes and Associated Components. Changes to road density within the affected watersheds (HUC10) are tabulated in **Table 3.4-7**. Specific differences by alternative are discussed below.

Table 3.4-6 Summary of Region I Alternative Route Impact Parameters

Parameter	Alternative I-A	Alternative I-B	Alternative I-C	Alternative I-D
Waterbody Crossings (count)				
Total	210	254	302	244
Perennial	2	2	18	4
Intermittent	203	250	270	235
Canals	1	1	6	1
Reservoirs/Lakes	4	1	8	4
Impaired	2	2	7	2
Springs/Seeps in 2-mile transmission line corridor	0	1	1	2
Floodplains over 1,000-feet wide (count)	2	2	5	3
Water Use (acre-feet)[1]	116	118	139	128
Construction Disturbance (acres)	2,057	2,083	2,511	2,306
Operation Disturbance (acres)	526	495	618	531
Construction Disturbance in Watersheds with Sediment or Alteration Impaired Steams (acres/percent of watershed)				
Upper Muddy Creek	N/A	N/A	165/0.1	N/A
Greasewood Gulch-Little Snake River	310/0.1	298/0.1	N/A	298/0.1
Deception Creek-Yampa River	N/A	N/A	185/0.1	N/A
Spring Creek-Yampa River	211/0.1	205/0.1	218/0.1	205/0.1
Hells Canyon-Yampa River	14/<0.1	14/<0.1	14/<0.1	14/<0.1

[1] Estimation of water use based on assumptions provided for construction of a 600-kV DC transmission line.

Table 3.4-7 Summary of Road Density Changes by Watershed (HUC10) in Region I

Watershed Name	HUC10[2]	Existing Density (mi/mi^2)			Alternative I-A Added Density (mi/mi^2)			Alternative I-B Added Density (mi/mi^2)			Alternative I-C Added Density (mi/mi^2)			Alternative I-D Added Density (mi/mi^2)		
		100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC
Deception Creek-Yampa River[1]	1405000204	0.65	1.56	1.33							0.09	0.09	0.09			
Dry Creek-Yampa River	1405000111	1.66	2.28	1.94							0.04	0.04	0.08			
Elkhead Creek	1405000106	0.83	1.41	1.00							0.01	0.01	0.02			
Fortification Creek	1405000107	1.19	2.02	1.36							0.13	0.13	0.11			
Fourmile Creek	1405000305	0.59	1.04	1.02							0.09	0.40	0.09			
Frewen Lake	1404020004	0.50	1.59	2.08	0	0	0.10	0	0	0.07	0	0	0.01	0	0	0.10
Greasewood Gulch-Little Snake River[1]	1405000309	0.38	0.66	0.86	0.05	0.04	0.10	0.04	0.03	0.09				0.04	0.03	0.09
Hells Canyon-Yampa River[1]	1405000206	0.17	0.51	0.68	0	0	<0.01	0	0	<0.01	0	0	<0.01	0	0	<0.01
Little Snake River-Powder Wash	1405000308	0.31	0.58	1.25	0	0	0.07	0	0	0.07				0	0	0.07
Little Snake River-Willow Creek	1405000302	0.54	1.13	1.38							0.06	0.04	0.03			
Lower Muddy Creek	1405000403	1.08	2.13	1.36							0.07	0.05	0.07	0.02	0.02	0.05
Lower Sand Creek	1405000307	0.99	1.79	0.88	0	0	0.07	0	0	0.06				0	0	0.08
Morgan Gulch-Yampa River	1405000202	3.47	3.28	1.53							0	0	0.09			
Red Wash	1405000402	1.25	2.37	1.32	0	0	0.07	0	0	0.09	0	0.06	0.01	0	0	0.05
Sand Wash	1405000310	4.20	3.66	0.83	0	0	0.01									
Spring Creek-Yampa River[1]	1405000205	0.47	1.01	1.03	0.03	0.03	0.07	0.03	0.04	0.07	0	0	0.07	0.03	0.04	0.07
Sugar Creek	1018000213	1.45	2.46	2.58	0	0	0.08	0	0	0.08	0	0	0.08	0	0	0.08
Upper Muddy Creek[1]	1405000401	1.02	1.92	1.50							0.06	0.05	0.08	0	0	0.00
Upper Sand Creek	1405000306	1.26	1.82	0.63				0	0	0.01						
Upper Separation Creek	1404020013	3.59	4.87	2.07	0	0	0.08	0	0	0.08	0	0	0.09	0	0	0.08
Wolf Creek	1405000701	4.60	5.37	1.28	0	0	0.10	0	0	0.10	0	0	0.10	0	0	0.10

[1] Watershed contains stream(s) that currently are on the states' 303(d) Impaired Streams lists for sedimentation and/or physical alterations.

[2] Ten digit USGS HUC, unique to each watershed.

Notes: Road density is reported as miles of road divided by square miles of area. Blanks indicate watershed is not affected by the alternative.

100 feet: area of watershed within 100 feet of a perennial waterway; 300 feet: area of watershed within 300 feet of a perennial waterway; HUC 10: entire HUC10 Watershed area.

Sources: NRCS et al. 2010; U.S. Census Bureau 2010.

Alternative I-A (Applicant Proposed)

Key Parameters Summary

Alternative I-A would entail the crossing of two perennial streams, both of which are impaired. The Little Snake River (in Colorado) is impaired due to elevated sediment concentrations. The Yampa River has elevated sediment and iron concentrations. Through the implementation of applicant-committed design features, agency BMPs, and mitigation measures **WR-1** and **WR-2**, impacts to water quality from stream crossings would be minimized to only include the potential for unstable streambanks to contribute sediment to the stream. The nearest existing crossing of the Little Snake River is nearly 4 straight line miles away on Highway 318 near Two Bar Ranch and the nearest crossing of the Yampa River is nearly 8 straight line miles away on Highway 318 near Sunbeam, Colorado.

Although many factors affect erosion in upland areas and sedimentation to streams (e.g., soil type, vegetative cover, slope), an increased contribution of sediment would be expected relative to the amount of construction and operation disturbance, and relative to the increase in road density especially near perennial waterways. Road density due to Alternative I-A increases no more than 0.1 mi/mi^2. Additionally, agency stipulations in the affected BLM FOs require the avoidance of areas near perennial waterways (see **Appendix C**).

Water use would require 116 acre-feet of water. Approximately 9 acre-feet of this need would come from the North Platte River drainage, with the remainder coming from the Upper Colorado drainage. Water would be supplied through arrangements with existing water rights holders and temporary use permits, subject to review and approval by the appropriate state. No new withdrawals would be required, and no effect on other water users would be anticipated.

Alternative I-B

Key Parameters Summary

Alternative I-B would entail the crossing of two perennial streams, both of which are impaired. The Little Snake River (in Colorado) is impaired due to elevated sediment concentrations. The Yampa River has elevated sediment and iron concentrations. Through the implementation of applicant-committed design features, agency BMPs, and mitigation measures **WR-1** and **WR-2**, impacts to water quality from stream crossings would include the potential for unstable streambanks to contribute sediment to the stream. The nearest existing crossing of the Little Snake River is nearly 9 straight line miles away on Highway 318 near Two Bar Ranch and the nearest crossing of the Yampa River is approximately 4 straight line miles away on Highway 318 near Sunbeam, Colorado.

Although many factors affect erosion in upland areas and sedimentation to streams (e.g., soil type, vegetative cover, slope), an increased contribution of sediment would be expected relative to the amount of construction and operation disturbance, and relative to the increase in road density especially near perennial waterways. Road density due to Alternative I-B increases no more than 0.1 mi/mi^2. Additionally, agency stipulations in the affected BLM FOs require the avoidance of areas near perennial waterways (see **Appendix C**).

Water use would require 118 acre-feet of water. Approximately 9 acre-feet of this need would come from the North Platte River drainage, with the remainder coming from the Upper Colorado drainage. Water would be supplied through arrangements with existing water rights holders and temporary use permits, subject to review and approval by the appropriate state. No new withdrawals would be required, and no effect on other water users would be anticipated.

Alternative I-C

Key Parameters Summary

Alternative I-C would entail the crossing of 18 perennial streams, three of which are impaired. Fortification Creek is impaired due to elevated selenium concentrations and the Yampa River is impaired for elevated sediment and iron concentrations. The State of Wyoming has developed a total maximum daily load (TMDL) to decrease impairment from physical alterations along Muddy Creek (5 crossings), and has applied for removal of the stream from the impaired waters list. Through the implementation of applicant-committed design features, agency BMPs, and mitigation measure **WR-1**, impacts to water quality from stream crossings would be minimized to include only the potential for unstable streambanks to contribute sediment to the stream. As part of mitigation measure **WR-1**, the existing crossings of Muddy Creek and Fortification Creek along Highway 789 would be utilized by the Project and no new crossings would be constructed. Likewise, existing crossings of the Yampa River around Craig, Colorado, and along Highway 40 would be utilized.

Although many factors affect erosion in upland areas and sedimentation to streams (e.g., soil type, vegetative cover, slope), an increased contribution of sediment would be expected relative to the amount of construction and operation disturbance, and relative to the increase in road density, especially near perennial waterways. Road density due to Alternative I-C generally increases no more than 0.1 mi/mi^2, with the exception of two watersheds where the highest increase is 0.40 mi/mi^2 (Fourmile Creek Watershed).

Water use would require 139 acre-feet of water. Approximately 9 acre-feet of this need would come from the North Platte River drainage, with the remainder coming from the Upper Colorado drainage. Water would be supplied through arrangements with existing water rights holders and temporary use permits, subject to review and approval by the appropriate state. No new withdrawals would be required, and no effect on other water users would be anticipated.

Alternative I-D (Agency Preferred)

Key Parameters Summary

Alternative I-D would entail the crossing of four perennial streams, two of which are impaired. The Little Snake River (in Colorado) is impaired due to elevated sediment concentrations. The Yampa River has elevated sediment and iron concentrations. Through the implementation of applicant-committed design features, agency BMPs, and mitigation measures **WR-1** and **WR-2**, impacts to water quality from stream crossings would be minimized to only include the potential for unstable streambanks to contribute sediment to the stream. The nearest existing crossing of the Little Snake River is nearly 9 straight line miles away on Highway 318 near Two Bar Ranch and the nearest crossing of the Yampa River is approximately 4 straight line miles away on Highway 318 near Sunbeam, Colorado.

Although many factors affect erosion in upland areas and sedimentation to streams (e.g., soil type, vegetative cover, slope), an increased contribution of sediment would be expected relative to the amount of construction and operation disturbance, and relative to the increase in road density especially near perennial waterways. Road density due to Alternative I-D increases no more than 0.1 mi/mi^2. Additionally, agency stipulations in the affected BLM FOs require the avoidance of areas near perennial waterways (see **Appendix C**).

Water use would require 128 acre-feet of water. Approximately 9 acre-feet of this need would come from the North Platte River drainage, with the remainder coming from the Upper Colorado drainage. Water would be supplied through arrangements with existing water rights holders and temporary use permits, subject to review and approval by the appropriate state. No new withdrawals would be required, and no effect on other water users would be anticipated.

Alternative Connectors in Region I

Each of the alternative connectors in Region I would include minor variations in the total number of waterbodies crossed, disturbed areas, and water use if they were to be utilized. The Mexican Flats Alternative Connector would cross one impaired waterbody; however the existing crossing of Muddy Creek by the secondary road outside of Dad, Wyoming, would be utilized. The Baggs Alternative Connector would cross one large floodplain where it crosses Muddy Creek. **Table 3.4-8** summarizes impacts associated with the alternative connectors in Region I.

Table 3.4-8 Summary of Region I Alternative Connector Impact Parameters

	Waterbody Crossings (count)									
	Total	Perennial	Intermittent	Canal	Reservoirs/Lakes	Impaired	Floodplains over 1,000 feet wide (count)	Water Use (acre-feet)[1]	Construction Disturbance (acres)	Operation Disturbance (acres)
Mexican Flats Alternative Connector	19	1	18	0	0	1	0	10	129	26
Conclusion	There are no apparent unique conditions or constraints for water resources by utilizing this connector.									
Baggs Alternative Connector	25	1	24	0	0	0	1	23	294	70
Conclusion	There are no apparent unique conditions or constraints for water resources by utilizing this connector.									
Fivemile Point North Alternative Connector	6	1	5	0	0	0	0	3	82	8
Conclusion	There are no apparent unique conditions or constraints for water resources by utilizing this connector.									
Fivemile Point South Alternative Connector	4	0	4	0	0	0	0	2	31	6
Conclusion	There are no apparent unique conditions or constraints for water resources by utilizing this connector.									

[1] Estimation of water use based on assumptions provided for construction of a 600-kV DC transmission line.

Alternative Ground Electrode Systems in Region I

It would be necessary to locate the northern ground electrode system within 100 miles of the Northern Terminal as discussed in Chapter 2.0. Although the location for this system has not been determined, conceptual locations and connections to the alternative routes have been provided by TWE. The impacts associated with constructing and operating this system are the same as those discussed in Section 3.4.6.2, Impacts Common to all Alternative Routes and Associated Components. **Table 3.4-9** summarizes impacts associated with the eight combinations of alternative routes and location possibilities for the northern ground electrode system.

Table 3.4-9 Summary of Region I Alternative Ground Electrode System Impact Parameters

	Waterbody Crossings (count)									
	Total	Perennial	Intermittent	Canal	Reservoirs/Lakes	Impaired	Floodplains over 1,000 feet wide (count)	Water Use[1] (acre-feet)	Construction Disturbance (acres)	Operation Disturbance (acres)
Separation Flat (All Alternatives)	25	0	25	0	0	0	0	10	128	39
Shell Creek (Alternatives I-A and I-D)	68	0	68	0	0	0	0	25	223	89
Little Snake East (Alternatives I-A, I-B, and I-D)	16	0	16	0	0	0	0	7	108	29
Little Snake West (Alternative I-A)	15	0	15	0	0	0	0	7	121	37

Table 3.4-9 Summary of Region I Alternative Ground Electrode System Impact Parameters

	Waterbody Crossings (count)									
	Total	Perennial	Intermittent	Canal	Reservoirs/Lakes	Impaired	Floodplains over 1,000 feet wide (count)	Water Use[1] (acre-feet)	Construction Disturbance (acres)	Operation Disturbance (acres)
Shell Creek (Alternative I-B)	62	0	62	0	0	0	0	20	189	71
Little Snake West (Alternative I-B and I-D)	21	0	21	0	0	0	0	10	93	21
Cottonwood Creek (Alternative I-C)	4	0	4	0	0	0	0	3	89	19
Separation Creek (All Alternatives)	2	0	2	0	0	0	0	10	138	48
Eight Mile Basin (All Alternatives)	7	0	7	0	0	0	0	3	86	18

[1] Estimation of water use based on assumptions provided for construction of a 600kV DC transmission line.

Region I Conclusion

Within Region I, Alternative I-C exhibits the highest impacts of all alternatives, with the most streams crossed, impaired streams crossed, floodplains crossed, water use, and construction and operation disturbance. Between the other alternatives (I-A, I-B, and I-D), there is no distinct difference in potential impacts to water resources.

3.4.6.5 Region II

Table 3.4-10 provides a tabulation of impacts associated with the alternative routes in Region II. Key impact parameters relate to the impact discussion in Section 3.4.6.2, Impacts Common to all Alternative Routes and Associated Components. Changes to road density within the affected watersheds (HUC10) are tabulated in **Table 3.4-11**. Specific differences by alternative are discussed below.

Table 3.4-10 Summary of Region II Alternative Route Impact Parameters

Parameter	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Waterbody Crossings (count)						
Total	360	579	541	348	415	336
Perennial	19	26	24	17	40	27
Intermittent	298	522	468	315	345	302
Canals	40	19	37	14	26	6
Reservoirs/Lakes	3	5	12	2	4	1
Impaired	4	3	5	1	5	3
Springs/Seeps in 2-mile transmission line corridor	6	7	5	2	7	4
Floodplains over 1,000 feet wide (count)	2	4	4	1	2	2
Water Use (acre-feet)	192	258	272	195	199	199
Construction Disturbance (acres)	3,745	5,003	5,066	4,055	3,935	4,276
Operation Disturbance (acres)	1,178	1,436	1,308	1,223	1,195	1,392
Construction Disturbance in Watersheds with Sediment or Alteration Impaired Streams (acres/percent of watershed)						
Outlet Douglas Creek	N/A	238/0.2%	238/0.2%	N/A	N/A	N/A
Evacuation Creek	N/A	286/0.2%	286/0.2%	N/A	N/A	N/A
Pigeon Water Creek-Lake Fork River	87/0.1%	N/A	N/A	N/A	83/0.1%	N/A

Table 3.4-10 Summary of Region II Alternative Route Impact Parameters

Parameter	Alternative II-A	Alternative II-B	Alternative II-C	Alternative II-D	Alternative II-E	Alternative II-F
Coal Creek-Price River	N/A	53/<0.1%	N/A	7/<0.1%	N/A	7/<0.1%
Soldier Creek	272/0.2%	N/A	N/A	N/A	384/0.3%	384/0.3%

[1] Estimation of water use based on assumptions provided for construction of a 600-kV DC transmission line.

Alternative II-A (Applicant Proposed)

Key Parameters Summary

Alternative II-A would entail the crossing of 19 perennial streams, four of which are impaired. The State of Utah has developed a TMDL for total dissolved solids (TDS) on the Lake Fork River. The Duchesne River is impaired because of elevated TDS concentrations and elevated water temperature, and observed bio-toxicity. Soldier Creek is impaired due to elevated nutrients, phosphorus, and sedimentation; Lake Fork (Soldier Creek) is listed as an impaired stream due to elevated TDS concentrations and sedimentation. Utah Department of Environmental Quality (UDEQ) (2010) has requested that the Lake Fork River be delisted. Each of these streams has existing crossing locations nearby that could be utilized according to mitigation measure **WR-1**. Through the implementation of applicant-committed design features, agency BMPs, and mitigation measures **WR-1** and **WR-2**, impacts to water quality from stream crossings would be minimized to include only the potential for unstable streambanks to contribute sediment to the stream. Although other factors contribute to erosion and sediment yield in upland areas (e.g., soil type, vegetative cover, slope), an increased contribution of sediment would be expected relative to the amount of construction and operation disturbance, and relative to the increase in road density especially near perennial waterways. Road density due to Alternative II-A generally increases no more than 0.1 mi/mi^2, with exceptions in 12 watersheds where the highest increase in road density of 0.27 mi/mi^2 was calculated within the 100-foot perennial of the Soldier Creek Watershed. Additionally, agency stipulations for the affected BLM FOs and USFS-administered lands require the avoidance of areas near perennial waterways (see **Appendix C**). Water use would require 192 acre-feet of water. Water would be supplied through arrangements with existing water rights holders and temporary use permits, subject to review and approval by the appropriate state. No new withdrawals would be required, and no effects on other water users would be anticipated.

Alternative II-B

Key Parameters Summary

Alternative II-B would entail the crossing of 26 perennial streams, three of which are impaired. Douglas Creek is impaired due to sedimentation. West Salt Creek (crossed 37 times, 5 of which are in perennial reaches) is impaired due to elevated sediment and iron concentrations. Huntington Creek has an established TMDL for TDS. UDEQ (2010) has requested that Huntington Creek be delisted. There are no obvious existing crossings of West Salt Creek along approximately 2 miles of perennial stream and 11 miles of intermittent stream that could be utilized, and construction of new crossings or use of Arizona or ford crossings would increase erosion and sedimentation in this stream. The locations of both Douglas Creek and Huntington Creek proposed new crossings have existing crossings within 2 miles or less that could be utilized. Through the implementation of applicant-committed design features, agency BMPs, and mitigation measures **WR-1** and **WR-2**, impacts to water quality from stream crossings would be minimized to include only those discussed along West Salt Creek, as well as the potential for unstable streambanks to contribute sediment to the stream. Although other factors contribute to erosion and sediment yield in upland areas (e.g., soil type, vegetative cover, slope), an increased contribution of sediment would be expected relative to the amount of construction and operation disturbance, and relative to the increase in road density especially near perennial waterways. Road density due to Alternative II-B generally increases no more than 0.1 mi/mi^2, with exceptions in 13 watersheds where the highest increase in road density of 1.33 mi/mi^2 was calculated within the 100-foot perennial buffer of West Salt Creek Watershed.

Table 3.4-11 Summary of Road Density Changes by Watershed (HUC 10) in Region II

Watershed Name	HUC10[2]	Existing Density (mi/mi²)			Alternative II-A Added Density (mi/mi²)			Alternative II-B Added Density (mi/mi²)			Alternative II-C Added Density (mi/mi²)			Alternative II-D Added Density (mi/mi²)			Alternative II-E Added Density (mi/mi²)			Alternative II-F Added Density (mi/mi²)		
		100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC
Agency Draw-Willow Creek	1406000604	3.30	4.19	1.60										0.07	0.06	0.08				0.07	0.06	0.08
Antelope Creek	1406000305	3.12	4.97	1.07										0	0	0.02	3.56	3.74	0.17	0	0	0.02
Avintaquin Creek	1406000402	1.76	1.54	0.94																0	0	0.03
Beaver Creek-Price River	1406000705	7.16	6.85	2.45										0.03	0.06	0.11	0.12	0.20	0.07	0.03	0.03	0.05
Bitter Creek	1403000101	0	0.12	1.53				0	0	0.07	0	0	0.07									
Bitter Creek	1405000709	4.34	4.96	1.33				0	0.04	0.02	0	0.04	0.02									
Chalk Creek	1603000514	11.43	5.46	2.08							0	0	0.03									
Cherry Creek Wash	1603000507	9.61	7.25	1.46	0	0	0.02							0	0	0.02	0	0	0.02			
Cisco Wash	1403000106	0	1.88	0.82				0	0	0.06	0	0	0.06									
Cliff Creek	1406000102	0.40	5.63	1.60	0	0	0.09							0	0	0.10	0	0	0.10	0	0	0.10
Coal Creek-Price River[1]	1406000708	2.03	2.90	2.62				0.12	0.08	0.02				0	0	<0.01						
Cottonwood Canyon	1403000104	4.50	3.77	0.56				0	0	0.03	0	0	0.03									
Cottonwood Creek	1406000902	1.63	2.97	1.64				0.01	0.01	0.08	0.01	0.01	0.03									
Cottonwood Creek-Dry Gulch Creek	1406000310	1.95	2.74	2.22	0.18	0.11	0.06										0.18	0.11	0.06			
Cottonwood Wash-White River	1405000711	0.36	0.79	1.70										0.05	0.05	0.08	0	0	0.01	0.05	0.05	0.08
Coyote Wash	1405000710	1.94	2.38	1.96										0.42	0.67	0.14	0.20	0.19	0.04	0.42	0.67	0.14
Currant Creek	1406000404	3.46	3.43	1.99	0.01	0.03	0.05															
Desert Seep Wash	1406000707	1.18	1.62	1.81				0.05	0.05	0.13												
Dog Valley Wash	1603000503	8.49	4.73	2.01	0	0	0.15	0	0	0.09				0	0	0.14	0	0	0.14	0	0	0.09
Dripping Rock Creek-White River	1405000705	1.54	2.80	1.96	0.03	0.03	0.04	0	0	<0.01	0	0	<0.01	0.03	0.03	0.04	0.03	0.03	0.04	0.03	0.03	0.04
Dry Gulch Creek	1406000309	1.64	2.45	2.13	0.21	0.18	0.07										0.21	0.16	0.03			
Duchesne River	1406000315	0.98	1.34	2.29	0	0	0.02										0	0	0.03			
Evacuation Creek[1]	1405000706	3.93	4.77	1.03				0	0	0.11	0	0	0.11									
Ferron Creek	1406000903	1.57	2.10	1.51							0.01	0.02	0.06									
Gordon Creek	1406000704	4.22	4.44	2.08										0.08	0.09	0.20						
Grassy Trail Creek	1406000709	11.58	7.38	1.70				0	0	0.05												
Headwaters Muddy Creek	1407000202	2.01	2.10	1.80							0.03	0.04	0.05									
Hog Back Reservoir-Old River Bed	1603000510	0	0.70	1.13	0	0	0.01	0	0	0.01	0	0	0.01	0	0	0.01	0	0	0.01	0	0	0.01
Huntington Creek	1406000901	3.94	4.22	1.65				0.03	0.03	0.10	0.01	0.01	0.03	0.01	0.01	0.03						
Ivie Creek	1407000201	3.91	6.30	2.90							0.07	0.20	0.11									
Ivie Creek	1603000501	3.50	3.53	1.87							0.05	0.15	0.20									
Little Grand Wash	1406000803	1.09	1.56	0.78				0.07	0.08	0.17	0.07	0.08	0.17									
Little Park Wash-Price River	1406000711	3.17	3.12	0.99				0.06	0.04	0.07	0	0	0.03									
Lost Creek-Sevier River	1603000305	9.67	9.84	4.88							0.06	0.08	0.09									
Lost Spring Wash-Saleratus Wash	1406000801	0.44	1.82	1.10				0	0	0.12	0	0	0.18									
Lower Ninemile Creek	1406000504	4.82	3.83	1.02										0	0	0.03				0	0	0.03
Lower Pariette Draw	1406000502	0.56	1.05	1.55										0	0	0.04				0	0	0.04
Lower Strawberry River	1406000408	1.00	2.14	1.74	0	0	0.04															
McDonald Creek-Colorado River	1401000519	0.17	0.43	1.04				0	0	0.03	0	0	0.03									
Middle Sevier River	1603000512	1.45	2.18	2.28				0.01	0.02	0.08	0.04	0.04	0.03							0.01	0.02	0.08
Middle Strawberry River	1406000403	8.03	5.55	1.30	0	0.08	0.14															
North Salt Wash	1406000904	4.07	4.16	1.15							0	0	0.05									

Table 3.4-11 Summary of Road Density Changes by Watershed (HUC 10) in Region II

Watershed Name	HUC10[2]	Existing Density (mi/mi^2)			Alternative II-A Added Density (mi/mi^2)			Alternative II-B Added Density (mi/mi^2)			Alternative II-C Added Density (mi/mi^2)			Alternative II-D Added Density (mi/mi^2)			Alternative II-E Added Density (mi/mi^2)			Alternative II-F Added Density (mi/mi^2)		
		100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC
Oak Creek	1603000515	8.63	6.17	1.93							0	0	0.07									
Outlet Douglas Creek[1]	1405000703	1.14	3.28	1.51				0.16	0.38	0.17	0.16	0.38	0.17									
Pelican Lake-Green River	1406000106	0.55	1.44	1.94	0.03	0.03	0.13										0.03	0.03	0.13			
Pigeon Water Creek-Lake Fork River[1]	1406000308	0.84	1.47	2.23	0.06	0.06	0.06										0.11	0.16	0.04			
Rabbit Gulch	1406000406	0.37	1.70	2.12	0	0	0.21															
Red Creek	1406000405	3.50	4.73	2.46	0.05	0.09	0.13															
Red Wash-White River	1405000704	1.18	2.61	1.41	0	0	0.06	0.06	0.05	0.07	0.06	0.05	0.07	0	0	0.06	0	0	0.06	0	0	0.06
Sagers Wash	1403000107	1.40	1.58	1.03				0.22	0.23	0.09	0.22	0.23	0.09									
Salina Creek	1603000304	8.89	12.15	3.83							0.13	0.13	0.12									
Salt Wash	1403000501	0.14	0.32	0.91				0	0	0.02	0	0	0.02									
Salt Wash-Green River	1406000804	0.13	0.64	1.54				0.04	0.04	0.06	0.04	0.04	0.06									
Scofield Reservoir	1406000702	3.90	4.66	2.67										0.03	0.16	0.09	0.01	0.01	<0.01			
Sheep Wash-Green River	1406000505	0.09	0.33	1.21										0.06	0.06	0.16				0.06	0.06	0.16
Silver Creek	1603000401	2.09	3.10	2.55				0.04	0.10	0.22				0	0	0.08						
Soldier Creek[1]	1602020201	8.48	6.99	2.45	0.27	0.19	0.16										0.53	0.44	0.25	0.53	0.44	0.25
Strawberry River-Duchesne River	1406000304	1.57	1.95	2.39	0.10	0.08	0.08										0.16	0.13	0.10			
Sugarville-Broad Canyon	1603000508	3.99	3.04	1.18	0	0	0.12	0	0	0.13	0	0	0.11	0	0	0.12	0	0	0.12	0	0	0.13
Tanner Creek	1603000505	5.90	4.83	2.20	0	0	0.07							0	0	0.07	0	0	0.07			
Tenmile Canyon	1406000805	4.00	4.85	1.31				0.17	0.16	0.04	0.17	0.16	0.04									
Thistle Creek	1602020202	10.98	7.25	2.76	0.23	0.19	0.20										0.23	0.19	0.20	0.23	0.19	0.20
Tusher Wash-Green River	1406000802	3.40	3.75	0.73				0	0	<0.01	0	0	<0.01									
Uinta River	1406000314	1.41	2.20	2.16	0.01	0.01	0.04										0.01	0.01	0.04			
Upper Ninemile Creek	1406000503	4.05	4.59	0.99										0.08	0.09	0.20	0.48	0.39	0.05	0.06	0.08	0.26
Upper Pariette Draw	1406000501	1.41	1.70	1.87										0	0	0.05				0	0	0.05
Upper San Pitch River	1603000402	4.29	4.57	2.94				0.54	0.45	0.16				0.08	0.18	0.13						
Upper San Rafael River	1406000905	0.70	0.95	1.30							0	0	0.08									
Upper Sevier River	1603000504	0.99	1.90	1.71				0.06	0.06	0.08										0.06	0.06	0.08
Upper Strawberry River	1406000401	1.03	1.61	1.72	0	0	0.05															
Walker Hollow-Green River	1406000105	0.79	1.99	2.46	0	0	0.18							0	0	0.01	0	0	0.08	0	0	0.01
West Creek	1602020101	3.67	4.24	2.08	0.22	0.24	0.20	0.07	0.08	0.13				0.14	0.16	0.17	0.16	0.19	0.20	0.16	0.19	0.20
West Salt Creek	1401000517	5.55	4.61	1.04				1.33	0.84	0.18	1.33	0.84	0.18									
Westwater Creek	1403000102	4.25	3.68	0.96				0	0	0.04	0	0	0.04									
Westwater Creek-Colorado River	1403000108	0.38	0.65	1.20				0	0	0.05	0	0	0.05									
White River	1406000701	6.37	6.29	2.44													0.04	0.06	0.11	0.19	0.24	0.16
Willow Creek	1406000703	4.16	4.26	1.37										0.21	0.50	0.30	0.43	0.45	0.23	0	0	0.24
Wolf Creek	1405000701	4.60	5.37	1.28	0	0	0.01	0	0	0.01	0	0	0.01	0	0	0.01	0	0	0.01	0	0	0.01

[1] Watershed contains stream(s) that are currently on the states' 303(d) Impaired Streams lists for sedimentation and/or physical alterations.
[2] Ten digit USGS HUC, unique to each watershed.

Note: Road density is reported as miles of road divided by square miles of area. Blanks indicate watershed is not affected by the alternative.
100 feet: area of watershed within 100 feet of a perennial waterway; 300 feet: area of watershed within 300 feet of a perennial waterway; HUC 10: entire HUC 10 Watershed area.

Sources: NRCS et al. 2010; U.S. Census Bureau 2010.

Additionally, agency stipulations for the affected BLM FOs and USFS-administered lands require the avoidance of areas near perennial waterways (see **Appendix C**). Water use would require 258 acre-feet of water. Water would be supplied through arrangements with existing water rights holders and temporary use permits, subject to review and approval by the appropriate state. No new withdrawals would be required, and no effects on other water users would be anticipated.

Alternative II-C

Key Parameters Summary

Alternative II-C would entail the crossing of 24 perennial streams, five of which are impaired. Cottonwood Creek is impaired due to elevated TSD. Douglas Creek is impaired due to sedimentation. West Salt Creek (crossed 37 times) is impaired due to elevated sediment and iron concentrations. Huntington Creek is impaired for elevated selenium concentrations. Quitchupah Creek is listed due to observed bio-toxicity. As discussed for Alternative II-B, impacts from crossings of West Salt Creek would increase erosion and sedimentation due to the need for construction of multiple crossings. The locations of Douglas Creek, Huntington Creek, and Quitchupah Creek proposed new crossings have existing crossings within 2 miles or less that could be utilized. Through the implementation of applicant-committed design features, agency BMPs, and mitigation measures **WR-1** and **WR-2**, impacts to water quality from stream crossings would be minimized to include only those discussed along West Salt Creek as well as the potential for unstable streambanks to contribute sediment to streams. Although other factors contribute to erosion and sediment yield in upland areas (e.g., soil type, vegetative cover, slope), an increased contribution of sediment would be expected relative to the amount of construction and operation disturbance, and relative to the increase in road density especially near perennial waterways. Road density due to Alternative II-C generally increases no more than 0.1 mi/mi^2, with exceptions in 10 watersheds where the highest increase in road density of 1.33 mi/mi^2 was calculated within the 300-foot perennial buffer of West Salt Creek Watershed. Additionally, agency stipulations for the affected BLM FOs and USFS-administered lands require the avoidance of areas near perennial waterways (see **Appendix C**). Water use would require 272 acre-feet of water. Water would be supplied through arrangements with existing water rights holders and temporary use permits, subject to review and approval by the appropriate state. No new withdrawals would be required, and no effects on other water users would be anticipated.

Alternative II-D

Key Parameters Summary

Alternative II-D would entail the crossing of 17 perennial streams, one of which is impaired. Willow Creek (tributary to Green River) is listed due to observed bio-toxicity. The nearest mapped existing crossing on Willow Creek is approximately 3 straight-line miles away. Through the implementation of applicant-committed design features, agency BMPs, and mitigation measures **WR-1** and **WR-2**, impacts to water quality from stream crossings would be minimized to include only those discussed along Cottonwood Creek as well as the potential for unstable streambanks to contribute sediment to streams. Although other factors contribute to erosion and sediment yield in upland areas (e.g., soil type, vegetative cover, slope), an increased contribution of sediment would be expected relative to the amount of construction and operation disturbance, and relative to the increase in road density especially near perennial waterways. Road density due to Alternative II-D generally increases no more than 0.1 mi/mi^2, with exceptions in 11 watersheds where the highest increase in road density of 0.67 mi/mi^2 was calculated within the 300-foot perennial buffer of Coyote Wash Watershed. Additionally, agency stipulations for the affected BLM FOs and USFS-administered lands require the avoidance of areas near perennial waterways (see **Appendix C**). Water use would require 195 acre-feet of water. Water would be supplied through arrangements with existing water rights holders and temporary use permits, subject to review and approval by the appropriate state. No new withdrawals would be required, and no effects on other water users would be anticipated.

Alternative II-E

Key Parameters Summary

Alternative II-E would entail the crossing of 40 perennial streams, five of which are impaired. The State of Utah has developed a TMDL for TDS on the Lake Fork River. The Duchesne River is listed due to elevated TDS concentrations and elevated water temperature, and observed bio-toxicity. Sowers Creek (crossed 5 times) is impaired due to elevated TDS and boron concentrations. Soldier Creek (crossed 5 times) is impaired due to elevated nutrients, phosphorus, and sedimentation. Lake Fork River (Soldier Creek) is listed as an impaired stream due to elevated TDS concentrations and sedimentation. UDEQ (2010) has requested that the Lake Fork River be delisted. Existing crossings of the Duchesne River, Lake Fork River, Soldier Creek, and Lake Fork River (Soldier Creek) exist within several miles or less from proposed new crossings. The reference line follows Sowers Creek through a narrow canyon for approximately 15 miles, crossing the stream numerous times. The road along this stretch of the creek is a small "cherrystem" into USFS inventoried roadless area. No apparent existing crossings exist along portions of this canyon, and the construction of crossings would increase erosion and sedimentation in this stream, which also would further increase the TDS concentrations. Through the implementation of applicant-committed design features, agency BMPs, and mitigation measures **WR-1** and **WR-2**, impacts to water quality from stream crossings would be minimized to include only those discussed along Sowers Creek, as well as the potential for unstable streambanks to contribute sediment to streams. Although other factors contribute to erosion and sediment yield in upland areas (e.g., soil type, vegetative cover, slope), an increased contribution of sediment would be expected relative to the amount of construction and operation disturbance, and relative to the increase in road density especially near perennial waterways. Road density due to Alternative II-E generally increases around 0.1 mi/mi^2, with exceptions in 16 watersheds where the highest increase in road density of 3.74 mi/mi^2 was calculated within the 300-foot perennial buffer of Antelope Creek Watershed (Sowers Creek). Additionally, agency stipulations for the affected BLM FOs and USFS-administered lands require the avoidance of areas near perennial waterways (see **Appendix C**). Water use would require 199 acre-feet of water. Water would be supplied through arrangements with existing water rights holders and temporary use permits, subject to review and approval by the appropriate state. No new withdrawals would be required, and no effects on other water users would be anticipated.

Alternative II-F (Agency Preferred)

Key Parameters Summary

Alternative II-F would require 336 stream crossings, 27 of which are perennial. Of those crossings, three streams are impaired: Lake Fork River (Soldier Creek) is impaired for sedimentation/siltation and TDS, Soldier Creek (crossed five times) is impaired for sedimentation/siltation and phosphorus, and Willow Creek (tributary of Green River) is listed due to observed bio-toxicity. Each of these streams has existing crossing locations nearby that could be utilized according to mitigation measure **WR-1**. Through the implementation of applicant-committed design features, agency BMPs, and mitigation measures **WR-1** and **WR-2**, impact to water quality from stream crossings would be minimized. An increased contribution of sediment would be expected from upland areas relative to the amount of construction and operation disturbance, and relative to the increase in road density especially near perennial waterways. Road density generally increases by no more than 0.1 mi/mi^2 in watersheds affected by this alternative, with the exception of nine watersheds. The highest increase is in the Coyote Wash Watershed where the road density might increase by 0.67 mi/mi^2 within 300 feet of perennial waterways. Additionally, agency stipulations for the affected BLM Fos and USFS-administered lands require the avoidance of areas near perennial waterways (see **Appendix C**). Water use would require 139 acre-feet of water. Water would be supplied through arrangements with existing water rights holders and temporary use permits, subject to review and approval by the appropriate state. No new withdrawals would be required, and no effects on other water users would be anticipated.

Alternative Variation in Region II

Emma Park Alternative Variation

Table 3.4-12 shows the water resource impact parameters associated with the Emma Park Alternative Variation and the comparable portion of Alternative II-F. This variation would require an increased number of stream crossings, increased water use, and increased ground disturbance when compared with the portion of Alternative II-F it would replace.

Table 3.4-12 Summary of Region II Alternative Variation Impact Parameters

	Waterbody Crossings (count)						Floodplains over 1,000 feet wide	Water Use (acre-feet)	Construction Disturbance (acres)	Operation Disturbance (acres)
	Total	Perennial	Intermittent	Canals	Reservoir/Lakes	Impaired				
Emma Park Alternative Variation	26	10	16	0	0	0	0	26	645	221
Comparable Portion of II-F	17	2	15	0	0	0	0	24	666	240

[1] Estimation of water use based on assumptions provided for construction of a 600-kV DC transmission line.

Alternative Connectors in Region II

Table 3.4-13 summarizes impacts associated with the alternative connectors in Region II. The Lynndyl Alternative Connector would include an increase in total waterbodies crossed, disturbed areas, and water use. The IPP Alternative Connector would include minor increases to water use and disturbance primarily due to its short length.

Table 3.4-13 Summary of Region II Alternative Connector Impact Parameters

	Waterbody Crossings (count)						Floodplains over 1,000 feet wide (count)	Water Use (acre-feet)[1]	Construction Disturbance (acres)	Operation Disturbance (acres)
	Total	Perennial	Intermittent	Canals	Reservoirs/Lakes	Impaired				
Castle Dale Alternative Connector	16	0	14	2	0	0	0	15	176	50
Conclusion	There are no apparent unique opportunities or constraints for water resources by utilizing this connector.									
Price Alternative Connector	33	4	29	0	0	0	0	23	280	81
Conclusion	There are no apparent unique opportunities or constraints for water resources by utilizing this connector.									
Lynndyl Alternative Connector	45	0	33	12	0	0	0	25	305	72
Conclusion	There are no apparent unique opportunities or constraints for water resources by utilizing this connector.									
IPP East Alternative Connector	0	0	0	0	0	0	0	3	36	7
Conclusion	There are no apparent unique opportunities or constraints for water resources by utilizing this connector.									
Highway 191 Alternative Connector	9	3	6	0	0	0	0	4	119	38
Conclusion	There are no apparent unique opportunities or constraints for water resources by utilizing this connector.									

[1] Estimation of water use based on assumptions provided for construction of a 600-kV DC transmission line.

Region II Conclusion

Alternatives II-A, II-D, and II-F all have similar impacts to water resources, which are less than the remaining alternatives. Alternatives II-B, II-C, and II-E would have a greater number of stream crossings listed for impaired water quality (without existing crossings nearby) and the largest increases to road densities in certain watersheds, which indicate that increased impacts to these streams would be likely. These alternatives also are longer in length, which equates to more ground disturbance and stream crossings. Alternatives II-B and II-C are 30 to 40 percent longer than Alternatives II-A, II-D, II-E, and II-F, which equates to increased crossings, ground disturbance, and water use.

3.4.6.6 Region III

Table 3.4-14 provides a tabulation of impacts associated with the alternative routes in Region III. Key impact parameters relate to the impact discussion in Section 3.4.6.2, Impacts Common to all Alternative Routes and Associated Components. Changes to road density within the affected watersheds (HUC10) are tabulated in **Table 3.4-15**. Specific differences by alternative are discussed below. No streams with impairments for sediment or physical alterations are crossed by alternatives in Region III.

Table 3.4-14 Summary of Region III Alternative Route Impact Parameters

Parameter	Alternative III-A	Alternative III-B	Alternative III-C
Waterbody Crossings (count)			
Total	535	449	515
Perennial	3	5	0
Intermittent	511	421	491
Canals	17	20	21
Reservoirs/Lakes	4	3	3
Impaired	2	1	0
Springs/Seeps in 2-mile transmission line corridor	16	9	10
Floodplains over 1,000 feet wide (count)	2	2	2
Water Use (acre-feet)[1]	206	212	230
Construction Disturbance (acres)	3,641	3,593	3,926
Operation Disturbance (acres)	996	875	953

[1] Estimation of water use based on assumptions provided for construction of a 600-kV DC transmission line.

Alternative III-A (Applicant Proposed)

Key Parameters Summary

Alternative III-A would entail the crossing of three perennial streams, two of which are impaired. Pinto Creek is listed because of observed bio-toxicity, and the Muddy River is impaired due to elevated iron, temperature, and boron. Existing crossings of these waterways are located within several miles of the proposed new crossings and would be utilized according to mitigation measure **WR-1**. Through the implementation of applicant-committed design features, agency BMPs, and mitigation measures **WR-1** and **WR-2**, impacts to water quality from stream crossings would be minimized to include only the potential for unstable streambanks to contribute sediment to streams. Although other factors contribute to erosion and sediment yield in upland areas (e.g., soil type, vegetative cover, slope), an increased contribution of sediment would be expected relative to the amount of construction and operation disturbance, and relative to the increase in road density especially near perennial waterways. Road density due to Alternative III-A generally increases no more than 0.1 mi/mi^2, with exceptions in 8 watersheds where the highest increase in road density of 1.61 mi/mi^2 was calculated within the 100-foot perennial buffer of The Big Wash-Beaver River Watershed. Additionally, agency stipulations for the affected BLM FOs and USFS-administered

Table 3.4-15 Summary of Road Density Changes by Watershed (HUC10) in Region III

Watershed Name	HUC10	Existing Density (mi/mi^2)			Alternative II-A Added Density (mi/mi^2)			Alternative II-B Added Density (mi/mi^2)			Alternative II-C Added Density (mi/mi^2)		
		100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC
California Wash	1501001207	0	0	0.73	0	0	0.14	0	0	0.09			
Cathedral Gorge-Meadow Valley Wash	1501001306	5.05	4.66	1.40							0	0	0.11
Clover Creek	1501001305	7.75	5.63	0.82				0	0	0.08			
Delamar Valley	1606000910	0	4.06	0.93							0	0	0.09
Dry Lake Valley	1501001206	0	0	0.73				0	0	0.04	0	0	0.15
Dry Lake Valley	1606000909	0	0	0.97							0	0	0.03
Elbow Canyon	1501001204	0	0	0.19							0	0	0.10
Escalante Valley-Pinto Creek	1603000614	5.21	5.35	1.59	0	0	0.07	0	0	0.02	0	0	0.02
Fisher's Wash	1603000607	2.97	5.89	1.60	0	0	0.06	0	0	0.06	0	0	0.06
Fourmile Wash-Frontal Lund Flats	1603000606	19.86	9.24	1.54	0	0	0.01	0	0	0.06	0	0	0.06
Garden Wash	1501001004	0	0	0.91				0	0	0.16			
Gold Springs Wash	1603000610	0.68	2.53	1.17				0	0	0.08	0	0	0.11
Government Wash-Colorado River	1501000512	0.05	0.12	1.09	0	0	0.02	0	0	0.02	0	0	0.01
Halfway Wash-Virgin River	1501001007	0.04	0.33	0.83	0	0	0.05	0	0	0.03			
Hog Back Reservoir-Old River Bed	1603000510	0	0.70	1.13	0	0	0.02	0	0	0.02	0	0	0.02
Iron Springs Creek-Frontal Lund Flats	1603000605	4.24	5.54	2.14	0	0	0.05	0	0	0.03	0	0	0.03
Kane Springs Wash	1501001201	0	1.10	0.61							0	0	0.01
Kershaw Canyon-Meadow Valley Wash	1501001307	6.88	7.74	0.66							0	0	0.02
Long Lick Canyon-Big Wash	1603000703	1.05	2.58	2.13	0	0	0.08	0	0	0.08	0	0	0.08
Lower Beaver Dam Wash	1501001002	0.96	1.40	0.80	0.19	0.20	0.04	0.33	0.33	0.05			
Lower Beaver River	1603000805	0	0	1.30							0	0	0.13
Lower Meadow Valley Wash	1501001309	0.38	1.00	0.31				0.31	0.36	0.01			
Lower Muddy River	1501001209	1.70	2.80	1.03	0.11	0.23	0.10	0	0	0.06			
Lower Santa Clara River	1501000808	2.91	4.43	2.00	0	0	0.05						
Lower Sevier River	1603000517	1.64	2.64	1.56	0	0	0.10	0	0	0.10	0	0.16	0.09
McDonald Wash-Negro Liza Wash	1603000612	2.25	2.58	1.27				0	0	0.09	0	0	0.09

Table 3.4-15 Summary of Road Density Changes by Watershed (HUC10) in Region III

Watershed Name	HUC10	Existing Density (mi/mi^2)			Alternative II-A Added Density (mi/mi^2)			Alternative II-B Added Density (mi/mi^2)			Alternative II-C Added Density (mi/mi^2)		
		100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC
Middle Pahranagat Wash	1501001203	0	0	0.36							0	0	0.11
Moody Wash	1501000806	2.09	3.02	1.46	0	0	0.19						
Morehouse Canyon-Beaver River	1603000707	0	0	1.44	0	0	0.11	0	0	0.11	0	0	0.11
Mountain Spring Wash	1603000609	2.88	6.16	1.30				0	0	0.02	0	0	0.02
Mud Spring Wash	1603000608	4.32	5.06	1.87	0	0	0.02	0	0	0.01	0	0	0.01
Nellis Air Force Base	1501001504	19.43	17.07	3.39							0	0	0.01
Pahranagat Creek	1501001116	1.67	2.31	0.80							0	0	0.03
Picture Rock Wash	1603000509	1.01	1.31	1.30	0	0	0.04	0	0	0.04	0	0	0.04
Red Rock Wash	1606000908	3.02	12.08	0.83							0	0	0.16
Sand Hollow Wash-Virgin River	1501001006	0.68	0.93	1.56	0	0	0.03						
Shoal Creek	1603000613	6.98	7.39	1.80	0.28	0.64	0.08						
Soap Hollow	1603000516	3.42	11.86	1.22	0	0	0.01	0	0	0.01			
Swasey Wash	1603000511	8.26	7.62	0.89	0	0	0.01	0	0	0.01	0	0	0.01
The Big Wash-Beaver River	1603000706	1.89	2.73	2.39	1.61	0.76	0.06	1.61	0.76	0.06	1.61	0.76	0.06
Toquop Wash	1501001005	5.07	3.74	0.57	0	0	0.09	0	0	0.10			
Upper Beaver Dam Wash	1501001001	5.62	3.39	0.95	0	0	0.07						
Upper Beaver River	1603000803	6.16	7.02	1.41	0	0	0.13	0	0	0.13	0	0	0.12
Upper Muddy River	1501001208	2.90	3.00	1.01	0	0	0.03	0.07	0.09	0.05			
Upper Pahranagat Wash	1501001202	0	3.73	0.27							0	0	0.09
Upper Santa Clara River	1501000807	1.82	2.65	1.56	0	0	0.06						

Notes: Road density is reported as miles of road divided by square miles of area. Blanks indicate watershed is not affected by the alternative.

100 feet: area of watershed within 100 feet of a perennial waterway; 300 feet: area of watershed within 300 feet of a perennial waterway; HUC 10: entire HUC 10 Watershed area.

Sources: NRCS et al. 2010; U.S. Census Bureau 2010.

lands require the avoidance of areas near perennial waterways (see **Appendix C**). Water use would require 206 acre-feet of water. Water would be supplied through arrangements with existing water rights holders and temporary use permits, subject to review and approval by the appropriate state. No new withdrawals would be required, and no effects on other water users would be anticipated.

Alternative III-B (Agency Preferred)

Key Parameters Summary

Alternative III-B would entail the crossing of five perennial streams, one of which is impaired. The Muddy River is impaired due to elevated iron, phosphate, temperature, and decreased dissolved oxygen. Existing crossings of the Muddy River are within 1 mile and would be utilized according to mitigation measure **WR-1**. Through the implementation of applicant-committed design features, agency BMPs, and mitigation measures **WR-1** and **WR-2**, impacts to water quality from stream crossings would be minimized to include only the potential for unstable streambanks to contribute sediment to streams. Although other factors contribute to erosion and sediment yield in upland areas (e.g., soil type, vegetative cover, slope), an increased contribution of sediment would be expected relative to the amount of construction and operation disturbance, and relative to the increase in road density especially near perennial waterways. Road density due to Alternative III-B generally increases no more than 0.1 mi/mi^2, with exceptions in 6 watersheds where the highest increase in road density of 1.61 mi/mi^2 was calculated within the 100-foot perennial buffer of the Big Wash–Beaver River Watershed. Additionally, agency stipulations in the affected BLM FOs require the avoidance of areas near perennial waterways (see **Appendix C**). Water use would require 212 acre-feet of water. Water would be supplied through arrangements with existing water rights holders and temporary use permits, subject to review and approval by the appropriate state. No new withdrawals would be required, and no effects on other water users would be anticipated.

Alternative III-C

Key Parameters Summary

Alternative III-C would not entail crossing perennial streams, and no impaired streams would be crossed. Through the implementation of applicant-committed design features, agency BMPs, and mitigation measures **WR-1** and **WR-2**, impacts to water quality from stream crossings would be minimized to include only the potential for unstable streambanks to contribute sediment to streams. Although other factors contribute to erosion and sediment yield in upland areas (e.g., soil type, vegetative cover, slope), an increased contribution of sediment would be expected relative to the amount of construction and operation disturbance, and relative to the increase in road density especially near perennial waterways. Road density due to Alternative III-C generally increases no more than 0.1 mi/mi^2, with exceptions in 8 watersheds where the highest increase in road density of 1.61 mi/mi^2 was calculated within the 100-foot perennial buffer of the Big Wash-Beaver River Watershed. Additionally, agency stipulations in the affected BLM FOs require the avoidance of areas near perennial waterways (see **Appendix C**). Water use would require 230 acre-feet of water. Water would be supplied through arrangements with existing water rights holders and temporary use permits, subject to review and approval by the appropriate state. No new withdrawals would be required, and no effects on other water users would be anticipated.

Alternative Variations in Region III

Table 3.4-16 provides a comparison of impacts associated with the alternative variations in Region III. Each of the alternative variations in Region III would require increased water use and disturbance areas when compared with the corresponding portion of the alternative route they would replace. Ox Valley East Alternative Variation would slightly reduce total waterbody crossings; Ox Valley West Alternative Variation and Pinto Alternative Variations would slightly increase total waterbody crossings. Both Ox Valley variations would reduce perennial stream crossings when compared with the corresponding portion of the alternative route they would replace.

Alternative Connectors in Region III

Table 3.4-17 summarizes impacts associated with the alternative connectors in Region III. The Moapa Alternative Connector would include an increase in total waterbodies crossed, disturbed areas, and water use.

Table 3.4-16 Summary of Region III Alternative Variation Impact Parameters

	Waterbody Crossings (count)						Floodplains over 1,000 feet wide (count)	Water Use (acre-feet)[1]	Construction Disturbance (acres)	Operation Disturbance (acres)
	Total	Perennial	Intermittent	Canals	Reservoirs/Lakes	Impaired				
Ox Valley East Alternative Variation	30	1	29	0	0	0	0	26	276	100
Comparable portion of III-A	33	2	30	0	1	0	0	25	252	95
Ox Valley West Alternative Variation	34	1	33	0	0	0	0	26	268	100
Comparable portion of III-A	33	2	30	0	1	0	0	25	252	95
Pinto Alternative Variation	64	7	57	0	0	4	0	34	449	111
Comparable portion of III-A	62	2	57	2	1	1	0	35	381	125

[1] Estimation of water use based on assumptions provided for construction of a 600-kV DC transmission line.

Table 3.4-17 Summary of Region III Alternative Connector Impact Parameters

	Waterbody Crossings (count)						Floodplains over 1,000 feet wide (count)	Water Use (acre-feet)[1]	Construction Disturbance (acres)	Operation Disturbance (acres)
	Total	Perennial	Intermittent	Canals	Reservoirs/Lakes	Impaired				
Avon Alternative Connector	0	None					0	8	104	21
Conclusion	There are no apparent unique opportunities or constraints for water resources by utilizing this connector.									
Moapa Alternative Connector	27	0	27	0	0	0	0	13	168	34
Conclusion	There are no apparent unique opportunities or constraints for water resources by utilizing this connector.									

[1] Estimation of water use based on assumptions provided for construction of a 600-kV DC transmission line.

Alternative Ground Electrode Systems in Region III

It would be necessary to locate the southern ground electrode system within 100 miles of the Southern Terminal as discussed in Chapter 2.0. Although the location for this system has not been determined, conceptual locations and connections to the alternative routes have been provided by TWE. The impacts associated with constructing and operating this system are the same as those discussed in Section 3.4.6.2, Impacts Common to all Alternative Routes and Associated Components. **Table 3.4-18** summarizes impacts associated with the seven combinations of alternative routing and locations possible for a southern ground electrode system.

Region III Conclusion

Impacts to water resources from the alternatives in Region III are all relatively similar. Alternative III-B would require the least number of stream crossings. Considering design features, stipulations, BMPs, and mitigation measures, impacts to water resources would be expected to be minor.

Table 3.4-18 Summary of Region III Alternative Ground Electrode System Impact Parameters

	Waterbody Crossings (count)						Floodplains over 1,000 feet wide (count)	Water Use[1] (acre-feet)	Construction Disturbance (acres)	Operation Disturbance (acres)
	Total	Perennial	Intermittent	Canals	Reservoirs/Lakes	Impaired				
Mormon Mesa-Carp Elgin Rd (Alternative III-A)	12	0	4	0	8	0	0	4	91	19
Halfway Wash-Virgin River (Alternative III-A)	3	0	3	0	0	0	0	3	84	16
Halfway Wash East (Alternative III-A)	12	0	12	0	0	0	0	6	104	26
Mormon Mesa-Carp Elgin Rd (Alternative III-B)	13	0	5	0	8	0	0	6	103	26
Halfway Wash-Virgin River (Alternative III-B)	3	0	3	0	0	0	0	4	93	20
Halfway Wash East (Alternative III-B)	1	0	1	0	0	0	0	6	102	25
Meadow Valley 2 (Alternative III-C)	27	0	27	0	0	0	0	16	174	66
Delta (Design Option 2)	16	0	16	0	0	0	0	14	160	50

[1] Estimation of water use based on assumptions provided for construction of a 600-kV DC transmission line.

3.4.6.7 Region IV

Table 3.4-19 provides a tabulation of impacts associated with the alternative routes in Region IV. Key impact parameters relate to the impact discussion in Section 3.4.6.2, Impacts Common to all Alternative Routes and Associated Components. Changes to road density within the affected watersheds (HUC10) are tabulated in **Table 3.4-20**. Specific differences by alternative are discussed below. No streams with impairments for sediment or physical alterations are crossed by alternatives in Region IV.

Table 3.4-19 Summary of Region IV Alternative Route Impact Parameters

Parameter	Alternative IV-A	Alternative IV-B	Alternative IV-C
Waterbody Crossings (count)			
Total	67	56	55
Perennial	1	3	2
Intermittent	65	48	49
Canals	1	5	4
Reservoirs/Lakes	0	0	0
Impaired	1	1	1
Springs/Seeps in 2-mile transmission line corridor	0	0	0
Floodplains over 1,000 feet wide (count)	0	0	0
Water Use (acre-feet)	29	30	32
Construction Disturbance (acres)	566	573	663
Operation Disturbance (acres)	148	180	182

[1] Estimation of water use based on assumptions provided for construction of a 600-kV DC transmission line.

Table 3.4-20 Summary of Road Density Changes by Watershed (HUC10) in Region IV

Watershed Name	HUC10	Existing Density (mi/mi^2)			Alternative II-A Added Density (mi/mi^2)			Alternative II-B Added Density (mi/mi^2)			Alternative II-C Added Density (mi/mi^2)		
		100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC	100 feet	300 feet	HUC
Duck Creek-Las Vegas Wash	1501001507	2.93	4.39	6.54	0.16	0.09	0.07						
Eldorado Valley	1606001518	0.61	1.85	1.28	0	0	0.06	0	0	0.08	0	0	0.10
Government Wash-Colorado River	1501000512	0.05	0.12	1.09	0	0	0.11	0	0	0.18	0	0	0.18
Gypsum Wash-Colorado River	1501000513	0.03	0.05	0.38				0	0.01	0.06	0	0.01	0.04
Jumbo Wash-Colorado River	1503010101	0.06	0.14	0.56							0	0	0.01

Note: Road density is reported as miles of road divided by square miles of area. Blanks indicate watershed is not affected by the alternative.

100 feet: area of watershed within 100 feet of a perennial waterway; 300 feet: area of watershed within 300 feet of a perennial waterway; HUC 10: entire HUC 10 Watershed area.

Sources: US Census Bureau 2010, NRCS et al. 2010

Alternative IV-A (Applicant Proposed and Agency Preferred)

Key Parameters Summary

Alternative IV-A would entail the crossing of one perennial stream that is impaired. Las Vegas Wash is impaired due to elevated iron and molybdenum. A TMDL has been established to limit phosphorus, ammonia, and chlorophyll-a. Construction of crossings in this wash would be avoided by utilization of existing crossings in the area. Through the implementation of applicant-committed design features, agency BMPs, and mitigation measures **WR-1** and **WR-2**, impacts to water quality from stream crossings would be minimized to include only the potential for unstable streambanks to contribute sediment to streams. Although other factors contribute to erosion and sediment yield in upland areas (e.g., soil type, vegetative cover, slope), an increased contribution of sediment would be expected relative to the amount of construction and operation disturbance, and relative to the increase in road density especially near perennial waterways. Road density due to Alternative IV-A increases no more than 0.16 mi/mi^2. Additionally, agency stipulations in the affected BLM FOs require the avoidance of areas near perennial waterways (see **Appendix C**). Water use would require 29 acre-feet of water. Water would be supplied through arrangements with existing water rights holders and temporary use permits, subject to review and approval by the appropriate state. No new withdrawals would be required, and no effects on other water users would be anticipated.

Alternative IV-B

Key Parameters Summary

Alternative IV-B would entail the crossing of three perennial streams, one of which is impaired. Las Vegas Wash is impaired due to elevated iron and molybdenum. A TMDL has been established to limit phosphorous, ammonia, and chlorophyll-a. Construction of crossings in this wash would be avoided by utilization of existing crossings in the area. Through the implementation of applicant-committed design features, agency BMPs, and mitigation measures **WR-1** and **WR-2**, impacts to water quality from stream crossings would be minimized to include only the potential for unstable streambanks to contribute sediment to streams. Although other factors contribute to erosion and sediment yield in upland areas (e.g., soil type, vegetative cover, slope), an increased contribution of sediment would be expected relative to the amount of construction and operation disturbance, and relative to the increase in road density especially near perennial waterways. Road density due to Alternative IV-B increases no more than 0.18 mi/mi^2. Additionally, agency stipulations in the affected BLM FOs require the avoidance of areas near perennial waterways (see **Appendix C**). Water use would require 30 acre-feet of water. Water would be supplied through arrangements with existing water rights holders and temporary use permits, subject to review and approval by the appropriate state. No new withdrawals would be required, and no effects on other water users would be anticipated.

Alternative IV-C

Key Parameters Summary

Alternative IV-C would entail the crossing of two perennial streams, one of which is impaired. Las Vegas Wash is impaired due to elevated iron and molybdenum. A TMDL has been established to limit phosphorous, ammonia, and chlorophyll-a. Construction of crossings in this wash would be avoided by utilization of existing crossings in the area. Through the implementation of applicant-committed design features, agency BMPs, and mitigation measures **WR-1** and **WR-2**, impacts to water quality from stream crossings would be minimized to include only the potential for unstable streambanks to contribute sediment to streams. Although other factors contribute to erosion and sediment yield in upland areas (e.g., soil type, vegetative cover, slope), an increased contribution of sediment would be expected relative to the amount of construction and operation disturbance, and relative to the increase in road density especially near perennial waterways. Road density due to Alternative IV-C increases no more than 0.18 mi/mi^2. Additionally, agency stipulations in the affected BLM FOs require the avoidance of areas near perennial waterways (see **Appendix C**). Water use would require 32 acre-feet of water. Water would be supplied through arrangements with existing water rights holders and temporary use permits, subject to

review and approval by the appropriate state. No new withdrawals would be required, and no effects on other water users would be anticipated.

Alternative Variations in Region IV

Table 3.4-21 provides a comparison of impacts associated with the alternative variation in Region IV. The Marketplace Alternative Variation would not cross any waterbodies, nor would the corresponding portion of the alternative route (Alternative IV-B) it would replace. The same comparison shows a slight increase in disturbance area and water use if the variation were constructed.

Table 3.4-21 Summary of Region IV Alternative Variation Impact Parameters

	Waterbody Crossings (count)						Floodplains over 1,000 feet wide (count)	Water Use (acre-feet)[1]	Construction Disturbance (acres)	Operation Disturbance (acres)
	Total	Perennial	Intermittent	Canals	Reservoirs/Lakes	Impaired				
Marketplace Alt. Variation	0	0	0	0	0	0	0	8	109	21
Comparable portion of IV-B	0	0	0	0	0	0	0	7	82	19

[1] Estimation of water use based on assumptions provided for construction of a 600-kV DC transmission line.

Alternative Connectors in Region IV

Table 3.4-22 tabulates impacts associated with the alternative connectors in Region IV. Each alternative connector would increase the total number of waterbodies crossed, disturbed areas, and amount of water used.

Table 3.4-22 Summary of Region IV Alternative Connector Impact Parameters

	Waterbody Crossings (count)						Floodplains over 1,000 feet wide (count)	Water Use (acre-feet)[1]	Construction Disturbance (acres)	Operation Disturbance (acres)
	Total	Perennial	Intermittent	Canals	Reservoirs/Lakes	Impaired				
Sunrise Mountain Alt. Connector	4	0	4	0	0	0	0	3	38	8
Conclusion	This connector could be utilized through numerous combinations to avoid crossing the impaired reach of Las Vegas Wash. There are no apparent unique constraints for water resources by utilizing this connector.									
Lake Las Vegas Alt. Connector	9	0	8	1	0	0	0	5	54	19
Conclusion	This connector could be utilized through numerous combinations to avoid crossing the impaired reach of Las Vegas Wash. There are no apparent unique constraints for water resources by utilizing this connector.									
Three Kids Mine Alt. Connector	8	0	8	0	0	0	0	9	93	34
Conclusion	This connector could be utilized through numerous combinations to avoid crossing the impaired reach of Las Vegas Wash. There are no apparent unique constraints for water resources by utilizing this connector.									
River Mountains Alt. Connector	10	1	8	1	0	0	0	14	142	57
Conclusion	There are no apparent unique opportunities or constraints for water resources by utilizing this connector.									
Railroad Pass Alt. Connector	4	0	4	0	0	0	0	4	58	14
Conclusion	There are no apparent unique opportunities or constraints for water resources by utilizing this connector.									

[1] Estimation of water use based on assumptions provided for construction of a 600-kV DC transmission line.

Region IV Conclusion

Impacts to water resources in Region IV are relatively similar. Alternative IV-A has more stream crossings; however, the development in the area would provide opportunities for use of existing crossings. Water use and construction disturbance show no appreciable differences among the alternatives. Considering design features, stipulations, BMPs, and mitigation measures, impacts to water resources would be expected to be minor.

3.4.6.8 Residual Impacts

Mitigation measures are designed to identify and reduce impacts to water resources but do not fully eliminate those impacts. The Project would result in the potential for site-specific increases of upland erosion during construction, thereby increasing sedimentation to streams. This impact would decrease with successful reclamation; however, some continued increases in sedimentation would be expected in areas with poor or low reclamation potential during operation due to the continued use of constructed roads.

3.4.6.9 Impacts from the No Action Alternative

Current management across the analysis area would be maintained under the No Action alternative. Under this alternative, there would be no Project construction, operation, or maintenance disturbance to impact water quality or water use. There would be no Project construction, operation, or maintenance equipment or infrastructure in the area to cause hazardous material spills.

3.4.6.10 Irreversible and Irretrievable Commitment of Resources

Irreversible impacts to surface water are not anticipated since environmental measures, including reclamation, would mitigate effects on water quantity and quality over time. Temporary reductions in water quality from erosion and sedimentation would be irretrievable.

Water consumptively used during the project would be irretrievable. However, this would not be irreversible because the water uses would end after construction of the Project.

3.4.6.11 Relationship Between Local Short-term Uses and Long-term Productivity

Increases in erosion and decreases in streamside bank vegetation during construction could potentially impact channel stability beyond the construction phase of the Project. If reclamation is effectively implemented, this would not impact the long-term productivity of the streams.